APPENDIX C

LAND READJUSTMENT

APPENDIX C

LAND READJUSTMENT

INTRODUCTION

Reasons for Selection of Laem Chabang

The Laem Chabang New Town area was selected for the land readjustment (L/R) study for two reasons. First, it offered the convenience of an already-prepared development plan. Several technical studies (e.g., "Technical Study for Preparation of Laem Chabang Coastal Area") had been prepared, and the staff of DTCP was well-acquainted with the study area through the preparation of its specific plan. The second reason for choosing Laem Chabang New Town was that it offered a test case for showing how the specific planning system can be made practical and functional. Indeed the goal of land readjustment is to make specific planning easier to implement.

Development Plan

The Development Plan for the Laem Chabang New Town area was prepared and incorporated in the Laem Chabang General Plan. Also, the Development Plan has been translated into a draft of a specific plan and is now awaiting its enactment into law. In this study, DTCP decided to use the first draft of the specific plan.

Laem Chabang New Town Community Development

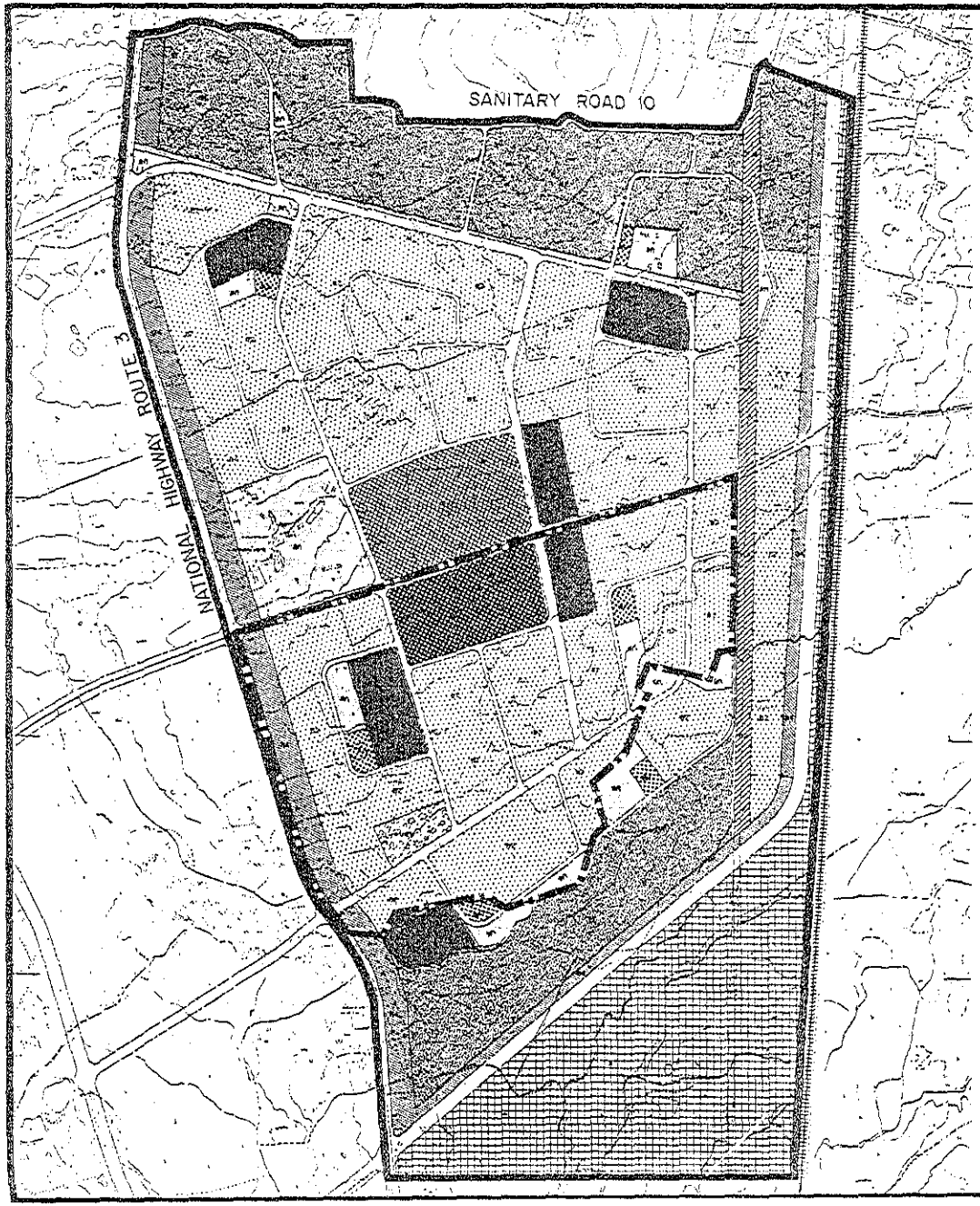
The new town community is one of the principal developments in the Laem Chabang area. The new town is aimed at providing housing to accommodate workers on the Laem Chabang Area Project, which consists of a deep-sea port and an industrial estate.

Land Use Plan and Project Site

Based on these development concepts, a land use plan was mapped out in the specific planning process (see Figure C-1). The site for the land readjustment project was designated within this new town (see Figure C-2).

PREPARATION OF ACTION PLAN

The study procedure for preparing an Action Plan is shown in Figure C-3. First, the project area boundary was delineated, followed by an analysis of existing conditions and the formulation of the land readjustment design, which provides the basic for replotting. Based on the L/R design, a financial plan and program were established centering on the calculation of contribution ratio and reserve land, key elements in project financing.



LEGEND

- RESIDENTIAL AREA (DETACHED, SEMI - DETACHED)
- RESIDENTIAL AREA (ROW HOUSE)
- RESIDENTIAL AREA (APARTMENT)
- RESIDENTIAL AREA (DETACHED)
- COMMERCIAL AREA (TOWN CENTER)
- FACILITIES AND "SUB COMMERCIAL" AREA (LOCAL ADMINISTRATIVE, PLAYGROUND, KINDERGARTEN, AND RETAIL SHOP)
- GOVERNMENT INSTITUTION, PUBLIC UTILITY & FACILITY AREA
- OPEN SPACE FOR RECREATION AREA (PRIMARY SCHOOL, PLAYGROUND, RECREATION AREA)
- EDUCATIONAL INSTITUTION AREA (SECONDARY SCHOOL)
- AGRICULTURAL AREA
- OPEN SPACE FOR CONSERVATION OF ENVIRONMENTAL DUALITY

- BOUNDARY OF PROJECT SITE FOR LAND READJUSTMENT FOR STUDY
- BOUNDARY OF LAEM CHABANG NEWTOWN PROJECT PLAN
- EXISTING ROAD
- PROPOSED ROAD
- RAILWAY LINE

Fig. C-1

Fig. C-1
ZONING OF LAEM CHABAN NEW TOWN

DTCP., MINISTRY OF INTERIOR
IN COOPERATION WITH JICA STUDY TEAM

LAND READJUSTMENT CASE STUDY I:
LAEM CHABANG NEW TOWN

LAND READJUSTMENT WORKING GROUP

SHOW:
ZONING OF
LAEM CHABANG NEWTOWN

NORTH

SCALE 0 200 400 600 M

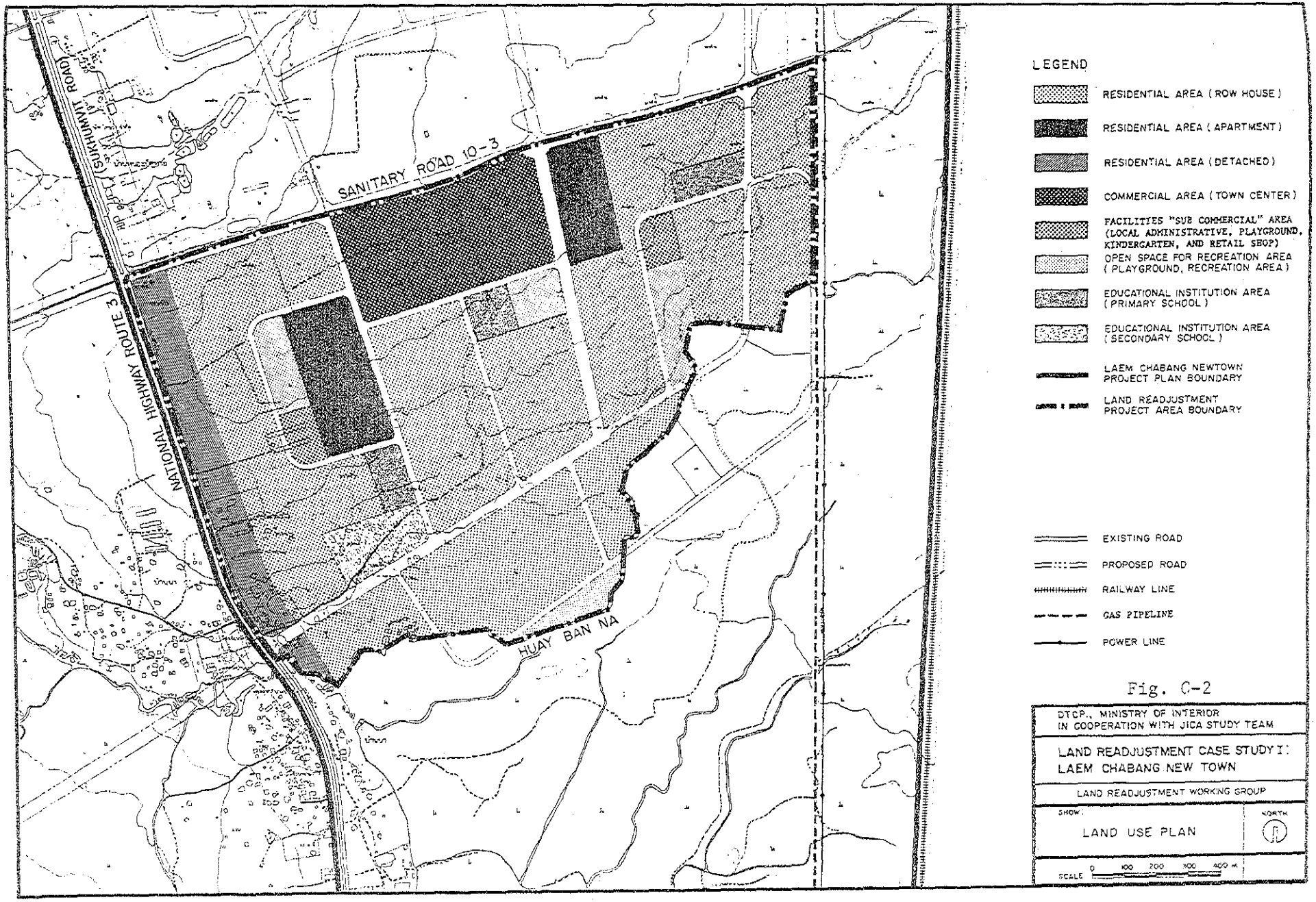

SANITARY ROAD 10-3
SUKHUMVIT ROAD (SUKHUMVIT)
NATIONAL HIGHWAY ROUTE 3
HUAY BAN NA
LEGEND
RESIDENTIAL AREA (ROW HOUSE)
RESIDENTIAL AREA (APARTMENT)
RESIDENTIAL AREA (DETACHED)
COMMERCIAL AREA (TOWN CENTER)
FACILITIES "SUB COMMERCIAL" AREA (LOCAL ADMINISTRATIVE, PLAYGROUND, KINDERGARTEN, AND RETAIL SHOP)
OPEN SPACE FOR RECREATION AREA (PLAYGROUND, RECREATION AREA)
EDUCATIONAL INSTITUTION AREA (PRIMARY SCHOOL)
EDUCATIONAL INSTITUTION AREA (SECONDARY SCHOOL)
LAEM CHABANG NEWTOWN PROJECT PLAN BOUNDARY
LAND READJUSTMENT PROJECT AREA BOUNDARY
EXISTING ROAD
PROPOSED ROAD
RAILWAY LINE
GAS PIPELINE
POWER LINE
DTCP., MINISTRY OF INTERIOR
IN COOPERATION WITH JICA STUDY TEAM
LAND READJUSTMENT CASE STUDY I:
LAEM CHABANG NEW TOWN
LAND READJUSTMENT WORKING GROUP
SHOW:
LAND USE PLAN
NORTH
SCALE 0 100 200 300 400 m

Fig. C-2

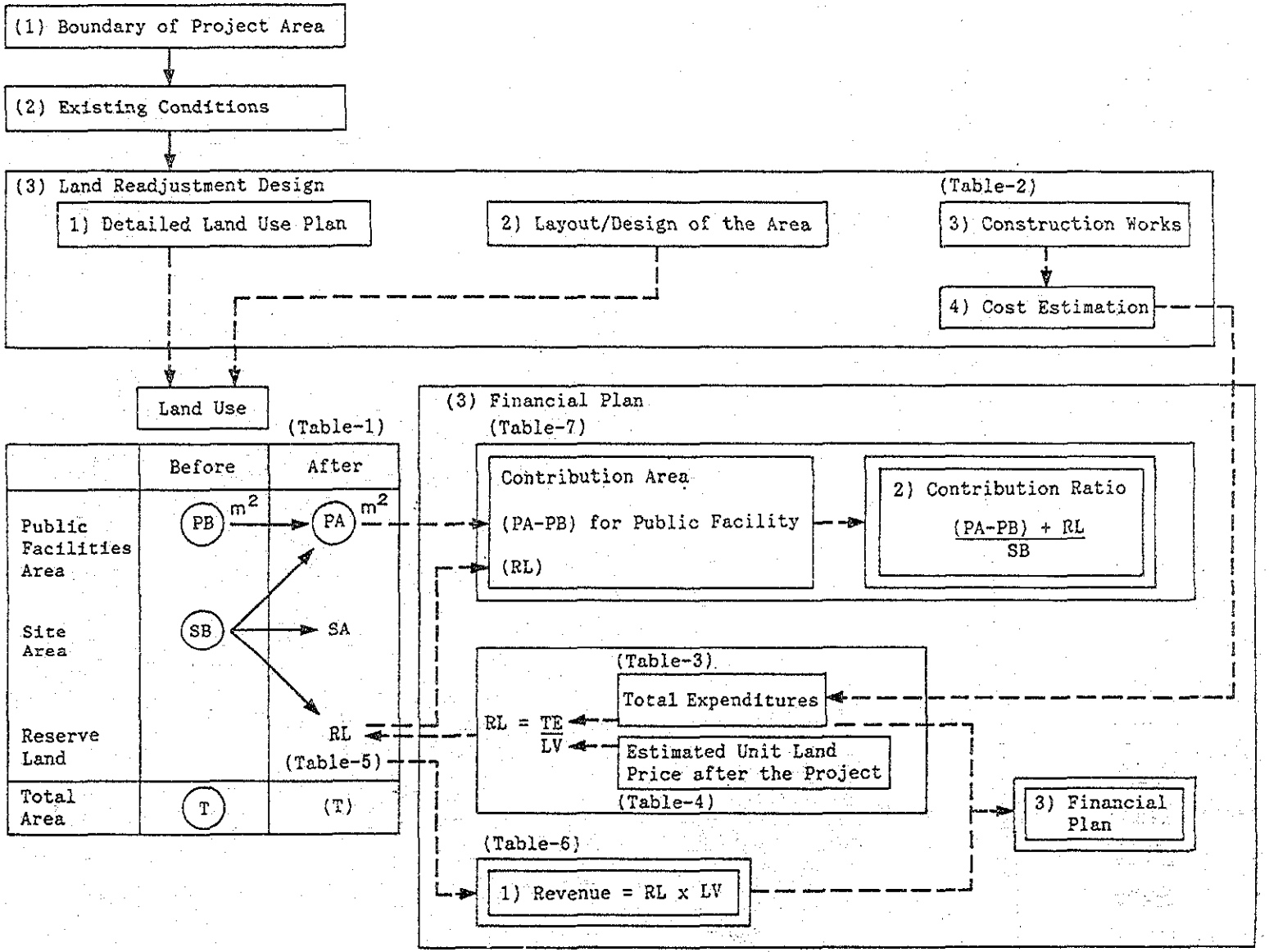


Fig. C-3 ACTION PLAN STUDY PROCEDURE

Project Area Boundary

The project area for the study covers about 2.5 square kilometers (1,636.39 rai), which is about one-fourth of the proposed New Town Area as defined by DTCP's Specific Planning Division. The project area boundary was established along immovable physical structures: Sanitary Road 10-3 (north), the Huay Ban Na Waterway (south), a gas pipeline (east), and the Sukhumvit Road (west). In addition, the following factors were taken into consideration in designating the project site:

- extent of service area of public facilities (e.g., roads and parks) being constructed through the land readjustment project area;
- economic, social, and physical unity envisioned in the land use plan (e.g., neighborhood units); and
- size of project area that would best facilitate implementation.

Unfortunately, the last factor could not effectively be applied in this study because the implementing body had not been identified. However, it was known that the new town development will be divided into three or four phases; therefore, to facilitate implementation, a project area equivalent to approximately one phase of the new town project was selected.

Existing Conditions

Topography and Vegetation. The topography of the study area is characterized by flat land with an elevation varying from 10 to 30 meters. Cassava fields cover most of the study area, with clusters of coconut and mango trees scattered throughout.

Climate. The study area has two distinct seasons. A dry season with a northeast monsoon lasts from November to April, while a wet season with a southwest monsoon extends from May to October.

The average temperature is 28.0 degrees C. The mean relative humidity ranges from 66% in December to 80% in September. The diurnal variation in relative humidity is 30-35% during the dry season and 25-31% during the rainy season. The average annual rainfall is about 1,300 mm, of which more than 80% occurs during the wet season.

Geology. In general, the geology of the study area provides a solid foundation. Most of the area is loamy.

Population. The study area has 68 households and a population of approximately 350, assuming an average household size of 5.

Existing Land Use. The area is mostly agricultural with a few developments along Sukhumvit Road. Approximately 40 households are clustered in the southwest corner of the study area, along Sukhumvit Road. Also, two warehouses are located near Sukhumvit Road. Paddy fields and orchards (coconut and mango) account for all the remaining land.

Existing Facilities. Currently, the study area has roads, electricity, and water. However, the road infrastructure is limited to a few laterite roads. And the water is not available through pipes, but rather the residents tap into the groundwater supply with their own artesian basins.

Land Readjustment Design

Detailed Land Use Plan

This land readjustment study was conducted in a manner consistent with the land use plan developed in the specific planning process. The land use plan called for a row house residential area over a large part of the project area, with a "town center" commercial area serving the residential areas.

Layout/Design

Basic Policy for Laying Out Road Network. The layout of the road network has a significant effect on the land readjustment process because the road network determines the physical and economic framework for replotting. [1] The main roads in the new town are a loop-type arterial road connected with the regional arterial road (Sukhumvit Road) and the other arterial roads traversing the site from east to west. These main roads are supplemented by secondary roads that provide access to areas left unserved by the arterial roads. These arterial and secondary roads seem to divide the new town into several super blocks into which feeder roads penetrate. The specific plan does not provide any details on access roads from these feeder roads to individual lots. The lack of any details on access roads could be explained by any of a number of reasons. For example, the planners may have assumed that the construction of these roads is the responsibility of the individual landowners. Also, it may have been assumed that the developers, whether public or private, would purchase and consolidate land for the development of access roads. In addition, it may be assumed that access roads were not designed because super block developments were intended. In any case, consistent with the specific plan, access roads were not designed in this land use readjustment study.

Basic Block Design Policy. In the draft of the specific plan, the size of an average block is approximately 300 m by 600 m. The technical manual prepared by the JICA Study Team indicated that the standard size of a block should be determined based on the size of the lots to be replotted in the block and the optimum size of lots for the land use. Taking these factors into consideration, such a block size may be appropriate to accommodate the row house or town center development called for in the draft of the specific plan.

---

[1] Replots are allotted in the blocks formed by the road network, and roads are a major factor affecting land values, which provide the basis for economic calculations in the replotting process.

Since the study accepted the condition of compliance with the draft of the specific plan, the working group adopted the blocks designed in the draft plan. However, additional measures must be implemented if the process is to prove to be a feasible means of bridging the gap between the existing land use (private and subdivided) and the planned use (row house and town center).

Construction Work

The public facilities to be improved in this project include roads (arterials 1 and 2 and a collector road), a klong or canal, parks, and many others. A more detailed list appears in Tables C-1 and C-2.

Cost Estimation

The total project cost of all facilities was estimated at 250 million baht, as shown in Table C-1. This includes both the cost of construction (about 70% of the total) and the cost for landfill (accounting for 25%). The total cost amounts to approximately 153,000 baht/rai.

Change in Land Allocation Based on the Lay Out/Design

Land use before and after the project is summarized in Table C-2. With implementation of the public facility improvement plan, the area devoted to public facilities would increase from 48.52 rai before the project to 254.22 rai after the project. At the same time, the area devoted to private uses would decrease from 1,587.87 rai to 1,302.17 rai (including 147 rai of reserve land).

Financial Plan

Estimated Revenue from Disposition of Reserve Land

Land value. The total land value before the project is estimated at 1.2703 billion baht. After the project it is expected to increase by 96% to 2.4879 billion baht. The details of the calculation are presented in Table C-3. The total land value amounts to 2,000 baht/wah or 800,00 baht/rai before the project and 4,500 baht/wah or 1,800,000 baht/rai after the project.

Reserve Land. As shown in Table C-4, the maximum allowable area of reserve land is calculated by dividing the increase in the total land value of the project area (1.2176 billion baht) by the estimated unit selling price of land after the project (4,500 baht/wah). The amount of reserve land necessary to fund the total project construction cost was estimated at 147 rai assuming that all the reserve land will be sold at a price of 4,500 baht/wah. This quantity of reserve land would consume only 21.7% of the maximum allowable land for reserve land. Thus, only 21.7% of the economic benefits (i.e., the land value increases) from the project would be needed for financing with the remaining 78.3% to be left for the participating landowners.

TABLE C-1 COST ESTIMATION (EXPENDITURES)

Item	Type	Unit	Quantity	B/Unit	Mil.Bt.	%
Roads :	Arterail	sq.m	133,680	400	53.5	21.4
	Collector	sq.m	55,150	600	33.1	13.2
174.98 Rai	Local	sq.m	91,152	300	27.3	10.9
or						
279,968 sq.m	Total road	construc.	279,982	---	113.9	45.5
Klong/Canal	9.23 Rai		2,600	800	2.1	0.8
Parks/Green	70.00 Rai		112,000	200	22.4	8.9
Electricity	255.00 Unit		255	52,000	13.3	5.30
Telephone	200.00 Number		200	20,500	4.1	1.64
Water Works	60,000.00 Litre/Day		60,000	135	8.1	3.24
Waste Water	19,240.00 Pipe in M.		19,240	285	5.5	2.19
Others						
	Total other cons.				55.4	22.14
Total					169.3	67.6
	Cost of compensation					
Buildings	Bldg		55	100,000	5.5	2.2
Demolition					0.0	0.0
Water Works					0.0	0.0
Others					0.0	0.0
Total					5.5	2.2
Cost of Land Filling	Rai		300	180,000	54.0	21.6
Other Construction Cost(Dike)	m.				0.0	0.0
Cost of Study & Design (3%)					7.2	2.9
Office Cost					0.3	0.1
Interest on Loan				5.0%	14.0	5.6
Share Defrayment of Water Works & Sewerage System					0.0	0.0
Total					75.5	30.2
Grand Total					250.3	100.0

TABLE C-2 LAND USE BEFORE AND AFTER THE PROJECT

		Before	Ratio	After	Ratio	
Area of Facilities	Road	39.29	2.4	174.99	10.7	
	Parks	0.00	0.0	70.00	4.3	
	Klong	9.23	0.6	9.23	0.6	
	Others	0.00	0.0	0.0	0.0	
	Total	48.52	3.0	254.22	15.5	205.70 *
						(Contributed Area)
Area of Private Sites	Residence	33.30	2.0	1,135.17	69.4	
	Commerce	1.04	0.1	0.00	0.0	(Transfer to Reserved Land)
	Community Center	0.00	0.0	20.00	1.2	
	Industry	15.75	1.0	0.00	0.0	
	Agriculture	1,537.78	94.0	0.00	0.0	
	Others	0.00	0.0	0.00	0.0	
	Total	1,587.87	97.0	1,155.17	70.6	
Area of Government Site	Governmental Sites	0.00	0.0	0.00	0.0	
	Religional Institution	0.00	0.0	0.00	0.0	
	Educational Institution	0.00	0.0	80.00	4.9	
	Others	0.00	0.0	0.00	0.0	
	Total	0.00	0.0	80.00	4.9	
Total Land Use		1,587.87	97.0	1,235.17	75.5	
Gap of Register Area Reserved Land				147.00	9.0	1382.2 *
						(Area of Propose Land Use + Reserved Land)
Grand Total		1,636.39	100.0	1,636.39	100.0	

TABLE C-3 LAND VALUE CALCULATION

Area of existing private land		1,587.87 rai
Adjusted area of sites before		rai
Existing unit land price	*	800,000 baht/Rai
Total existing private's land value		1,270.3 mil.-baht
Total proposed project landuse (including reserved land)		1,382.17 rai
Estimated unit land price after the project	**	1,800,000 baht/Rai
Total land value after the project		2,487.9 mil.-baht
Increase ratio in total land value		195.9 %

* Estimated 2,000 baht/wa or 800,000 baht/Rai
** Estimated 4,5000 baht/wa or 1,8000,000 baht/Rai

TABLE C-4 RESERVE LAND CALCULATION

Total existing private land value of the site	1,270.3	Mil.-baht
Total land value of the sites after the project	2,487.9	Mil.-baht
Total increase in land value between before and after the project	1,217.6	Mil.-baht
Estimated selling unit price of land after the project	1,800,000	Baht/Rai
Maximum allowable area for reserved land	676.5	rai
Necessary area for reserved land	147.00	rai
Percentage of necessary area to maximum alllowable land for reserved land	21.7	%

Contribution Ratio/Area

Land in the project area is to be contributed to create sites for public facilities and to provide reserve land. Table C-5 shows the calculation of contribution area and the contribution ratio. The contribution area for public facilities is equal to the increase in area devoted to public facilities. In other words, it is the area (254.22 rai) of public facilities after the project minus the public facilities area (48.52 rai) before the project. The total contribution area is equal to the sum of reserve land and the increase in area devoted to public facilities. The contribution ratio is equal to total contribution area divided by total area devoted to existing land uses.

Financial Plan

Details of the financial plan are described in Table C-6. The cash flow of the land readjustment project from 1991 to 2005 is presented.

LAND VALUATION AND REPLOTTING

Purpose and Methodology

The aim of the land readjustment study was to train DTCP staff members to the point at which they could train themselves. To aid the DTCP staff, technical manuals were prepared, including one that focused on land valuation and another on replotting (calculation of area and replotting design). The manuals included examples, standards, guidelines, and detailed explanations (e.g., as shown in Figure C-4).

Land Information

The land information used was drawn from municipal tax maps and cadastrial maps prepared by the Department of Lands. One problem is that parts of the project area have not been covered by these maps. Also, land speculation has led to some land transactions not being registered, making it very difficult to know who actually owns land.

Calculation of Street Value

"Street Value" is equal to the sum of three elements: the Street Coefficient, the Accessibility Coefficient, and the Land Coefficient. The three coefficients are discussed below, but first street numbers are described.

Street Numbers. Street number maps, which are used to divide streets into sections that represent blocks, show street numbers before and after development. Streets before development are represented with three-digit numbers, and streets after development are represented with four-digit numbers.

In the case study, street numbers were designed in accordance with a street hierarchy based on proposed width. Number 1100 represented a street with a proposed width of 60 meters; Numbers 2200 through 3012 represented streets with a proposed width of 40 meters; numbers 4010-

TABLE C-5 CONTRIBUTION RATIO CALCULATION

Total area of Existing Landuses		1,587.87	rai
The area adjusted with gaps between registered and surveyed area			rai
The area of sites after the project	Including reserved land	1,382.17	rai
	Excluding reserved land	1,235.17	rai
Contribution area	For public facilities	205.70	rai
	For public facilities and reserved land	352.70	rai
Contribution ratio	For public facilities	13.0	%
	For public facilities and reserved land	22.2	%

TABLE C-6 FINANCIAL PLAN (REVENUES)

CASHFLOW FOR LAND READJUSTMENT PROJECT: 1991-2005

	Phase I: 1991-1995(1)					Phase II: 1996-2000(1)					Phase III: 2001-2005(1)					
	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
REVENUES																
A.Proj Loan(2)	13.00	16.00	12.00	10.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	56.00
B.Land Sales(3)	0.00	0.00	9.00	16.20	27.00	32.40	32.40	27.00	23.40	18.00	18.00	15.30	15.30	15.30	15.30	264.60
TOTAL REVENUES	13.00	16.00	21.00	26.20	32.00	32.40	32.40	27.00	23.40	18.00	18.00	15.30	15.30	15.30	15.30	320.60
EXPENDITURES(4)																
A.LOAN REPAYMENT																
Interest(5)5.0%	0.00	0.65	1.45	2.05	2.55	2.80	2.15	1.35	0.75	0.25	0.00	0.00	0.00	0.00	0.00	14.00
Capital(6)	0.00	0.00	0.00	0.00	0.00	13.00	16.00	12.00	10.00	5.00	0.00	0.00	0.00	0.00	0.00	56.00
TOTAL LOAN REPAYMENT	0.00	0.65	1.45	2.05	2.55	15.80	18.15	13.35	10.75	5.25	0.00	0.00	0.00	0.00	0.00	70.00
B.CONSTRUCTION																
1. Roads																
Arterial 1 & 2	1.88	2.83	3.77	4.71	5.65	2.83	2.83	2.83	2.83	2.83	2.83	2.83	2.83	2.83	2.83	47.09
Collector St. 1	1.38	2.07	2.76	3.45	4.14	2.07	2.07	2.07	2.07	2.07	2.07	2.07	2.07	2.07	2.07	34.50
Collector St. 2	1.22	1.83	2.44	3.05	3.66	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	30.53
Total Roads	4.48	6.73	8.97	11.21	13.45	6.73	6.73	6.73	6.73	6.73	6.73	6.73	6.73	6.73	6.73	112.12
2. Xiong/Canal	0.12	0.18	0.24	0.30	0.35	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	2.95
3.Park/GreenArea	2.24	3.36	4.48	5.60	6.72	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36	56.00
TOTAL CONSTRUC-TION COSTS	6.84	10.25	13.69	17.11	20.53	10.26	10.26	10.26	10.26	10.26	10.26	10.26	10.26	10.26	10.26	171.07
C.BUILDING COMPENSATION	0.22	0.33	0.44	0.55	0.66	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	5.50
D.LAND FILLING	2.40	3.60	4.80	6.00	7.20	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	60.00
E.STUDY AND DESIGN(7)	2.88	0.00	0.00	0.00	0.00	2.16	0.00	0.00	0.00	0.00	2.16	0.00	0.00	0.00	0.00	7.20
F.SHARE DEPRAY.																
Electricity 30%	0.12	0.18	0.24	0.30	0.36	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	3.00
Water works 30%	0.14	0.22	0.29	0.36	0.43	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	3.60
TOTAL SHARE DEPRAYMENTS	0.26	0.40	0.53	0.66	0.79	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	6.60
TOTAL EXPENDITURES	12.61	15.24	20.90	26.37	31.13	32.55	32.74	27.94	25.34	19.84	16.75	14.59	14.59	14.59	14.59	320.37
REVENUES LESS EXPENDITURES	0.39	0.76	0.10	(0.17)	0.27	(0.15)	(0.34)	(0.94)	(1.94)	(1.84)	1.25	0.71	0.71	0.71	0.71	0.23

Notes:
(1) Fourty percent of project to be conducted in Phase I, thirty percent in Phase II and thirty percent in Phase III
(2) Loan at 5% interest to be taken for Phase I, to cover costs not set by sales of reserved land in Project Yrs. 3-5
(3) Sale of reserved land to begin in Project Yr. 3
(4) Expenditures in Phase I will increase annually as project builds up. Expenditures in Phase II and III (except loan repayment and project survey and design) will remain steady.
(5) Interest for each year's loan will begin year following loan payment
(6) Capital to be repaid in full 5 years after loan. Each year's loan to be repaid separately.
(7) Study and Design for each Phase to be conducted in the first year of the phase.

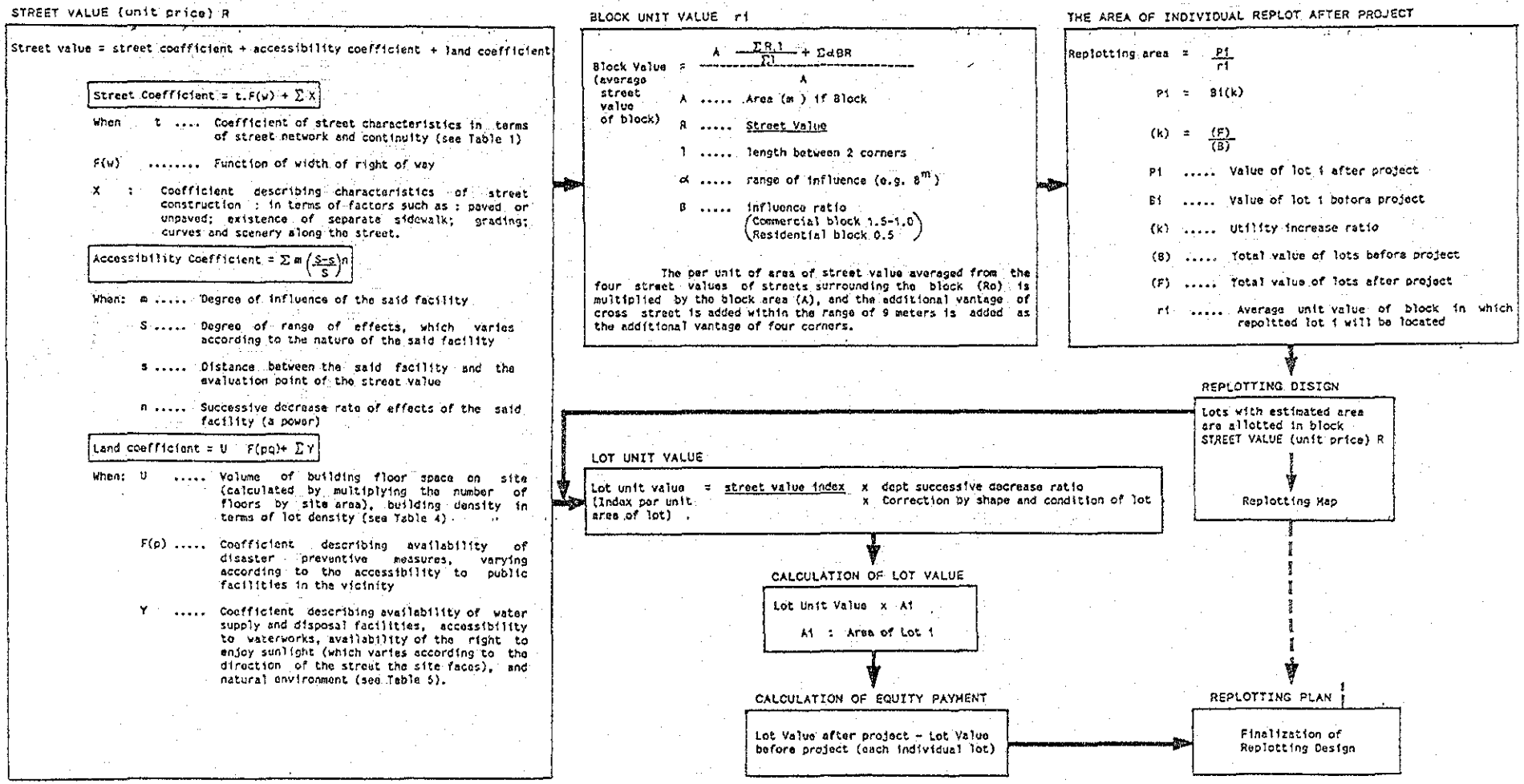


Fig. C-4 REPLOTTING DESIGN/PLAN

4024 represented streets with a proposed width of 25 meters; and numbers 5000 to 5052 represented streets with a proposed width of 18 meters.

The proposed road number 5020, which is located in the replotting area, is profiled in detail below to provide a clearer understanding of how street value is calculated.

Street Coefficient. The Street Coefficient varies according to the street hierarchy, continuity, width, construction, grading, curves, and scenery along the street. The variables that determine the street coefficient are:

W = Street width;

F(W) = A function of street width;

T = Coefficient of street characteristics in terms of street hierarchy, network, and continuity in relation to land use; and

X = Coefficient describing the of street in terms of factors such as paving, existence of a separate sidewalk, grading, curves, and scenery.

For the proposed road (number 5020), W equals 18 meters, F(W) equals 0.92, T equals 3 (relatively high for a road with a width of 18 meters because it is located near a commercial area), and x equals 3.

The Street Coefficient is calculated as follows:

$$T * F(W) + EX = .92 * 3.0 + 3.0 = 5.75$$

Therefore, the Street Coefficient of the proposed road (number 5020) is 5.75.

Table C-7 presents the calculation of street coefficients after development. Figures C-5 and C-6 present computer-drawn graphs of street coefficients, both before (Figure C-5) and after (Figure C-6) project implementation.

Accessibility Coefficient. The Accessibility Coefficient describes the distance between the site and public facilities, and varies with the nature of the facility. In the case study, seven "facilities" were designed to serve the study area: a bus stop, a park, a school, a social welfare facility, an administrative office, and two commercial districts.

To calculate the Accessibility Coefficient, it is first necessary to calculate coefficient values for each facility. In particular, the following variables must be considered:

m = Degree of influence of the particular facility (e.g., the "m" value of a bus stop is fixed at "0.20.");

TABLE C-7 STREET COEFFICIENTS (AFTER DEVELOPMENT)

Street Number	Street Width (m)	F(w)	t	t*F(w)	X1 Pave	X2 Gradie	X3 Scenery	SUM of X	Street Coefficient t*F(w)+SumX
1100	60.00	0.97	2.00	1.95	1.00			1.00	2.95
2200	40.00	0.96	2.00	1.93	1.00			1.00	2.92
2201	40.00	0.96	5.00	4.81	3.00			3.00	7.81
2202	40.00	0.96	2.00	1.93	1.00			1.00	2.92
2203	40.00	0.96	2.00	1.93	1.00			1.00	2.92
2204	40.00	0.96	2.00	1.93	1.00			1.00	2.92
2205	40.00	0.96	2.00	1.93	1.00			1.00	2.92
3000	40.00	0.96	2.00	1.93	1.00			1.00	2.92
3001/1	40.00	0.96	3.00	2.89	1.00			1.00	3.89
3001/2	40.00	0.96	2.00	1.93	1.00			1.00	2.92
3002	40.00	0.96	2.00	1.93	1.00			1.00	2.92
3003	40.00	0.96	2.00	1.93	1.00			1.00	2.92
3004	40.00	0.96	2.00	1.93	1.00			1.00	2.92
3010	40.00	0.96	2.00	1.93	1.00			1.00	2.92
3011/1	40.00	0.96	5.00	4.81	3.00			3.00	7.81
3011/2	40.00	0.96	2.00	1.93	1.00			1.00	2.92
3012/1	40.00	0.96	5.00	4.81	3.00			3.00	7.81
3012/2	40.00	0.96	2.00	1.93	1.00			1.00	2.92
4010/1	25.00	0.94	2.0	1.88	1.0			1.00	2.88
4010/2	25.00	0.94	2.5	2.35	1.0			1.00	3.35
4011/1	25.00	0.94	2.5	2.35	1.0			1.00	3.35
4011/2	25.00	0.94	2.0	1.88	1.0			1.00	2.88
4012	25.00	0.94	2.5	2.35	1.0			1.00	3.35
4013/1	25.00	0.94	4.0	3.76	3.0			3.00	6.76
4013/2	25.00	0.94	2.5	2.35	1.0			1.00	3.35
4020	25.00	0.94	2.5	2.35	1.0			1.00	3.35
4021/1	25.00	0.94	2.5	2.35	1.0			1.00	3.35
4021/2	25.00	0.94	2.5	2.35	1.0			1.00	3.35
4022	25.00	0.94	2.5	2.35	1.0			1.00	3.35
4023	25.00	0.94	2.5	2.35	1.0			1.00	3.35
4024	0.00	0.00	0.0	0.00	0.0			0.00	0.00
5000/1	18.00	0.92	2.0	1.83	1.0			1.00	2.83
5000/2	18.00	0.92	2.0	1.83	1.0			1.00	2.83
5010	18.00	0.92	2.0	1.83	1.0			1.00	2.83
5011/1	18.00	0.92	2.0	1.83	2.0			2.00	3.83
5011/2	18.00	0.92	2.0	1.83	1.0			1.00	2.83
5012	18.00	0.92	2.0	1.83	1.0			1.00	2.83
5013	18.00	0.92	2.0	1.83	1.0			1.00	2.83
5020/1	18.00	0.92	3.0	2.75	3.0			3.00	5.75
5020/2	18.00	0.92	2.0	1.83	1.0			1.00	2.83
5021/1	18.00	0.92	3.0	2.75	3.0			3.00	5.75
5021/2	18.00	0.92	2.0	1.83	1.0			1.00	2.83
5022	18.00	0.92	2.0	1.83	1.0			1.00	2.83
5030	18.00	0.92	2.0	1.83	1.0			1.00	2.83
5031/1	18.00	0.92	2.0	1.83	2.0			2.00	3.83
5031/2	18.00	0.92	2.0	1.83	1.0			1.00	2.83
5032	18.00	0.92	2.0	1.83	1.0			1.00	2.83
5033/1	18.00	0.92	2.0	1.83	1.0			1.00	2.83
5033/2	18.00	0.92	2.0	1.83	1.0			1.00	2.83
5034	18.00	0.92	2.0	1.83	1.0			1.00	2.83
5035	18.00	0.92	2.0	1.83	1.0			1.00	2.83
5040	18.00	0.92	2.0	1.83	1.0			1.00	2.83
5041/1	18.00	0.92	2.0	1.83	1.0			1.00	2.83
5041/2	18.00	0.92	2.0	1.83	1.0			1.00	2.83
5050	18.00	0.92	2.0	1.83	1.0			1.00	2.83
5051	18.00	0.92	2.0	1.83	1.0			1.00	2.83
5052	18.00	0.92	2.0	1.83	1.0			1.00	2.83

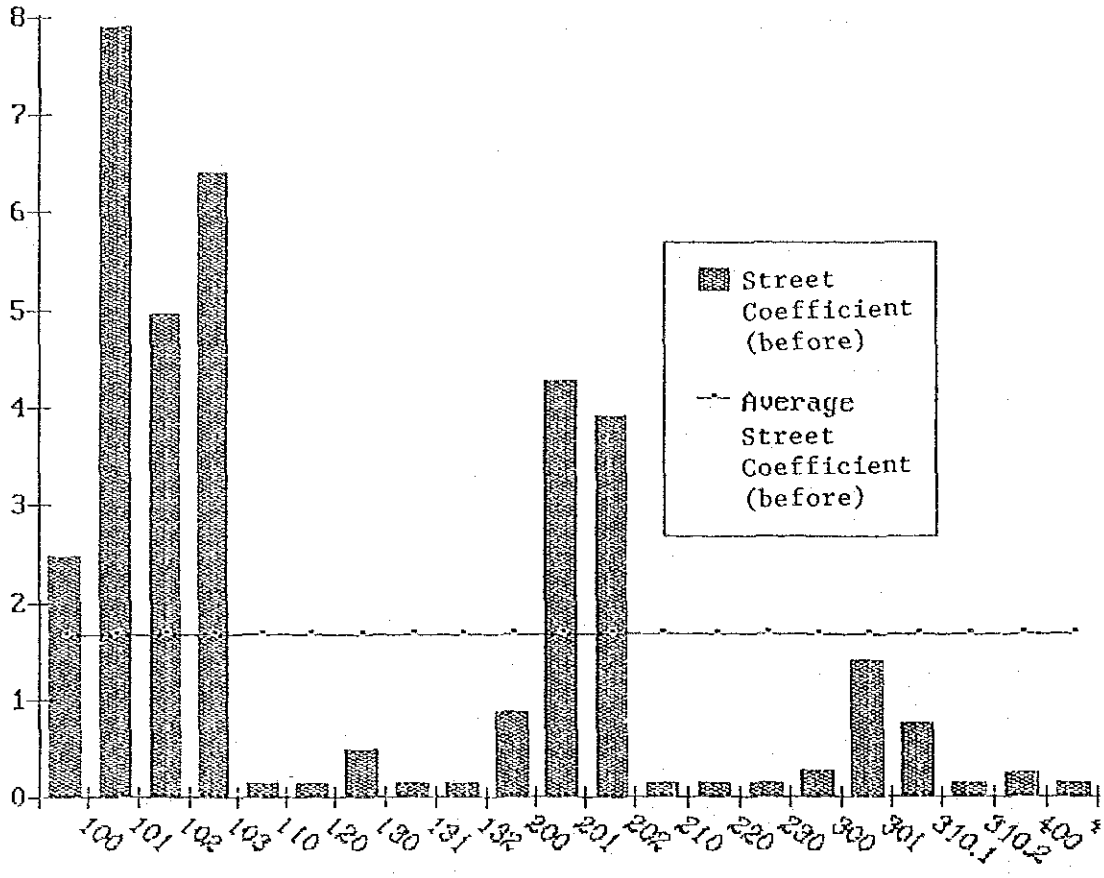


Fig. C-5 STREET COEFFICIENT (BEFORE)

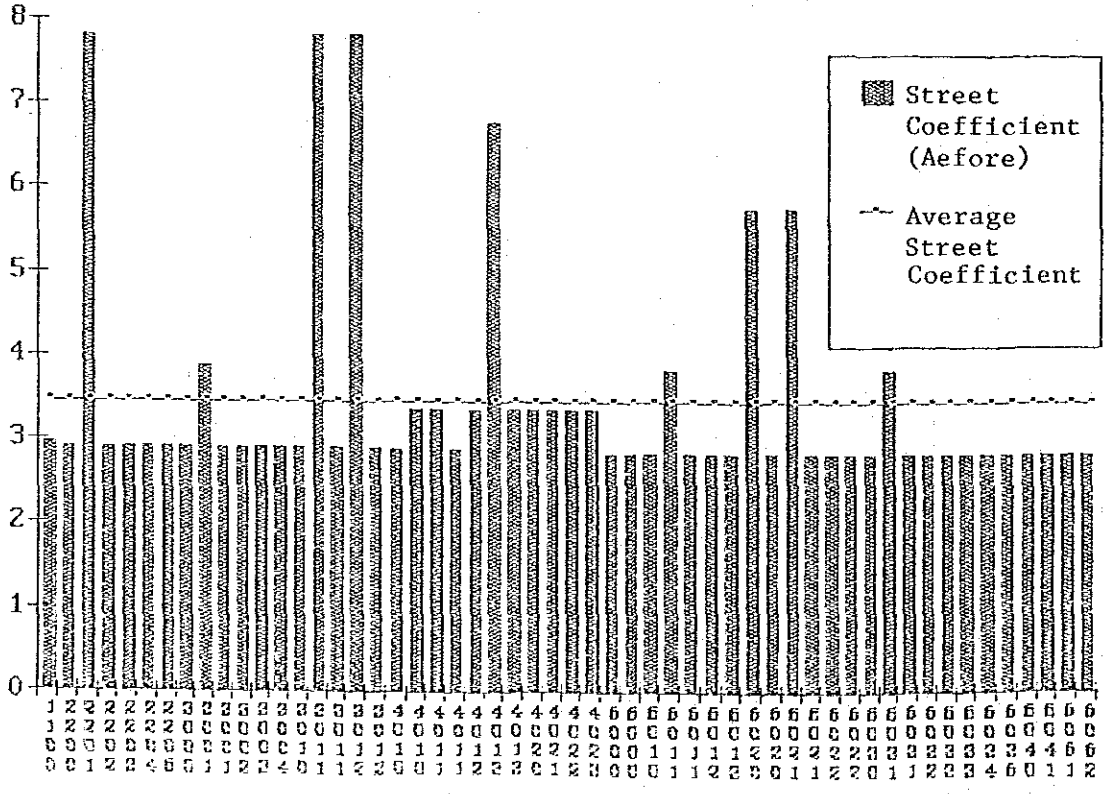


Fig. C-6 STREET COEFFICIENT (AFTER)

N = "No dimension successive decrease rate of effect" of the facility (the "N" value of all seven facilities are fixed equally at 2.0);

S = Range of impact, which varies depending on the nature of the facility (e.g., a bus stop as a range of impact of 300 meters);

R = Fixed distance for which the "M" value remains constant (for all seven examples, the "R" value is fixed at 50 meters);

s = Distance between the facility and the point for street valuation (varies with distance to the facility; the "s" value of road 5020 for a bus stop is 207 meters);

F(s) = Reduced "M" value in accordance with the distance (s) between the facility and the point for street valuation.

F(s) is expressed as follows:

if $s \geq R$, $F(s) = \frac{S-s^n}{S-R}$;

if $s < R$, $F(s) = 1$.

For road 5020, the F(s) for a bus stop is 0.028. After obtaining the value for each facility, the Accessibility Coefficient can be calculated by multiplying m times F(s). Thus, the Accessibility Coefficient for road 5020 is equal to 0.028 + 0.157 or 0.185. See Table C-8 for all the details.

Accessibility coefficients can be calculated for the situation both before and after development. Figures C-7 and C-8 show computer-drawn graphs of accessibility coefficients before and after development, respectively.

Land Coefficient. The Land Coefficient is used to evaluate the proposed land use area (e.g., residential, commercial, industrial, agricultural), the availability of utility and disposal facilities, and other factors. Calculation of the Land Coefficient involves two sets of variables.

The first set includes the following variables:

U: Utilization value of the lot as urban land (influenced by land use, building density, commercial potential, maturity of urban development and other factors);

P: the percentage of public open land in the block where land value is measured;

Q: the street density in the block where land values are measured;

TABLE C-8 ACCESSIBILITY COEFFICIENT (AFTER)

Street Number	FACILITY 1 Bus Stop No.1 S = 300 m = 0.20 n = 2.00 R = 50.00		FACILITY 2 Park S = 800 m = 0.50 n = 2.00 R = 50.00		FACILITY 3 School S = 500 m = 0.30 n = 2.00 R = 50.00		FACILITY 4 Social Welfar S = 800 m = 0.20 n = 2.00 R = 50.00		FACILITY 5 Administrativ S = 500 m = 0.20 n = 2.00 R = 50.00		FACILITY 6 Advanced Commercial S = 800 m = 1.20 n = 2.00 R = 50.00		FACILITY 7 Commercial S = 500 m 0.30 n 2.00 R 50.00		Accessibility Coefficient SUM of m * ((S-s)/(S-P)) ^n
	s	m*f(s)	s	m*f(s)	s	m*f(s)	s	m*f(s)	s	m*f(s)	s	m*f(s)	s	m*f(s)	
1100	15	0.260													0.26
2200	110	0.116									475	0.225			0.34
2201	60	0.184													0.18
2202	140	0.082									650	0.048			0.13
2203	10	0.269			455	0.003									0.27
2204	210	0.026	560	0.051							300	0.533			0.61
2205	150	0.072													0.07
3000	200	0.032			310	0.053									0.09
3001/1	65	0.177			43	0.309									0.49
3001/2															0.00
3002	214	0.024			275	0.075									0.10
3003	70	0.169	590	0.039											0.21
3004	140	0.082			490	0.000									0.08
3010	200	0.032	460	0.103							545	0.139			0.27
3011/1	80	0.155	180	0.342	435	0.006					226	0.703			1.21
3011/2															0.00
3012/1	90	0.141	280	0.240											0.29
3012/2											15	1.315			1.31
4010/1	30	0.233			160	0.171	663	0.007							0.41
4010/2															0.00
4011/1	140	0.082	787	0.000	60	0.287	500	0.032			575	0.033			0.42
4011/2															0.00
4012	120	0.104	770	0.001	235	0.104	567	0.019			380	0.376			0.60
4013/1	120	0.104	570	0.047			567	0.019			5	1.348			1.52
4013/2															0.00
4020	220	0.020	345	0.184			647	0.008							0.21
4021/1	50	0.200	250	0.269			555	0.021							0.49
4021/2															0.00
4022	100	0.128			250	0.093	622	0.011							0.23
4023	10	0.269	775	0.001	86	0.254	475	0.028	477	0.001	477	0.223	477	0.223	1.01
4024	150	0.072			254	0.090	633	0.010							0.17
5000/1	340	0.005	615	0.030	126	0.207	222	0.081	330	0.029	630	0.062	330	0.471	0.89
5000/2															0.00
5010	254	0.007	488	0.087	250	0.093	200	0.128	200	0.089	753	0.005	200	0.769	1.18
5011/1	80	0.155	305	0.218	423	0.007	15	0.219	15	0.232			15	1.315	2.15
5011/2															0.00
5012	175	0.050	59	0.488			350	0.022	350	0.022	508	0.182	350	0.429	1.25
5013	200	0.032	383	0.155			675	0.006			188	0.799			0.99
5020/1	207	0.028			174	0.157									0.19
5020/2											165	0.860			0.86
5021/1	5	0.278	172	0.351	77	0.265									0.89
5021/2															0.00
5022	170	0.054	10	0.555	255	0.089									0.70
5030	250	0.008	15	0.548			316	0.082	316	0.033			316	0.500	1.17
5031/1	70	0.169	327	0.199	370	0.025	20	0.216	20	0.228			20	1.208	2.13
5031/2															0.00
5032	228	0.017	466	0.099	234	0.105	156	0.147	160	0.114			160	0.874	1.26
5033/1	170	0.054	605	0.034	100	0.237	290	0.092	295	0.042					0.46
5033/2													295	0.544	0.54
5034	185	0.042			141	0.191	516	0.029	500	0.000					0.26
5035	135	0.087			455	0.003									0.09
5040	130	0.092			308	0.055					330	0.471	330	0.471	1.09
5041/1	170	0.054			82	0.259					103	1.036	103	1.036	2.39
5041/2															0.00
5050	160	0.063	621	0.028	208	0.126									0.22
5051	20	0.251	6	0.560											0.81
5052	245	0.010	366	0.167											0.18

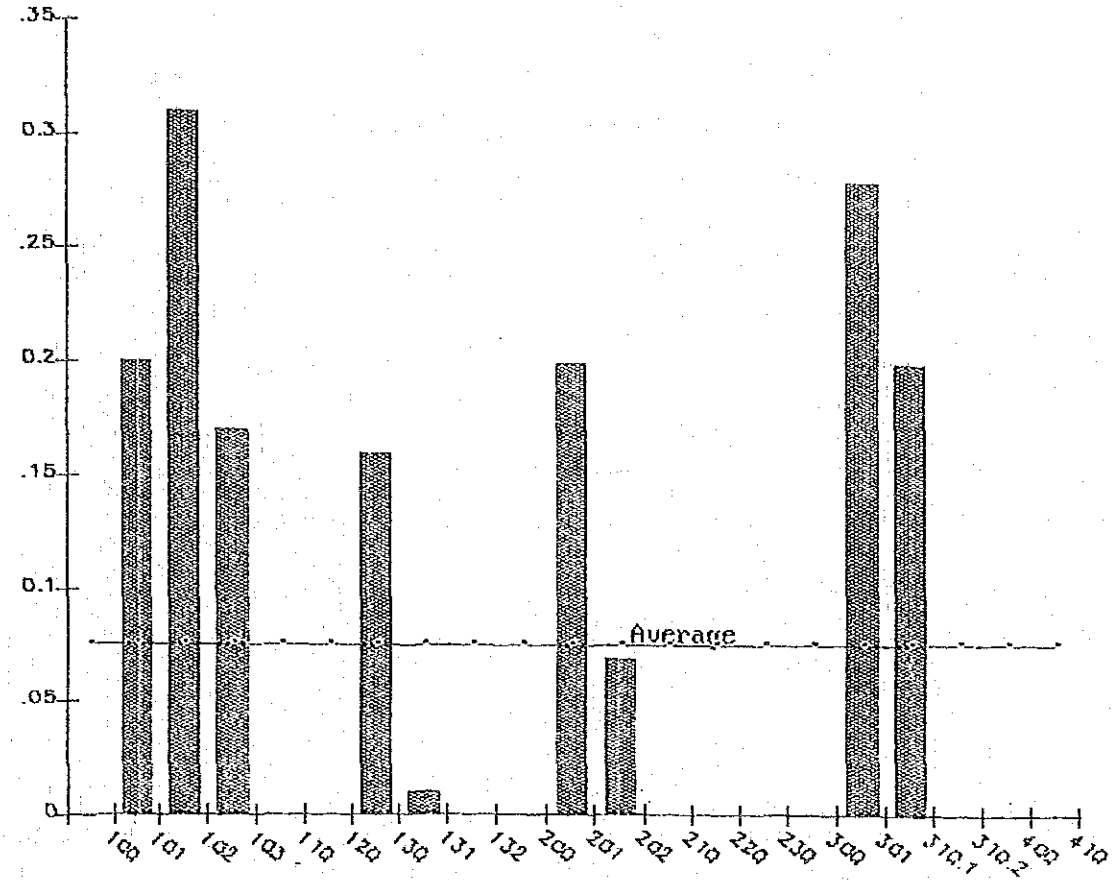


Fig. C-7 ACCESSIBILITY COEFFICIENT (BEFORE)

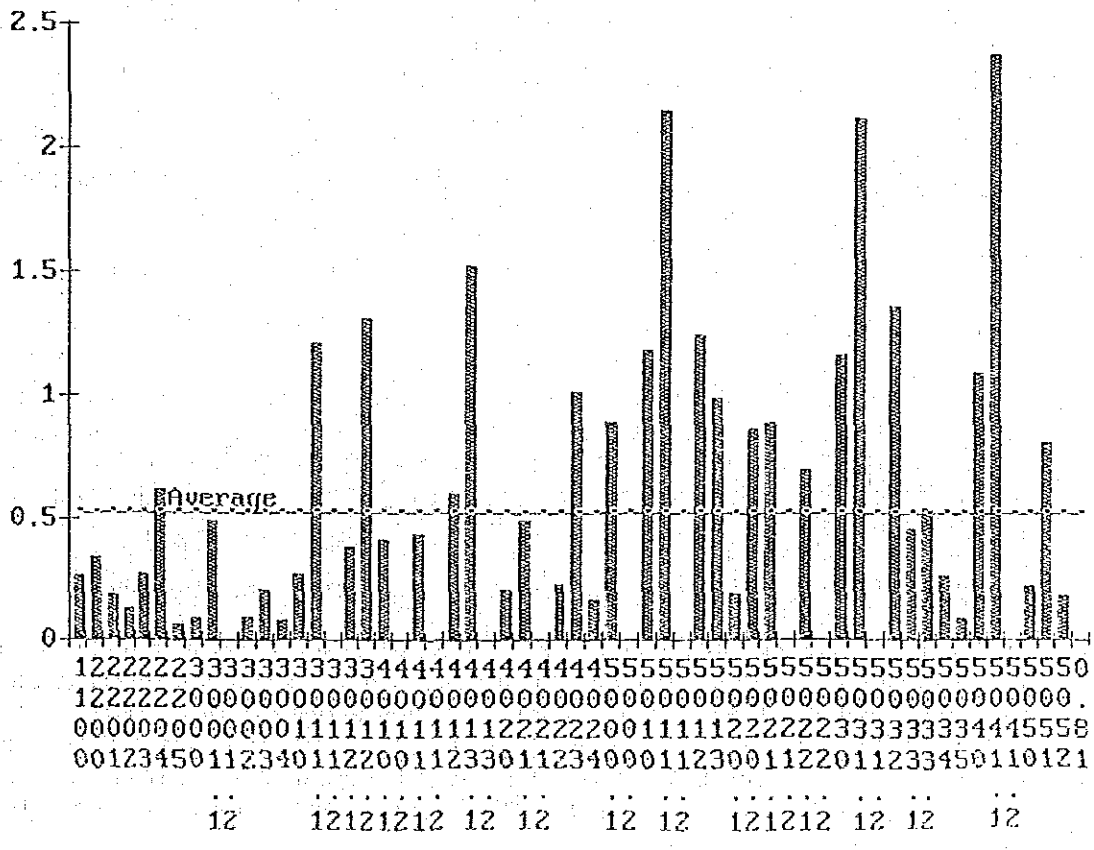


Fig. C-8 ACCESSIBILITY COEFFICIENT (AFTER)

P0: the standard percentage of public open land;

Q0: the standard street density; and

F(P*Q): a modification of "U" that depends on land use, disaster prevention, and safety enhancements from infrastructure improvements

The second set of variables, the so-called Y variables, represent the impact of physical conditions on the lot. Five Y variables were employed in this case study. Y1 represents the water supply and sewerage system, Y2 represents electricity, Y3 represents the telephone system, Y4 represents parks, and Y5 represents adverse environmental effects such as noise (a negative value).

For road number 5020, the following values were used:

U = 4.0 (relatively high due to location near a commercial area);

P = 12.35% (calculated by dividing the total road area, 52.06 rai, by the total block area, 421.0 rai);

Q = 69.83 (calculated by dividing total road length, 4,704 meters, by total block area, 67.36 hectares);

P0 = 30 (relatively high due to location near a commercial area);

Q0 = 350 (again, relatively high due to location near a commercial area);

F(P*Q) = 1.28; and

Y = 0.90 (based on the values for the three utilities provided to the road, Y1, Y2, and Y3)

Calculation of the land values are based on the following equation:

Land Coefficient = U*F(P*Q) + Y

Thus, the Land Coefficient for proposed road number 520 is equal to 4*1.28 + 0.90 or 6.02. Table C-9 provides the details of the Land Coefficient calculations for all the proposed roads in the study area. Figures C-9 and C-10 show computer-drawn graphs of Land Coefficients before and after development, respectively.

Calculation of Street Value Index (Before and After Development)

Street Value. Street Value is the sum of the three coefficients described above: the Street Coefficient, the Accessibility Coefficient, and the Land Coefficient. For proposed road 5020, the Street Value is 11.96 (5.75 + 0.19 + 6.02). Please note that the Street Value Index for this road is relatively high, close to the maximum of 14-56 (see Table C-10). The reason why proposed road 5020

TABLE C-9 CALCULATION OF LAND COEFFICIENT (AFTER)

Street Number	U	P	Q	Po	Oo	F(P,Q)	UPF(P,Q)	Physical Conditions					ΣiYn	Land Coefficient UPF(P,Q)+ΣiYn (Y)	Street Detail		
								Y1	Y2	Y3	Y4	Y5			Lenght	Width	Area
	(m/Ha)	(%)															
1100	1.2	13	63	25	250	1.36	1.63	0.5	0.0	0.0		-0.2	0.70	2.33	1,205.00	30.00	38,850.00
2200	1.4	13	63	25	250	1.36	1.91	0.5	0.0	0.0			0.00	2.91	554.00	20.00	11,080.00
2201	4.0	12	70	30	350	1.28	5.13	0.5	0.0	0.0			0.00	5.63	719.00	20.00	14,380.00
2202	1.4	13	74	25	250	1.39	1.95	0.5	0.0	0.0			0.00	2.45	525.00	20.00	10,500.00
2203	1.4	13	64	25	250	1.37	1.91	0.5	0.0	0.0			0.00	2.91	237.00	20.00	4,740.00
2204	2.0	13	74	25	250	1.39	2.78	0.5	0.0	0.0			0.00	3.28	135.00	20.00	2,700.00
2205	1.2	13	63	25	250	1.36	1.63	0.5	0.0	0.0		-0.2	0.70	2.33	120.00	20.00	2,400.00
3000	1.4	13	63	25	250	1.36	1.91	0.5	0.0	0.0			0.00	2.91	221.00	40.00	8,840.00
3001/1	1.4	13	63	25	250	1.36	1.91	0.5	0.0	0.0			0.00	2.91	206.00	20.00	4,120.00
3001/2	1.4	13	64	25	250	1.37	1.91	0.5	0.0	0.0			0.00	2.91	162.00	20.00	3,240.00
3002	1.4	13	70	25	250	1.38	1.93	0.5	0.0	0.0			0.00	2.93	237.00	20.00	4,740.00
3003	1.4	13	70	25	250	1.38	1.93	0.5	0.0	0.0			0.00	2.93	210.00	20.00	4,200.00
3004	1.2	13	63	25	250	1.36	1.63	0.5	0.0	0.0			0.00	2.53	120.00	20.00	2,400.00
3010	1.4	13	74	25	250	1.39	1.95	0.5	0.0	0.0			0.00	2.85	237.00	20.00	4,740.00
3011/1	1.4	12	70	25	250	1.37	1.91	0.5	0.0	0.0			0.00	2.91	175.00	20.00	3,500.00
3011/2	1.4	13	74	25	250	1.39	2.08	0.5	0.0	0.0			0.00	3.08	175.00	20.00	3,500.00
3012/1	4.0	12	70	25	250	1.37	5.48	0.5	0.0	0.0			0.00	5.98	274.00	20.00	7,480.00
3012/2	2.0	13	74	30	250	1.30	2.60	0.5	0.0	0.0			0.00	3.50	274.00	20.00	7,480.00
4010/1	1.4	13	63	25	250	1.36	0.00	0.5	0.0	0.0			0.00	0.00	104.00	12.50	1,300.00
4010/2	1.4	12	70	30	250	1.28	1.80	0.5	0.0	0.0			0.00	2.30	104.00	12.50	1,300.00
4011/1	1.4	13	63	25	250	1.36	0.00	0.5	0.0	0.0			0.00	0.00	223.00	12.50	2,787.50
4011/2	1.4	12	70	30	250	1.28	1.80	0.5	0.0	0.0			0.00	2.30	223.00	12.50	2,787.50
4012	2.0	13	70	30	350	1.36	2.72	0.5	0.0	0.0			0.00	3.22	364.00	12.50	4,550.00
4013/1	1.4	13	63	25	250	1.36	1.91	0.5	0.0	0.0			0.00	2.91	320.00	12.50	4,000.00
4013/2	4.0	12	70	30	350	1.28	5.13	0.5	0.0	0.0			0.00	5.63	320.00	12.50	4,000.00
4020	1.4	13	74	25	250	1.39	1.95	0.5	0.0	0.0			0.00	2.45	270.00	12.50	4,375.00
4021/1	1.4	13	74	25	250	1.39	0.00	0.5	0.0	0.0			0.00	0.00	75.00	12.50	937.50
4021/2	1.4	13	64	25	250	1.37	1.92	0.5	0.0	0.0			0.00	2.92	75.00	12.50	937.50
4022	1.4	13	74	25	250	1.39	1.95	0.5	0.0	0.0			0.00	2.45	455.00	12.50	5,687.50
4023	1.4	13	74	25	250	1.39	1.95	0.5	0.0	0.0			0.00	2.45	140.00	12.50	1,750.00
4024	1.4	13	74	25	250	1.39	1.95	0.5	0.0	0.0			0.00	2.45	179.00	12.50	2,237.50
5000/1	2.0	13	63	25	250	1.36	2.72	0.5	0.0	0.0			0.00	3.22	148.00	0.00	4,144.00
5000/2	2.0	13	63	25	250	1.36	2.72	0.5	0.0	0.0			0.00	3.22	146.00	0.00	4,144.00
5010	2.0	13	63	25	250	1.36	4.08	0.5	0.0	0.0			0.00	4.58	80.00	18.00	1,440.00
5011/1	3.0	13	63	25	250	1.36	4.08	0.5	0.0	0.0			0.00	4.58	209.00	0.00	3,837.00
5011/2	1.4	13	63	25	250	1.36	1.90	0.5	0.0	0.0	0.2		1.10	3.00	209.00	0.00	3,837.00
5012	1.4	13	63	25	250	1.36	1.90	0.5	0.0	0.0			0.00	2.90	421.00	18.00	7,758.00
5013	2.0	13	63	25	250	1.36	2.72	0.5	0.0	0.0			0.00	3.22	211.00	18.00	3,798.00
5020/1	4.0	12	70	30	350	1.28	5.12	0.5	0.0	0.0			0.00	5.62	336.00	0.00	6,384.00
5020/2	1.4	12	70	30	350	1.28	1.80	0.5	0.0	0.0			0.00	2.30	329.00	0.00	6,251.00
5021/1	4.0	12	70	30	350	1.28	5.12	0.5	0.0	0.0			0.00	5.62	178.00	0.00	3,384.00
5021/2	4.0	12	70	30	350	1.28	5.12	0.5	0.0	0.0			0.00	5.62	178.00	0.00	3,384.00
5022	4.0	12	70	30	350	1.28	5.12	0.5	0.0	0.0	0.2		1.10	6.72	177.00	18.00	3,186.00
5030	1.4	13	74	25	250	1.39	1.95	0.5	0.0	0.0	0.2		1.10	3.00	209.00	12.00	2,004.00
5031/1	1.4	13	74	25	250	1.39	1.95	0.5	0.0	0.0			0.00	2.45	255.00	0.00	3,825.00
5031/2	3.0	13	74	25	250	1.39	4.17	0.5	0.0	0.0			0.00	4.67	255.00	0.00	3,825.00
5032	1.4	13	74	25	250	1.39	4.17	0.5	0.0	0.0			0.00	4.67	50.00	18.00	900.00
5033/1	1.4	13	74	25	250	1.39	4.17	0.5	0.0	0.0			0.00	4.67	219.00	0.00	1,971.00
5033/2	1.4	13	74	25	250	1.39	4.17	0.5	0.0	0.0			0.00	4.67	219.00	0.00	1,971.00
5034	1.4	13	64	25	250	1.37	1.92	0.5	0.0	0.0			0.00	2.92	230.00	18.00	4,230.00
5035	1.4	13	64	25	250	1.37	1.92	0.5	0.0	0.0		-0.2	0.70	3.12	208.00	18.00	3,744.00
5040	1.4	12	70	30	350	1.28	1.79	0.5	0.0	0.0			0.00	2.29	451.00	18.00	8,118.00
5041/1	1.4	12	70	30	350	1.28	1.79	0.5	0.0	0.0			0.00	2.29	182.00	0.00	1,638.00
5041/2	1.4	12	70	30	350	1.28	1.79	0.5	0.0	0.0			0.00	2.29	182.00	0.00	1,638.00
5050	1.4	14	64	25	250	1.36	1.90	0.5	0.0	0.0			0.00	2.90	240.00	20.00	4,800.00
5051	1.4	13	64	25	250	1.37	1.92	0.5	0.0	0.0			0.00	2.92	465.00	18.00	8,370.00
5052	1.4	13	64	25	250	1.37	1.92	0.5	0.0	0.0			0.00	2.92	345.00	18.00	6,210.00

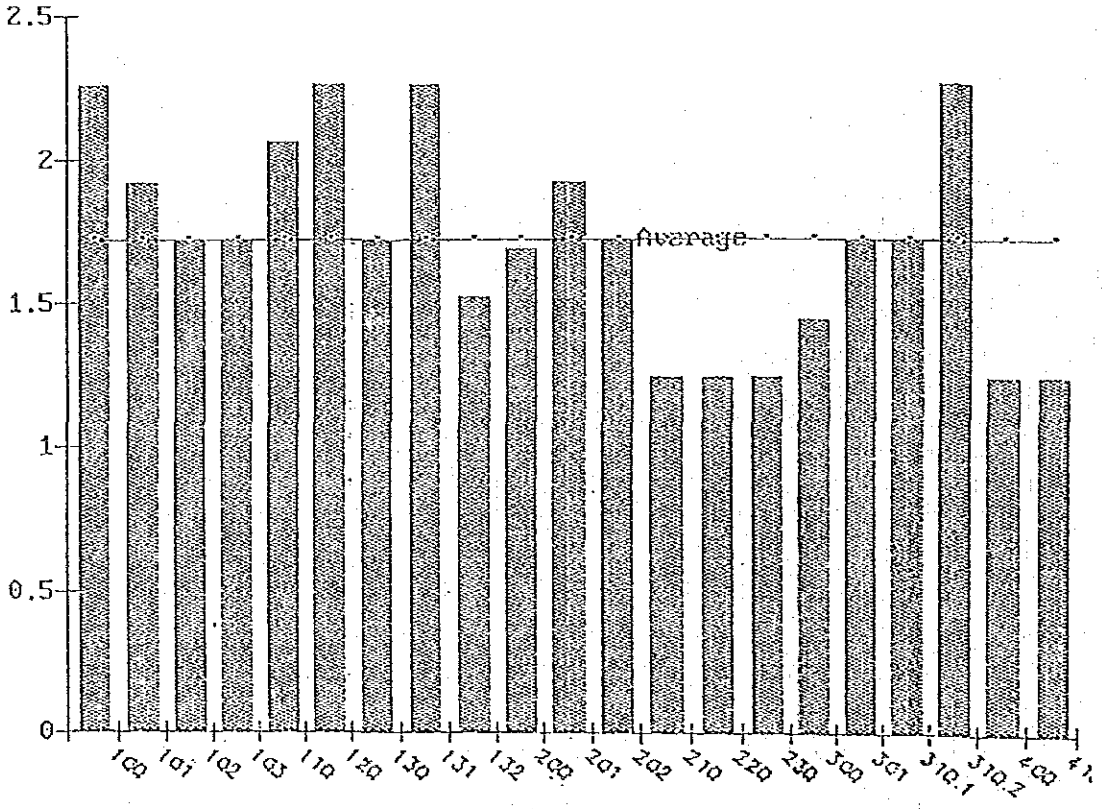


Fig. C-9 LAND COEFFICIENT (BEFORE)

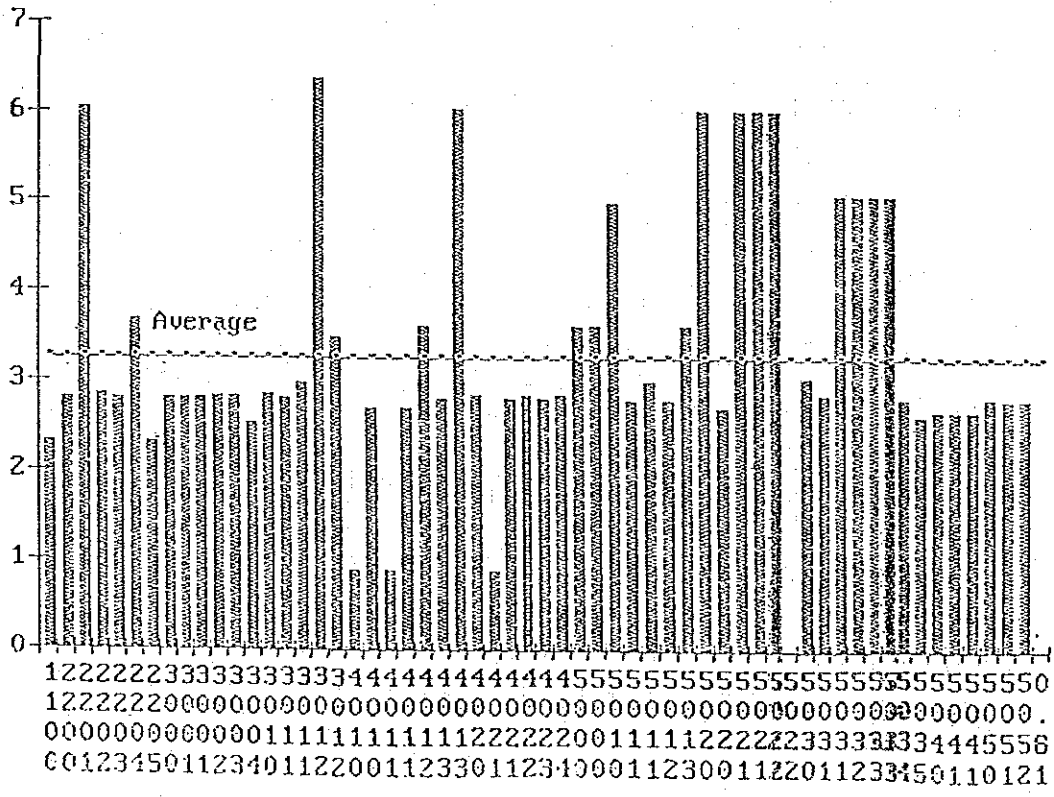


Fig. C-10 LAND COEFFICIENT (AFTER)

TABLE C-10 CALCULATION OF STREET VALUE INDEX (AFTER DEVELOPMENT)

Street (Section) No.	Street Coefficient	Accessibility Coefficient	Land Coefficient	Street Value R' (MAX.= 14.56 -------)	Street Value Index R (MAX.= 1000 ----------)	Length of Street (Section) L (m)	Street Value Index X Length of Street RtL
1100	2.95	0.26	2.33	5.54	381	1,295.00	493,395
2200	2.92	0.34	2.81	6.07	417	554.00	231,018
2201	7.81	0.18	6.03	14.03	963	719.00	692,397
2202	2.92	0.13	2.85	5.90	405	525.00	212,525
2203	2.92	0.27	2.81	6.01	413	237.00	97,881
2204	2.92	0.61	3.68	7.22	496	185.00	91,760
2205	2.92	0.07	2.33	5.33	366	130.00	47,580
3000	2.92	0.09	2.81	5.82	400	221.00	88,400
3001/1	3.89	0.49	2.81	7.18	493	295.00	145,435
3001/2	2.92	0.00	2.81	5.74	394	295.00	116,230
3002	2.92	0.10	2.83	5.85	402	337.00	135,474
3003	2.92	0.21	2.83	5.97	410	313.00	128,330
3004	2.92	0.08	2.53	5.54	381	130.00	49,530
3010	2.92	0.27	2.85	6.05	415	387.00	160,605
3011/1	7.81	1.21	2.81	11.83	813	175.00	142,275
3011/2	2.92	0.00	2.98	5.91	406	175.00	71,050
3012/1	7.81	0.38	6.36	14.56	1,000	374.00	374,000
3012/2	2.92	1.31	3.50	7.74	532	374.00	198,968
4010/1	2.88	0.41	0.90	4.19	288	104.00	29,952
4010/2	3.35	0.00	2.70	6.05	415	104.00	43,160
4011/1	3.35	0.43	0.90	4.68	322	223.00	71,806
4011/2	2.88	0.00	2.70	5.58	383	223.00	85,409
4012	3.35	0.60	3.62	7.57	520	364.00	189,280
4013/1	6.76	1.52	2.81	11.08	761	396.00	301,356
4013/2	3.35	0.00	6.03	9.38	644	396.00	255,024
4020	3.35	0.21	2.85	6.41	440	270.00	118,800
4021/1	3.35	0.49	0.90	4.74	326	75.00	24,450
4021/2	3.35	0.00	2.82	6.17	424	75.00	31,800
4022	3.35	0.23	2.85	6.43	442	455.00	201,110
4023	3.35	1.01	2.82	7.18	493	140.00	69,020
4024	0.00	0.17	2.85	3.02	207	179.00	37,053
5000/1	2.83	0.99	3.62	7.34	504	146.00	73,584
5000/2	2.83	0.00	3.62	6.45	444	146.00	64,824
5010	2.83	1.18	4.98	8.99	617	80.00	49,360
5011/1	3.83	2.15	2.80	8.78	603	293.00	176,679
5011/2	2.83	0.00	3.00	5.83	401	293.00	117,493
5012	2.83	1.25	2.80	6.88	473	431.00	203,863
5013	2.83	0.99	3.62	7.45	512	211.00	108,032
5020/1	5.75	0.19	6.02	11.96	821	326.00	267,646
5020/2	2.83	0.86	2.70	6.39	439	326.00	143,114
5021/1	5.75	0.89	6.03	12.66	870	176.00	153,120
5021/2	2.83	0.00	6.02	8.85	608	176.00	107,008
5022	2.83	0.70	6.22	9.75	670	177.00	118,590
5030	2.83	1.17	3.05	7.05	484	288.00	139,392
5031/1	3.83	2.13	2.85	8.82	606	255.00	154,530
5031/2	2.83	0.00	5.07	7.90	542	255.00	138,465
5032	2.83	1.36	5.07	9.26	636	52.00	33,072
5033/1	2.83	0.45	2.85	6.14	422	219.00	92,418
5033/2	2.83	0.54	5.07	8.45	580	219.00	127,020
5034	2.83	0.26	2.82	5.92	406	239.00	97,034
5035	2.83	0.09	2.62	5.54	381	388.00	147,828
5040	2.83	1.09	2.69	6.61	454	451.00	204,754
5041/1	2.83	2.39	2.69	7.91	543	451.00	244,893
5041/2	2.83	0.00	2.69	5.52	379	182.00	68,978
5050	2.83	0.22	2.83	5.88	404	240.00	96,960
5051	2.83	0.81	2.82	6.46	444	456.00	202,464
5052	2.83	0.18	2.82	5.83	400	345.00	138,000

has a relatively high street value is that it is located near a well-developed commercial area.

Figures C-11 and C-12 show computer-drawn graphs of Street Values before and after development, respectively. Figure C-13 presents a map of Street Values before the project.

Street Value Index. With the maximum Street Value set at 1,000, the Street Value indices for particular streets were calculated as follows:

$$\text{Street Value Index} = \frac{\text{Street Value} \times 1{,}000}{\text{Maximum Street Value}}$$

Thus, the Street Value Index of proposed road 5020 is 11.96 x 1,000/14.56 or 821.

Table C-9 provides the details for calculation of the Street Value Index for all proposed roads. Figure C-14 presents a map of Street Value Index figures after the project.

Final Adjustment of Street Value Index. The Street Value Index should be adjusted if there are streets with a Street Value Index that differs significantly from land valuations such as those performed for property tax assessments. In some cases the Street Value Index after development should be checked by comparing the "average contribution ratio of the project site" with the "affordable share of each street value." An adjustment should be made if these two values differ greatly.

Calculation of Lot Land Value

Lot Land Value was established through modifying Street Value based on the individual nature of the lot. A "unit index" (index number per sq. m.) and a "total index" were calculated for each lot in the planning area before and after development.

The variables used for calculation of Lot Land Value were the following:

h = "Depth" of lot (the distance in meters between of the frontage lot and the centroid);

l = Frontage length (the length in meters of the side of the lot adjacent to the street);

A = Area of lot (in square meters);

R = Street Value Index;

U = "Depth Successive Decrease Ratio" (a ratio expressing the change in lot value by lot depth);

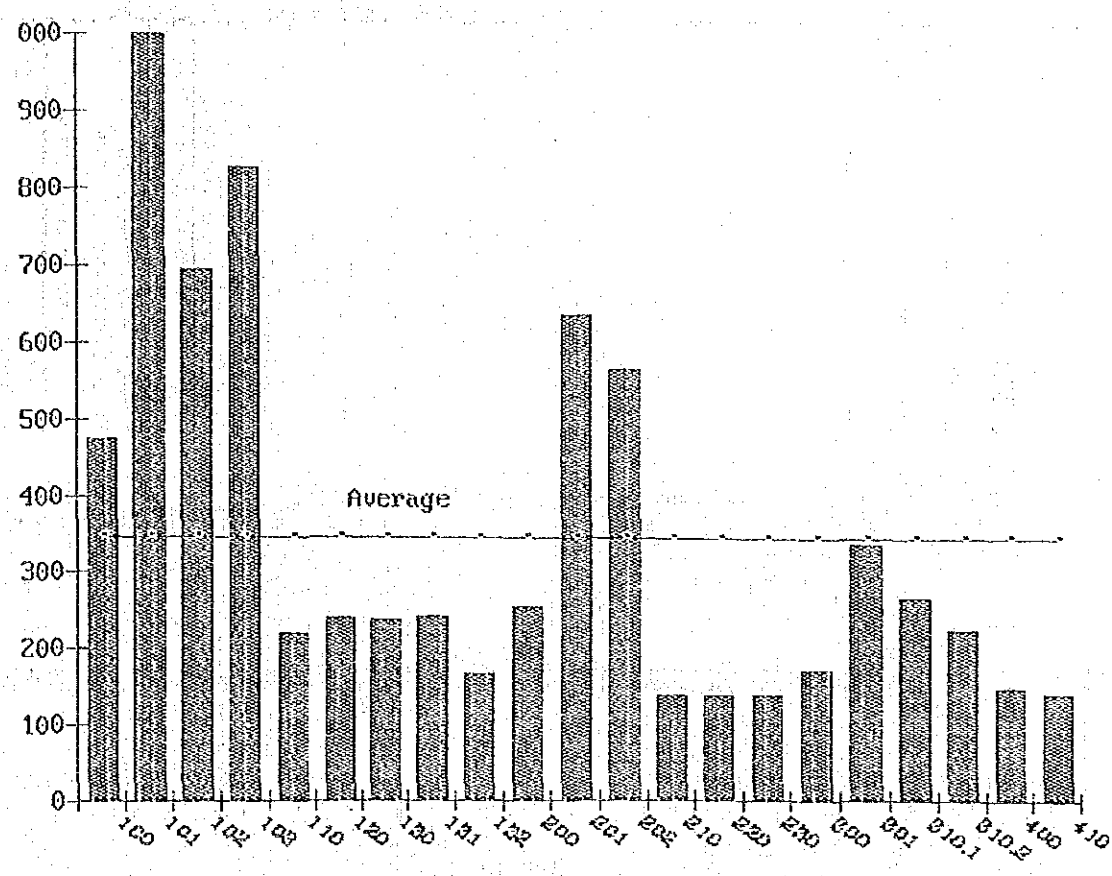


Fig. C-11 STREET VALUE INDEX (BEFORE)

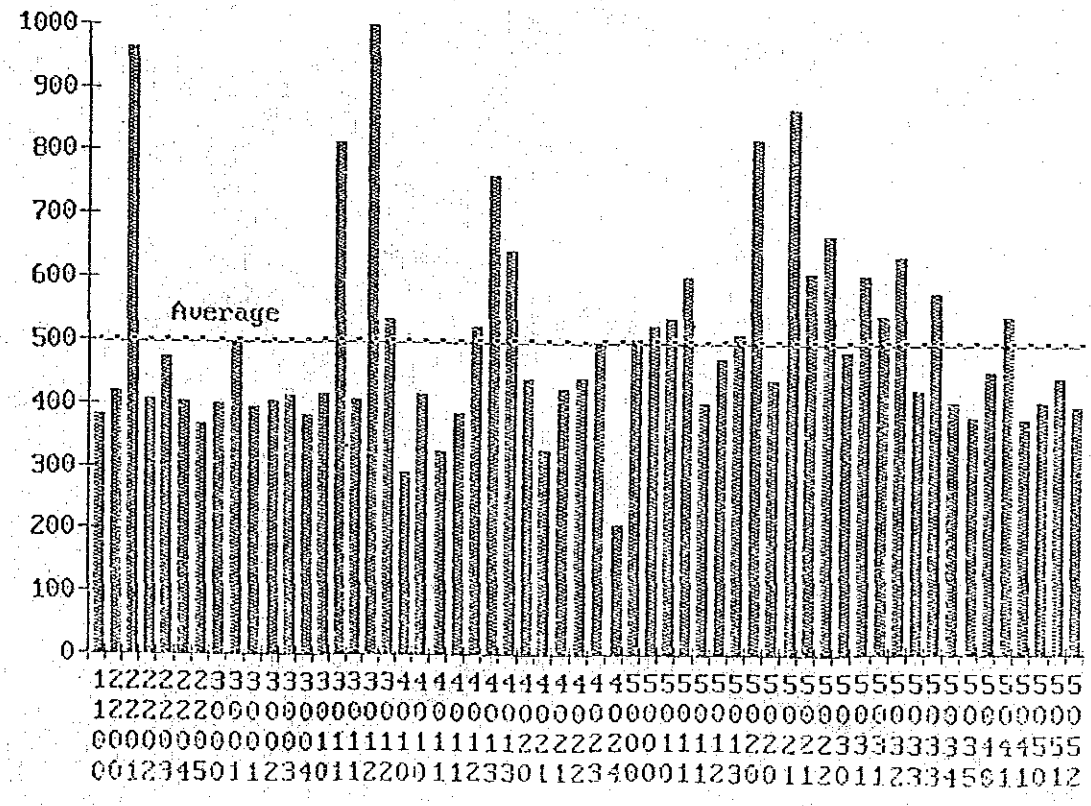


Fig. C-12 STREET VALUE INDEX (AFTER)

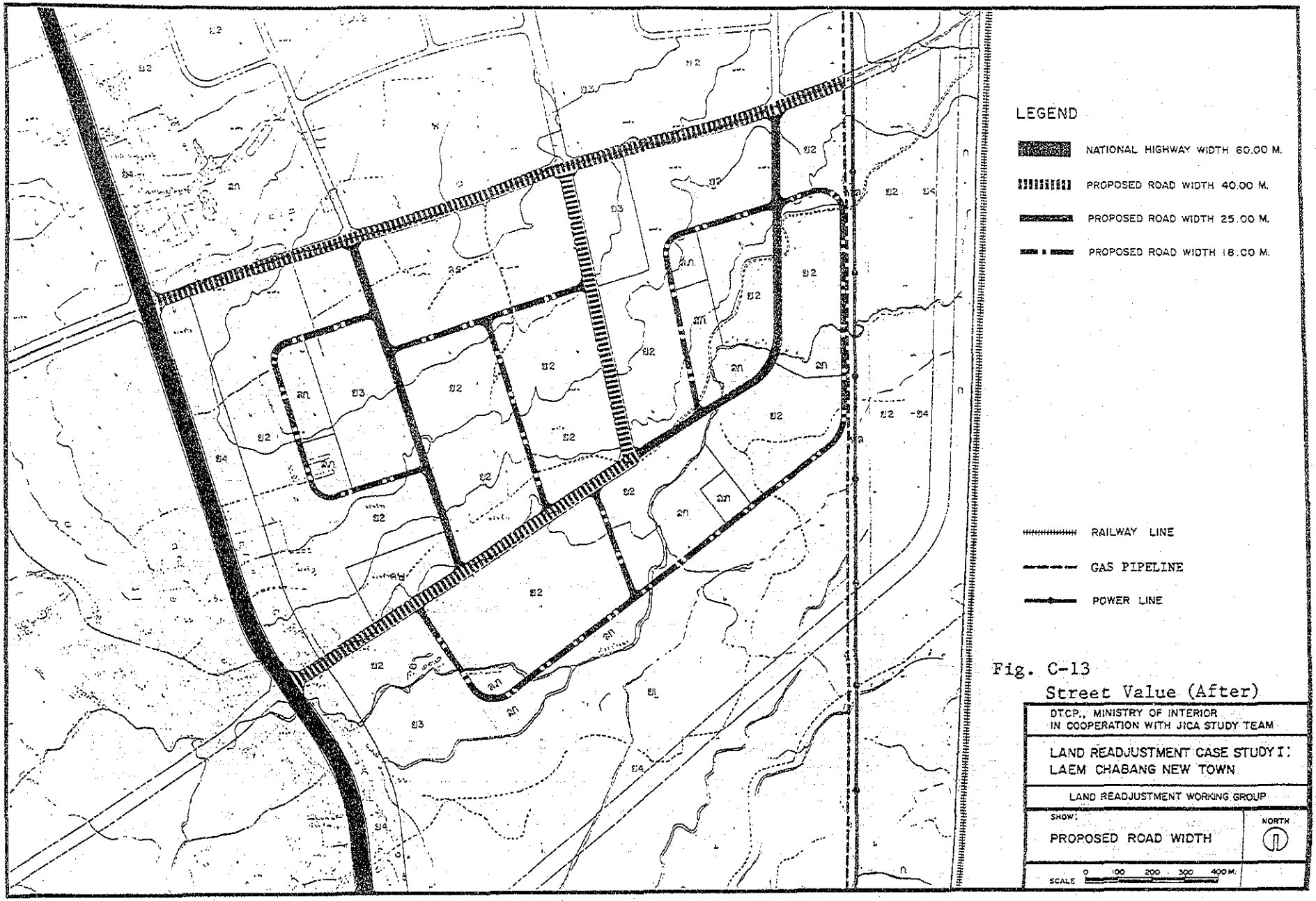


Fig. C-13
Street Value (After)

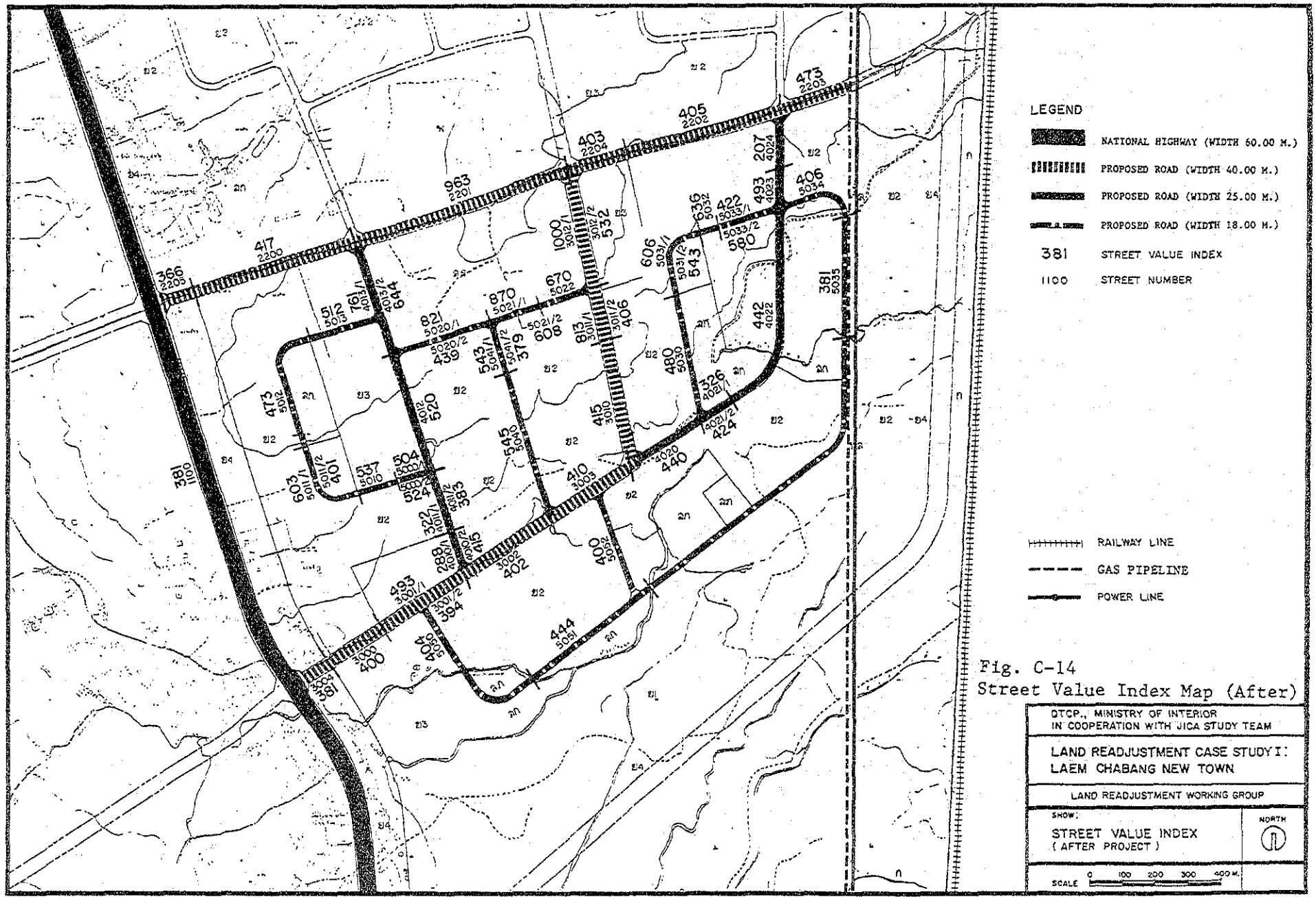


Fig. C-14
Street Value Index Map (After)

n-island = "Island Decrease Ratio" (a standard ratio expressing the change in value "island lot" type); and

n-angle = "Irregular Angle Decrease Ratio"

The Unit Land Value Index, or "v" is calculated by multiplying R times N. The Total Land Value Index, or "v," is calculated by multiplying A by a.

Lot types were classified into the following five categories:

- Ordinary Lot. A lot having one side adjacent to a street.
- Corner Lot. A lot that faces two intersecting streets.
- Island Lot. A lot that is not adjacent to any street.
- Sandwiched Lot. A lot adjacent to two parallel streets.
- Special Lot. A lot adjacent to three or four different streets.

Only ordinary lots, corner lots, and island lots were represented in this case study.

Consider Lot No. 74, an island lot, as an example. The variables used for calculation are:

Depth of lot (h) = 110.0 meters

Frontage length (l) = 0

Lot Area (A) = 6,400 square meters

Street Value Index (R) = 84.0

Depth Successive Ratio (U) = 0.75

Island Decrease Ratio (n-island) = 0.90

The calculations of the indices are as follows:

Unit Land Value Index (a) = R * U * N
= 84.0 * 0.75 * 0.90
= 57.00

Total Land Value Index (V) = A * a
= 6400 * 57.0
= 364,800

Table C-11 presents the details of the Lot Land Value calculations for all lots in the study area.

TABLE C-11 CALCULATION OF LOT LAND VALUE

Lot No.	Depth h	Frontage Length l	Area A	St. Value Index R	Depth Succ. Decrease Ratio u	n-island	n-Angle	Unit Land Value Index @	Total Land Value Index V= A*@	Remark
74	110.0		6,400	84.00	0.75	0.90		57.00	364,800	75.40
86	50.4	197.70	10,720	78.00	0.87			64.60	692,512	87.20
87	58.0	61.00	5,056	78.00	0.86		0.965	64.70	327,123	86.00
88	79.2	22.00	4,208	78.00	0.83		1.000	65.10	273,941	83.50
89	125.0		12,080	78.00	0.75	0.90		52.70	636,616	75.00
90	134.0		5,600	78.00	0.74	0.90		52.30	292,880	74.50
91	122.0		4,992	84.00	0.75	0.90		56.70	283,046	75.00
92	37.6	91.10	15,200	84.00	0.90		0.920	69.70	1,059,440	90.20
93			0		0.00		0.920		0	
101	196.0		6,960	84.00	0.72	0.90		54.80	381,408	72.50
102	194.2		9,008	84.00	0.72	0.90		54.80	493,638	72.50
103	195.7		8,640	84.00	0.72	0.90		54.80	473,472	72.00
105	129.1		9,600	97.00	0.74	0.90		64.90	623,040	74.30
107	37.3	132.30	12,928	97.00	0.92		0.965	85.60	1,106,637	91.50
108	37.7	358.50	22,560	84.00	0.92		0.950	73.00	1,646,880	91.50
109	103.5		9,792	84.00	0.76	0.90		57.20	560,102	75.60
110	41.4	58.00	3,872	97.00	0.89			86.70	335,702	89.40
111	54.4	25.00	3,200	97.00	0.87		0.935	78.50	251,200	86.60
163	53.2	98.00	8,048	97.00	0.87		1.000	84.00	676,032	86.80
164	60.3	46.00	6,032	97.00	0.86		1.000	83.10	501,259	85.70
165	92.4	21.00	3,888	97.00	0.82		1.000	79.90	310,651	82.40
166	91.7	22.70	3,712	97.00	0.82		1.000	79.90	296,589	82.40
167	83.9	20.00	3,856	97.00	0.83		1.000	80.50	310,408	83.00
168	81.7	23.80	2,352	97.00	0.83		0.995	80.30	188,866	83.20
169	49.6	72.00	5,280	97.00	0.87		1.000	84.80	447,744	87.40
170	57.3	61.00	4,240	97.00	0.86		0.985	82.30	348,952	86.10
171	52.8	25.30	2,256	97.00	0.87		0.965	81.20	183,187	86.80
172	57.6	30.60	2,880	97.00	0.86		0.950	79.20	228,096	86.00
173	66.6	44.00	5,120	97.00	0.85		0.985	80.90	414,208	84.70
174	159.5		14,896	97.00	0.85	0.90		64.60	962,282	84.90
192	66.5		5,760	84.00	0.00		0.935	66.70	384,192	
192			0		0.00				0	
194	137.0		9,760	78.00	0.74	0.90		52.30	510,448	74.50
196	55.8	25.40	3,040	97.00	0.86		0.935	78.30	238,032	86.30

Calculation of Block Unit Value

Block Unit Value is calculated to provide a balanced value index and a contribution ratio for the lots on one block. An average unit land value for the block is used in calculating the area of replotting.

The variables used for calculation of Block Unit Value are Street Length (L) and the Street Value Index (R). Block unit value is calculated by the following equation:

$$\text{Block Unit Value (ri)} = \frac{R * L}{L}$$

A block with complete cadastrial maps was selected for an example. This area contains 10 lots (Lots 74, 86, 87, 88, 89, 90, 91, 92, 192, and 194) with a combined area of 49.6 rai or 7.9 hectares. The selected block would be surrounded by several proposed roads (4012, 5020, 5041, and 907) with a combined length of 877 meters. The calculation of Block Unit Value is as follows:

$$.ri = \frac{R * L}{L}$$

$$= \frac{469,815}{877}$$

$$= 535.71$$

Table C-12 provides the details of the calculation.

Lot Value Before and After Development

In principle, a replotted lot should be similar to the original lot in terms of location, area, soil conditions, water supply, land use, environment, and other factors. The replotting process should redistribute land after the development on the basis of the lots owned before the development. The documentation for a replotting should include a table and a map comparing the original lots with the replotted lots.

The variables used to calculate Lot Land Values in the replotting process are:

(B): The accumulated total land value index of all the original lots;

(F): The accumulated total land value index of all replotted lots;

(K): Proportion ratio = average total land value increase ratio of project site (Utility Increase Ratio);

Bi: "Standard Original Land Value Index" (value of lot before development);

Pi: "Standard Replotting Land Value Index" (value of lot after development)

ei: Unit Land Value Index of the block in which the lot is replotted;

Ei: The area of the replot; and

ri: Average unit value of the block.

The formulas are:

$$(K) = \frac{(F)}{(B)}$$

$$Pi = Bi \ (K)$$

$$Ei = \frac{Pi}{ei}$$

Table C-13 shows how lot values before and after replotting are calculated in the example.

The total value of lots before development (B) can be obtained by the taking the sum of the value of the individual lots (referring to Table C-10: V = A * a), which is 4,795,286 units in the example.

For the total value of the lots after the project, (F) is first obtained by calculation of block value (ri) as shown in Table C-12. In the example, the ri value is 535.71. Next, total area after the project (A), 40,724 square meters in the example, is found. Then, the total land value index of all the replotted lots (F) can be calculated by using the following formula:

$$(F) = A \times ri = 40{,}724 \times 535.71 = 21{,}816{,}254$$

To find the Utility Increase Ratio (K), the following formula is used:

$$(K) = \frac{(F)}{(B)} = \frac{21{,}816{,}245}{4{,}795{,}286} = 4.55$$

To calculate the value of Lot 74 (an example) after development, first estimate the Standard Original Land Value Index (the value of the lot before development) in the following manner:

$$(Bi) = (A) * a = 6400 \times 57 = 364{,}800 \text{ units}$$

Next, estimate the Standard Land Value Index (the value of the development) as follows:

$$(Pi) = Bi * (K) = 364{,}800 * 4.55 = 1{,}659{,}840 \text{ units}$$

TABLE C-12 CALCULATION OF BLOCK UNIT VALUE: AN EXAMPLE

BLOCK UNIT VALUE (ri)

Street Number	Street Length (L)	Street Value (R)	L*R	Block Unit Value Σ(R*L)/ΣL
5,020	305	753	229,665	535.71
5,041	135	442	59,670	535.71
4,012	130	480	62,400	535.71
907	307	256	78,592	535.71
TOTAL	877		469,815	

TABLE C-13 REPLOTTING: LOT VALUE BEFORE AND AFTER (AN EXAMPLE)

Lot Number	Area Before (SQ.M) [A]	Lot Unit Value [@]	Lot Value (U-SQ.M) [V=A*@]	Utility Increase Ratio [k]	Total Lot Unit Value [Pi=V*k]	Average Block Unit Value (ri)	Replott Area (SQ.M) (Ar=Pi/ri)	Remark Area Rai Before	After	Area Remained (%)	Area (%)
74	6,400	57.0	364,800	4.55	1,659,840	535.71	3,098.00	4.00	1.94	48.41	51.59
86	10,720	64.6	692,512	4.55	3,150,930	535.71	5,881.00	6.70	3.68	54.86	45.14
87	5,056	64.7	327,123	4.55	1,488,411	535.71	2,778.00	3.16	1.74	54.94	45.06
88	4,208	65.1	273,941	4.55	1,246,431	535.71	2,326.00	2.63	1.45	55.28	44.72
89	12,080	52.7	636,616	4.55	2,896,603	535.71	5,407.00	7.55	3.38	44.76	55.24
90	5,600	52.3	292,880	4.55	1,332,604	535.71	2,487.00	3.50	1.55	44.41	55.59
91	4,992	56.7	283,046	4.55	1,287,861	535.71	2,404.00	3.12	1.50	48.16	51.84
92	15,200	69.7	1,059,440	4.55	4,820,452	535.71	8,998.00	9.50	5.62	59.20	40.80
192	5,440	66.7	362,848	4.55	1,650,958	535.71	3,081.00	3.40	1.93	56.64	43.36
194	9,600	52.3	502,080	4.55	2,284,464	535.71	4,264.00	6.00	2.67	44.42	55.58
Total	79,296		4,795,286	4.55	21,818,553	535.71	40,724.00	49.56	25.45	51.36	48.64

Then, estimate the value of Lot 74 after development with the following equation:

$$\frac{Pi}{ri} = \frac{1,659,840}{535.71}$$

$$= 3,098 \text{ square meters or } 1.9 \text{ rai}$$

The value for the remainder of the replotting area (Lots 86, 87, 88, 89, 90, 91, 92, 192 and 194) can be calculated in the same manner. The total replotted area is 40,724 square meters or 25.45 rai compared to the original area of 79,296 square kilometers or 49.56 rai. Figures C-15 and C-16 provide maps showing the project area before and after replotting.

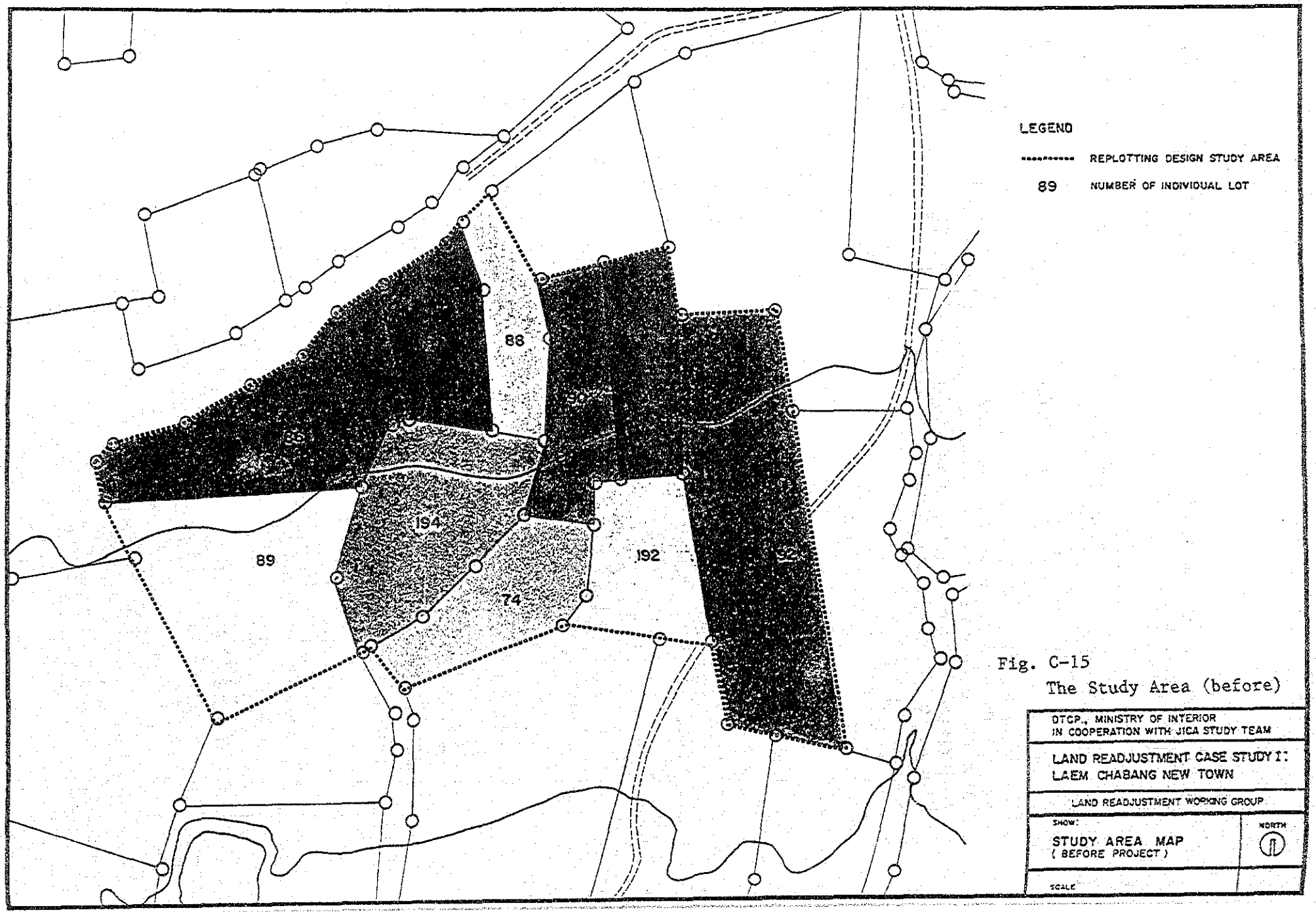


Fig. C-15
The Study Area (before)

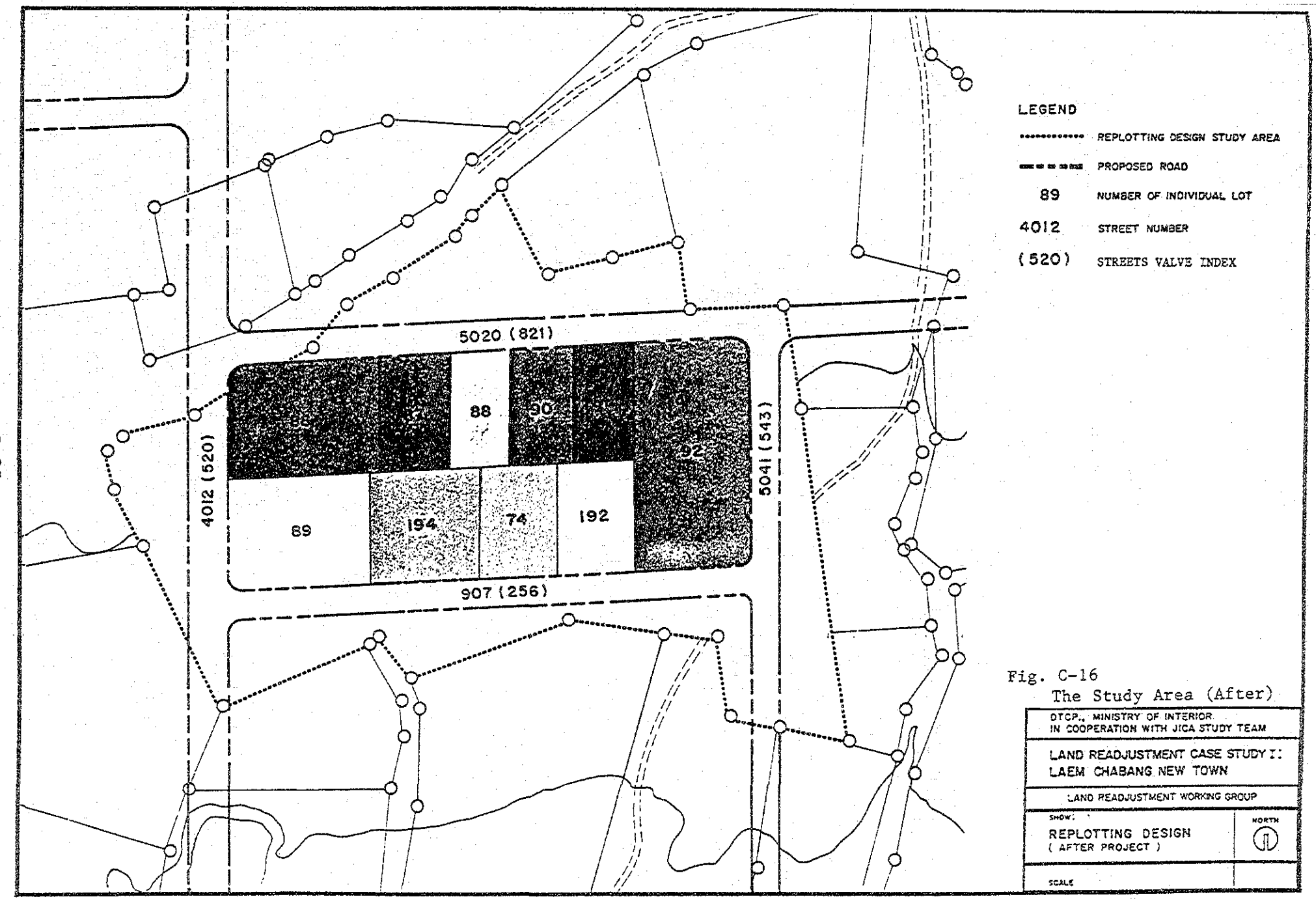


Fig. C-16
The Study Area (After)

APPENDIX D

DISTRICT PLANNING

APPENDIX D

DISTRICT PLANNING

EXERCISE I (OLD CHIANG MAI)

The first district planning exercise involved implementing the following steps for the old section of the city of Chiang Mai:

- analysis of existing conditions;
- establishment of development goals;
- development of a district improvement plan; and
- development of a detailed district control plan.

Each step is discussed below.

Existing Conditions

Socioeconomic conditions in the region, the general plan for Chiang Mai, tourism development programs, and other factors were evaluated at the outset. Elements considered included existing land use, building conditions, parks and open space, education, health services, population, wholesale/retail trade, manufacturing industry, employment, urban development projects, and traffic conditions.

One major task was the development of a database in which detailed information on the planning area (e.g., existing rights-of-way, traffic volumes, building use by category, construction materials, height and color of the buildings, street plans, ancient monuments, and new buildings) were plotted on a base map with a scale of 1/4,000.

The database was developed with the aid of a field survey, which made the following findings, especially with regard to buildings:

- Most buildings are residences. After residential uses, religious, commercial, and institutional uses were most common (in that order).
- Building materials are of three types: wood, concrete, and a combination of wood and concrete.
- White or gray and brown are the most common colors. However, the roofs are typically of local terra cotta, which is mostly brown or yellow.
- Roofs were either flat or had gables.

Figure D-1 presents a grading of buildings and spaces in the study area in terms of historical and environmental value, with the grades ranging from A (highest importance) to D (no significance). Figure D-2 maps the existing visual structure (e.g., nodes, paths, edges) in the study area.

The analysis of existing visual conditions resulted in two principal conclusions. First, Rajadamneon Avenue has served as an important focus for urban activities and points of historic interest. In fact,

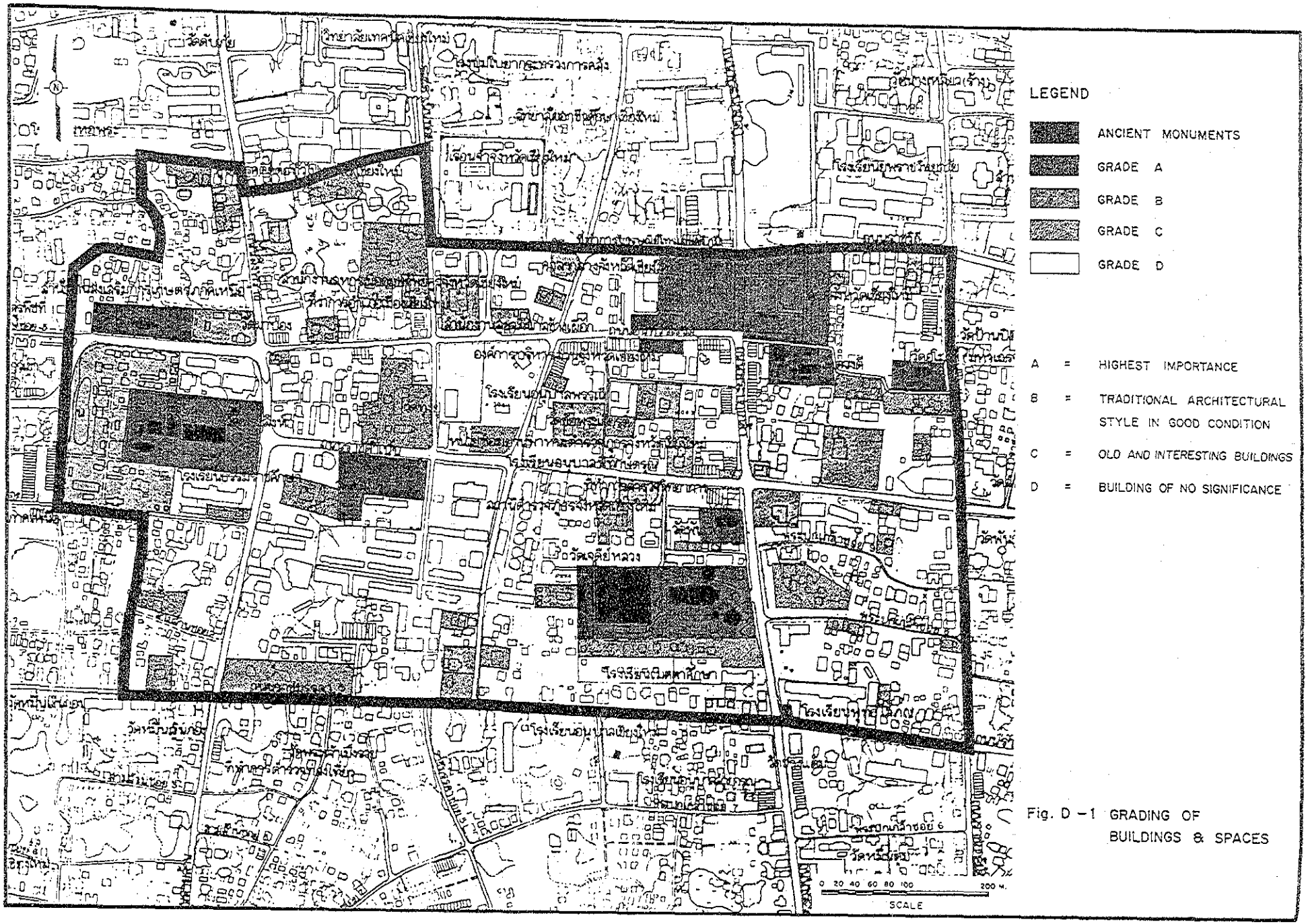


Fig. D – 1 GRADING OF BUILDINGS & SPACES

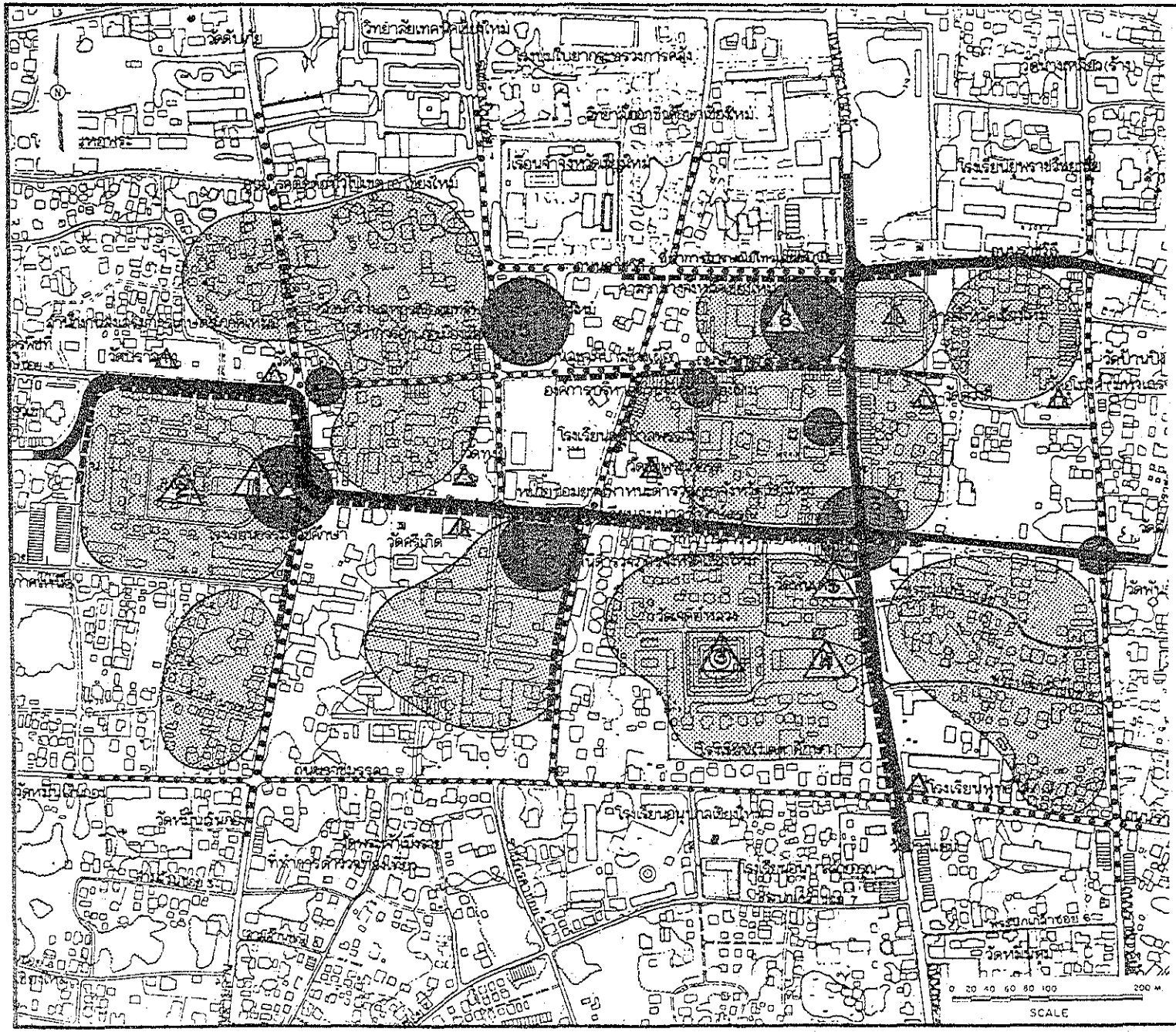


Fig. D-2 EXISTING VISUAL STRUCTURE

the most important historic monuments in the study area are located along the avenue. In addition, many local festivals, ceremonies, and parades take place on the street. The avenue offers a combination of the old and the new, with a mixture of different residential, religious, and governmental uses. The second principal conclusion of the analysis of existing visual conditions was that Tha Pae Gate, Glang Square, and Wat Phra Singh compose a visual corridor that organizes the landscape of the area.

Development Goals

In addition to the analysis of existing conditions, development plans for the planning area and vicinity were reviewed in order to set development goals for the area. Plans reviewed included the "Five-Year Development Plan of the Northern Region," the general and master plan for the area, and the "Tourism Development Plan of Chiang Mai." In addition, Thailand's Fifth Economic and Social Development Plan was examined. It identified Chiang Mai as the principal city of the Northern Region, a center of activities in the commerce, finance, education, public health, communications and transportation, and tourism sectors. Further, various specific objectives were established for Chiang Mai:

- reinforce the city's status as a center of tourism as well as commerce, services, and industry;
- enhance the city's economic base to increase employment;
- develop social programs such as vocational education to meet the needs of the city's work force;
- develop the city's transportation system and its public utilities.

The old section of Chiang Mai is of major historic and religious significant for the Thai people. Indeed, Old Chiang Mai has several well-known sites that attract both Thai and foreign tourists. Therefore, it is classified as a conservation area in the general plan.

Conservation of the historic and cultural monuments in Chiang Mai is strongly related to development of the city's tourism industry. The motivation of most tourists who come to Chiang Mai is to experience the rich history and culture of the area. Therefore, the conservation of the monuments of Old Chiang Mai is vital to promote tourism and to generate tourism-related income for the Municipality.

Setting development objectives is often complicated. Consider, for example, that short-term and long-term objectives may conflict. Tourism development in the old parts of Chiang Mai may well stimulate economic growth in the short run but may change the indigenous culture and lifestyle in the long run.

One of the primary reasons Chiang Mai has been attracting tourists from all over the world is that Old Chiang Mai is clearly a city that was built in an earlier era. Thus, the promotion of tourism and historic conservation are inextricably linked. The development plan is therefore designed to preserve historic resources by enhancing the

historic atmosphere created by such physical elements as temples, pagodas, monuments, and (more generally) the townscape of the historic quarter of the old city.

The Chiang Mai historic conservation project had two goals. One was to preserve historic and religious resources, such as temples, old buildings, and townscapes in the old city. The other was to promote tourism to revitalize the city and surrounding areas.

District Improvement Plan

Based on the evaluation of existing conditions and the development goals set for the area, a district improvement plan was formulated in the form of conservation and development policies for the areas identified. In particular, the areas were classified into four major categories:

- areas to be strictly preserved;
- areas to be preserved but not rehabilitated;
- areas in need of environmental improvements; and
- areas to be redeveloped for public purposes.

Figure D-3 presents a conservation and development policy map for the study area. The details of the classification scheme are set forth below.

- Areas classified as P are to be fully preserved and enhanced. New developments, including the alteration or expansion of existing structures, are not allowed in P areas. All buildings and surrounding spaces are to be maintained in their present state. For certain special buildings, sensitive treatments (e.g., "damp-proofing" or the replacing of damaged wooden structures) may be required, but no significant changes to the exterior or the interior are permitted. All open space, trees, and landscaping must be specially treated; new plantings must be suitable and any unsightly land must be improved.

  P2 areas are those with recently-constructed structures that create visual conflict resulting in the degradation of the quality of the area. In P2 areas, these structures are to be removed. However, a case-by-case consideration is necessary to identify appropriate solutions for the removal of eyesores; in some cases, an external change may be sufficient.

- Areas classified as C are to be preserved and conserved. New developments and large-scale renewal projects cannot be carried out in these areas. C areas are not of the highest historic or architectural importance, but they have some important buildings. Therefore, these individual buildings and the special fabric of the area should be preserved. Trees and open space must also be taken into consideration.

  In C2 areas, the rehabilitation of existing buildings and the development of vacant land is to be encouraged. A

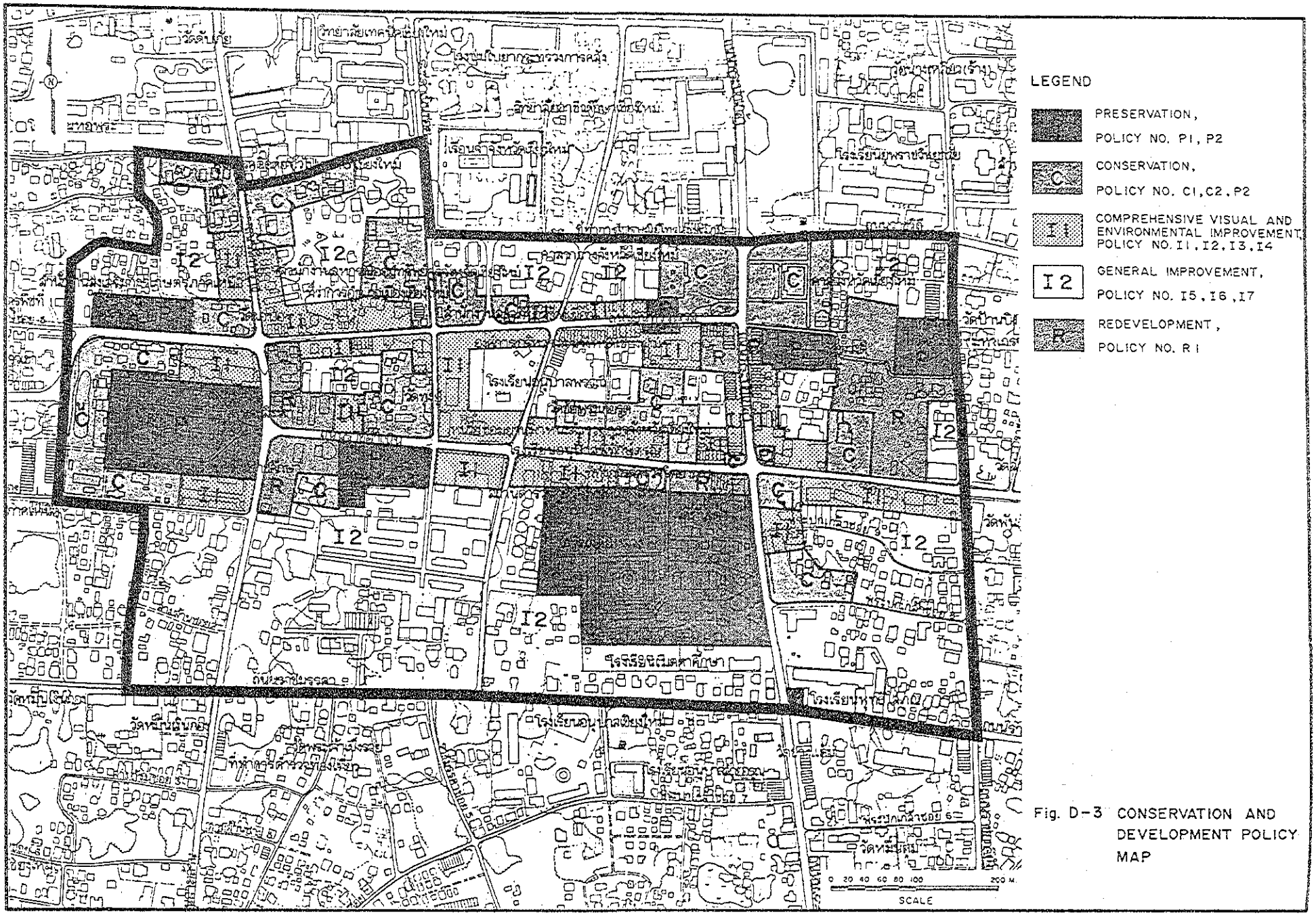


Fig. D-3 CONSERVATION AND DEVELOPMENT POLICY MAP

comprehensive survey to identify buildings to be rehabilitated and sites to be developed should be made. Incentives should be employed to encourage property owners and developers to act in accordance with the plan.

- Area classified as I are designated for environmental improvement. In areas classified as I1, the streetscape will be improved by imposing controls over advertising, new sidewalks, street furniture, plants, and trees. An I2 area is one in which pedestrian circulation is to be improved by gradually reducing vehicular movements and diverting autos from the area in the long term. I2 areas are mostly residential neighborhoods at some distance from Rajadamneon Avenue and the main tourist attractions. In an area designated as I3, development (and demolition) proposals must be examined on their merits by the municipality, which will evaluate such proposals based on the district plan. In an I4 area, unsightly structures (e.g., ugly signs) are to be removed. In the long term, visually inappropriate structures of a more permanent nature such as buildings, electric cables, and posts must also be removed. General improvement schemes (e.g., the improvement of footpaths, open space, and street lighting) should be carried out in I5 areas. In I6 areas, surveys of building conditions must be undertaken, to be followed by rehabilitation, upgrading, or home improvement schemes, as appropriate. In I7 areas new development is most likely to be accepted if it is consistent with development control policies.

- The R areas are to be redeveloped by the municipality for public purposes. These areas obstruct views of important buildings and permit the opportunity for redevelopment for the purpose of tourism.

The improvement plan also includes a district facilities plan, as shown in Figure D-4. Access roads, pedestrian ways, open space, and parks are included.

Detailed Control District Plan

Evaluation of Past Performance

Existing conservation activities in Thailand can be classified into three major areas. The first category is activities relating to ancient monuments, or religious places of great archaeological significance. The well-known Department of Arts of the Ministry of Education is responsible for these tasks but suffers from financial, manpower, and technical constraints.

Second, the Town and Country Planning Act (1975) has empowered DTCP to formulate general and specific plans for towns and cities all over the country. Currently, Chiang Mai has only a general plan. Specific plans are formulated primarily for the purpose of implementing development control in zones identified in the general plan. The identification of conservation areas may be accompanied by a policy to

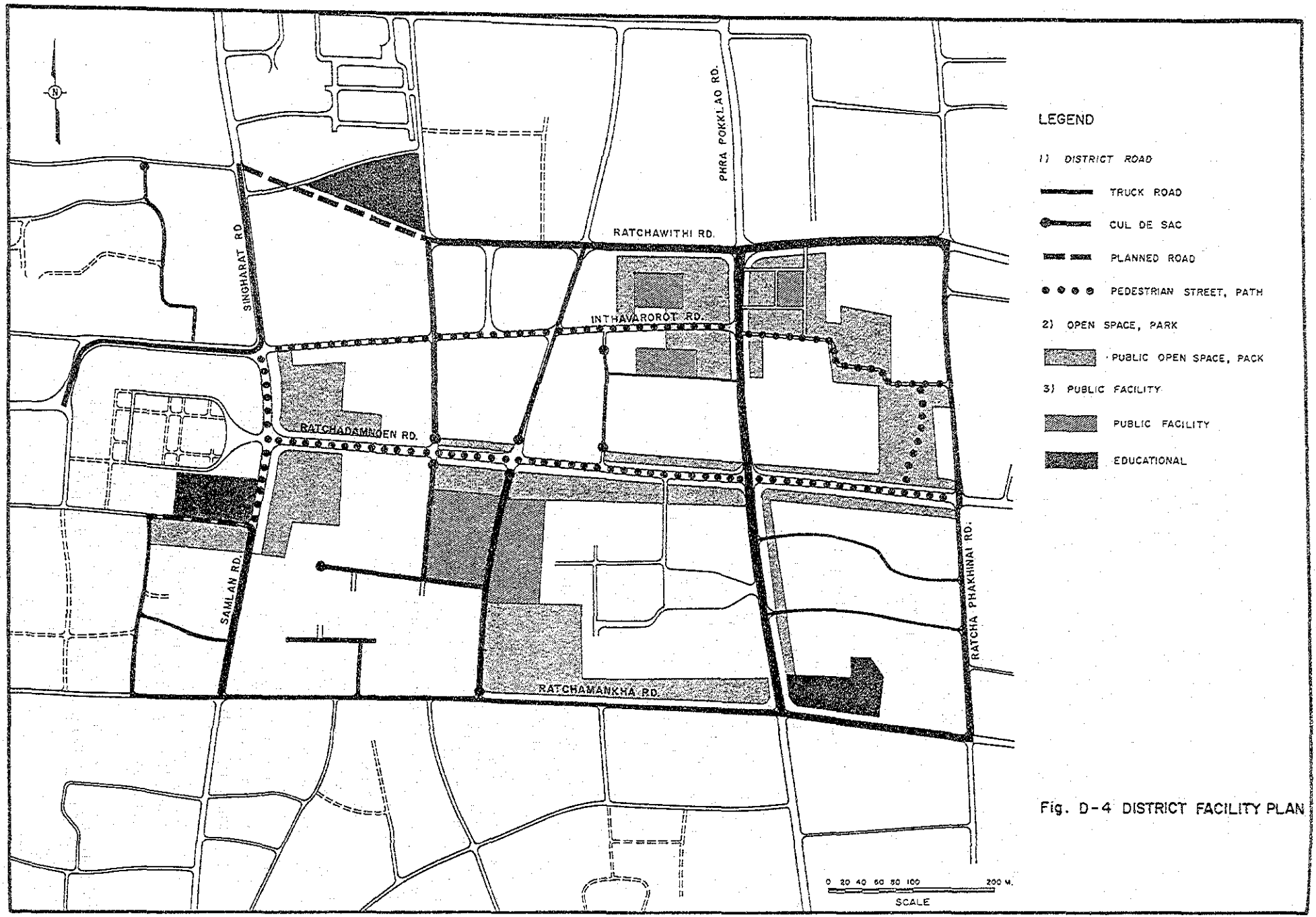


Fig. D-4 DISTRICT FACILITY PLAN

prevent undesirable types of developments (e.g., factories or fuel stores) in the area. Since specific plans have the force to limit development rights, they are effective tools for implementing district plans.

Third, under the Building Control Act (1979) and local "Bylaws," municipalities regulate the demolition and renovation of buildings. Major considerations in this process include structural soundness and fire safety. Chiang Mai Municipality has recently introduced the regulations to control building design. However, the regulations are limited to roofing and very little emphasis is placed upon preserving buildings of historic importance.

Thus, it is clear that the existing planning and control practices in Thailand in general and in Chiang Mai in particular are not achieving their objectives in terms of conservation of the built environment. However, there is an urgent need to encourage only appropriate development in conservation areas and to better integrate conservation and tourism development policies.

Criteria for Formulating Control Measures

The exercise attempted to formulate the most appropriate urban control measures to promote specific development purposes in Chiang Mai, with the measures formulated intended to serve as an example for similar areas. Considering the special character of the old section of Chiang Mai, the plan aims to conserve the historical environment of the area by encouraging desirable development. Only under these conditions can tourism play an important role in the economic and social development of the old city.

The aims declared above will be achieved by means of district planning. Regarding implementation feasibility, the plan will be formulated to meet three criteria:

- It must be designed to minimize the potential for arbitrary manipulation.
- Its enforcement must be feasible taking into account local administrative capabilities.
- The cost of its administration must be reasonable in the light of other demands on public funds.

Basic Policy for the Control Plan

The basic policies underlying the detailed district control plan are outlined below.

- The area along Rajadamneon Avenue was selected for this pilot conservation project for three reasons. First, it has long been the main axis of the historic city, running across the middle of Old Chiang Mai in an east-west direction. Second, many of Chiang Mai's most important ancient monuments are on this avenue, including Wat Phra Singh and Wat Chedi Luang. Third, Ratchadamneon Avenue has served the city as a site for important local festivals, ceremonies, and parades.

- Conservation of ancient monuments is essential for Chiang Mai to preserve its local culture and promote tourism. It is believed that religious monuments, such as temples and pagodas, will be generally well-preserved through the generous support of the Thai people.
- However, many traditional residential units are disappearing from the old part of Chiang Mai due to the high cost of maintenance and changing lifestyles. Therefore, urgent assistance for maintenance and renovation (including the control of demolition) is required to preserve the traditional culture of the area. In this exercise, control systems for the conservation of these historic and religious monuments were proposed.

Detailed Control Plan

New Building Control

Zoning. Zoning, the most important development control measure, is aimed at promoting the efficient use of land in an urban area. The planning area was zoned in a manner consistent with the conservation policies established for the old part of Chaing Mai (see Figure D-3) and the city's general plan. More detailed control measures, such as building restrictions, are linked to the zoning classifications.

Building Coverage Ratio. The survey of existing conditions in the old section of Chiang Mai found that the average building coverage ratio was 24%. The maximum ratio permitted in this area by the local Bylaws is 70%. In this exercise, a maximum ratio was set for each zone based on the characteristics and development objectives of the zone (Figure D-5). The maximum coverage ratio provided for each type of zone was as follows:

- Commercial Zone I 70%
- Commercial Zone II 60%
- Residential Zone 60%
- Environmental Conservation Zone 40%
- Educational and Institutional Zone 50%
- Governmental and Public Facilities Zone.. 60%

However, the municipality reserves the authority to formulate more specific provisions.

Building Height. The Bylaws provide for a maximum building height of 12 m, measured up to the ceiling of the top floor. Based on development objectives and the existing townscape, a maximum height was set for each zone in this exercise. The proposed height limits were as follows:

- Commercial Zone I ..... 12 m
- Commercial Zone II ..... 8 m
- Residential Zone ..... 8 m
- Environmental Conservation Zone ..... 4 m
- Educational and Institutional Zone ..... 12 m
- Governmental and Public Facilities Zone.. 12 m

Fig. D-5 PROPOSED LAND UTILIZATION PLAN

Building Lines and Setbacks. Building lines and setbacks are regulated in the Chiang Mai Municipality Bylaws. Effective controls were instituted to preserve conservation areas and pedestrian space (see Figures D-4 and D-6). Such controls will result in a widening of existing pedestrian ways, thereby promoting more enjoyable walking and sightseeing. The increase in pedestrians that should result is expected to generate increased retail sales in the study area.

Building Design, Color, and Style. In order to maintain the traditional atmosphere of the area, the exercise adopted the building design controls included in the municipal Bylaws. Either the Larnna-Thai style or the local northern style (with ga-lae on top of gables) is required.

Special controls were adopted for the tourist areas along Rhajadamnerne and Intarawarorot Roads, as shown in Figure D-6. Buildings must be brown (light or dark), white, or gray. Roofs must be yellow, orange, or brown. The design of the roof must be gable, hip, or hip-gable, with a slope of 30 to 40 degrees.

Controls for Existing Buildings

The control measures proposed for existing buildings include the following:

Restoration. All plans for building restoration must comply with the conservation policy. All restoration work requires the approval of municipality, with the approval to be based on a written application with drawings.

Alteration. The existing Bylaws already restrict building alterations and should assure compliance with the conservation policy. All alteration work requires the approval of the municipality, with the approval to be based on a written application with drawings.

Demolition. The Building Control Act regulates demolition for safety reasons. However, in this exercise, demolition is controlled to preserve buildings of historic or religious significance in the old city of Chiang Mai. It is recommended that a comprehensive building survey be conducted to identify such buildings, with the results of the survey to be applied in the regulatory process.

EXERCISE II (JOMTIEN, PATTAYA)

First, existing conditions in the Jomtien Beach area were analyzed. Next, development goals were set. Finally, a detailed district control plan was formulated. Each of these tasks is summarized below.

Existing Conditions

The evaluation of existing conditions included an analysis of general geographic characteristics, urban growth, resort and tourism development, and the infrastructure of Pattaya.

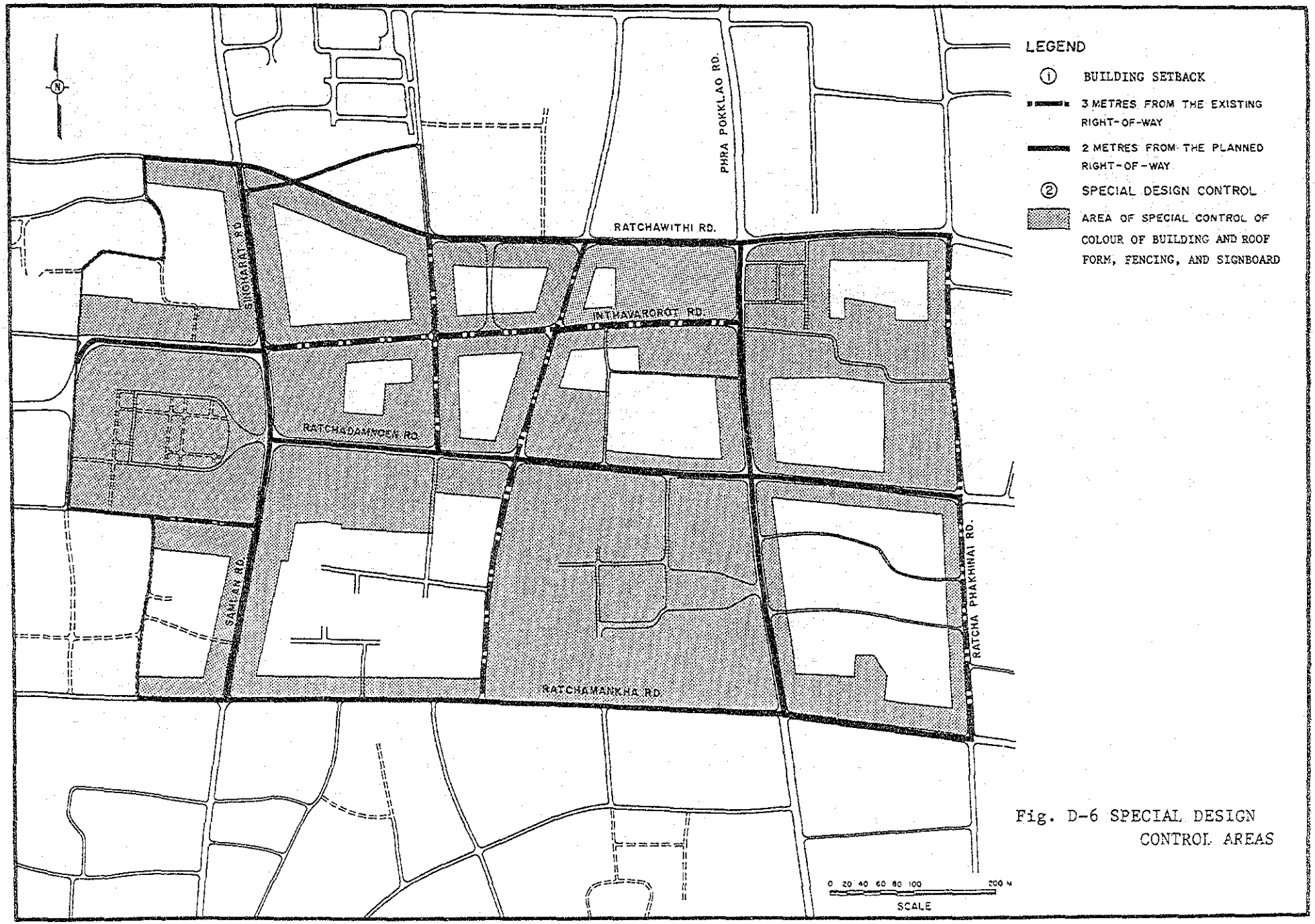


Fig. D-6 SPECIAL DESIGN CONTROL AREAS

1) General Geographic Characteristics

Jomtien Beach is a part of the city of Pattaya, located at a latitude of 13 degrees north and a longitude of 101 degrees east, approximately 150 kilometers from Bangkok (see Figure D-7). It is within the administrative boundary of the Bang-la-mung District in Chon Buri Province.

Pattaya, which is on the eastern coast of Thailand, covers approximately 208.1 square kilometers. The total beach length is approximately 15 kilometers. Jomtien Beach alone is about 6.8 kilometers long and is in the southern part of the city.

2) Urban Growth

Pattaya first became recognized as a major Thai seaside resort about thirty years ago. In the last ten years, Pattaya has become well-known as a seaside resort that meets international standards. Since Pattya is located relatively close to Bangkok, it attracts many Thai tourists who make day or weekend trips. With the pace of urban growth quickening as tourism to the area increased, in 1978 the Government established the city of Pattaya with a city manager system under the control of a professional administrator.

Currently, the northern part of Pattaya and the area along Ao Pattaya are fully developed. In particular, the area along Ao Pattaya is well-known for its heterogeneous urban atmosphere and night life. At the same time, Jomtien Beach (south of Ao Pattaya) has gradually gained in popularity among the tourists and visitors who prefer a quieter and more relaxing atmosphere. Jomtien Beach is at present a relatively low density area, but the development potential of the area is extremely high. Indeed, land prices have increased rapidly and the city has received a number of applications for projects on Jomtien Beach.

3) Resort and Tourism Development

Pattaya was formerly a small fishing village with a medium population density. However, as previously mentioned, Pattaya has become an internationally-recognized resort. As a consequence, rapid economic growth has occurred in the area, with large investments made in the hotel sector and numerous other tourism-related businesses having developed.

Jomtien Beach differs quite substantially from the main tourist spots in Pattaya in that it is much quieter and more peaceful. Therefore, the hotel facilities in this area are much smaller.

4) Infrastructure

The tourism industry of Pattaya has expanded in recent years, resulting in the rapid development of hotels, restaurants, and entertainment facilities. As a consequence, the city's infrastructure is now insufficient to provide basic public utilities services such as water supply, wastewater disposal, and telecommunications. These

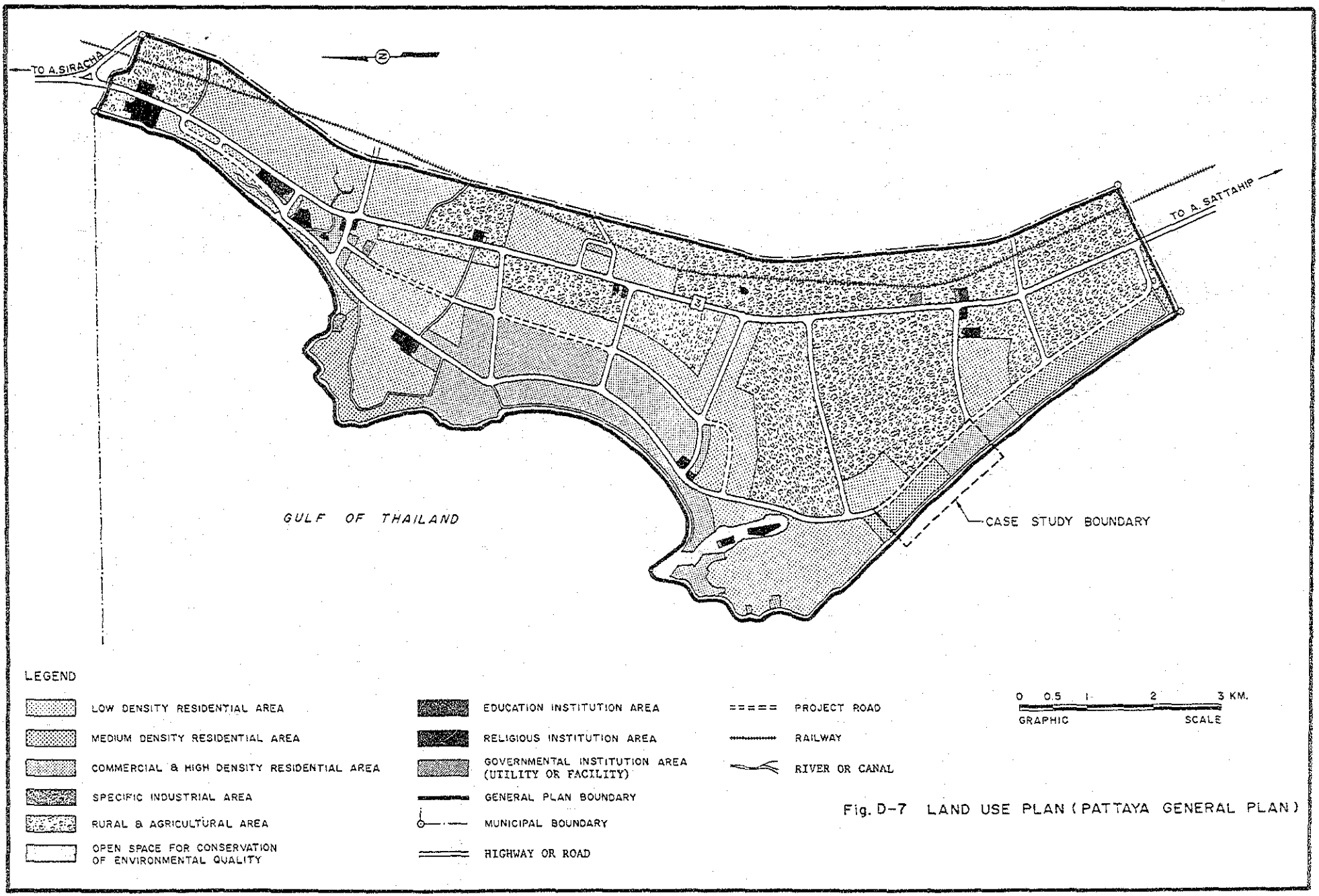


Fig. D-7 LAND USE PLAN (PATTAYA GENERAL PLAN)

problems must be promptly addressed, particularly regarding the supply of water during the peak of the tourist season and the disposal of wastewater from the big hotels.

5) General Plan

As shown in Figure D-7, the Pattaya general plan calls for only limited development in the Had Na Jomtien area, with the goal of establishing commercial and medium-density residential areas in order to maintain the area's excellent environment. In addition, the Pattaya Hill area has been designated a low-density residential area with a public park on top of the hill.

Development Goals

Based on the analysis of existing conditions, the review of the Pattaya general plan, and an assessment of tourism development programs, it has been determined that the development goals for Jomtien Beach are for a resort area that maintains a quiet atmosphere and natural seaside environment. Therefore, only orderly development should be permitted, to keep densities relatively low and to control traffic congestion.

District Detailed District Control Plan

The formulation of development control measures in the Jomtien area reflect the need to preserve the area's natural environment, while permitting some development. Other objectives considered included personal security, public health, and the promotion of the tourism industry. The control measures are described below.

Zoning

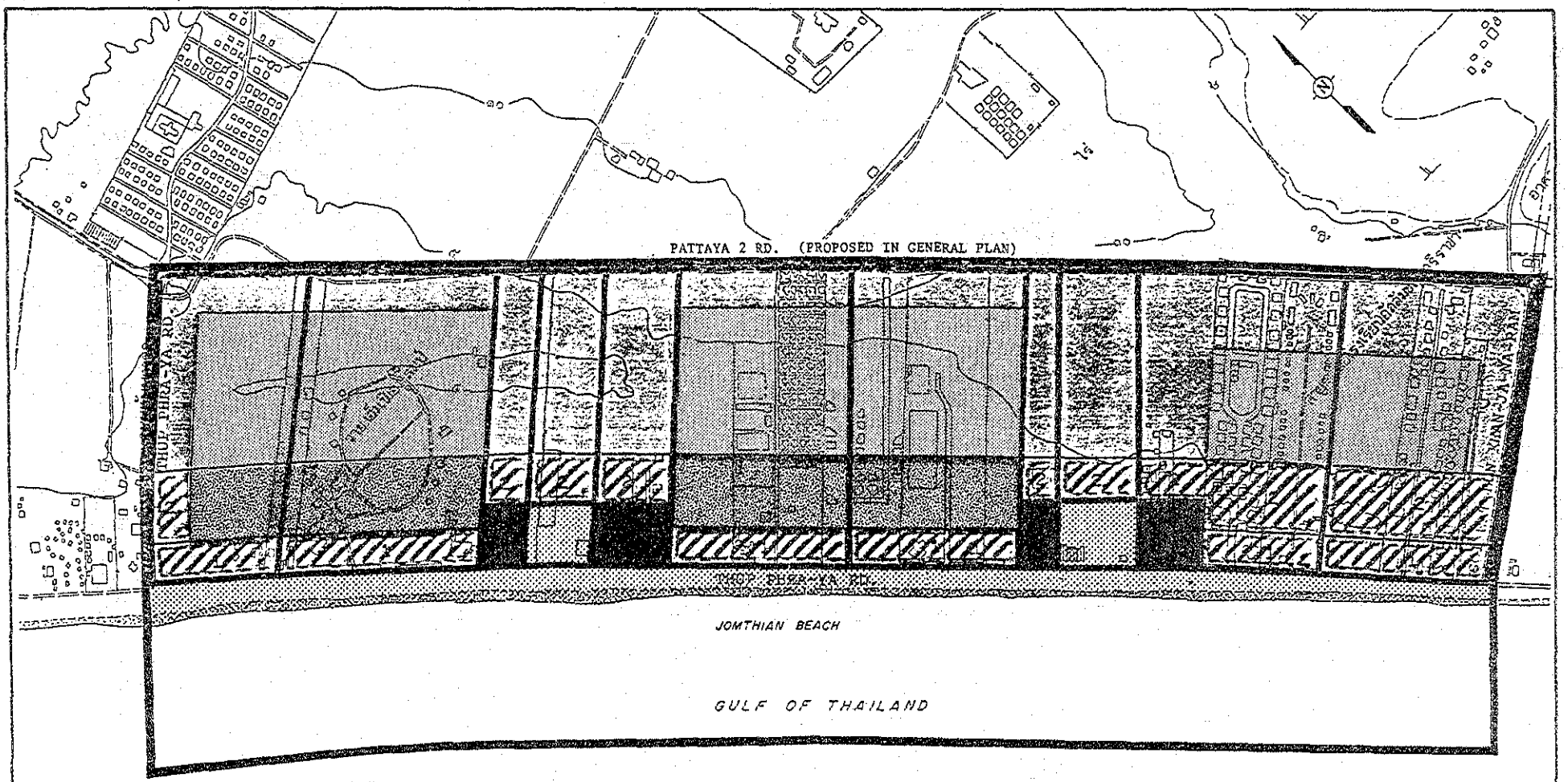
Bearing in mind the land use policy set forth in the Pattaya general plan, land uses in the Jomtien district plan area were further subdivided into six zones, as listed below and shown in Figure D-8:

- high density commercial and residential areas;
- low density commercial and residential areas;
- medium density residential areas;
- low density residential areas;
- governmental institution, public facility, or utility areas; and
- open space for recreation and environmental conservation.

Building Coverage Ratio

In this exercise, maximum building coverage ratios were set for each zone based on the characteristics and development objectives of the zone. The maximum coverage ratio provided for each type of zone was as follows:

- high density commercial and residential areas: 60%
- low density commercial and residential areas (I): 25%
- low density commercial and residential areas (II): 30%



LEGEND

- HIGH DENSITY COMMERCIAL AND RESIDENTIAL AREA (60 | – | – | –)
- LOW DENSITY COMMERCIAL AND RESIDENTIAL AREA (1: 25 | 7 | 9 | 5; 2: 30 | 12 | 4 | –)
- MEDIUM DENSITY RESIDENTIAL AREA (50 | – | – | –)
- DISTRICT PLANNING BOUNDARY
- LOW DENSITY RESIDENTIAL AREA (30 | 12 | 4 | –)
- GOVERNMENTAL INSTITUTION, PUBLIC FACILITY OR UTILITY AREA (25 | 7 | 9 | 5)
- OPEN SPACE FOR RECREATION AND ENVIRONMENTAL CONSERVATION (5 | 3.5 | 6 | 4)

25 | 7 | 9 | 5 — A | B | C

A. MAXIMUM HEIGHT MEASURED FROM THE ROAD LEVEL TO THE TOP OF CEILING
B. ABSOLUTE HEIGHT
C. MINIMUM HEIGHT

MAXIMUM BUILDING COVERAGE RATIO

NUMBERS OF FLOORS ALLOWED

Fig. D-8 PROPOSED LAND UTILIZATION PLAN

- medium density residential area: 50%
- low density residential area: 30%
- governmental institution, public facility, or utility areas: 25%
- open space for recreation and environmental conservation: 5%

Building Height

The city's Bylaws provide for a maximum height of 14 meters for all buildings within 200 meters of the beach; no limit is set for buildings in other locations. However, additional building height limits were proposed in the exercise to control population density and promote the harmony of the townscape:

- high density commercial and residential areas: no limit
- low density commercial and residential areas (I): 7-9 meters
- low density commercial and residential areas (II): 12-14 meters
- medium density residential areas: no limit
- low density residential areas: 12-14 meters
- governmental institution, public facility, or utility areas: 7-9 meters
- open space for recreation and environmental conservation: 3-6 meters

Of course, the current building height limits in the Bylaws still apply to high density commercial and residential areas and to medium density areas if the areas are within 200 meters of the beach.

Building Lines and Setbacks

In the exercise, setback requirements were applied to reserve space for pedestrians. For example, a setback requirement of four meters was applied along Beach Road and three meters along the Pattaya 2 Road. Along other roads the setback requirement was put at either two meters or the requirement established in the city's existing Bylaws, whichever is greater.

Floor Height

Floor height controls are effective tools for promoting attractive townscapes. In this exercise, a floor height of 3.5 meters was proposed for the ground floor (first floor) and 3.0 meters for upper floors in all buildings other than detached or semi-detached residences. The restrictions in the existing Bylaws were recommended for detached and semi-detached residences.

6) Building Color

The objective of controlling the color of buildings is to harmonize development with the natural environment. The areas to be subjected to color regulations are those which are most important for maintaining the attractive townscape of the district plan area. These areas are classified as special design control areas, as shown in Figure D-9. It is recommended that buildings in special design

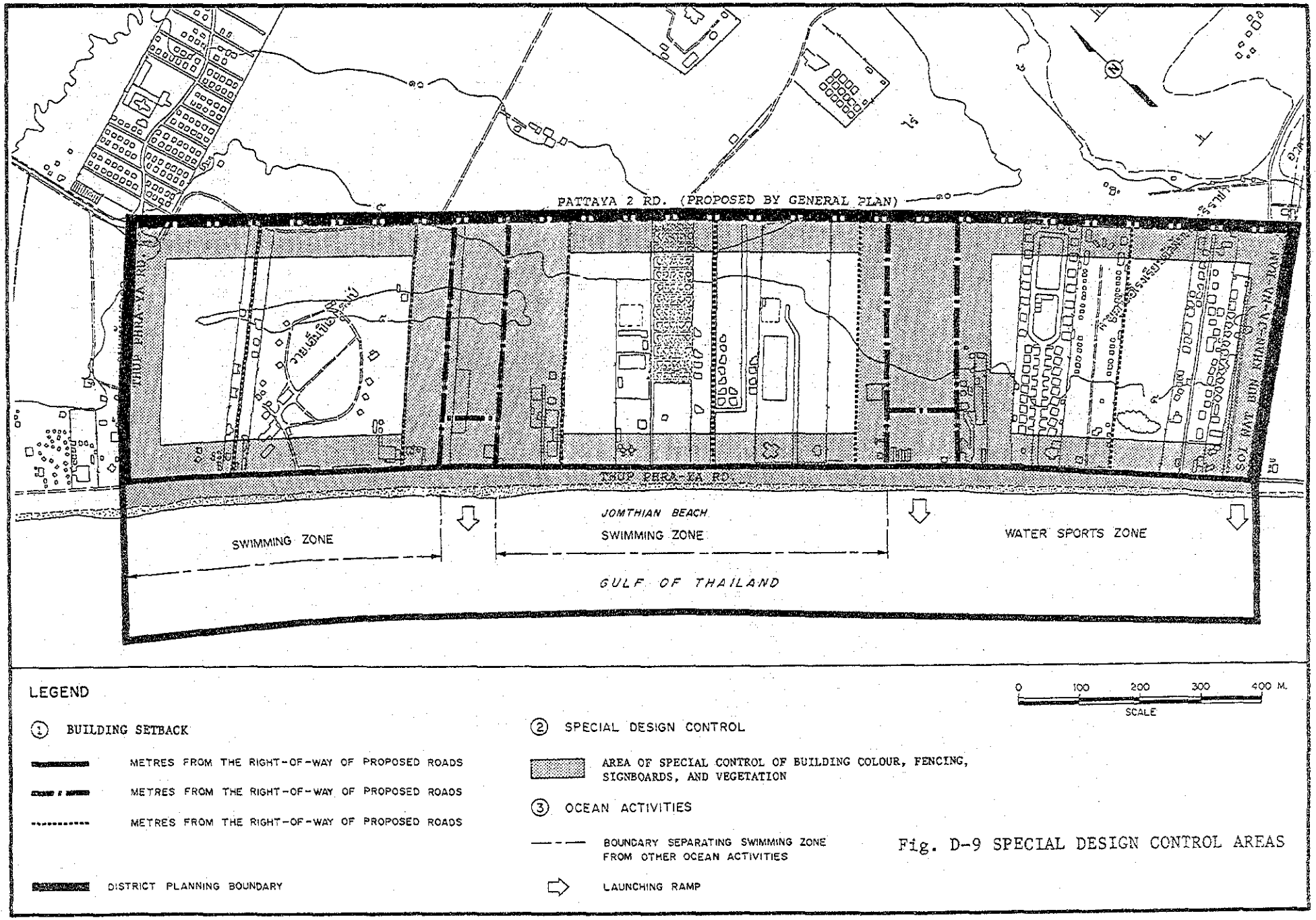


Fig. D-9 SPECIAL DESIGN CONTROL AREAS

control areas be made of natural materials from the local area.

7) Fencing

Fencing is an essential component of any townscape. The Bylaws of the Building Control Act regulate only the maximum height of a fence, which is set at three meters measured from the level of the road. In this exercise, measures for regulating fencing were recommended in the special design control areas (see Figure D-9) to help maintain attractive townscapes. It was proposed that solid-wall fences should not be more than one meter above pavement level. If a fence is to be above this height, it must be a light structure.

8) Signboards

The control of signboards is an important measure contributing to an attractive townscape. Therefore, provisions regulating the size and form of signboards are recommended for the Jomtien District Plan area.

The control measures proposed in the exercise were the following:

- A sign attached to the fascia of a roof or located on a sloping roof may not extend more than 1.20 meters above the upper edge of the fascia.
- A sign to be painted or installed upon the hanging border of any awning or canopy must have only one line of letters, the height of the letters not to exceed 0.20 meter.
- A projecting signboard attached to the wall of a building may not exceed 3.50 meters in length and may not project more than 1.20 meters into the public right-of-way. The lower edge of the signboard must be no less than 2.40 meters above the footpath level.
- A hanging signboard attached to the canopy of any building must not exceed 0.40 meter in width and 1.80 meters in length. The signboard may not extend beyond 3.00 meters into the public right-of-way. The lower edge of the signboard must be no less than 2.4 meters above the footpath level.
- A detached signboard supported by a post on the ground may not obstruct the public right-of-way. The lower edge of the signboard must be no less than 2.40 meters above the footpath level. In addition, the upper edge of the signboard may not extend more than 1.20 meters above the upper edge of the fascia of the roof of the building associated with the signboard.
- Signboards must be safely installed so that they will not endanger the public.

The signboard controls are to implemented in the special design control areas shown in Figure D-9.

9) Vegetation

The preservation of local vegetation is an important measure for protecting the natural environment. It is proposed that sugar palm trees be preserved since they contribute greatly to the identity of

the Jomtien Beach area. If it becomes absolutely necessary to cut down any of the sugar palms, advance permission from the Pattaya Municipality should be required.

In addition, if any tree (whatever the species) with a diameter of more than 0.15 meter is to be cut down, advance permission from the Pattaya Municipality should be required. Also, a new tree of the same species or a species recommended by the Pattaya Municipality should be planted for each tree that is cut down.

APPENDIX E

CONTENTS OF THE PLANNING MANUALS

APPENDIX E CONTENTS OF THE SECTORAL PLANNING MANUALS

VOLUME I INTEGRATED CITY PLANNING

1. Upon Using "City Planning Manual"

1.1 Purposes of Manual
1.2 Composition of Manual

2. What is City Planning?

2.1 Meaning and Application of City Planning
2.1.1 Meaning of City Planning
2.1.2 Areas Subject to City Planning
2.2 Contents and Characteristics of City Plans
2.2.1 Contents of City Plans
2.2.2 Contents and Characteristics of Integrated Physical Plan
2.3 Procedures for Preparation of Integrated Physical Plan
2.3.1 General Procedures for Analysis and Planning
2.3.2 City Planning Area
2.3.3 Analysis of Existing Conditions
2.3.4 Projection of Future Conditions
2.3.5 Setting Goals and Objectives
2.3.6 Setting Socioeconomic Framework
2.3.7 Establishment of Urban Policies and Future Urban Structure
2.4 Coordination with Higher-Ranking and Related Plans
2.5 Revision of City Plans

3. Outline of Sectorial Studies and Plans

3.1 Mapping
3.1.1 Fundamental Maps for City Plans
3.1.2 Mapping Procedures
3.1.3 Relationship with Other Sectorial Studies and Plans
3.2 Socioeconomic Analysis
3.2.1 Contents and Objectives of Socioeconomic Analysis
3.2.2 Analysis Procedures
3.2.3 Relationship with Other Sectorial Studies and Plans
3.2.4 Presentation of Analysis Results
3.3 Land Use Planning
3.3.1 *Contents and Objectives of Land Use Plan*
3.3.2 Planning Procedures
3.3.3 Relationship with Other Sectorial Studies and Plans
3.3.4 Presentation of Plan
3.4 Transport Planning
3.4.1 Contents and Objectives of Transport Plan
3.4.2 Planning Procedures
3.4.3 Relationship with Other Sectorial Studies and Plans
3.5 Urban Facility Planning
3.5.1 Contents and Objectives of Urban Facility Plan
3.5.2 Planning Procedures
3.5.3 Relationship with Other Sectorial Studies and Plans
3.5.4 Presentation of Plan

4. Programming and Evaluation of City Plan

4.1 Programming of Work Plan
4.1.1 Standard Assignment of Sectorial Works
4.1.2 Programming of Work Plan
4.2 Preparation of Development Investment Program
4.2.1 Meaning of Development Investment Program
4.2.2 Presentation of Development Investment Program
4.3 Evaluation of City Plan
4.3.1 Evaluation of Integrated Physical Plan
4.3.2 Evaluation of Projects

VOLUME II MAPPING

Introduction

Chapter 1 Fundamental Maps for City Planning

1.1 The Application of Maps for City Planning
1.2 Basic Fundamental Map Components
1.3 Different Types of Maps
1.3.1 General Maps
1.3.1.1 Base Map
1.3.1.2 Vicinity Map
1.3.2 Thematic Maps
1.3.2.1 Topographic Map
1.3.2.2 Hydro-geologic Map
1.3.2.3 Slope Map
1.3.2.4 Soil Map
1.3.2.5 Flooding Hazard Map
1.3.2.6 Land Classification Map
1.3.2.7 Infrastructure Map
1.3.2.8 Cadastral Map
1.3.2.9 Land Values Map
1.3.2.10 Land Use Map.
1.3.2.11 Development Constraint Map
1.3.2.12 Population Distribution Map
1.3.2 13 Population Density Map
1.3.3 Analytical Maps.
1.3.3.1 Erosion Potential Map
1.3.3.2 Land Capability Classification Map
1.3.3.3 Soil Suitability Map.
1.3.4 Digital Maps
1.3.4.1 General
1.3.4.2 Input Data
1.3.4.3 Output
1.3.5 Photomap

Chapter 2 Mapping.

2.1 General
2.1.1 Scope Work of Surveying
2.2 Control Survey.
2.2.1 General
2.2.2 Control Survey with Traverses or Triangulation
(Theory of Adjustments)
(Method of variation)
2.3 Leveling
2.3.1 General
2.3.2 Adjustment by the Method of Least Squares
2.4 Topographical Mapping
2.4.1 General
2.4.2 Map Design
2.5 Photogrammetric Mapping
2.5.1 General
2.5.2 Ground Survey for Photogrammetry
2.5.3 Establishment of Air-Photo Signal
2.5.4 Aerial Photography
2.5.5 Pricking
2.5.6 *Aero Triangulation (Phototriangulation)*
2.5.7 Mapping
2.6 Field Editing
2.6.1 General
2.6.2 Establishment of Control Points
2.6.3 Detailed Survey
2.7 Map Compilation
2.7.1 General
2.7.2 Map Contents
2.7.3 Names and Labels
2.7.4 Symbols
2.8 Drafting
2.9 Final Results

VOLUME II MAPPING

Chapter 3 Map Projection and Applied Techniques for Maps

3.1 Transverse Mercator Projection
- 3.1.1 History and Features
- 3.1.2 Formulas for the Ellipsoidal Projection.

3.2 Conformal Mapping

3.3 Methods of Determining Area
- 3.3.1 General
- 3.3.2 Methods of Determining Area
- 3.3.3 Instruments
- 3.3.4 Measurement by Using the Digitizer.

3.4 Digital Maps

VOLUME III SOCIOECONOMIC ANALYSIS

PART I

1. Objectives of Socio-Economic Analysis

2. Analysis Procedures

3. Data Collection and Compilation
   - 3.1 Population
     - 3.1.1 Data to be Collected
     - 3.1.2 Compilation Format
   - 3.2 Economic Activity
     - 3.2.1 Data to be Collected
     - 3.2.2 Compilation Format

4. Analysis of Existing Conditions
   - 4.1 Population
     - 4.1.1 Population Growth Trend
     - 4.1.2 Population Distribution Density
     - 4.1.3 Age-Sex Structure
     - 4.1.4 Labor Force
     - 4.1.5 Household Characteristics
     - 4.1.6 Other Special Matters
   - 4.2 Economic Activity
     - 4.2.1 Age-Sex Structure of Employed Population
     - 4.2.2 Employment by Sector
     - 4.2.3 Employment Distribution
     - 4.2.4 Situation of Commercial Activities
     - 4.2.5 Situation of Industrial Activities
     - 4.2.6 Special Economic Activity
     - 4.2.7 Household Income
     - 4.2.8 Economic Position and Role of the Area in a Wider Area

5. Projection of Future Conditions
   - 5.1 Population
     - 5.1.1 Total Population
     - 5.1.2 Age-Sex Structure
     - 5.1.3 Labor Force
     - 5.1.4 Other Special Aspects
   - 5.2 Economic Activity
     - 5.2.1 Employment by Sector
     - 5.2.2 Value Added by Sector
     - 5.2.3 Special Economic Activity

6. Setting up Socioeconomic Framework
   - 6.1 Contents of Framework
   - 6.2 Items to be Considered

PART II

1 Introduction

2 Concept of System
- 2-1 Purpose of System
- 2-2 Concept of System

3 System Design
- 3-1 Definition of System Function
- 3-2 Data Items
- 3-3 Code Design
- 3-4 Input/Output Format
- 3-5 Details of Software

4 Operation Manual
- 4-1 Starting dBASE III PLUS
- 4-2 Operation of Data Input
- 4-3 Operation of Basic Tabulation

VOLUME IV LAND USE PLANNING

1 Land Use Planning and Its Objectives

2 Planning Procedures and Approaches

3 Methodology
- 3.1 Preparatory Work
  - 3.1.1 Preparation for Survey
  - 3.1.2 Basic Survey
- 3.2 Analysis and Evaluation
  - 3.2.1 Items to be Analyzed
  - 3.2.2 Analytical Methods
  - 3.2.3 Conclusions
- 3.3 Land Demand Projections
  - 3.3.1 Residential Land
  - 3.3.2 Commercial Land
  - 3.3.3 Industrial Land
  - 3.3.4 Agricultural Land
  - 3.3.5 Recreation and Open Space
- 3.4 Land Use Planning
  - 3.4.1 Setting Up of Goals and Objectives
  - 3.4.2 Land Use Policies
  - 3.4.3 Layout
  - 3.4.4 Coordination with the Concerned Agencies
  - 3.4.5 Compilation of the Draft Land Use Plan

4 Presentation
- 4.1 Planning Boundary
- 4.2 Draft Land Use Plan
- 4.3 Land Use Plan

5 Revision

VOLUME V TRANSPORT PLANNING

PART 1: INTRODUCTION

- 1.1 Use of This Manual
- 1.2 Institutional Background to the Planning for the Transport System in Thai Cities (transport planning as statutory planning / relevant authorities responsible for planning of urban transport systems in Thailand)
- 1.3 Definition and Scope of Transport Planning Concerned in This Manual

PART 2: TRANSPORT PLANNING PROCESS

- 2.1 Transport Planning Process - Generalized Procedure
- 2.2 Coordination with Related Sectors

PART 3: TRANSPORT AND TRAFFIC SURVEYS

- 3.1 Design of Field Survey
- 3.2 Transport System Survey (road inventory / public transport system / bicycle and pedestrian routes)
- 3.3 Traffic Studies
  - 3.3.1 Traffic Volume and Composition (time span for expressing traffic volume / type of traffic count / counting techniques / when and how long should the traffic volume count be conducted)
  - 3.3.2 Travel Time and Speed Survey (purpose of travel time and speed survey / measuring method)
- 3.4 O-D Surveys
  - 3.4.1 Type of O-D Surveys (person trip survey / vehicle O-D survey / commodity flow survey)
  - 3.4.2 O-D Survey Design (zoning / sample design/ preparation and conduct of field survey)
- 3.5 Other Related Information (traffic congestion / accident statistics / passenger occupancy survey)

PART 4: ANALYSIS OF EXISTING SYSTEMS

- 4.1 Compilation and Analysis of Basic Data
  - 4.1.1 Compilation of Transport System Data
  - 4.1.2 Traffic Data Analysis (traffic volume and composition of analysis/ volume to capacity (V/C) ratio / traffic speed / functions of road section / summarizing overall traffic problems)
  - 4.1.3 Analysis of Travel Behaviour and Existing O-D Pattern (modal split / trip rate / O-D pattern)
- 4.2 Identification of Existing Problems and Constraints (area-wide transport problems / problems by routes/ land use constraints)
- 4.3 Formulating Planning Strategy (Goals and Objectives)

PART 5: TRANSPORT DEMAND ANALYSIS

- 5.1 Introduction (modelling approach to transport demand analysis / resource requirement / which cities require modelling approach / alternative approaches)
- 5.2 Preliminary Analysis
  - 5.2.1 Construction of Present O-D Matrix (types of traffic movement / definition of O-D matrix / O-D matrix and types of traffic movement / the summation of data collected through interview survey and cordon line survey / occupancy rates / expansion factors/ construction of O-D matrices)
  - 5.2.2 Network Representation (traffic zone and zone centroid / link and node data/ Q/V curves)
  - 5.2.3 Socio-Economic Framework (simple allocation method of population and employment)
- 5.3 Trip Generation
  - 5.3.1 Trip Rate Method (land use ratio method / person trip ratio method)
  - 5.3.2 Regression Analysis Method (theory and modelling process / example regression models)
- 5.4 Trip Distribution
  - 5.4.1 Growth Factor Method (uniform factor method / average factor *method / Detroit / Fratar* method)
  - 5.4.2 Gravity Model
- 5.5 Modal Split Analysis (factors affecting modal split / modal split approaches / diversion curve / discret choice modelling)
- 5.6 Traffic Assignment
  - 5.6.1 Shortest Path Algorithm
  - 5.6.2 All or Nothing Assignment
  - 5.6.3 Capacity Constrained Assignment

PART 6: ALTERNATIVE APPROACHES TO DEMAND ANALYSIS

- 6.1 Introduction
- 6.2 Simplified Approaches to Demand Analysis (trend analysis / road density approach / simplification in O-D data collection / simplification in modelling)
- 6.3 Estimation of O-D Matrix Based on Traffic Counts (modelling / solution method / worked example)
- 6.4 Discrete Choice Analysis (random utility theory and discrete choice models/ parameter estimation / modelling procedure / applications to transport demand analysis / questionnaire design / sample design)

PART 7: PLAN SYNTHESIS - GUIDELINES TO BETTER PLAN DESIGNING

- 7.1 Introduction (element of a transport plan / transport development framework / land use constraints)
- 7.2 Road Network Design
  - 7.2.1 Urban Structure and Network Patterns (urban structure / local street network patterns)
  - 7.2.2 Function of Roads (function of roads / design volume and capacity specification)
  - 7.2.3 Road Density and Accessibility
- 7.3 Planning for Buses (role of bus transport / bus route planning / related bus improvement measures)
- 7.4 Transport Terminals and Other Mode of Transport (airport / bus and truck terminals / docks and harbours / railway system / pedestrian and bicycle path)
- 7.5 Traffic Management Measures

PART 8: EVALUATION OF TRANSPORT PLANS

- 8.1 Evaluation Process in Transport Planning
- 8.2 Comprehensive Evaluation
  - 8.2.1 Evaluation Criteria
  - 8.2.2 Selection Method
- 8.3 Economic Evaluation
  - 8.3.1 Purpose of Economic Evaluation
  - 8.3.2 Calculation of Cost and Benefits (estimation of the capital cost / vehicle operating costs / value of time / calculation of benefits / discount rate)

PART 9: NOTE ON PLAN REVISION

APPENDICES

REFERENCES

VOLUME VI URBAN FACILITIES PLANNING

Part I : Procedure and Guideline

Chapter 1 Planning Procedures
- 1.1 Urban Utility Planning Procedure
- 1.2 Park and Recreation Area Planning Procedure
- 1.3 Coordination with Related Sectors
- 1.4 Planning Approaches

Chapter 2 Urban Utilities
- 2.1 Drainage/Sewerage/Flood Control
- 2.2 Water Supply
- 2.3 Electricity
- 2.4 Telecommunications
- 2.5 Solid Waste
- 2.6 Slaughterhouse
- 2.7 Firefighting
- 2.8 Other Facilities

Chapter 3 Park and Recreation Areas
- 3.1 Role of Parks and Recreation Areas
- 3.2 Size of Parks and Recreation Areas
- 3.3 Location
- 3.4 Classification
- 3.5 Facilities
- 3.6 Planning

VOLUME VI URBAN FACILITIES PLANNING

Chapter 4 Social Service Facilities and Others
- 4.1 Classification of Social Service Facilities
- 4.2 Data Collection
- 4.3 Educational Facilities
- 4.4 Public Health/Medical Facilities
- 4.5 Cultural Facilities
- 4.6 Religions Facilities
- 4.7 Markets
- 4.8 Truck Terminal
- 4.9 Other Facilities

Part II : Technical Reference

Chapter 1 Drainage/Severage
- 1.1 General
- 1.2 Design Procedure

Chapter 2 Water Supply
- 2.1 Production and Transmission System
- 2.2 Drinking Water Quality

Chapter 3 Electricity
- 3.1 Electric Power System
- 3.2 Demand Forecast

Chapter 4 Telecommunications

Chapter 5 Solid Waste
- 5.1 Classification of Solid Wastes
- 5.2 Amount and Quality of Waste
- 5.3 Method of Transfer
- 5.4 Method of Final Disposal
- 5.5 Sanitary Landfill
- 5.6 Incineration
- 5.7 Composting
- 5.8 Glossary

Chapter 6 Slaughterhouse
- 6.1 Guidelines of Location
- 6.2 Operation

Chapter 7 Firefighting
- 7.1 Location of Fire Station
- 7.2 City Planning Measures for Fire Prevention

Chapter 8 Parks and Recreation Areas
- 8.1 Example of Standard and Classification
- 8.2 Offices/Authorities Concerned
- 8.3 Check Points for Planning
- 8.4 Size of Sports Facilities
- 8.5 Example of Parks
- 8.6 Standards Prepared by Specific Planning Division

Chapter 9 Authorities and Related Laws/Regulations of Urban Facilities

VOLUME VII DATA BASE MANAGEMENT SYSTEM

1. Introduction

2. Purpose of DBMS in City Planning

3. Concept of DBMS in City Planning

4. System Design (Software)
   - 4-1 Organization of Software System
   - 4-2 Definition of System Function
   - 4-3 Input/Output Data Items
   - 4-4 Code Design
   - 4-5 File Design
   - 4-6 Data Base Management Package
   - 4-7 Program Specification

5. Computer System Development (Hardware)
   - 5-1 Outline of Computer System Development
   - 5-2 Hardware of Inceptive Stage
   - 5-3 Hardware of Innovative Stage
   - 5-4 Proposal for Full Scale Development

6. Operation of Computer System

7. Appendix

VOLUME VIII LAND READJUSTMENT

1 Implementing Procedure of Land Readjustment in Japan

2 Preparation of Development Plan

3 Preparation of Action Plan
- 3-1 Study Procedure
- 3-2 Study Items and Contents
  - (1) Boundary of Project Area
  - (2) Existing Condition
  - (3) Land Readjustment Design
    - 1) Detailed Land Use Plan
    - 2) Layout/Design
    - 3) Construction Work
    - 4) Cost Estimation
  - (4) Financial Plan
    - 1) Revenue by Disposition of Reserve Land
    - 2) Contribution Ratio/Area
    - 3) Financial Plan

APPENDIX FORMAT FOR PREPARATION OF ACTION PLAN

4 Land Evaluation
- 4-1 Concept of Land Evaluation
- 4-2 Land Evaluation for Land Readjustment Projects
  - (1) Purpose
  - (2) Conditions
  - (3) Methods of Land Evaluation
- 4-3 Necessary Data for Land Evaluation
  - (1) Surveys on Land Evaluation
  - (2) Preparation of Data for Valuation
  - (3) Formation of Standard for Land Evaluation
- 4-4 Calculation of Street Value
  - (1) Street Value and Street Value Index
  - (2) Method of Setting Up Street Value
  - (3) Calculation of Street Value
- 4-5 Lot Evaluation
- 4-6 Evaluation of Block
  - (1) Purposes
  - (2) Method of Block Evaluation
  - (3) Output of Block Evaluation
- 4-7 Roles of Evaluator

VOLUME VIII LAND READJUSTMENT

APPENDIX-1 EXAMPLE OF STANDARDS FOR LAND VALUATION

APPENDIX-2 EXAMPLE OF GUIDELINES FOR CALCULATING STREET VALUE

APPENDIX-3 EXAMPLE OF GUIDELINES FOR CALCULATING LOT LAND VALUE

5 Replotting Design
- 5-1 Purposes
- 5-2 Method of Replotting Design
  - (1) Location of Replot
  - (2) Area of Replot
    - a. Evaluation Replotting Calculation Method
    - b. Areal Replotting Design Method
    - c. Combined Replotting Calculation Method
- 5-3 Standard for Replotting Design
- 5-4 First Lines of Replotting Design
- 5-5 Replotting Design
  - (1) Basic Data for Replotting Design
  - (2) Putting Lots into Block

APPENDIX-1 EXAMPLE OF STANDARD FOR REPLOTTING DESIGN

APPENDIX-2 EXAMPLE OF GUIDELINE FOR REPLOTTING DESIGN

VOLUME IX DISTRICT PLANNING

INTRODUCTION

I DISTRICT PLANNING SYSTEM IN JAPAN

1 Establishment of District Planning System
- 1.1 Background of the District Planning System
- 1.2 Requirements for the District Plan

2 Outline of the District Planning System
- 2.1 Role of District Plan
- 2.2 Objective Area for District Plan

3 Control Measures Applied in District Planning Area
- 3.1 Notification and Advice
- 3.2 District Planning and Development Permit
- 3.3 Transfer of the Control Measures of District Plan to be a Building Code
- 3.4 Development of District Facilities

4 Planning Method
- 4.1 Base of the Formulation of District Plan
- 4.2 Planning Procedure for Formulation of District Plan
- 4.3 Planning Organization

5 Participation of the Residents
- 5.1 Significance of Participation
- 5.2 Provision for the Participation of the Residents
- 5.3 Form of Participation of the Residents

II APPLICATION OF DISTRICT PLAN IN THAILAND

1 General View
- 1.1 Background
- 1.2 Present Situation of Control System for Urban Development

2 Application of the District Plan
- 2.1 Objective of District Plan
- 2.2 Application of the District Plan in Thailand
- 2.3 Proposed Planning Procedure
  - 1) Stage 1 : Preparation
  - 2) Stage 2 : Study of Existing Conditions
  - 3) Stage 3 : Setting of the Goal of Development
  - 4) Stage 4 : Formulation of District Plan
  - 5) Stage 5 : Implementation Program

3 Considerable Constraints Factor for District Planning
- 3.1 Advantages and Disadvantages for Landowners and Tenants
- 3.2 Interest by the Residents
- 3.3 Consensus for Development Objectives
- 3.4 Others

III FUTURE PROSPECTS OF DISTRICT PLANNING IN THAILAND

1 Institutional
- 1.1 Promotion of the District Plan
- 1.2 Generalization of the District Planning Method
- 1.3 Establishment of a Standard for Implementation
- 1.4 Cooperation with other Concerned Authorities
- 1.5 Advance to the Localization
- 1.6 Securing the Consensus

2 Promotional Measures
- 2.1 Taxation
- 2.2 Financial
- 2.3 Social Benefits
- 2.4 Legal Benefits

3 Implementation of the District Plan
- 3.1 The Measures to be Implemented by the Current Urban Control System
- 3.2 The Measures to be Implemented by the Specific Plan

4 Recommendations

ANNEXES 1. Classification of Land Use Plan in DTCP
2. Research Survey Sheet
3. Existing Urban Control Measures (Bylaws)
4. Procedure of Permission
5. Basic Knowledge of District Planning in Japan

APPENDIX F

SUMMARY OF THE SEMINARS

APPENDIX F

SUMMARY OF THE SEMINARS

As an essential part of the study, a series of seminars were held at critical points during the study period (i.e., at the end of each stage of the study). The purposes and targeted participants were specifically defined for each seminar.

Groups Targeted for Technology Transfer

During the course of this project, the JICA Study Team shared its planning expertise with the DTCP Counterpart Team. However, it was considered important to spread knowledge of the techniques developed to planners throughout DTCP and more generally to planners in other agencies at all levels of government. The seminars proved very effective in achieving this objective of disseminating knowledge of advanced planning techniques.

Subjects Considered

The seminars had the following specific objectives:

- dissemination of information on techniques developed during this study;
- refinement of the manuals with the aid of the feedback received during the seminars; and
- stimulation of discussion and interest to aid in DTCP's goal of implementing technical improvements (e.g., a database management system).

In the first seminar, the DTCP study team members (along with JICA members) shared with their division colleagues the insights they gained during the preparation of the planning manuals and implementation of the case studies. In the second seminar, the manuals were presented to representatives of DTCP's divisions in order to further familiarize department staff with the manuals to gain feedback from them to aid in the revision and refinement of the manuals. In addition, it stimulated discussion of DTCP's plans to implement advanced planning techniques. In the third seminar, policy issues such as DTCP's new approach for integrated city planning and development were discussed with several prominent Thai city planners, both government planners from outside DTCP and planning experts from the academic community. Excerpts from the draft final report of this study and the manuals were presented.

The seminars are summarized in Table E-1, with information provided on the seminar schedule, lecturers, objectives, subjects, and materials.

Table F-1 SUMMARY OF THE SEMINAR

	First Seminar	Second Seminar	Third Seminar
Date	Feb. 15 ~ 29, 1988 (10 days)	Aug. 1 ~ 5, 1988 (5 days)	Nov. 23 ~ 25, 1988 (3 days)
Participant	Sectoral session to each division concerned General session to the representative of all division .	- ditto -	DTCP, Other central government local government acadeaic institutes
Lecturer	DTCP counterpart and JICA STUDY TEAM	- ditto -	DTCP Directors and Head of Working Group Representative of Other Central and Local Government Professor of Thai/Japanese Universities
Objectives	Sectoral Session (1) Introduce newly proposed methods and techniques to related divisions and to discuss their appropriateness (2) Make planning manuals known to each division, which are being prepared by JICA Study Team and DTCP counterparts, and familiarize the procedure of case studies General Session To discuss the key areas that are significant for the overall improvement in the planning process of DTCP (1) Standardization of city planning (2) Computer application in planning (3) New Implementation Techniques in city planning	(1) To present the draft manuals for city planning, which were consolidated through the case studies, to the representatives of all the divisions (2) To activate further discussion on the realization of Data Base Management System, and Land Readjustment, which are proposed to constitute main focuses of the forth-coming improvement thrust of DTCP	(1) To disseminate the techniques and knowledges developed in the study, and get feedback to the proposed manuals. (2) To attain understandings and cooperations amongst agencies concerned on DTCP's improvement thrust including training services, implementation of Land Readjustment and so on. (3) To establish the initiatives of DTCP to lead and coordinate Thai City Planning and Developments
Schedule and Subjects	Feb. 15 Opening Special lecture (Sectorial Session) 15 Mapping 16 Socio Economic Data Base 17 Land Use Planning 18 Transport Planning 19 Urban Facility 23 Land Readjustment 24 District Planning (General Session) 25 New Techniques of Implementation in City Planning 26 Computer Application 29 Standardization of City Planning	Aug. 1 Opening (General Session) . Integrated City Planning and Sectorial Outline . Data Base Management . Land Readjustment (Sectorial Session) Aug. 2 Mapping Socio-Economic Aug. 3 Land Use Transport Aug. 4 Urban Facility District Planning (Workshop) Aug. 2 DBMS (System Management) Aug. 3 " (System Design) Aug. 4 " (Evaluation) Aug. 2 Land Readjustment (Action Plan) Aug. 3 " " (Replotting) Aug. 4 " " (Possible Application) (Panel Discussion) Aug. 5 City Planning Manual Data Base Management Land Readjustment (Necessary Implementing Arrangement)	Nov. 23 Opening Address . New approach in city planning . NESDB's responding remarks . Special lecture on "General View on City Planning System Japan" . Outline of Proposed Technical improvement 1 City planning techniques and manuals 2 Data Base Management System 3 Implementation Techniques Nov. 24 . Technical reports divided into 3 groups . Current topics on Thai City Planning - Urban Planning and Housing policy - The role of private sector - Transport planning in Thai context Nov. 25 (Panel Discussion) Toward integrated city planning - Keynote . Thai Urban Development Administration . Proposed Planning System Implementation of urban development - Keynote . Asian Context of Land Readjustment . Prospect of Land Readjustment in Thailand
Seminar Materials	Proposed technical improvement plan and draft planning manuals	Technical Reports of Case Study (I), (II)	Excerpt from Draft Final Report of the Study and Manuals Special paper prepared by the guest speakers