GOVERNMENT OF MALAYSIA

THE RECLAMATION PROJECT OF EX-MINING LAND FOR HOUSING DEVELOPMENT AND OTHER PURPOSES

FEASIBILITY STUDY REPORT

Volume 1

MAIN TEXT

OCTOBER, 1981

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In response to the request of the Government of Malaysia, the Japanese Government decided to conduct a feasibility study on the Reclamation Project of Ex-Mining Land for Housing Development and Other Purposes and entrusted the study to the Japan International Cooperation Agency (JICA).
The JICA sent to Malaysia a study team headed by Dr. Kakuichiro Adachi, Kisojiban Consultants Co., Ltd. from December, 1979 to July, 1981.

The team exchanged views with the officials concerned of the Government of Malaysia on the project and conducted a field survey in Kuala Lumpur.
After the team returned to Japan, further studies were made and the present report has been prepared.

I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

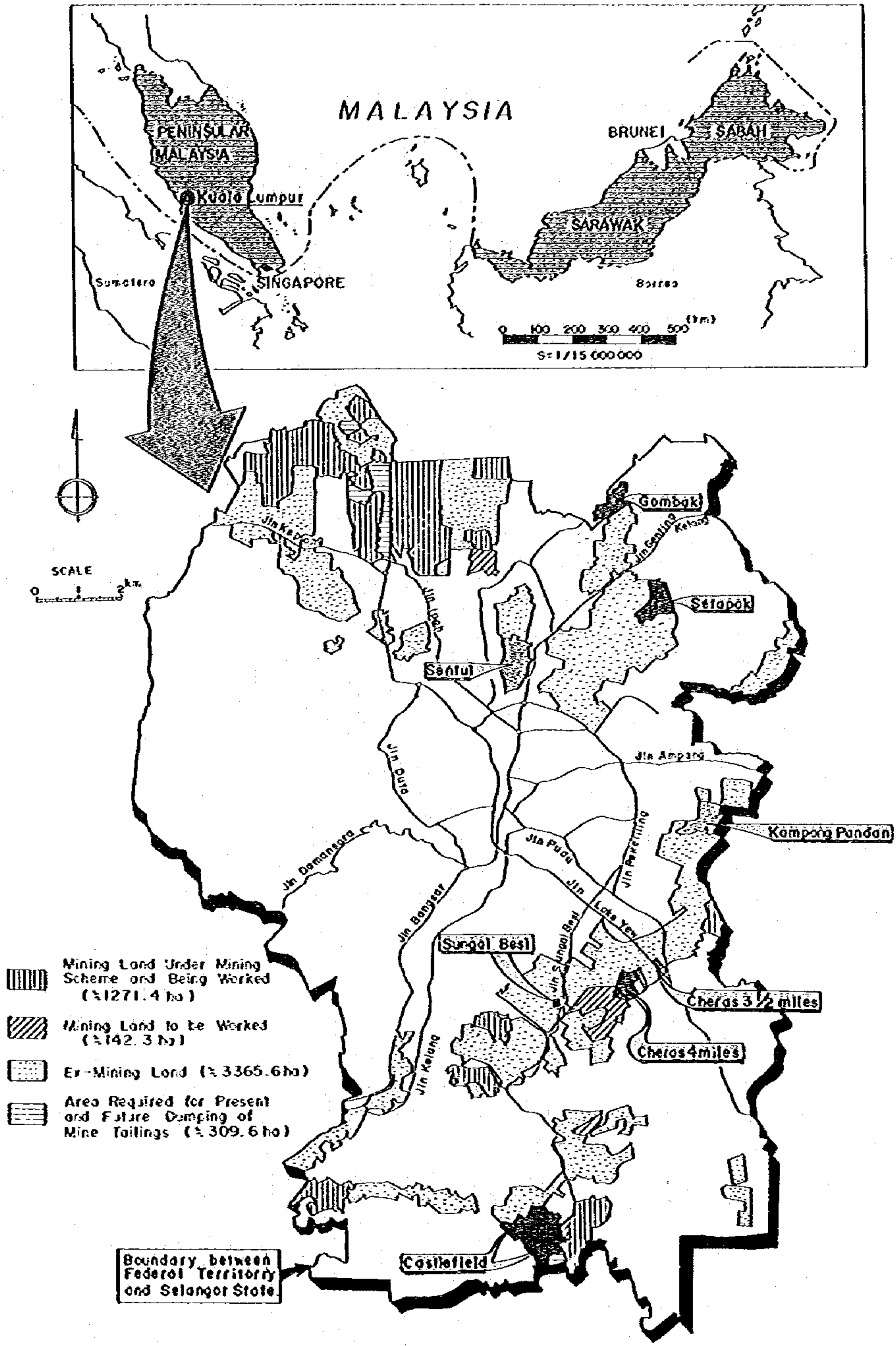
I wish to express my deep appreciation to the officials concerned of the Government of Malaysia for their close cooperation extended to the team.

October, 1981

Keisuke Arita

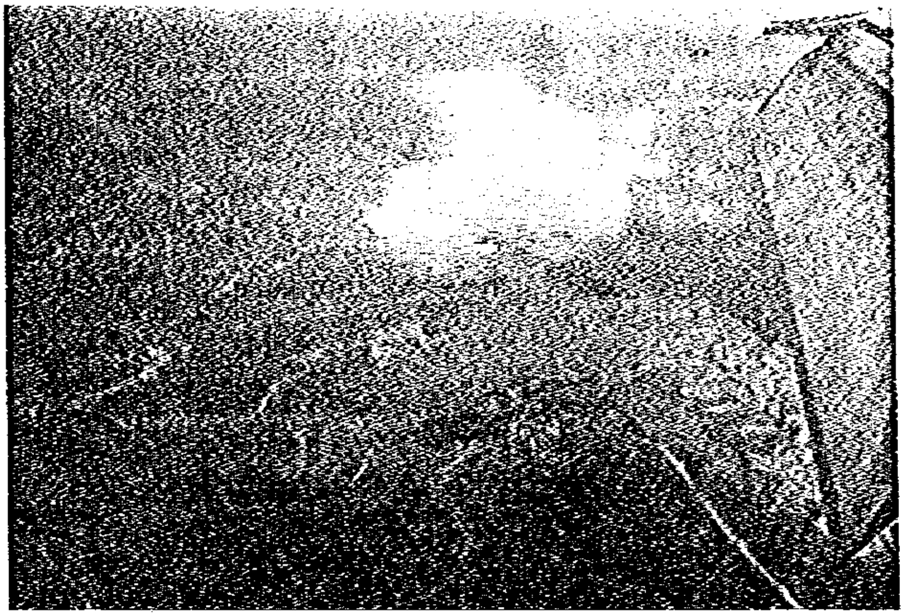
President

Japan International Cooperation Agency

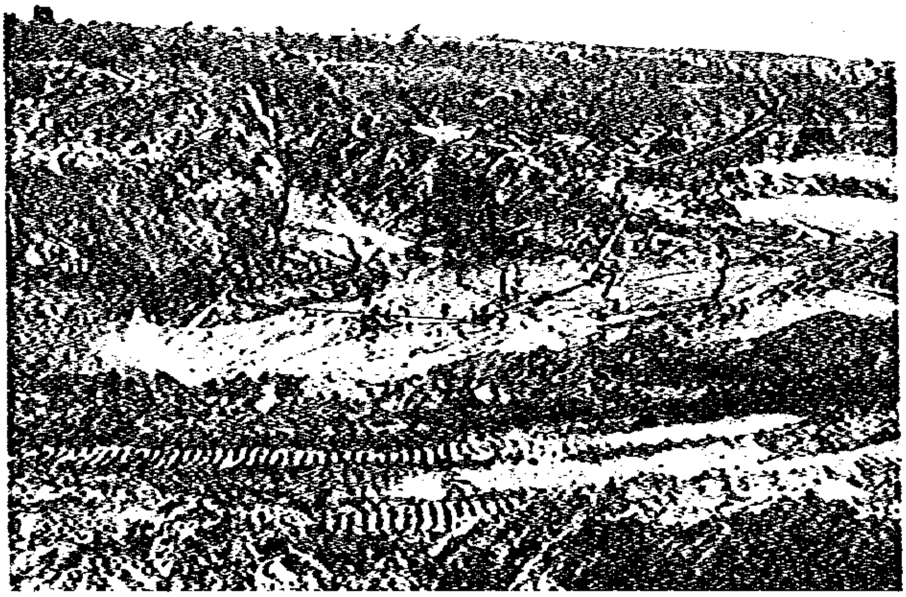


Project Location Map

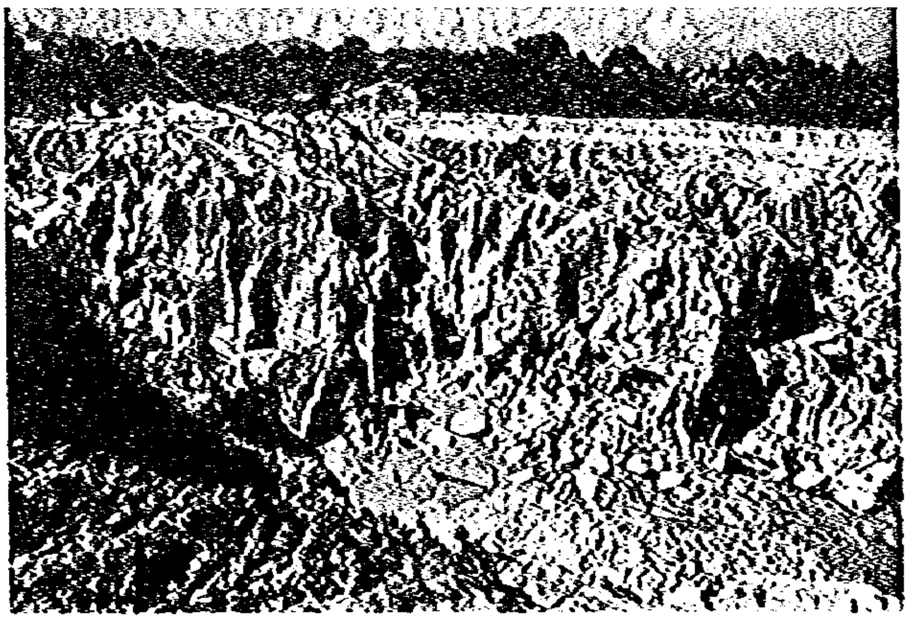
Tin Mining Areas



Dredge Mining Area



Gravel-Pump Mining



Mining Hole after
Gravel-Pump Mining

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This report presents the results of the "Feasibility Study for the Reclamation Project of Ex-Mining Land for Housing Development and Other Purposes."

1. METHODOLOGY AND KEY ACCOMPLISHMENTS

Basic methodology to suggest solutions to anticipated problems is outlined in Fig. S-1. Sections of this report which correspond to the subject indicated are also given in the figure. Among the subjects studied comprehensively for the reclamation project of ex-mining land for housing development, the following are the key accomplishments:

(1) Tin mining is thoroughly studied, especially from the viewpoint of foundation engineering. Overall subsurface ground conditions of ex-mining land are clarified by a detailed study of tin-mining operations (Section 3).

(2) Subsurface ground conditions of ex-mining land are investigated in detail. After the investigations, the ex-mining land is classified into 5 typical types. The recommended approach to investigate the subsurface ground conditions of ex-mining land is also presented (Sections 4 and 5).

(3) Foundation engineering problems for structures to be constructed on ex-mining land are carefully studied. The types of foundations and measures necessary to counter soft subsurface deposits are recommended according to the

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ground conditions of ex-mining land and the size of the proposed structures (Sections 6 to 9).

(4) In addition to the technical and engineering study, financial and economic studies are also performed. Through these studies, it is found that ex-mining land is feasible for housing development or other purposes (Sections 10 and 11). Conclusions and recommendations reached by the present study are presented below.

2. OBJECT AND CONTENT OF STUDY

This study is conducted by the Japan International Co-operation Agency in response to a request of the Government of Malaysia to the Government of Japan, and follows the results of the prefeasibility study performed by the survey mission of Japan in March, 1979.

The Government of Malaysia plans to overcome the housing shortage for the urban poor in Kuala Lumpur by constructing more low-cost housing units in the suburbs of Kuala Lumpur. However, the areas with relatively good ground conditions have already been developed, and ex-mining lands in the suburbs of Kuala Lumpur are to be used for the proposed housing developments. The ground condition of the ex-mining land is generally poor and complex, and many foundation engineering problems are expected for the housing development at ex-mining lands.

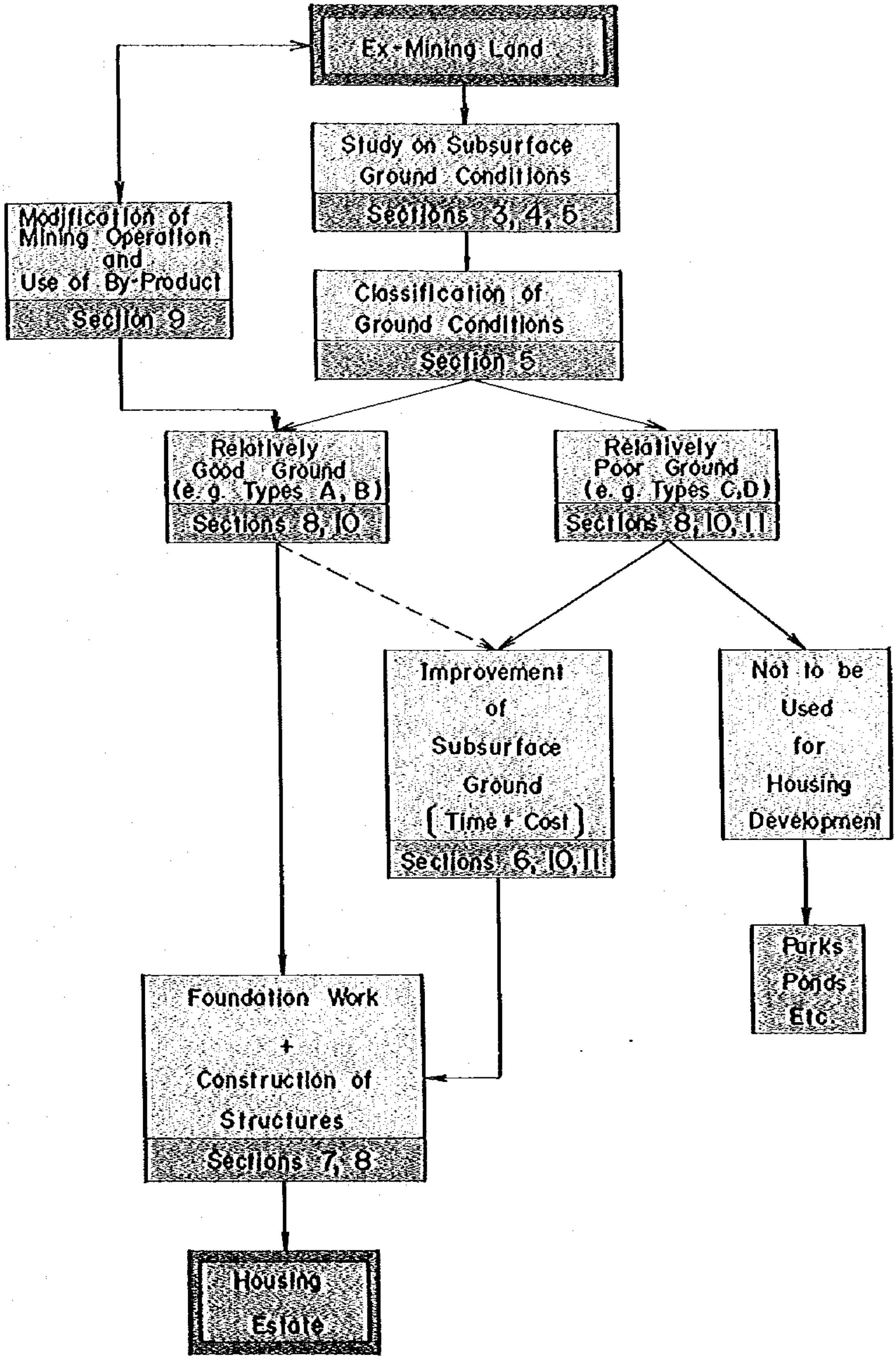


Fig. S-1 Methodolgy of the Study

The feasibility study is comprised of the following contents:-

(1) Reconnaissance Survey and Data Collection

(2) Subsurface Ground Investigation

(3) Engineering Study for Massive Reclamation

(4) Engineering Study for Foundation and Construction Methods

(5) Economic and Financial Studies

The feasibility study was divided into two phases, i.e. Phase I and Phase II. The Phase I study was carried out between December, 1979 and March, 1980, and the Phase II study between August, 1980 and October, 1981. This report presents the results of both Phase I and Phase II studies.

3. SUMMARY AND RECOMMENDATIONS

3.1 Housing Development in Kuala Lumpur

As the basis of the present study, the current housing situation in Malaysia and in Kuala Lumpur is reviewed and presented in detail in Section 2. Firstly, the necessity and benefits of utilizing ex-mining land for low-cost housing development in Kuala Lumpur are studied together with related squatter problems. There are nearly 8,300 acres of ex-mining land in the Federal Territory comprising approximately 14% of the total area. The majority of the ex-mining land is very well located, being 4 to 12 km from the city centre.

About 40% of this land has very favourable ground conditions for low-cost housing development, but large portions are currently being occupied by squatters.

Secondly, the current situation and future needs for housing in Malaysia and for those in the Federal Territory are discussed by studying possible housing production and the population trends. Housing requirements in the Federal Territory are primarily of a low-cost type necessary for the estimated 233,000 squatters who comprised nearly 25% of the territory's population in 1980.

Finally, the construction of low-cost housing is reviwed. Standards for and the state of low-cost housing construction are summarized, together with a study of problems associated with the construction.

3.2 Tin Mining

After a brief review of the tin-mining industry in Malaysia, tin-mining operations are thoroughly studied, especially from the viewpoint of foundation engineering.

Most of the tin mines in the Kuala Lumpur region are located in areas of limestone formation. At present, there are more than a dozen areas in the Federal Territory where tin mines are still in operation. Tin ore, originating from granite at its intrusion into older formations, was eroded and the tin-ore-bearing materials were transported and deposited in areas of deeply weathered limestone formation. Heavy materials bearing tin ore tended to be deposited in areas with a complex topography of numerous pinnacles, troughs, and deep channels.

About 95% of the Malaysian tin is mined by two methods, i.e. dredging and gravel pumping.

Of these two methods, gravel-pump mining is the most common in Kuala Lumpur. Fig. S-2a explains the typical gravel-pump mining method. It must be noted that this gravel-pump mining causes complete exposure of the bedrock. In limestone areas, numerous limestone pinnacles are exposed in mining holes. After the separation of tin ore, soils are deposited in the tailing pond. In the deposition process, coarser materials are deposited near the discharging point of the tailings and the finer materials are deposited far from the discharging point. Due to this reason, the ground condition near the discharging point will be sand rich, and it will be clay rich far from the discharging point. Thus, the ground conditions of the ex-mining land will be greatly dependent on the mining layout. Fig. S-2b shows a possible soil profile of ex-mining land.

Although the ground conditions of ex-mining land are different depending on the method of mining and the method of backfilling, the ground condition of ex-mining land is usually characterized by ① poor ground conditions which will be detrimental to shallow foundations and present difficulties to both excavation and earth filling works, ② very complex stratification of the backfilled layers, and ③ very irregular profile of the bedrock.

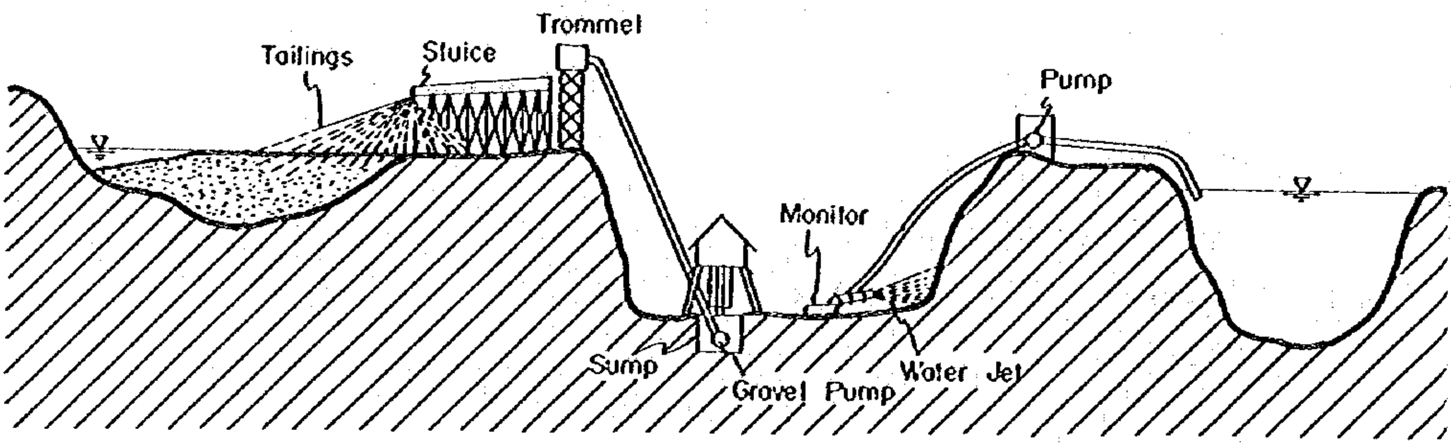


Fig. S-2a Concept of Gravel-Pump Mining

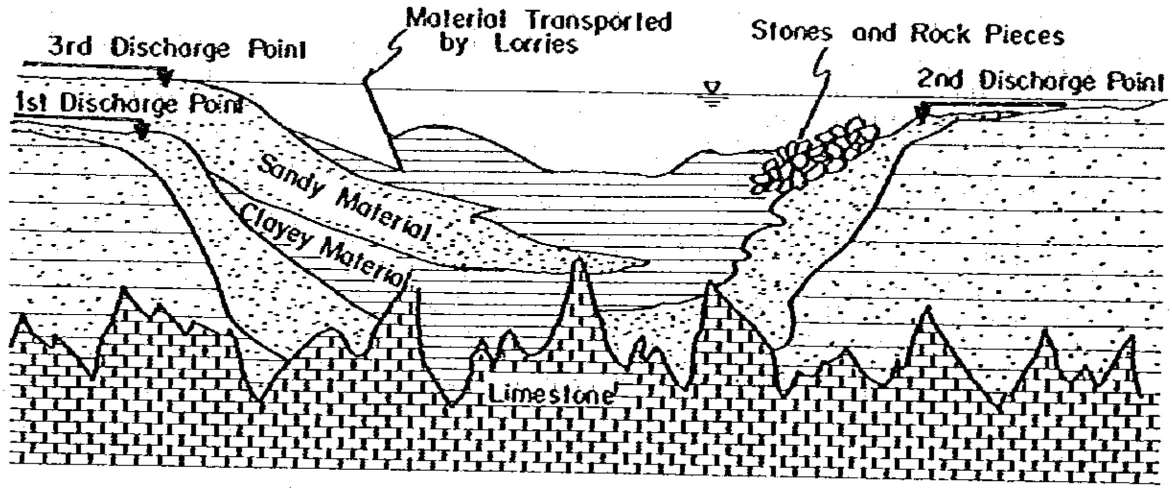


Fig. S-2b Possible Soil Profile of Ex-Mining Land

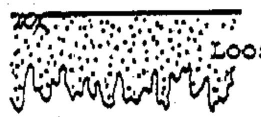
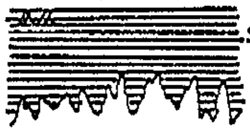
3.3 Ground Conditions of Ex-Mining Land

Ground conditions of ex-mining land are investigated in detail by various types of field exploration and laboratory tests. Kampong Pandan, Sentul, and several other ex-mining sites were investigated. After the investigation, ex-mining land is classified into 5 typical types. Table S-1 summarizes the classification of ex-mining land and the relationship between the occurrence of the five types of foundation ground and the major mining operation performed. Of the sites investigated, relatively numerous examples of sites having foundation ground of each type are listed. Rough estimates of the proportionate distribution of each type of ground are also listed in Table S-1. As seen from the table, the average proportions of the types of foundation ground found at ex-mining sites are; about 20% each of Types A and D; about 25% of Types B and C; and about 10% of Type E.

In Fig. S-3, distribution of the five types of ground at Sentul is indicated by way of a ground type classification map. The map is useful for land-use planning such as the layout of housing estates, etc. However, the map is reliable for locations near the borings and soundings, and further detailed investigation is recommended for the design of each individual structure.

Special attention must be given to the extremely soft, surface clayey deposits. They are softer and more compressible than most natural deposits, and very often , it is difficult for human beings to walk on them. In Table S-2, the representative soil properties of the major layers to be encountered in the ex-mining land are summarized after the results of the present study.

Table S-1 Types of Ground in Ex-Mining Land Classified from Engineering Viewpoint

Type of deposit on bedrock or other bearing layer	Relation to mining operation	Rate of Distribution	Example of Ex-mining Land
Type A 	Tailing area near tailing point	19%	Kampong Pandan Cheras 3-1/2 miles Cheras 4 miles Sungai Besi
Type B 	Tailing area and/or slime pond covered later with sandy tailings or sandy dumpings	24%	Gombak, Kampong Pandan, Cheras 3-1/2 miles, Cheras 4 miles Sungai Besi, Castlefield
Type C 	Tailing area far from tailing point, or slime pond	23%	Sentul, Bombak Kampong Pandan, Cheras 3-1/2 miles, Cheras 4 miles
Type D 	Slime pond, tailing area far from tailing point	21%	Sentul, Setapak Castlefield
Type E 	Old mining hole	13%	Pond of Kampong Pandan Setapak

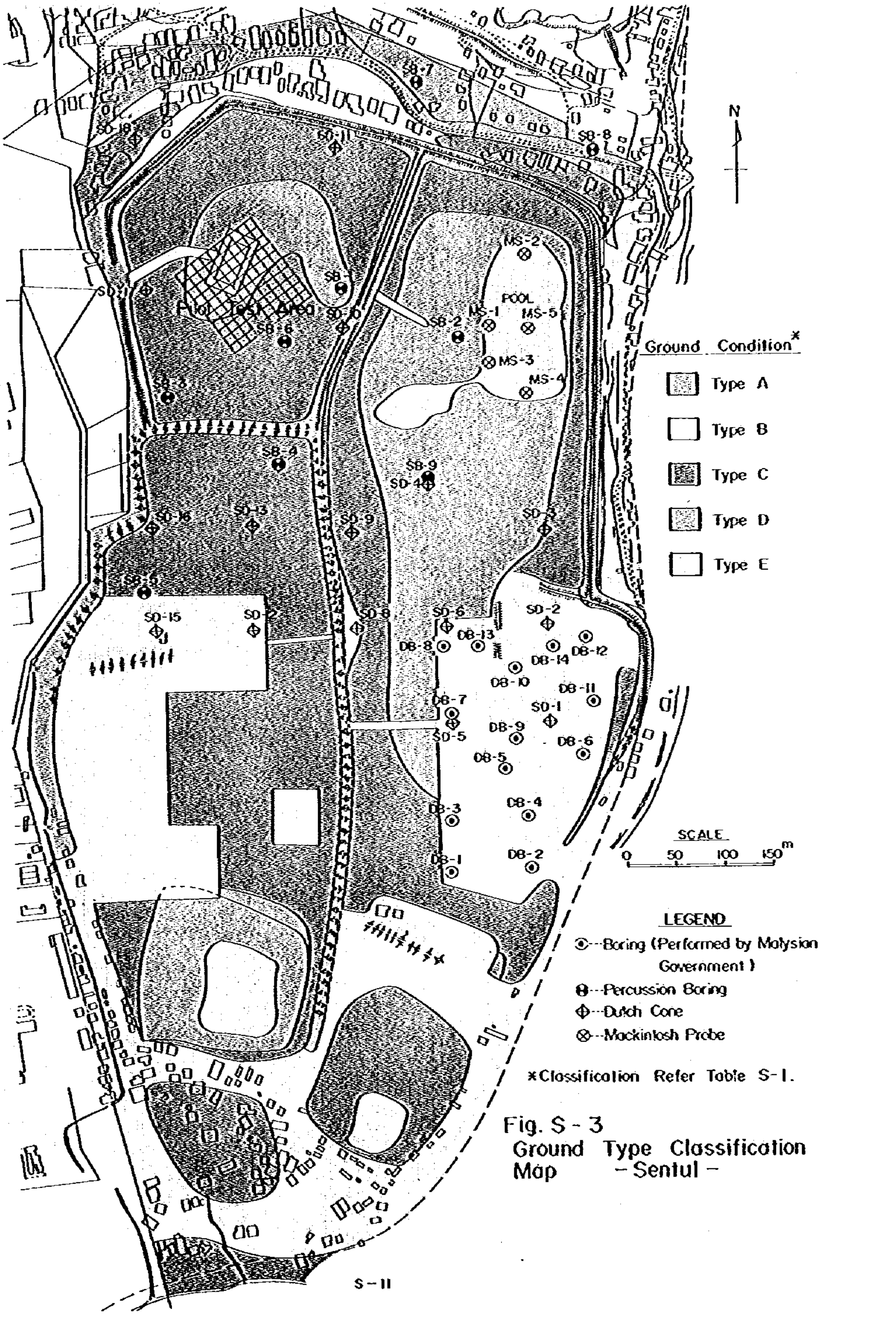


Fig. S-3 Ground Type Classification Map - Sentul -

Table S-2 Summary of Soil Properties of Each Layer

Type of Soil	Colour	N-Value	N_{sw} *1	Wet Density γ_t (t/m^3)	Undrained Shear Strength C_u (t/m^2)	Angle of internal Friction ϕ (Degree)	Compression Index C_c	Co-efficient of Consolidation, C_v (cm^2/sec)	Rate of *2 Distribution at Ground Surface (%)	Major Origin and Distribution
Floating Mud	Grey, White, Yellowish Brown, Reddish Brown	0	0	(1.1-1.3)	(0)	-	-	-	0	Young slime in mining pond, e.g. Kampong Pandan, Sentul
Very Soft Clay *3	"	0-1	0	≒1.4 (1.3-1.5)	0.1-0.3	-	0.5-0.8	0.04-0.1	40	Slime deposits, e.g. Sentul Castlefield
Soft Clay *3	"	2-4	0-20	1.5-1.7	1.0-1.5	-	0.5-0.7	0.05-0.2	10	Slime deposits, e.g. Sentapak, Sentul, Castlefield
Medium Stiff Clay	Grey, Reddish Brown, Yellowish brown	4-8 -(15)	20-	(1.7-2.0)	(2.5-5.0)	-	(0.2-0.3)	-	5	Old clayey tailing, unexcavated Old Alluvium, weathered bedrock, e.g. Cheras 3-1/2 miles, Cheras 4 miles
Very Stiff to Hard Clay	Reddish Brown, Yellowish Brown	>15	-	(1.9-2.2)	>10	-	-	-	0	Unexcavated Old Alluvium, weathered bedrock, e.g. Cheras 3-1/2 miles
Very Loose Sand *3	White, Yellowish brown	1-3	0-50	(1.4-1.6)	-	(25-28)	-	-	20	Ex-mining sand, e.g. Kampong Pandan, Cheras 4 miles, Castlefield
Loose Sand *3	"	≒5 (4-10)	50-150	(1.6-1.8)	-	≒30 (28-33)	-	-	20	Ex-mining sand, e.g. Gombak; Kampong Pandan, Sungai Basi, Castlefield
Medium Dense Sand	Grey, Yellowish Brown, Reddish Brown	10-30	150-300	(1.8-2.0)	-	(33-40)	-	-	5	Ex-mining sand, unexcavated Old Alluvium, weathered bedrock, e.g. Cheras 3-1/2 miles
Medium Dense Sand	"	>30	>300	(2.0-)	-	(>40)	-	-	0	Unexcavated Old Alluvium, weathered bedrock, e.g. Cheras 3-1/2 miles
Limestone Bedrock	White, Grey, Yellowish Brown	Refusal	Refusal	2.6-2.8	-	-	-	-	0	-

*1 Required half turn for 1m penetration under 100kg weight by Swedish sounding

*2 Approximate rate of distribution at the ground surface of ex-mining land excluding mining pond

*3 Indicates surface layer

Note: Values in parentheses are estimates based on engineering judgement.

3.4 Recommended Method of Investigation of Ex-Mining Land

The methods of investigating the foundation ground at the ex-mining sites are evaluated and effective investigation methods for the provision of structural design parameters are proposed. Fig. S-4 shows the recommended method of investigation.

3.5 Foundations for Proposed Housing

Results of the test embankment are carefully studied. The effectiveness of sand drains is clearly shown through the experiment. The technical applicability and costs of various types of other ground improvement methods are also studied. The results of the study are summarized in Table 6-5 of Section 6.

Evaluation of the foundations for the proposed housing structures to be constructed on ex-mining land is performed. Suitable types of foundations for different housing structures, i.e. low-, medium- and high-rise, are studied. Costs are also evaluated, and the most recommendable type of foundation is selected according to the size of the structure and the type of subsurface ground. Table S-3 summarizes the findings. The results of the cost study are compiled in Table 8-3 of Section 8.

3.6 By-Products of Tin Mining

Possible uses of the by-products of tin mining are discussed. The by-products can be used for industrial material (clay for ceramics, silica sand, etc.), for construction material (fine and coarse aggregate, etc.), and for fill material. Fig. S-5 outlines the uses of the by-products of tin mining.

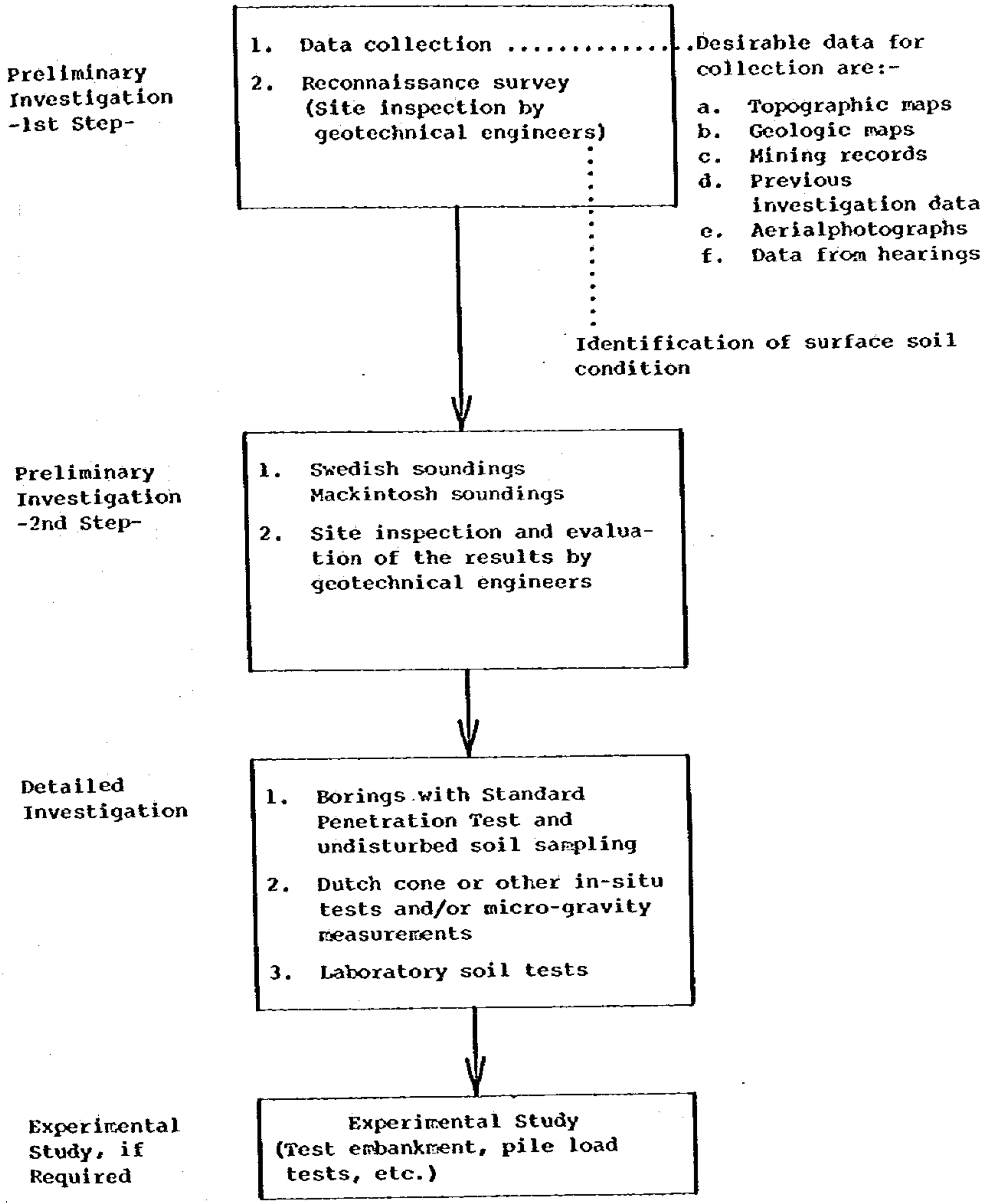


Fig. S-4 Recommended Method of Ground Investigation for Ex-Mining Land

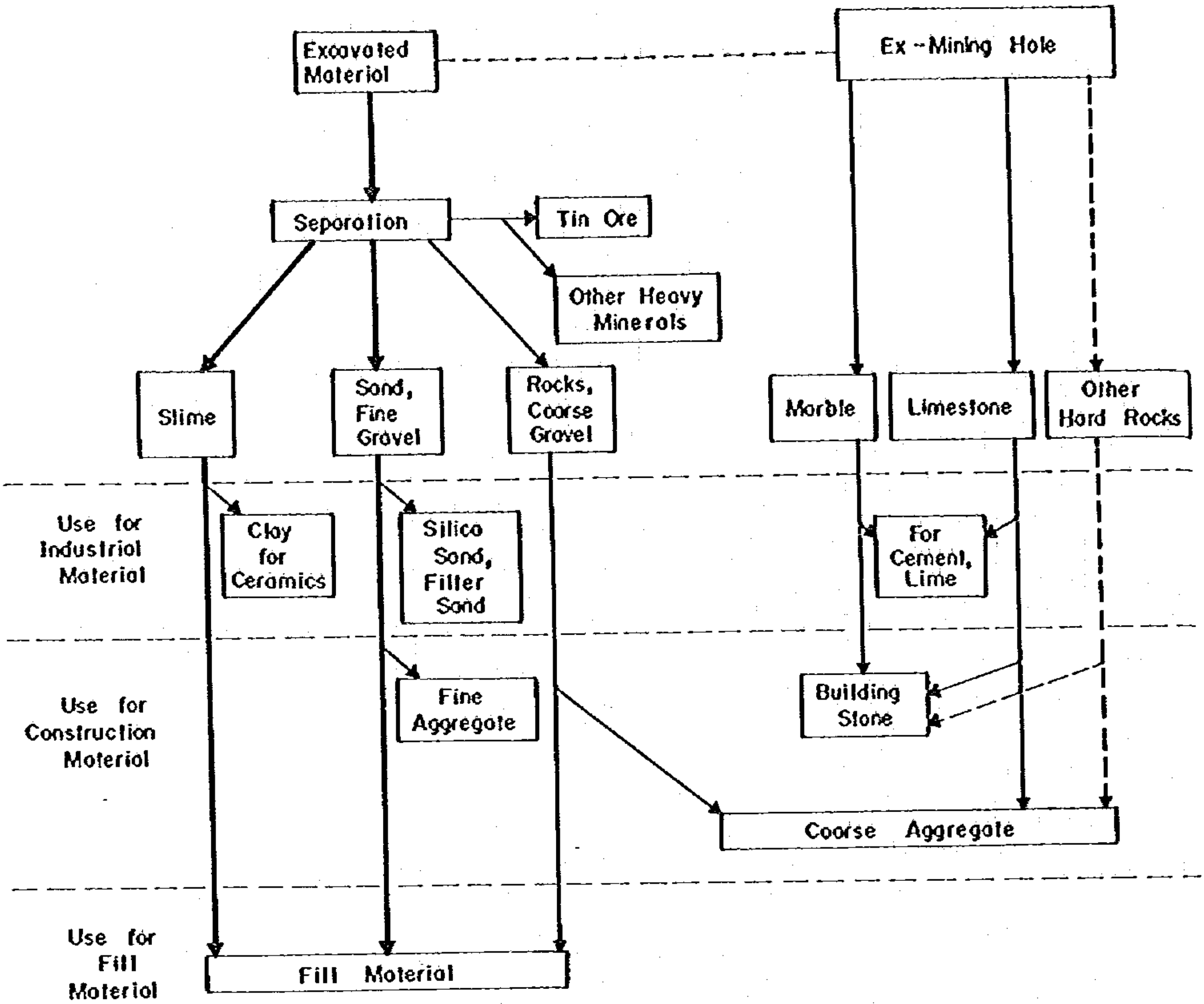
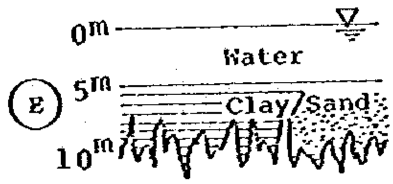
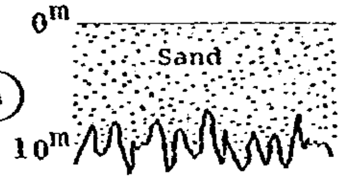
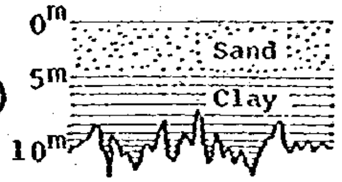
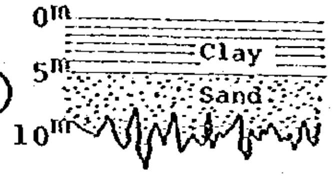
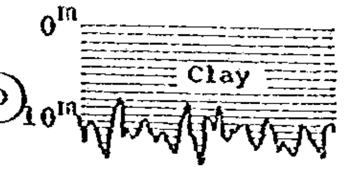
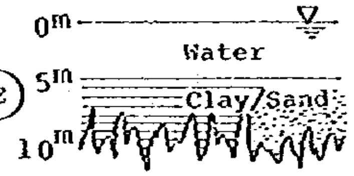


Fig. S-5 Use of Tin Mining By-Products

Ground Conditi / Size of Structure		
Low Rise (1 - 2F)	red	Not to be used unless necessary as cost of treatment is expensive and time consuming. If necessary, fill with sandy materials and follow procedures as in (B)
Medium Rise (4 - 5	red	Same as above
·High Rise (17 - 18	red	Same as above

e applicable.

Table S-3 Recommended Types of Foundations and Ground Improvement Methods

Ground Condition / Size of Structure	Ⓐ  0m Sand 10m	Ⓑ  0m Sand 5m Clay 10m	Ⓒ  0m Clay 5m Sand 10m	Ⓓ  0m Clay 10m	Ⓔ  0m Water 5m Clay/Sand 10m
Low Rise (1 - 2F)	Surface Compaction ↓ Direct Foundation (Individual Footing, Strip Footing, Raft)	Preloading (H = 1.5m) + Surface Compaction ↓ Direct Foundation	Sand Mat + Surface Soil (with Compaction) + Preloading (H = 1.5m) ↓ Direct Foundation	Same as Ⓒ * Longer time required for preloading * More settlement by preloading	Not to be used unless necessary as cost of treatment is expensive and time consuming. If necessary, fill with sandy materials and follow procedures as in Ⓑ
Medium Rise (4 - 5F)	Compaction of Sand Layer (D ≒ 5m) {Vibro-Rod, Dynamic Consolidation, Vibroflotation, Composer Pile} ↓ Direct Foundation [2nd choice] Surface Compaction ↓ Treated Timber Pile (or RC/PC Pile)	Preloading (H = 3m) + Surface Compaction ↓ Treated Timber Pile (or RC/PC Pile)	Sand Mat + Surface Soil (with Compaction) + Preloading (H = 3m) ↓ Treated Timber Pile (or RC/PC Pile) [2nd choice] Replacement of Clay Layer ↓ Direct Foundation	Same as Ⓒ * Longer time required for preloading * More settlement by preloading	Same as above
High Rise (17 - 18F)	Surface Compaction ↓ Steel Pile (or RC/PC Pile, Bored Pile)	Preloading (H = 3m) + Surface Compaction ↓ Steel Pile (or RC/PC Pile, Bored Pile)	Sand Mat + Surface Soil (with Compaction) + Preloading (H = 3m) ↓ Steel Pile (or RC/PC Pile, Bored Pile)	Same as Ⓒ * Longer time required for preloading * More settlement by preloading	Same as above

Note: Preloading for ground Types B and C can be replaced by 'ground water lowering methods' where applicable.

3.7 Recommendations on Tin-Mining Operations and Massive Reclamation

Suggestions and recommendations on tin-mining operations and massive reclamation are also presented. The details are presented in Sections 7 and 9. Among these, a fundamental recommendation is to produce Type B (or Type A) ground by carrying out preloading concurrent with mining operations. To achieve this aim, advance planning of land use will be essential. Fig. S-6 explains the recommendation.

3.8 Cost Study and Development Model

In the present study, development models of low-cost housing are established according to the following three conditions:-

(1) Ground Conditions: 4 cases (Type A, B, C, and D)

(2) Size of Structure: 3 cases (Low-, Medium-, and High-Rise)

(3) Density of Inhabitant: 4 cases

Low Density	60	Persons/Acre
Medium Density	100	"
High Density	200	"
Very High Density	250	"

In total, the study considers 36 cases. In the cost study, unit prices current in 1980 are used. Details of the development cost for each development model are shown in Table S-4. Figs. S-7a to S-7c show the breakdown of development costs for representative models. The development cost

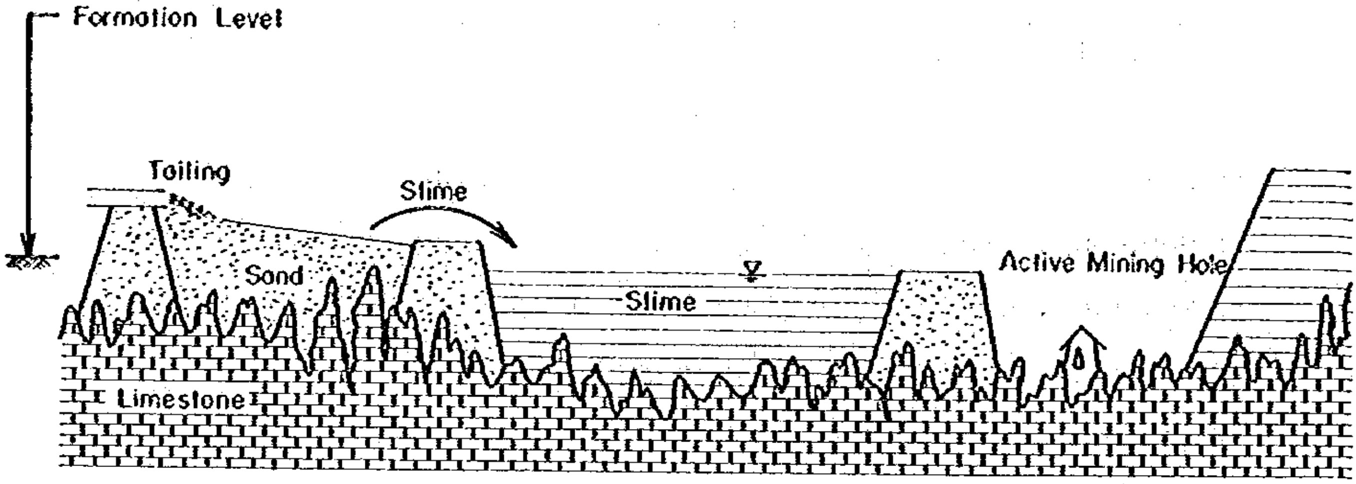


Fig. S-6a

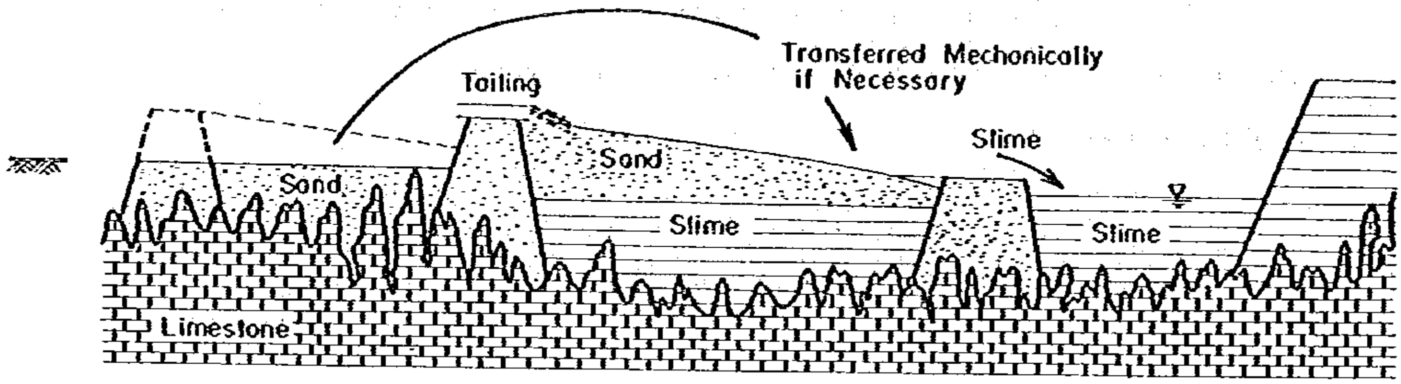


Fig. S-6b

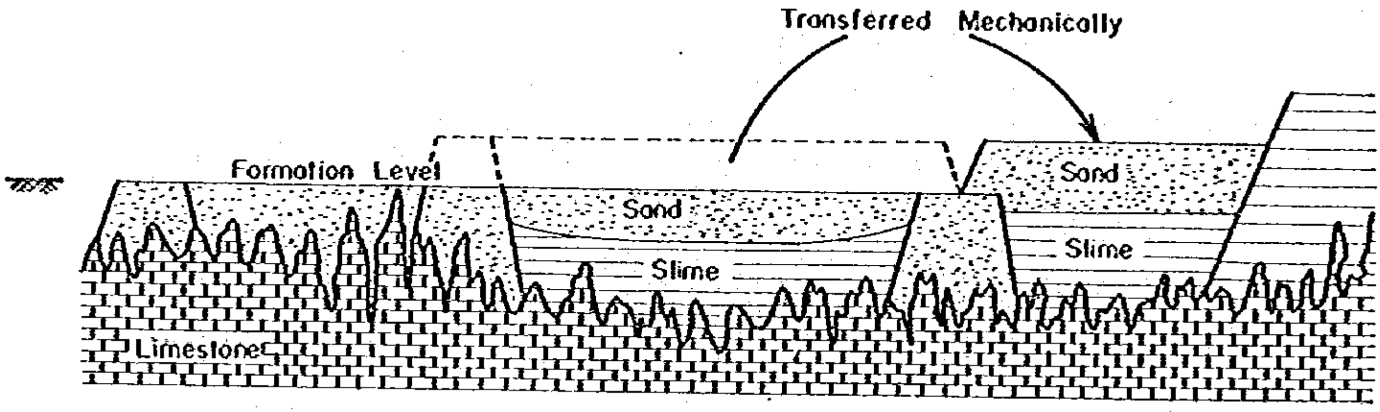


Fig. S-6c

Fig. S-6 Preloading by Sandy Tailings

Table S-4 Development Cost for Each Development Model

Development Model Number	Ground Utilization Model: Development Density	Ground Utilization Model: House Type	Ground Conditions (Type)	Civil Works (M$1,000): Building: Architectural Works	Building: Electrical Works	Building: Mechanical Works	Building: Sub-Total	Foundation *	Land Development: Ground Improvement (Including Interest)	Infrastructure: Road	Infrastructure: Car Park	Infrastructure: Water Supply and Drainage	Infrastructure: Sub-Total	Parks	Landscaping: Open Space	Landscaping: Private Area	Landscaping: Sub-Total	Land Development: Sub-Total	Civil Works: Sub-Total	Investigation, Design, etc. (M$1,000)	Physical Contingency (M$1,000)	Total (M$1,000)	No. of Houses	Unit Cost (M$)	Order in Cost
1	60 Persons/Acre	Low-Rise	A	8,802	852	-	9,654	-	468	1,022	74	1,020	2,116	47	143	63	253	3,090	12,744	637	637	14,018	1,200	11,682	2
2			B						1,664									4,286	13,940	697	697	15,334		12,778	4
3			C						2,764									5,386	15,040	752	752	16,544		13,787	7
4			D						3,247									5,869	15,523	776	776	17,075		14,229	8
5		Medium-Rise	A	12,474	852	132	13,398	703 (2,300)	468	962			2,056		260	26	333	2,857	16,958	848	848	18,654		15,545	16
6			B						958									3,347	17,448	872	872	19,192		15,993	18
7			C						1,063									3,452	17,553	878	878	19,309		16,091	19
8			D						1,225									3,614	17,715	886	886	19,487		16,239	20
9		High-Rise	A	14,262	852	924	16,038	732 (2,716)	468						284	14	345	2,869	19,639	982	982	21,603		18,003	33
10			B						630									3,031	19,801	990	990	21,781		18,151	34
11			C						673									3,074	19,844	992	992	21,828		18,190	35
12			D						760									3,161	19,931	997	997	21,925		18,271	36
13	100 Persons/Acre	Low-Rise	A	14,670	1,420	-	16,090	-	468	1,144	124	1,700	2,968	62	3	105	170	3,606	19,696	985	985	21,666	2,000	10,833	1
14			B						2,438									5,576	21,666	1,083	1,083	23,834		11,917	3
15			C						4,260									7,398	23,488	1,174	1,174	25,836		12,918	5
16			D						5,025									8,163	24,253	1,213	1,213	26,679		13,340	6
17		Medium-Rise	A	20,690	1,420	220	22,330	1,170 (3,829)	468	1,068			2,892		186	44	292	3,652	27,152	1,358	1,358	29,868		14,934	11
18			B						1,262									4,446	27,946	1,397	1,397	30,740		15,370	14
19			C						1,423									4,607	28,107	1,405	1,405	30,917		15,459	15
20			D						1,653									4,836	28,336	1,417	1,417	31,170		15,585	17
21		High-Rise	A	23,770	1,420	1,540	26,730	1,221 (4,529)	468						227	24	313	3,673	31,614	1,581	1,581	34,776		17,388	29
22			B						714									3,919	31,860	1,593	1,593	35,046		17,523	30
23			C						772									3,977	31,918	1,596	1,596	35,110		17,555	31
24			D						879									4,084	32,025	1,601	1,601	35,227		17,614	32
25	200 Persons/Acre	Medium-Rise	A	41,380	2,840	440	44,660	2,340 (7,657)	468	1,337	248	3,400	4,985	111	-	88	199	5,652	52,652	2,633	2,633	57,918	4,000	14,480	9
26			B						2,020									7,204	54,204	2,710	2,710	59,624		14,906	10
27			C						2,326									7,510	54,510	2,726	2,726	59,962		14,991	12
28			D						2,726									7,910	54,910	2,746	2,746	60,402		15,101	13
29		High-Rise	A	47,540	2,840	3,080	53,460	2,441 (9,055)	468						80	48	239	5,692	61,593	3,080	3,080	67,753		16,938	22
30			B						925									6,149	62,050	3,103	3,103	68,256		17,064	26
31			C						1,024									6,248	62,149	3,107	3,107	68,363		17,091	27
32			D						1,178									6,402	62,303	3,115	3,115	68,533		17,133	28
33	250 Persons/Acre	High-Rise	A	59,425	3,550	3,850	66,825	3,005 (11,319)	468	1,483	310	4,250	6,043	130	9	60	199	6,710	76,540	3,827	3,827	84,194	5,000	16,839	21
34			B						1,031									7,213	77,103	3,855	3,855	84,813		16,963	23
35			C						1,149									7,391	77,221	3,861	3,861	84,943		16,989	24
36			D						1,327									7,569	77,399	3,870	3,870	85,139		17,028	25

* Figures in parentheses are for 30 m deep foundations.

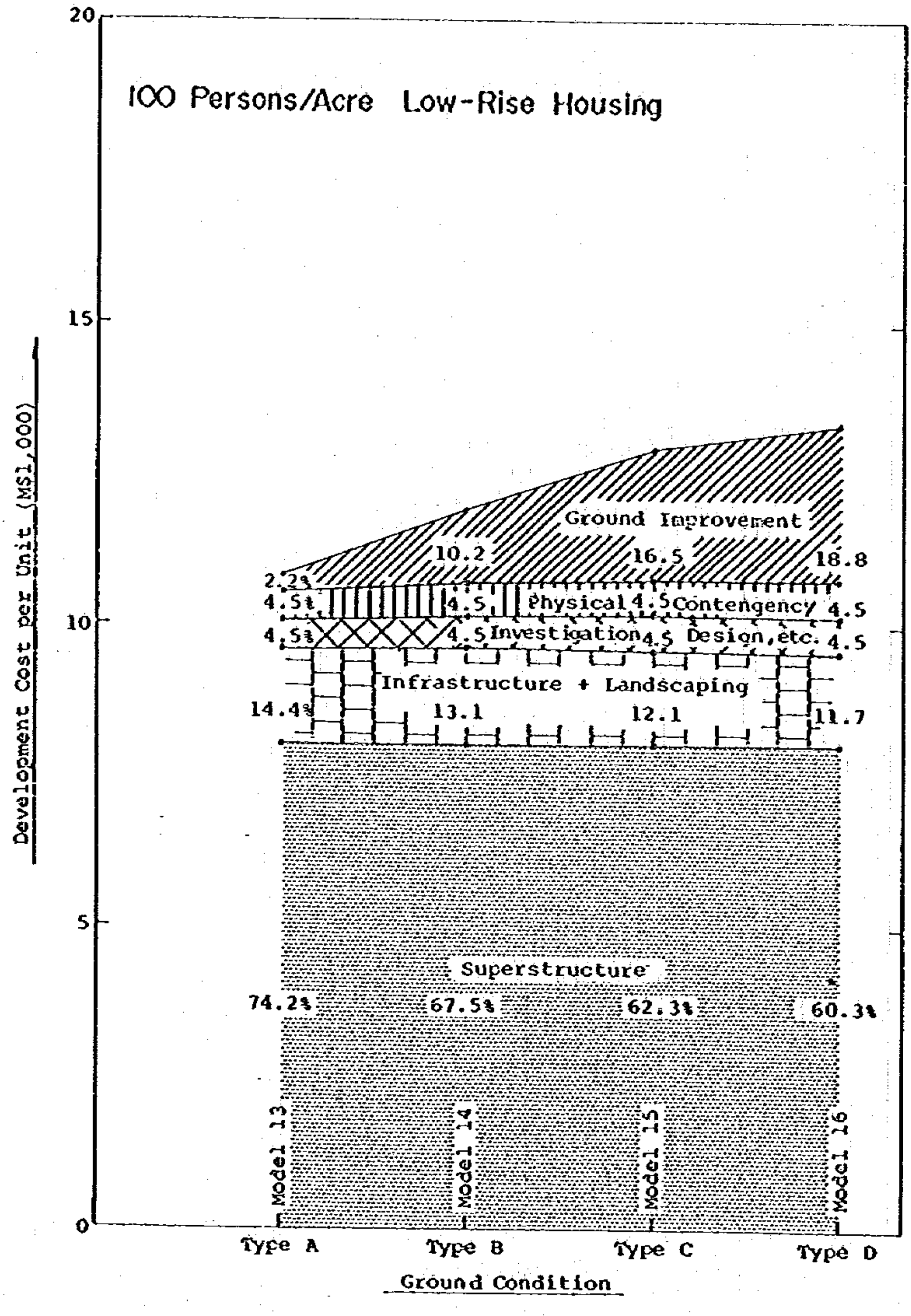


Fig. S-7a Breakdown of Development Cost (1)

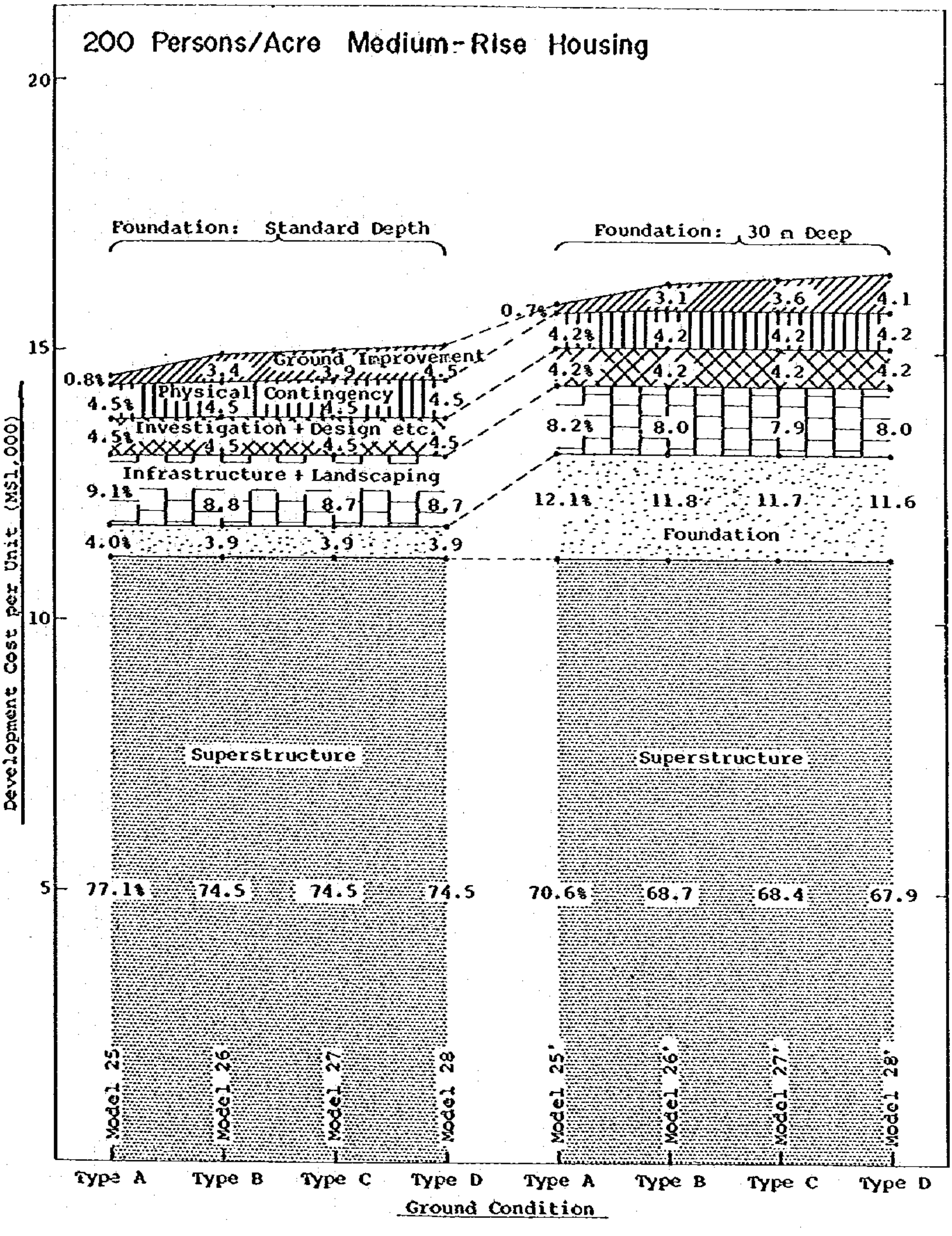


Fig. S-7b Breakdown of Development Costs (2)

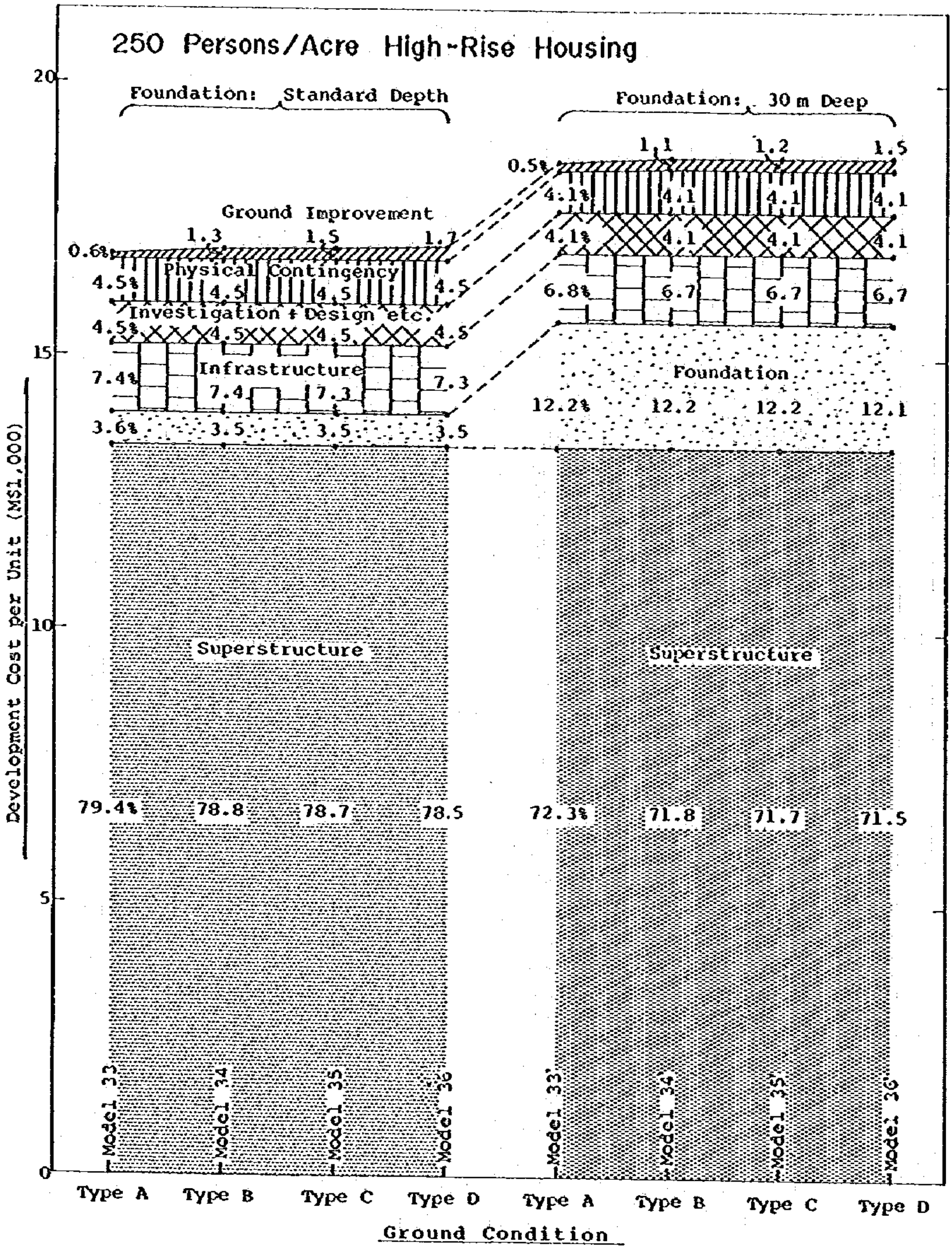


Fig. S-7c Breakdown of Development Costs (3) per housing unit is also plotted versus ground conditions in Fig. S-8. The following observations are made on the results of cost evaluation:-

(1) The cheapest case is Case 13 [Low-rise structures with medium density (100 persons/acre) on Type A ground], and is M$10,833 per unit.

(2) The most expensive case is Case 12 [High-rise structures with low density (60 persons/acre) on Type D ground], and is M$18,271 per unit.

(3) Construction cost for superstructures constitutes major portion of the development cost. The proportion increases with the size of structures, i.e. about 60 to 70% for low-rise, about 75% for medium-rise, and about 80% for high-rise structures.

(4) Development cost per unit increases sharply with the size of structures, i.e. relatively cheap for low-rise housing (between M$10,800 and M$14,300), and considerably more expensive for high-rise housing (between M$16,800 and M$18,300). For medium-rise housing, the unit cost is between M$14,500 and M$16,300. The difference between low-rise and high-rise housing on the same ground or with the same density condition is between M$4,000 and M$6,500.

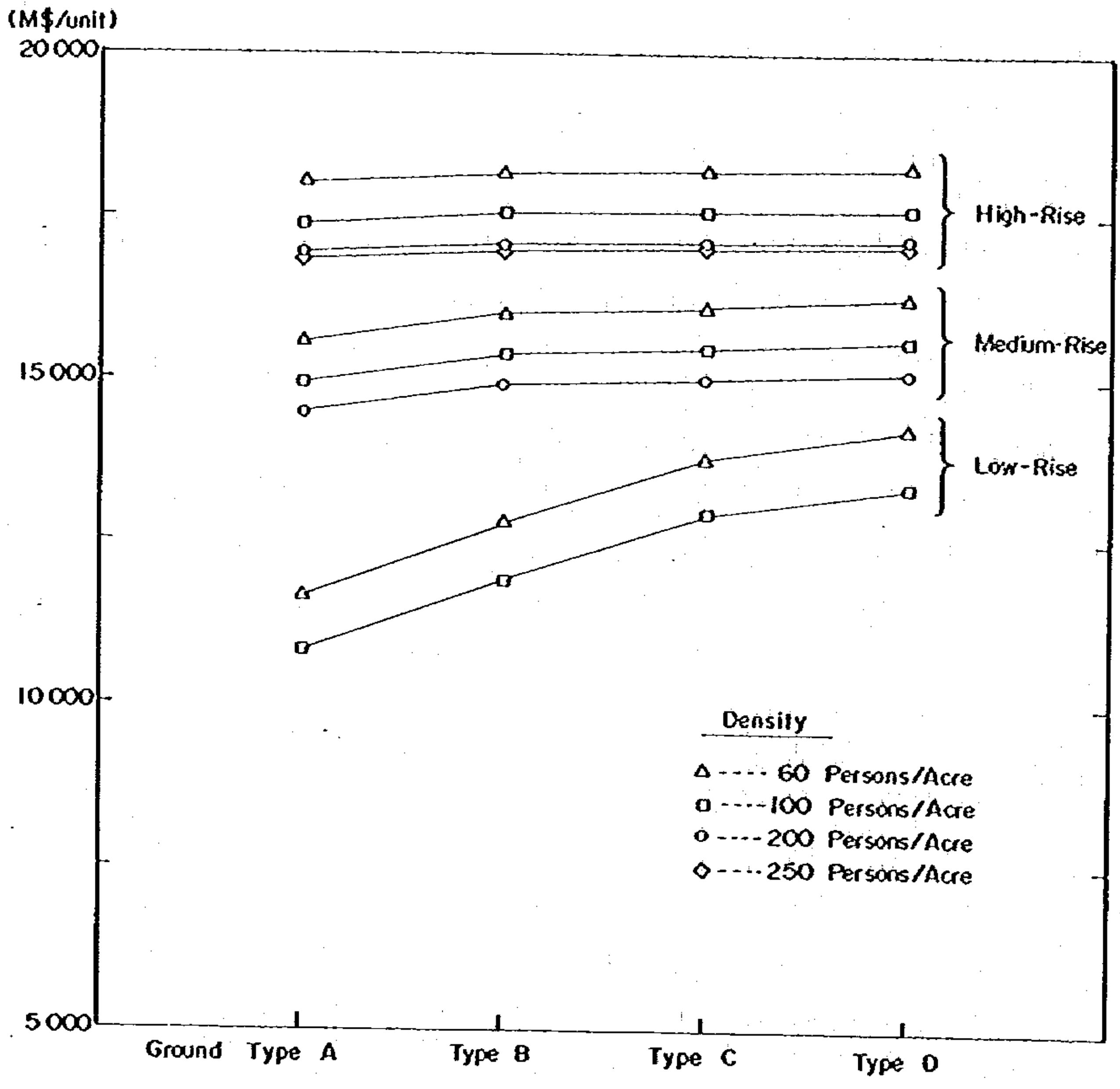


Fig. S-8 Comparison of Development Cost per Unit (w. r. t. Ground Condition)

(5) Ground condition affects the development cost, more sensitive for low-rise structures and less sensitive for high-rise structures. Differences in development cost per unit between ground Types A and D are about M$2,500 (ranges M$2,507 to M$2,547) for low-rise units and about M$200 (ranges M$189 to M$268) for high-rise units.

(6) Development density also influences the construction cost. High-density development gives cheaper unit costs than low-density development.

3.9 Influence of Land Cost and Optimum Development Model

Costs for land acquisition are not included in the cost study presented above. This is because ex-mining land is generally available without cost for housing developments executed by the public sector. However, the various properties surrounding ex-mining land obviously have market values. Therefore, even ex-mining land which is improved and developed for housing development by the public sector must be evaluated and utilised with due consideration for the implicit land value. This consideration is also necessary for the justification of the extra cost and time required for the ground improvement of ex-mining land.

Further evaluation of the development cost of low-cost housing is performed for 3 cases; i.e. for the land price of M$3, 5, and 10 per square foot.

Fig. S-9 shows the difference in development cost per unit between ① housing development using ex-mining land after ground improvement, and ② housing development using general land purchased at the prevailing market price. It is seen from Fig. S-9 that in all cases, housing development using ex-mining land after ground improvement is cheaper than the developments using non ex-mining land purchased at market prices.

For selection of the most appropriate housing development model, due consideration must be given to the implicit land value even in cases where ex-mining land is acquired cheaply by the public sector. For the best use of the available land space, optimum development models must be selected with reasonable consideration of land value as may be represented by the prevailing land price. Fig. S-10 shows the development cost per unit with respect to development density and structure size for various land costs. If we are to consider a housing development in an area with a land value of M$5/$ft^2$, the cheapest model is a medium-rise structure with 200 persons/acre, and the 2nd cheapest being a high-rise structure with 250 persons/acre.

3.10 Financial and Economic Study

A financial feasibility study is performed on the basis of full financial redemption with the establishment of independently estimated financial costs and benefits. The economic aspects of the project are indirectly studied as based on the results of the financial studies.

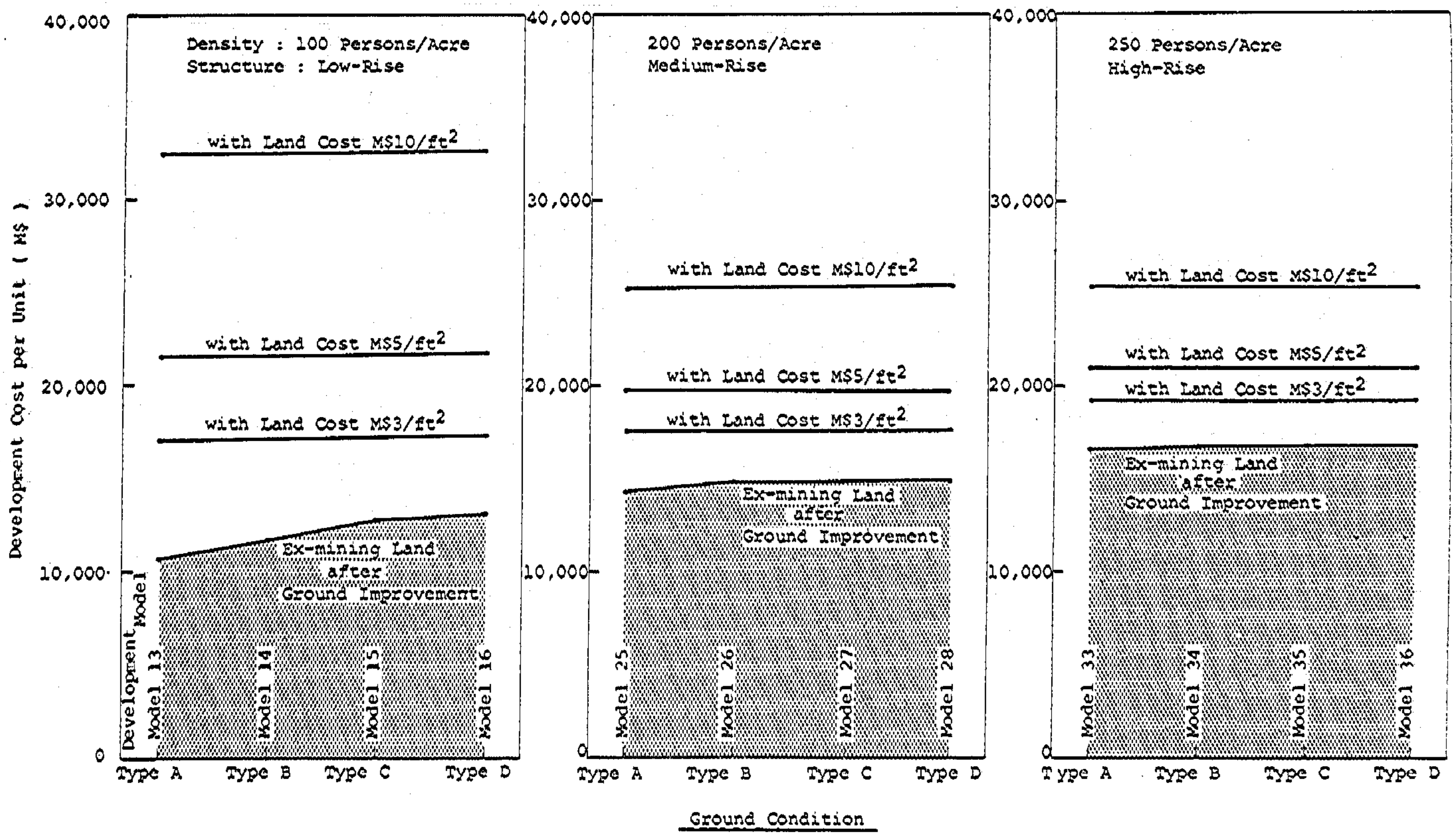


Fig. S-9 Difference of Development Cost by Land Prices

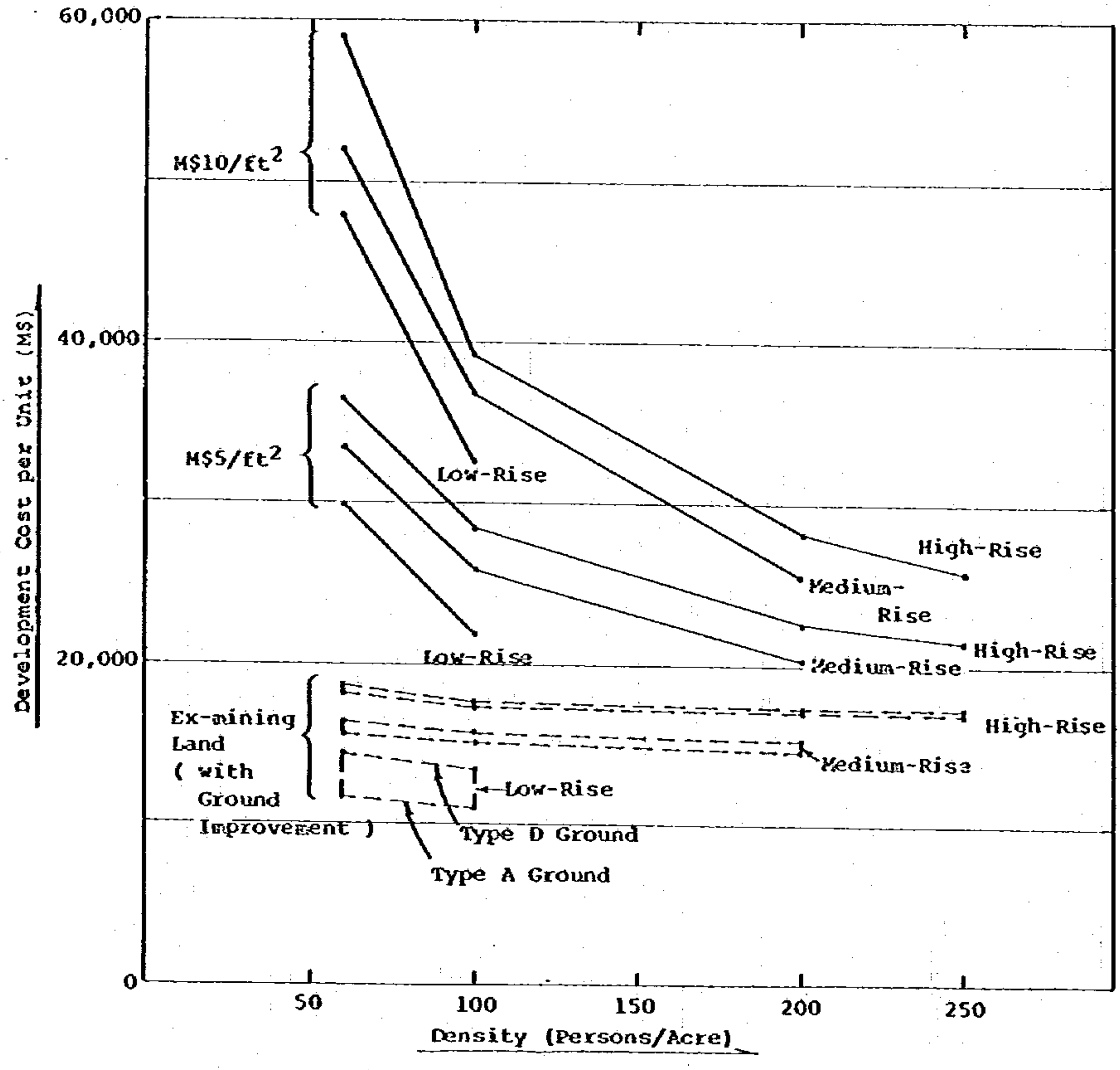


Fig. S-10 Effect of Land Cost to the Development Cost

3.10.1 Financial Study

Three development models are selected for financial cost analysis from among the 36 development models studied in Section 10. They are Development Models 13, 26 and 34. The financial analysis is performed based on the following conditions:

* Interest Rate: 7.5% and 3.0 %/year
* Ownership : Sale and Rent
* Price Policy : Low-Cost and Commercial

In total, 24 cases are analysed.

The results of the analysis is tabulated and shown in Table S-5. The feasibility of each case and the financial balance 20 years after completion of the project are listed in the right-hand column of the table. According to the results shown in this table, 14 of the 24 cases are financially feasible, while 10 are not. From the same statistics, it also becomes clear that if a commercial price scheme is adopted, all cases become feasible including that embracing a low-cost price policy for low-rise houses on Type A ground when sold.

3.10.2 Equilibrium Price

Among the 24 cases analysed above, financial equilibrium prices are calculated for four cases on Type B ground. The equilibrium price is the selling price or the rent which leads to a financial balance. The equilibrium prices obtained are tabulated in Table S-6.

Table S-5 Financial Balance and Financial Feasibility

Case No.	Development Model No.	Type of House Structure	Ground Condition	Interest Rate	Ownership	Price * Policy	Financial Balance at 20 years after Construction (M$1,000)	Financial Feasibility
1	Model 13	Low-Rise (Single Storey)	Type A	3.0%	Sale	Low Cost	10,626	Yes
2						Commercial	236,419	Yes
3					Rent	Low Cost	-15,997	No
4						Commercial	112,394	Yes
5				7.5%	Sale	Low Cost	4,196	Yes
6						Commercial	229,990	Yes
7					Rent	Low Cost	-65,302	No
8						Commercial	98,299	Yes
9	Model 26	Medium-Rise (5 Storey)	Type B	3.0%	Sale	Low Cost	-24,180	No
10						Commercial	430,965	Yes
11					Rent	Low Cost	-57,496	No
12						Commercial	196,213	Yes
13				7.5%	Sale	Low Cost	-73,955	No
14						Commercial	411,500	Yes
15					Rent	Low Cost	210,967	No
16						Commercial	132,369	Yes
17	Model 34	High-Rise (18 Storey)	Type B	3.0%	Sale	Low Cost	-52,158	No
18						Commercial	487,286	Yes
19					Rent	Low Cost	-87,910	No
20						Commercial	216,994	Yes
21				7.5%	Sale	Low Cost	-144,821	No
22						Commercial	462,002	Yes
23					Rent	Low Cost	-310,174	No
24						Commercial	118,995	Yes

* Low Cost : Low-Cost Policy Price
* Commercial: Commercial Price

Table S-6 Equilibrium Price per Unit

Development Model	Structure	Ground Condition	Interest Rate	Ownership	Equilibrium Price in 1983 (M$)	Equilibrium Price in 1980 (M$)	Low-Cost Policy Price (M$)	Ratio between Equilibrium Price in 1980 and Low-Cost Policy Price
Model 26	Medium-Rise	Type B	7.5%	Sale	19,250	15,496	11,310	1.37
				Rent	183*	147*	62*	2.37
Model 34	High-Rise			Sale	21,900	17,629	11,310	1.56
				Rent	209*	168*	62*	2.71

* per month

3.10.3 Breakdown of Development Cost

Composition of the development cost is analysed and the breakdown of development cost is prepared. The total development cost is determined by adding 15% of price contingency to the direct cost. A typical example of the breakdown of the development cost is shown in Table S-7. The foreign currency portion of the total cost is about 20%. As the foreign currency portion is relatively low, it is probable that the secondary multiplier effect is quite high.

3.10.4 Economic Study

A certain amount of difficulty exists in estimating economic benefits in the present study due to reasons of uncertainty regarding the concept of benefit for housing projects in general and for this project in particular as it embraces a cost policy for lower income groups.

Table S-7 Breakdown of Development Cost for Development Model 26 (Medium-Rise Houses on Type B Ground)

	100 acre (1,000M$)			Per Housing Unit (M$)		
	Total Amount	Local Currency	Foreign Currency	Total Amount	Local Currency	Foreign Currency
1. Civil Works	54,204	42,470 (78)	11,734 (22)	13,551	10,618 (78)	2,934 (22)
1) Building	44,660	35,028 (78)	9,632 (22)	11,165	8,757 (78)	2,408 (22)
·Architectural Works	41,380	33,104 (80)	8,276 (20)	10,345	8,276 (80)	2,069 (20)
·Electrical Works	2,840	1,704 (60)	1,136 (40)	710	426 (60)	284 (40)
·Mechanical Works	440	220 (50)	220 (50)	110	55 (50)	55 (50)
2) Foundation	2,340	1,989 (85)	351 (15)	585	497 (85)	88 (15)
3) Land Development	7,204	5,453 (76)	1,751 (24)	1,801	1,363 (76)	438 (24)
·Land Improvement	2,020	1,515 (75)	505 (25)	505	379 (75)	126 (25)
·Infrastructure	4,985	3,739 (75)	1,246 (25)	1,246	935 (75)	312 (25)
·Landscaping	199	199 (100)	- (0)	50	50 (100)	- (0)
2. Administration & Supervision	2,710	2,710 (100)	- (0)	678	678 (100)	- (0)
3. Physical Contingency	2,710	2,114 (78)	596 (22)	678	529 (78)	149 (22)
4. Price Contingency	8,944	6,976 (78)	1,968 (22)	2,236	1,744 (78)	492 (22)
Total	68,568	54,270 (79)	14,298 (21)	17,142	13,568 (79)	3,575 (21)

* Figures in parentheses indicate percentage.

(1) Opportunity Cost of Ex-Mining Land

At present, ex-mining land is not fully utilized and thus provides a significant opportunity for development with a relatively small investment. The capital inflow required for ground improvement is almost a zero amount for Type A ground and is about 1 to 10% of the total development cost for Type B ground. These amounts are cheaper than those necessary to acquire land other than ex-mining property for housing development. Thus, the development of housing projects on reclaimed ex-mining land can produce a significant effect on the nation's economy as the said property represents an opportunity cost of almost zero at present.

(2) Aspect of Social Welfare

According to the financial analysis, all projects under the low-cost scheme, with the exception of sale for Type A ground, are not feasible unless the low-cost policy price is adjusted to meet the equilibrium price. In this case, it is necessary to evaluate the project from the viewpoint of social welfare. Although the project is not feasible through simple financial evaluation, consideration of the benefits accrued through a social welfare transfer indicated that a large number of people could enjoy a healthier lifestyle.

(3) Multiplier Effect

i) Multiplier Effect by Flow

Through large capital investment for housing developments on ex-mining land, equally large demand will be produced for cement, steel products, construction equipment, etc. In addition, demand for construction and transportation services will be created, which in turn will create demand for energy, communications, etc.

As the local currency portion of the project is considerably high (about 80%), it is probable that the secondary multiplier effect is quite high and will continue for a considerable period of time. Further, as the proposed projects are located in and around Kuala Lumpur, the employment effect will also be significant.

ii) Multiplier Effect by Stock

In addition to the multiplier effect through the development of the project, a multiplier effect will be produced by the social and economic interaction of the inhabitants of housing developments. This type of multiplier effect will increase demand for general consumer industries and others related to recreation, education, etc.

It is concluded that the multiplier effect of the project is extremely high and the project will contribute to the economical development of Malaysia. This multiplier effect is one important factor in making the proposed project feasible.

(4) Project Feasibility

A conclusion of project feasibility can be supported given the situation where ex-mining land can be procured at an opportunity cost of almost zero and can be used for housing development with reasonably small amounts of capital investment. It is considered that the project is also economically feasible as the economic price approaches the commercial price, and as the project also produces various multiplier effects and social benefits. The following aspects are important for the feasibility of the project:

* Evaluation of Multiplier Effects
* Utilisation of a Low-Cost Fund
* Establishment of a Social Welfare Fund

3.11 Suggestions for Future Activities

Some concluding remarks are prepared for the future action of the proposed project.

(1) Ex-mining land is feasible for housing development, the degree of feasibility depending on the ground conditions and the necessary ground treatment required to make it feasible. Of the 5 ground conditions classified earlier for ex-mining land, Type A is the most suitable for housing development followed by Type B. It is recommended that housing development on ex-mining land should begin with ground condition Types A and B.

(2) When proceeded by well established development planning, ex-mining land, including Type C and D grounds, can be fully utilised for housing developments as well as other purposes. For most cases, cost requirements for the improvement of soft ground are less than 10% of the total development cost and the time required is 1 to 1.5 years.

(3) The following actions should be carried out immediately, especially in the Federal Territory so that more land can be released to ease the housing shortage:

* Investigation and classification of ex-mining lands into 5 types of ground conditions, and preparation of classification maps.
* Establishment of land-use and housing-development planning, and execution of soft ground improvement work according to an established plan.
* Modification of tin mining operations according to recommendations provided in this report.

SECTION 1 INTRODUCTION

1. INTRODUCTION

The Government of Malaysia plans to overcome the housing shortage for the urban poor in Kuala Lumpur by constructing more low-cost housing units in the suburbs of Kuala Lumpur. However, the areas with relatively good ground conditions have already been developed, and ex-mining lands in the suburbs of Kuala Lumpur are to be used for the proposed housing developments. The ground condition of the ex-mining land is generally poor and complex, and many foundation engineering problems are expected for housing development.

With the above background, the Government of Malaysia made a request to the Government of Japan to conduct a feasibility study for the use of ex-mining lands for housing development and other purposes (refer to Appendix A).

In response to the request of the Government of Malaysia, a preliminary survey mission from Japan visited Kuala Lumpur in March, 1979. The mission team exchanged views and held a series of discussions with the representatives of the Economic Planning Unit, Ministry of Housing and Local Government, and Kuala Lumpur City Hall on the Scope of Work and desirable measures to be undertaken by both Governments for the successful execution of the study (refer to Appendix B). Based on the advice given in the report prepared by the mission, it was decided to perform a feasibility study for the reclamation project of ex-mining land for housing development and other purposes. The feasibility study is comprised of the following:-

(1) Reconnaissance Survey and Data Colleoiton

(2) Subsurface Ground Investigation

(3) Engineering Study for Massive Reclamation

(4) Engineering Study for Foundation and Consturction Methods

(5) Economic and Financial Studies

The feasibility study is divided into 2 phases (Phase I and Phase II). The Phase I study was carried out between December, 1979 and March, 1980, and the Phase II study between August, 1980 and October, 1981. Organisations of the study teams for Phase I and Phase II studies are indicated in Figs. 1-1 and 1-2 respectively. Fig. 1-3 shows the progress of the study in both Phase I and Phase II.

The results of Phase I and Phase II studies are presented in this final report. The final report consists of 3 volumes, i.e. Summary and Recommendations, Main Text, and Appendices.

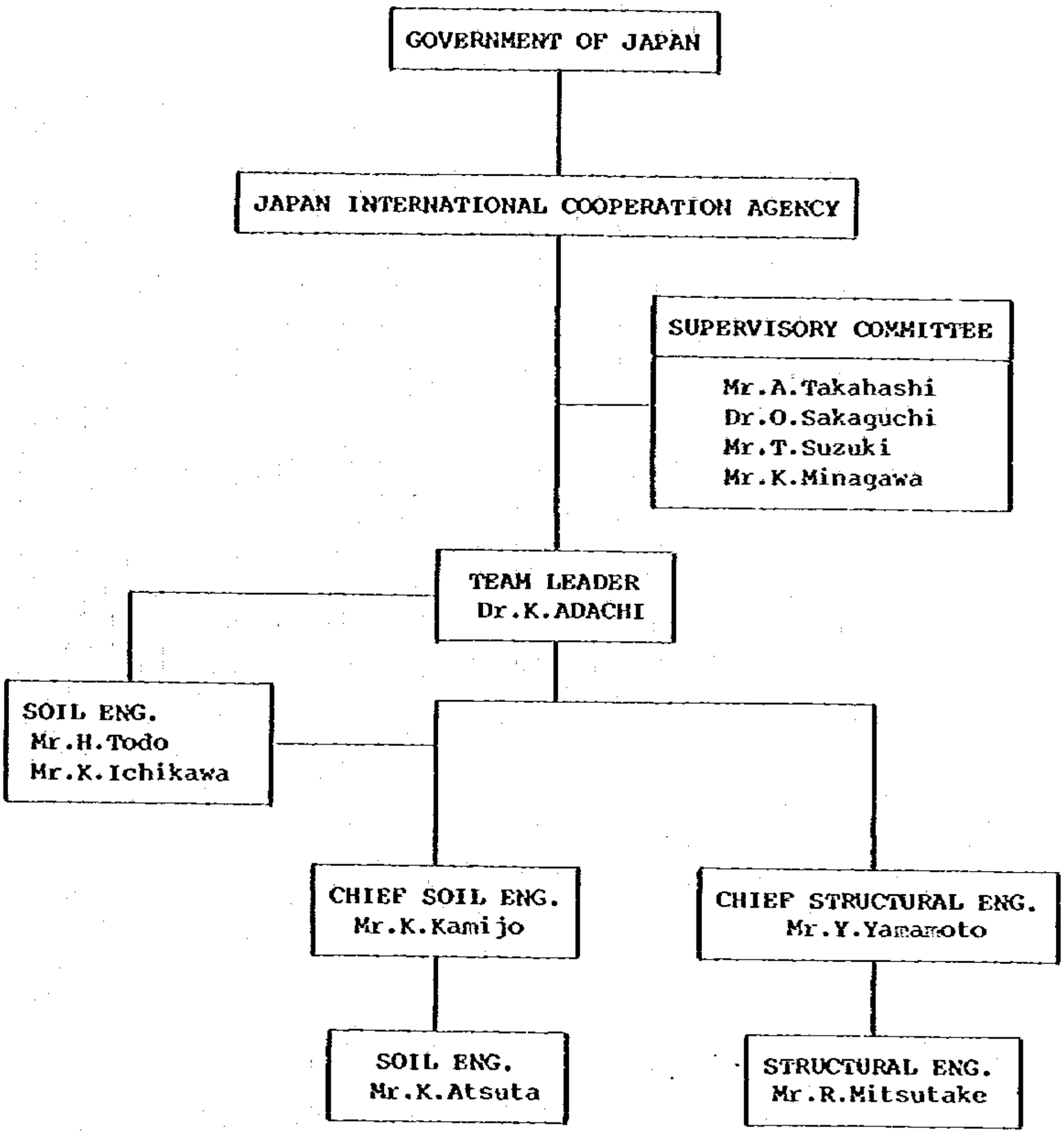


Fig. 1-1 Organisation of Study Team, Phase I

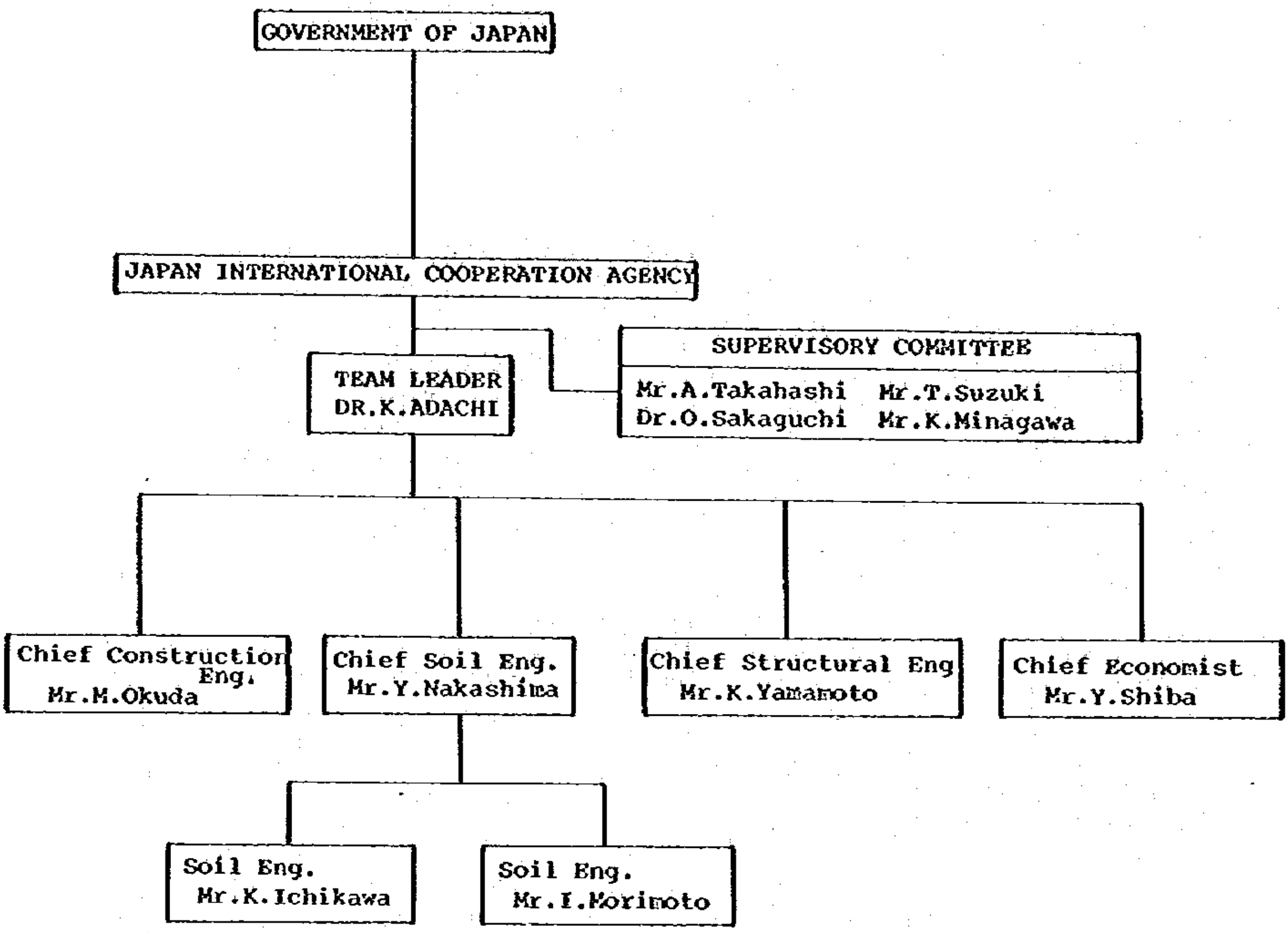


Fig. 1-2 Organisation of Study Team, Phase II

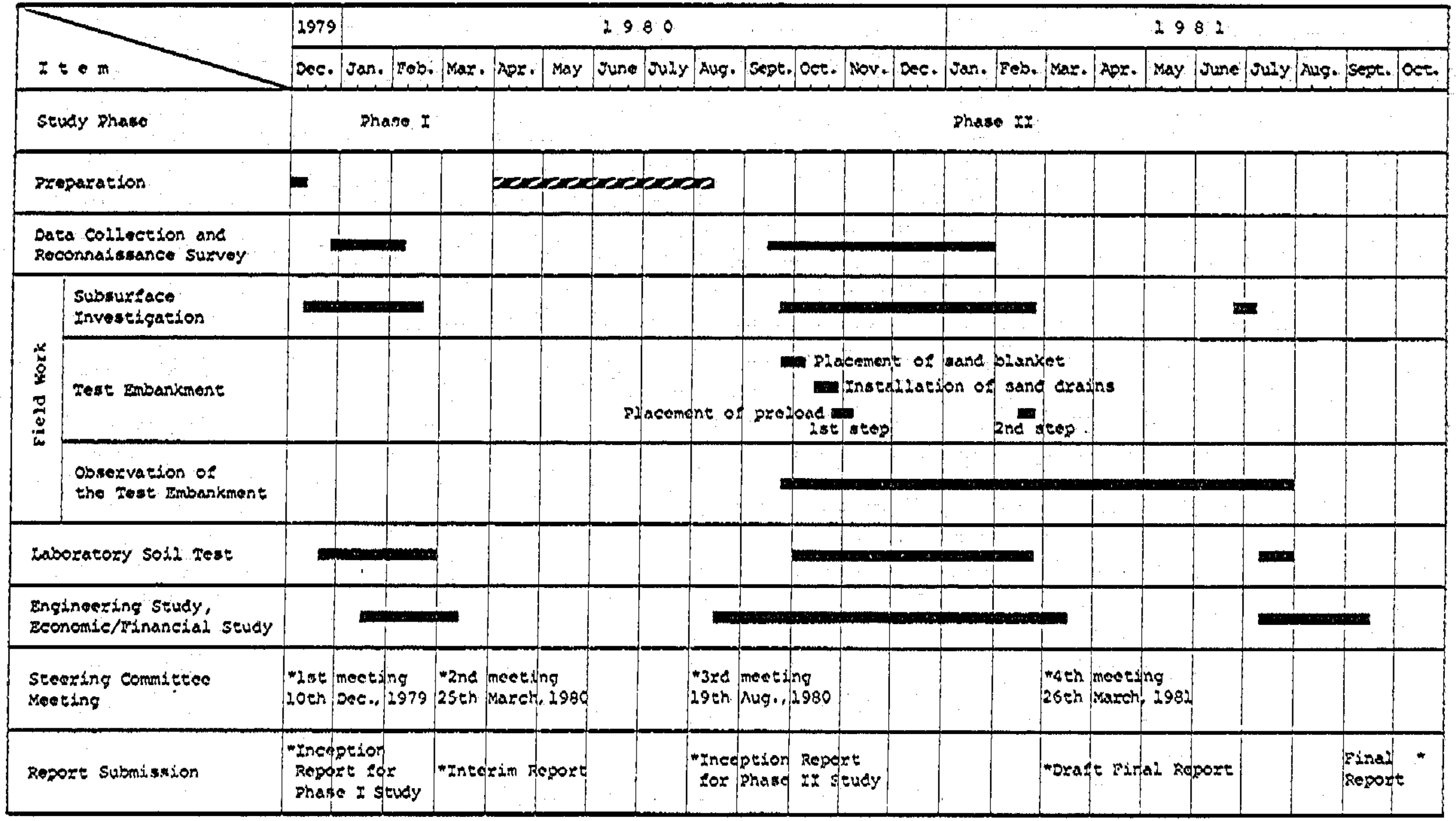


Fig. 1-3 Work Progress Chart

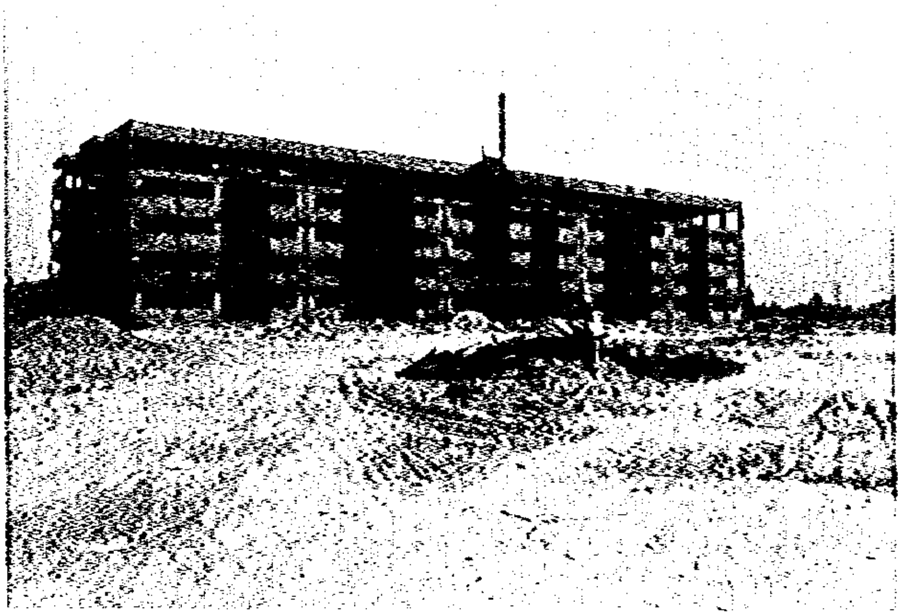
SECTION 2 HOUSING SITUATION IN KUALA LUMPUR

SECTION 2

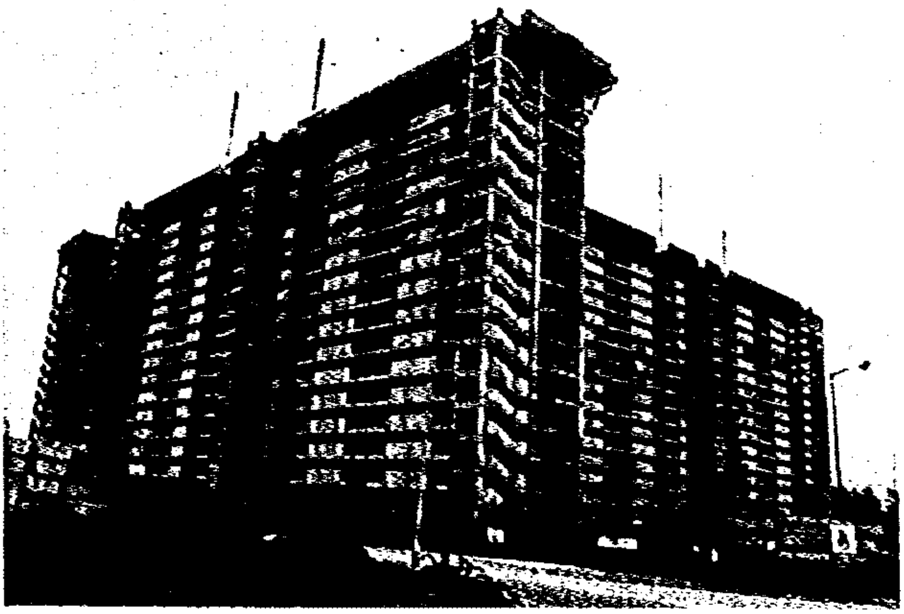
HOUSING SITUATION IN KUALA LUMPUR

Low-Cost Housing in the Federal Territory

Low-Rise Housing



Medium-Rise Housing



High-Rise Housing

2. HOUSING SITUATION IN KUALA LUMPUR

2.1 Federal Territory Ex-Mining Lands

Federal Territory boundaries were established in 1974 as shown on Fig. 2-1. When the present administrative boundaries were drawn in 1974, the capital of Selangor State was transfered to Shah Alam, 25 km west of Kuala Lumpur. The Ministry of Federal Territory was created in July, 1978 to administer and plan the development of the Federal Territory of Kuala Lumpur, with the City Hall Kuala Lumpur as its major executive arm. The Federal Territory completely encompasses the city of Kuala Lumpur, which was enlarged to its present size in 1950.

Ex-mining areas now comprise almost 14% of the Federal Territory, as shown on Fig. 2-2. Eventually, ex-mining areas will include the present mining areas and the areas that are now allocated for future mines. There are approximately 8,300 acres of ex-mining area, about 40% of which is designated Type A or B ground, the site types which are most favourable for low-cost housing (LCH) development.

2.1.1 Advantage for Low-Cost Housing Siting

There are several advantages to utilizing ex-mining areas for low-cost housing sites. These advantages relate to the location, sheer amount, existing infrastructure, and the eventual cost of the ex-mining areas.

Location advantages stem from the proximity of ex-mining

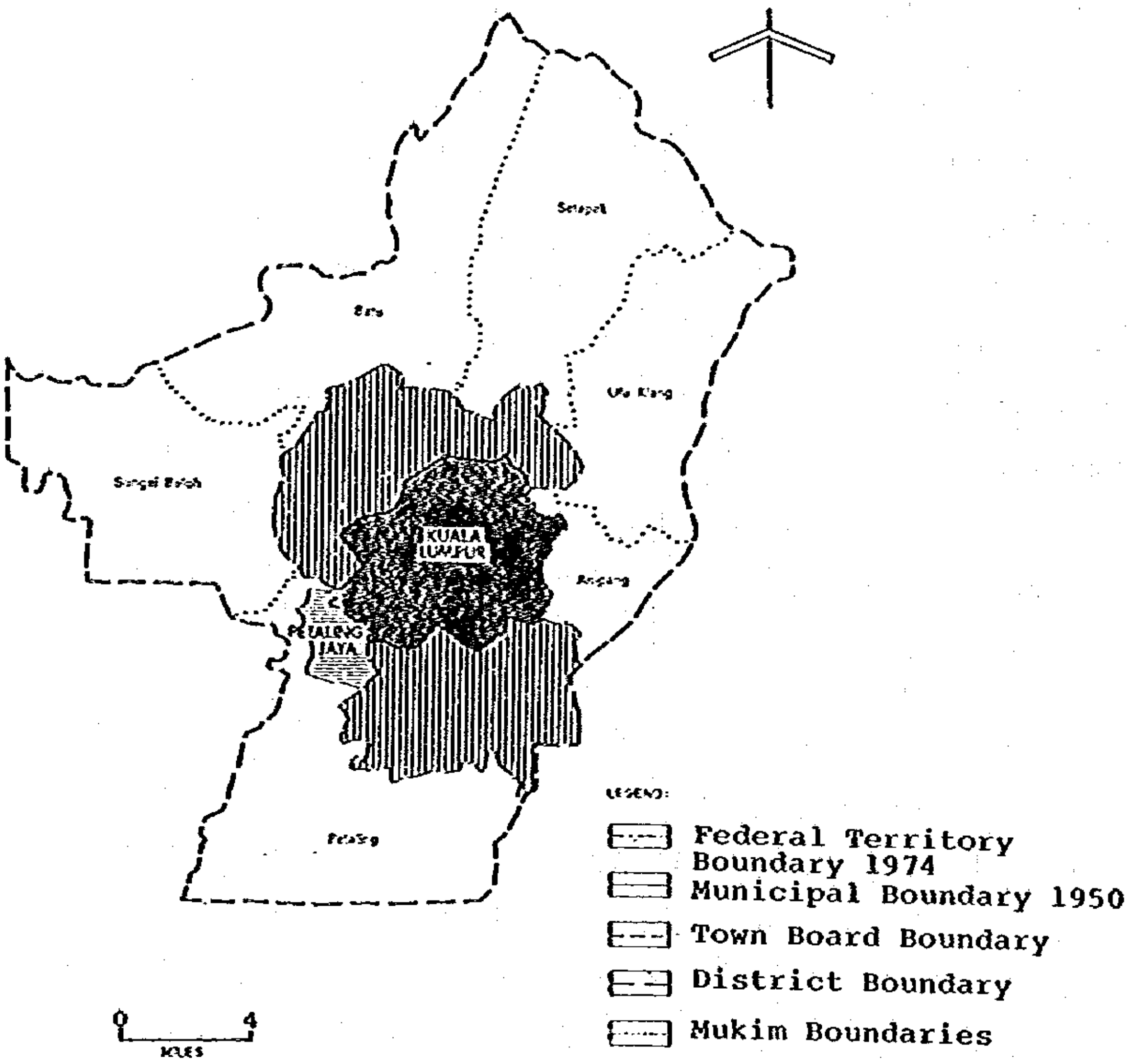
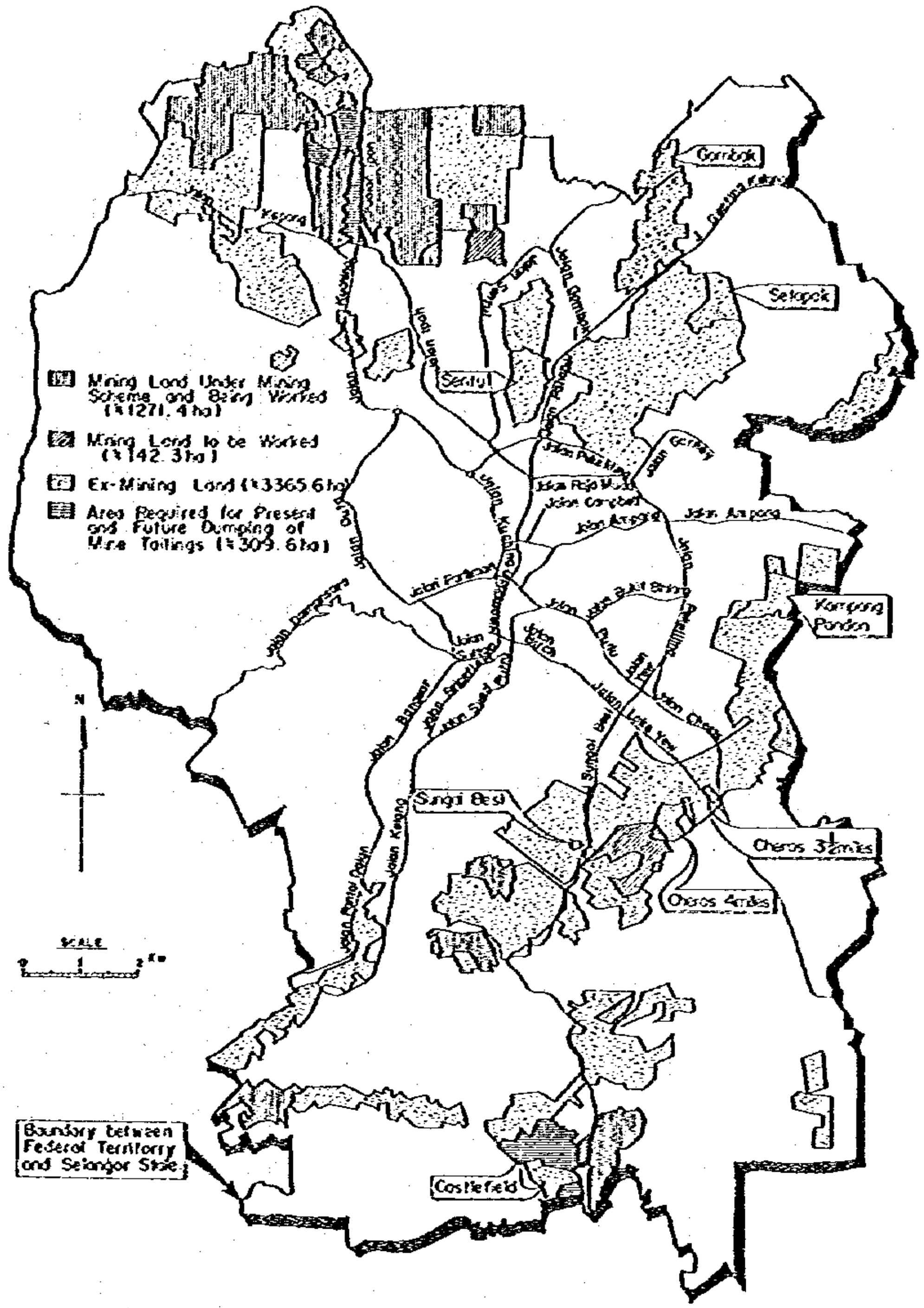


Fig. 2-1 Kuala Lumpur Administrative Boundaries



	Area		Percentage of Federal Territory Land Area
	(Areas)	(ha)	
Mines in Operation	3,139.31	1,271.4	5.2
Mines Scheduled	351.24	142.3	0.5
Dump Sites	764.41	309.6	1.3
Ex-Mining Land	8,310.20	3,365.6	13.8
Total	12,565.16	5,088.9	20.8

Fig. 2-2 Location of Tin-Mining Area and Ex-Mining Areas in the Federal Territory

areas to the central city. Ex-mining areas in Kuala Lumpur lie 4 to 12 km away from the central part of the city. Sentul and Kampong Pandan, which are the main sites of the present investigation, are situated about 5 km from the centre. This places them very conveniently with respect to mass transit systems and also close to the major job market for relatively unskilled labourers.

The significance of the sheer amount of ex-mining land cannot be overemphasized. At nominal densities of 100 persons per acre, the number of persons whose dwellings could be accommodated on acreage of Types A or B is 330,000 which is roughly 40% of the total 1980 Federal Territory population, and about 2.5 times the 1980 Federal Territory squatter population.

Except for unused, governmentally owned lands, the amount of land available for development of any sort is very small. Land to be used for low-cost housing must compete with the commercial market and the private sector, who are prepared to pay much more per square foot.

Because mining land is presently owned by the government, the only costs associated with using the land for low-cost housing sites are costs incurred to improve the sub-soil. This cost varies according to the present condition and intended use of each potential site, but in comparison to the average 1980 price of land (say M$7 to M$12 per square foot), improvement costs are about 10% to 20% of the purchase costs. This ratio is expected to improve in coming years as land cost-inflation will exceed soil improvement inflation.

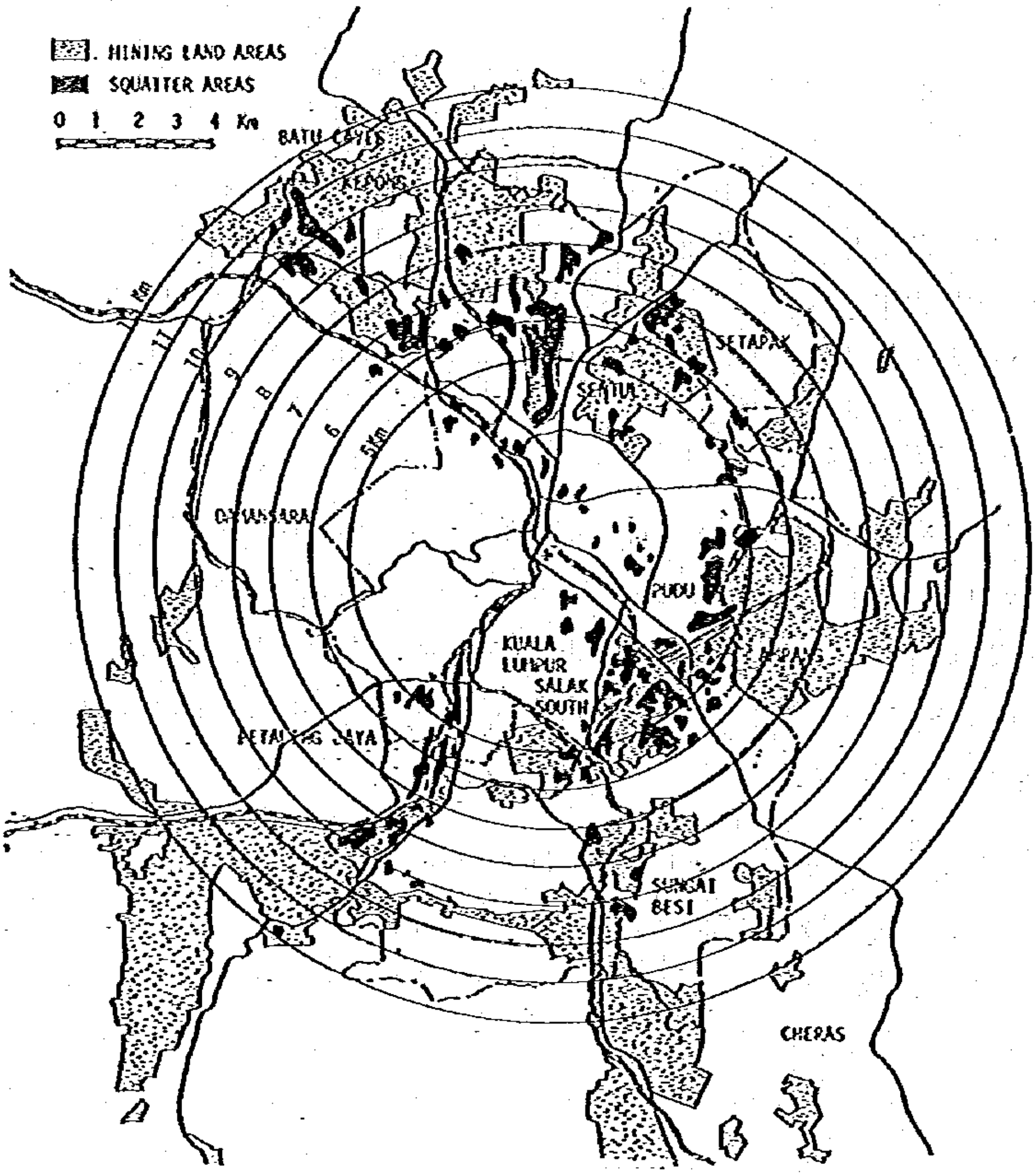
Another less measurable advantage of the present governmental ownership of these lands is that it may speed up development by reducing the number of permits necessary to utilize the land for low-cost housing sites.

2.1.2 Immediate Availability Subject to

The availability of ex-mining land for immediate development is subject to two circumstances that cannot be abrogated by simple decision making. First, there are considerable numbers of squatters who are presently living on these lands in established and recognized communities.

By extrapolating from 1975 squatter land occupation statistics using 1980 population figures, the squatters probably occupied close to 3,600 acres of government land in 1980, most of which were on ex-mining land (Fig. 2-3). This is approximately the same amount as the total amount of Type A and B Ground in existence, so one might draw the conclusion that the most favorable land is very nearly completely occupied.

The second circumstance delaying the availability of ex-mining lands for development is the time factor for soil improvement. The satisfactory improvement of Type B Ground, which constitutes about half of the most favorable land, takes on the order of one to one-and-one-half years. Site Type C also takes about the same length of time.



Population of Squatters in Kuala Lumpur (1980)

Kuala Lumpur	14,019
Setapak	75,799
Sungai Besi	73,331
Damansara	30,063
Kepong	39,897
Total	233,109

Fig. 2-3 Location of Squatter Areas and Tin-mining Area

2.2 Federal Territory Low-Cost Housing Needs

Housing in the Federal Territory ranges from exclusive estates worth on the average of M$500,000 to squatter homes constructed of cardboard and other perishable materials. A simple breakdown of housing available for sale begins with the newly constructed low-cost housing unit, with a regulated first offer price not to exceed M$24,000 (reported to have recently been increased from M$20,000), followed by used low-cost housing units, single storey terrace houses, two storey terrace houses, luxury condominiums and then private homes ranging upwards to the equivalent of large, country estates. The Federal Territory housing types are contrasted with those in other cities on Tables 2-1 and 2-2.

It is a testimony to the area's rapid population growth and economic expansion that housing for all economic sectors is in very short supply. The supply for commercial space is just as tight. The construction industry and all related industries are stretched to the limit and still unable to accommodate the rising demand for space.

2.2.1 Supply and Demand Situation at Year-End 1980

At year-end 1980 there were unfilled applications on the books for nearly 25,000 low-cost housing units in the Federal Territory. This number is contrasted to the mere 15,888 low-cost housing units available in 1977, 5,000 of which were under construction at the time. Most of these units were offered for rent. Increasingly, low-cost housing

Table 2-1 Percentages of Housing Types in Major cities, Peninsular Malaysia, 1970

	Squatter	Hybrid	Conventional
Alor Setar	20.0	52.0	28.0
Batu Pahat	5.1	49.7	45.2
Bentong	3.7	76.5	19.8
Butterworth	9.7	60.2	31.2
Georg Town	7.2	25.9	66.9
Ipoh	9.2	43.4	47.4
Johor Bahru	8.4	41.1	50.5
Kelang	37.3	22.5	40.2
Keluang	5.4	62.8	31.9
Kota Bahru	9.3	52.7	38.0
Kuala Lumpur	37.0	10.5	52.5
Kuala Trengganu	4.2	58.9	37.0
Kuantan	12.8	60.1	27.1
Malaka	6.0	38.2	55.8
Sungai Petani	9.4	60.2	30.4

Note:

Conventional housing is that constructed of permanent, manufactured materials and is largely coincident with government and private construction.

Hybrid housing is that constructed of less permanent and durable materials such as wood, zinc, attap, and scrap but not officially designated as squatter dwellings.

Table 2-2 Materials of Housing Roofs and Walls by Community Size, Peninslar Malaysia, 1970

		Kuala Lumpur	Other Large Cities	Small Cities	Rural	West Malaysia	Base Figures
Roofing Materials	Concrete	11.4	2.9	0.9	0.8	2.5	35,603
	Tiles	43.8	35.8	19.1	12.0	19.6	284,254
	Asbestos	8.0	11.1	9.7	8.0	8.5	123,523
	Zinc and Corrugated sheets	29.7	31.2	52.6	43.5	41.4	599,761
	Attap	6.7	18.8	17.5	35.1	27.5	397,631
	Other	0.4	0.2	0.2	0.6	0.5	6,868
Materials of Walls	Sawn Timber	35.0	60.4	68.7	74.1	66.8	967,522
	Sawn Timber/ Bricks	9.6	9.2	12.1	6.3	7.8	112,355
	Bricks	34.3	17.0	9.0	3.9	9.9	143,925
	Concrete	20.2	10.4	6.7	3.4	6.8	98,105
	Attap and Bamboo	0.3	1.3	1.8	7.1	4.9	71,716
	Zinc/Corrugated Sheets and Others	0.6	1.7	1.7	4.2	3.8	54,017
	% of Housing Units in Malaysia	13.5	10.4	11.8	64.3	100.0	1,447,640
	Base Figures	195,260	150,606	171,167	930,607		

units are offered for sale rather than for rent. Rents for public low-cost housing units are standardized with respect to number of rooms and distance from the centre city. Rents range from M$32 to 68 /month as shown in Table 2-3.

Other indications of the short housing supply in the Federal Territory are the incredible yearly inflation rate in market prices for all ranges of housing, as well as the fact that houses offered for sale by private developers sell out within a few weeks at longest, even at premiums of 10% to 20%.

Between 1978 and 1980, construction cost for public low-cost housing units increased 184% to 242% and now range from M$15/ft^2 for a single storey terrace house to $29/ft^2 for a flat in a five storey building as shown in Table 2-4. In 1979-1980, increases of 25% for non-low-cost, one storey terrace houses were not uncommon. Typical prices increased from M$45,000 to about M$60,000. Similarly, two storey terrace houses jumped in price from about M$75,000 to M$90,000 (Table 2-5, Fig. 2-4). In the past these units had been purchased by the middle class, but now they are rapidly becoming upper middle class housing. Luxury condominiums and large estates also experienced price increases, but typical increases are difficult to establish.

The Federal Territory's housing need stems from both a backlog and natural processes associated with the passage of time. The backlog of houses needed is founded in the need to replace structures which are beyond repair, and to reduce

Table 2-3 Cost of Rent of Public Low-Cost Housing Units According to Distance from Center of Kuala Lumpur

	Within 3 miles (M$)	Over 3 miles (M$)
1-Room Flats	32	36
2-Room Flats	42	47
3-Room Flats	55	-
4-Room Flats	68	-

Table 2-4 Increase of Building Cost of Public Low Cost Houses

($M\$/ft^2$)

Year	Single Story Terrace House	Double Story Terrace House	5-story Flat
1978	6.55 ~ 9.23	7.20 ~ 8.74	11.98 ~ 15.75
1980	14.7 ~ 17.0	17.0	29.0
Rate of Increase (%)	184 ~ 224	195 ~ 236	184 ~ 242

Table 2-5 Increase in Price of Terrace House in Kuala Lumpur, 1978~79 (Non-Low-Cost House)

	SINGLE STORY TERRACE			TWO STORY TERRACE		
	Price (M$)		Increase	Price (M$)		Increase
	1978	1979	(%)	1978	1979	(%)
Bangsar Area	55,000	66,000	20	78,000	116,000	49
Cheras Area	48,000	56,000	17	64,000	80,000	25
Old Klang Road Area	42,000	56,000	33	77,000	95,000	23
Kepong Area	40,000	50,000	25	55,000	70,000	27
Average	23.8%			31.0%		

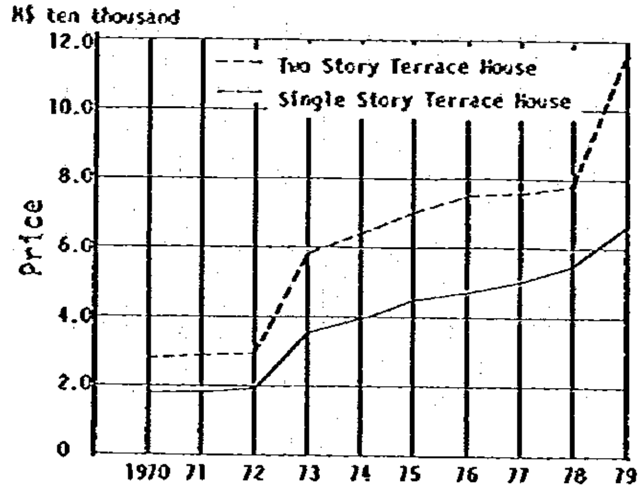


Fig. 2-4 Price Movement of Terrace Houses in Kuala Lumpur, 1970~79

existing, overcrowded conditions. Natural, yearly processes which create a demand for housing include population increase and housing obsolescence.

In 1970, it was estimated that between 4 and 5 per cent of all Malaysia's housing needed to be immediately replaced. About 20% needed urgent repair. It is not known to what extent this backlog has been alleviated.

The federally expressed density goal is for housing units to be occupied by one family, and for individual rooms to house no more than 4 persons. At the time of the 1970 census, the average number of families per unit in Malaysia was 1.08. For urban areas the number was 1.2 families per unit. Overall the average number of persons per room equalled 2.1, but 24% of all dwellings had 4 or more persons per room. An additional 238,000 rooms (113,000 typical living units) were needed to ensure that no room accommodated more than 4 persons.

In 1979, according to the Third Malaysia Plan Interim Report, the average number of families per unit among the Federal Territory squatters was 1.25. Most of these homes only contained one room which housed an average of 7 to 8 persons. Only 25% of these dwellings had running water, and 20% had electricity. Land use and population density per acre in Kuala Lumpur are matters of zoning. The territory has been zoned with respect to both land use, and population density as shown in Figs. 2-5 and 2-6. Table 2-6 lists the low-cost housing developments in Kuala Lumpur through 1978,

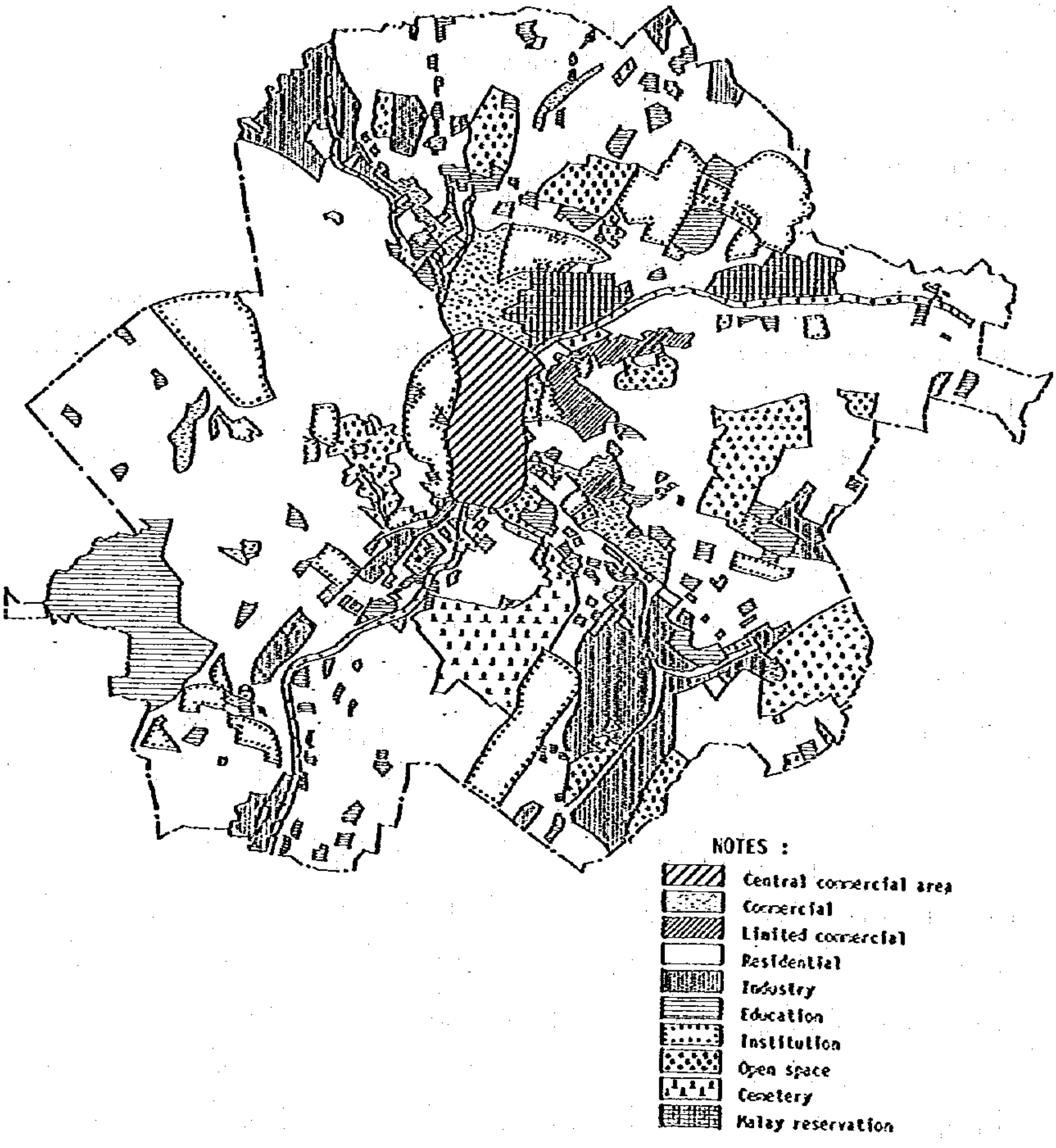
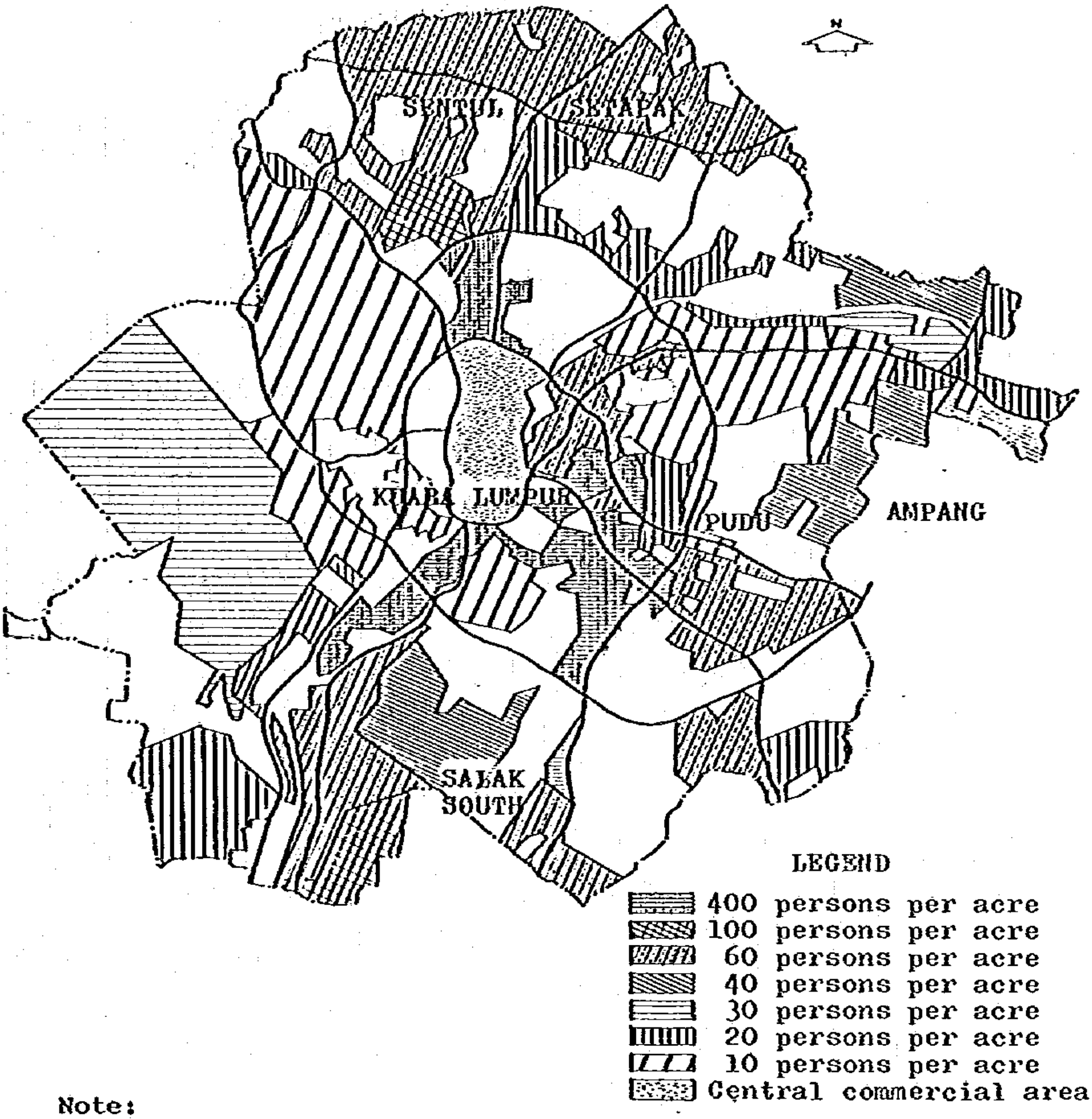


Fig. 2-5 Land Use Zoning, Kuala Lumpur



Note:
for the purpose of conversion of persons per acre into dwelling units per acre, 5 persons shall constitute a dwelling unit.

Fig. 2-6 Density Zoning, Kuala Lumpur

Table 2-6 Outline of Public Low-Cost Housing Developments in Kuala Lumpur, 1956~1978

Location	Year	Type		No.of Story		No.of Units
Ulu Kelang	1956-57	for Sale	Detached	-	1	150
Ayer Panas	1956	"	Terrace	-	1	49
KG Datuk Keramat	1956-57	"	Detached	-	1	200
Kampung Pandan	1963-65	"	"	-	1	1,068
Suleiman Court	1958	Rental	Flats	3	4,12	321
Jalan Loke Yew	1958-71	"	"	4	9,12,17,20	1,036
Razak Mansions	1962-67	"	"	15	4	684
Jalan Pekeliling	1968-69	"	"	4	4,17	3,009
Jalan Shaw	1969	"	"	2	4,17	808
Jalan Cheras	1969-72	"	"	16	4	1,280
Sri Pahang	1972-75	"	"	9	4,17	876
Sri Selangor (1)	1974	"	"	3	17	802
HDA Cheras	1977	"	"	-	2	676
Youth Hostek	1977-78	"	"	2	8	252
Sri SSelangor(2)	1977	"	"	3	17	802
KG Konggo	1977-78	for Sale	Cluster	-	1	1,842
Sentul Selatan	1977	Rental	Flats	1	17	252
Salak South	1978	for Sale	Site and Service	-	1	312
Kampong Konggo	1978	Rental	Flats	8	4	640
				Total		15,059

detailing type, size, number of units, and whether the units are offered for sale or rent. Table 2-7 contains population and population density statistics for several of the developments. On the average it seems that low-cost housing population density averages close to 500 persons/acre.

Particular emphasis is placed on improving the lot of the native Malay population through allocation of Malay reserves. The ethnic distribution of the squatter population is shown on Table 2-8.

Population increase in Peninsular Malaysia seems to have stabilized at about 2.6% per year. On the average, urban areas are growing at a much faster rate than are the rural areas, although this disparity has been much reduced in recent years. Currently urban populations are increasing at a rate of about 4.4% per year. Curiously, the Kuala Lumpur area does not follow this trend. According to the population statistics shown on Fig. 2-7 and Table 2-9, the Federal Territory's population is only expanding at an annual rate of 2% to 3%. But if Petaling Jaya is included, the increase probably exceeds the average urban increase per year.

The average yearly replacement rate of existing buildings is typically assumed to be about 2% per year. So if the backlog were to suddenly be eliminated, the yearly housing demand in the Federal Territory seem to be on the order of 5% to 7% of the existing structures.

Table 2-7 Density of Rented Housing Units and of Occupants of Various Housing Estates

Location	Population	No. of Units	Ground Area for Total Units (acre)	Density	
				Persons/ acre	Unit/ acre
Suleiman Court	1,906	321	2	953	161
Jalan Loke Yew	6,905	1,036	9	767	115
Razak Mansions	4,599	684	15	307	47
Jalan Pekeliling	13,592	3,009	18	755	167
Jalan Shaw	4,708	808	4	1,177	202
Jalan Cheras	7,161	1,208	35	205	37
Jalan San Peng	4,483	802	5	996	178
HDA Cheras	-	676	12	-	58
Total*	43,354	7,868	88	493	89

*Excluding HDA Cheras

Table 2-8 Distribution of Squatters by Ethnic Group in Kuala Lumpur

Year	Chinese	Malays	Indians,Pakistanis and Others
1970 (Census)	67.2	20.4	12.4
1973	64.5	25.0	10.5
1978 (T M P)	45.0	45.0	10.0

TMP : Third Malaysian Plan Interim Report

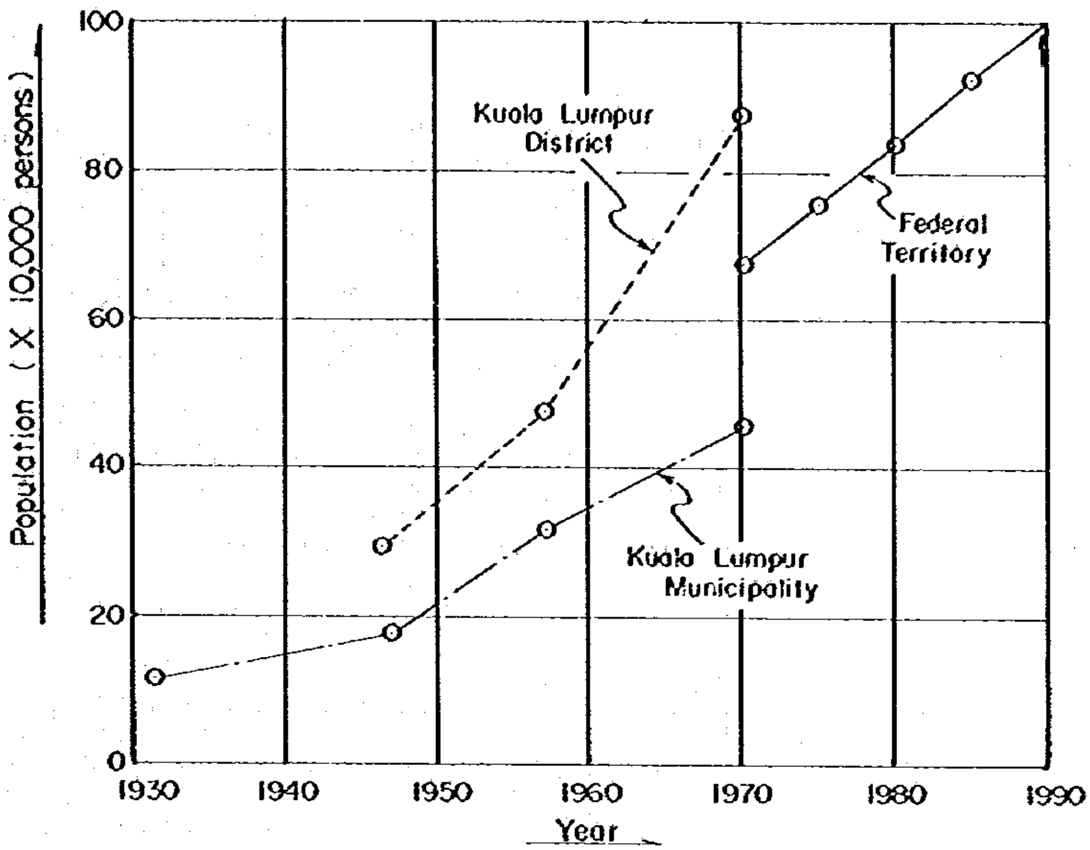


Fig. 2-7 Population Trends in Kuala Lumpur

Table 2-9 Population Trends in Kuala Lumpur

Administrative District	Population (x1,000)		
	1947	1957	1970
KUALA LUMPUR DISTRICT	291.3	477.2	876.4
KUALA LUMPUR MINICIPALITY	176.0	316.2	451.8
PETALING JAYA TOWN BOARD	-	16.6	93.4
MUKIM of AMPANG*	160.0	12.1	29.7
BATU*	28.5	46.2	101.7
KUALA LUMPUR*	16.7	13.0	31.1
PETALING	29.4	41.7	105.8
SETAPAK*	16.1	19.5	41.8
SUNGAI BESI	6.4	11.5	18.8
ULU KELANG	2.4	0.4	2.2

Note: After 1947, parts of Mukim marked with asterisks were incorporated into the K.L. Municipality.

2.2.2 Supply Plans Through 1985

Since Malaysia was established in 1948, housing supply has been the responsibility of the State Governments. This is primarily accomplished through State Economic Development Corporations using both Federal and State funds. In some wealthy locales, Kulal Lumpur being among these, local authorities also participate in housing provision with the direct use of Federal funds.

In addition to the large scale housing programmes of the state corporations and local authorities, the needs of special sectors of the society are met through several other organizations. The Majlis Amanah Rakyat (MARA) provides construction materials and construction loans for self-help projects among the rural poor. Squatters in the outskirts of the Federal Territory have received aid under the auspices of this programme.

Housing needs of persons who have migrated specifically to help meet the expansion objectives of regional industries as set forth in the Malaysia Plans are looked after by the Federal Land Development Authority (FELDA). Plans to meet the housing needs of government employees are the responsibility of the Government Officer's Housing Company (SBPK), with financing provided by the Treasury House Loans Division.

The Malaysian Federal Government has undertaken several comprehensive five-year programmes to develop every aspect of the Malaysian economy and standard of living. The twin objectives of the First (1966-1970), Second (1971-1975) and Third (1976-1980) Malaysia Plans have been both to eradicate poverty and to eliminate economic differences along ethnic lines. A Fourth Malaysia Plan is currently in the works to cover progress from 1981 to 1985. But the Fourth Plan will overlap the Third, because the Third was revised and expanded in 1979.

To fully appreciate the nature and accomplishment of the Malaysia Plans one must appreciate that these plans were extremely ambitious and well coordinated. They sought not only to expand the basic industries of Malaysia, but to orchestrate Malaysia's existing resources in such a way as to optimize both industry capabilities and industry production for external and internal markets.

It is remarkable that such large scale reordering of the ecomomic sector was accomplished without unbalancing the employment situation, disrupting the housing situation or unsettling the population's confidence in the vision and judgement of the federal government.

It is again remarkable that Malaysia's substantial capital investment in industry expansion together with her investment in production for internal consumption, and subsidized consumption at that, was effected without upsetting the export production that underwrote the better part of all new investment (Fig. 2-8 and 2-9).

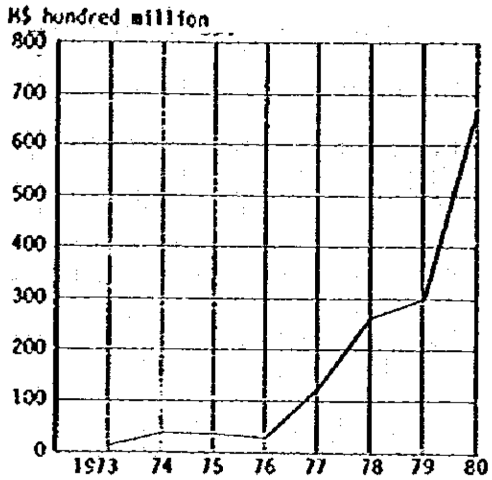


Fig. 2-8 Federal Goverment Expenditure for Housing Development, 1973～80

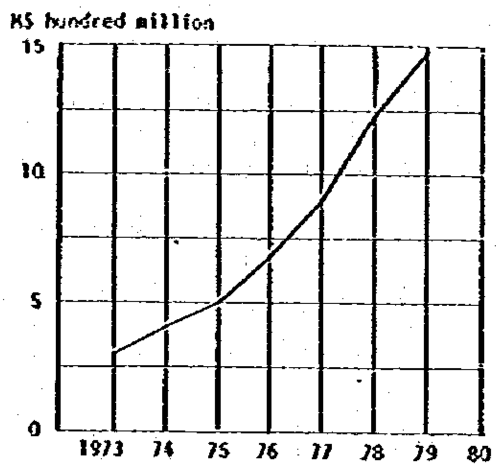


Fig. 2-9 Commercial Banks' Loans and Advances for Housing Development, 1973～79

The First Malaysia Plan constructed 22,522 low-cost housing units in the whole of Malaysia. One of the goals of the Second Malaysia Plan was to build 345,000 houses. The number of units actually constructed during the period of the plan was only 260,000. This construction included 43,000 low-cost housing units, which was still about double the accomplishment of the first plan.

The Third Malaysia Plan envisioned housing development on a larger scale, originally planning to construct 62,000 low-cost housing units. But when the interim progress report was published in 1979, this target was increased to 73,500 (Table 2-10).

Actually, in 1979, low-cost housing construction progress was in the worst shape of all planned construction, with only 19% of the planned units actually completed. But the substantial progress of other aspects of the Third Malaysia Plan supported an overall revision upwards to more optomistic targets in all sectors.

Under the Third Malaysia Plan from 1977 to 1979, about 6,600 low-cost housing units were supplied to squatters in the Federal Territory as shown in Table 2-11. At the time of the revision, low-cost housing construction plans were increased, but completion was delayed until 1983. The construction schedule and breakdown of the remaining 15,262 low-cost housing units is shown in Table 2-12. Locations of the planned units are shown on Fig. 2-10. In total, the

Table 2-10 Realisation of Housing Construction Goals during First Half of Third Malaysia Plan, 1976~78 and Revised Goals for Public Housing Construction

		Number of Units Planned (1976-80)	Number of Units Completed	Number of Units under Various Stages of Implementation	Revised Number of Units Planned
Public Sector	Public housing schemes*1	62,200	11,395	30,923	73,500
	Federal agencies and regional development authorities housing programmes (FELDA, FELCRA, DARA, KEJORA and KETENGAH)	53,100	19,574	11,571	52,500
	Institutional quarters and other staff accommodation	41,300	18,600	13,807	58,100
	Sarawak and Sabah Land Development Boards and Jabatan Orang Asli	6,900	1,846	559	11,100
	SEDCs' Commercial Housing Projects, Government Officers Housing Company/Loan and other minor housing programme*2	57,300	14,521	11,191	46,100
	Sub-Total	220,800	65,936	68,051	241,300
Private Sector	Private developer*3	100,000	81,628	33,300	150,000
	Co-operative Societies	12,000	2,470	1,759	not shown
	Individual and groups	150,000	45,600	15,200	"
	Sub-Total	262,000	129,698	50,259	150,000
	Grand Total	482,800	195,634	118,310	391,300

*1 Includes the provision for SEDCs' low-cost housing programme.

*2 Excludes the SEDCs' joint-venture housing projects.

*3 Includes the SEDCs' joint-venture housing projects.

Table 2-11 Number of Houses Supplied to Squatter Families in Kuala Lumpur, 1977~1979

	by Scheme of / by Organization	No. of Families	Total
by City Government	Low Cost Housing Scheme	1,930	3,512
	Sewerage System	600	
	Roads	313	
	Beautification Scheme	669	
by Other Public Section	Ministry of Public Works	1,434	3,114
	Ministry of Education	400	
	Public Works Department	128	
	Ministry of Health	41	
	Prime Minister's Department	215	
	Ministry of Home Affairs (Police)	96	
	Universiti Teknoloji Malaysia	800	
Total			6,626

Table 2-12 Project of Public Low Cost Housing in Kuala Lumpur, 1980-83

Year	Location	Blocks	No. of Story	No. of Units
1980	Jalan Sentul Utara	3	17	786
	Jalan Kenanga	3	17	786
	Kampung Konggo	8	4, 5	640
1981	Bandar Baru Sentul (A)	8	5	800
	Jalan Sentul Selatan	2	17	512
	Cheras Batu (III A)	4	18	816
	Cheras Batu (A, B, C)	27	5	2,360
	Kampung Konggo	-	Terrace	310
1982	Kg. Haji Abdullah Hukum	Link	5	360
	Bukit Kerrinchi	1	17	256
	Gombak	5	5	500
	Cheras Batu (III B)	5	18	1,020
	Cheras Batu (D, F, G)	Link	5	1,200
1983	Setapak	10	5	500
	Bandar Baru Sentul (C)	7	18	1,420
	Bukit Kerinchi	-	-	692
	Kampung Konggo	6	18	1,224
	Total			15,262

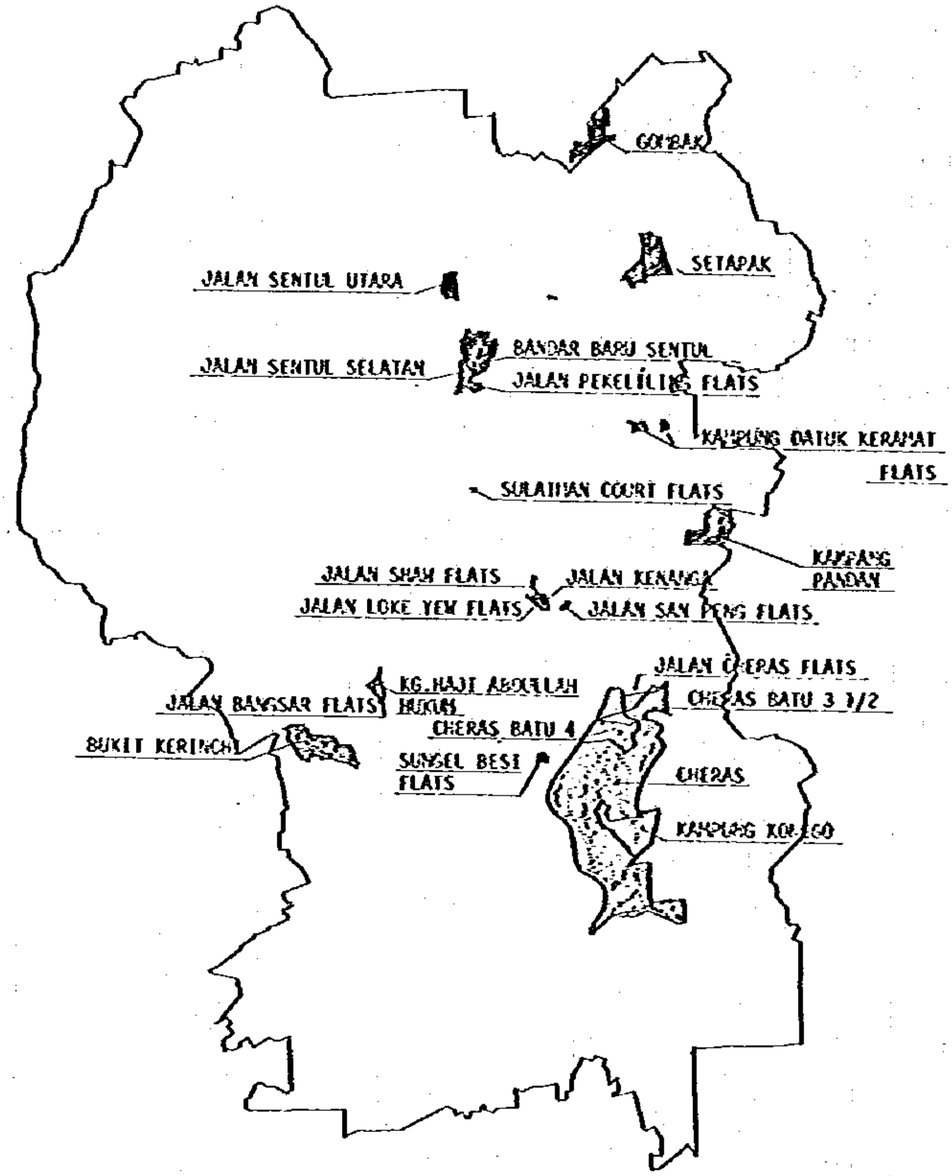


Fig. 2-10 Location of Low Cost Housing Estate in Kuala Lumpur

Third Malaysia Plan will provide about 22,000 low-cost housing units to the Federal Territory.

Currently, the Forth Malaysian Plan calls for the construction of about 122,000 low-cost housing units, 30,000 of which are planned for the Federal Territory. But there have been indications that the Federal Territory target will be revised to 45,000 units, through the use of prefabricated building materials which will permit increased utilization of unskilled labourers. Low-cost housing construction under the first three Malaysia Plans is summarized in Table 2-13 for Malaysia and for the Federal Territory.

2.2.3 Historic and Forecast Low-Cost Housing Completion Delays

Historically, low-cost housing completions under all the Malaysia Plans have lagged substantially behind completions of other types of housing. There are several pressures which resist the timely completion of low-cost housing units.

The low-cost housing builder is caught between the inflation and scarcity of land, materials and qualified labour, and the federally imposed number of low-cost housing units he must build, and the imposed maximum price which he can charge. In a totally free market situation, no low-cost housing units would be built in view of the imposed allowable sale price. But the Malay builder must allocate 30% of his unit production to low-cost housing units.

Table 2-13 LOW-COST HOUSING UNITS CONSTRUCTED UNDER MALAYSIA PLANS

Plans		Malaysia	Federal Territory
First Malaysia Plan (1966 - 1970)		22,522	unknown
Second Malaysia Plan (1971 - 1975)		43,000	unknown
Third Malaysia Plan status at end of 1980 (1976 - 1980)	Completed	26,250	6,626
	Implemented	54,490	15,000
	Total	(80,740)	(21,626)
Fourth Malaysia Plan (1981 - 1985)	Orig. Draft	122,000	30,000
	Potential	unknown	45,000
Total		268,262	51,626 (66,626)

To get around the financial burden imposed by these well-meaning regulations, the builder takes advantage of all possible delays to his attempts to construct low-cost housing units. He also is forced to recover his low-cost housing losses by overcharging for private construction. Hence the private sector is subsidizing low-cost housing to some unknown and unauthorized extent.

The overcharging of the private sector feeds the inflation and scarcity of construction materials, labour and land, which in turn makes low-cost housing more unattractive and hence further delayed. The fact that builders feel justified to overcharge for private construction to recoup unmeasurable present and future losses from low-cost housing construction, also gives free reign to unrestrained greed.

Price markups of as much as M$100,000 per condominium apartment have been reported. And the situation seems to be moving towards a 'whatever the market will bear' type attitude. Since this tends to benefit property owners, the upper economic classes seem to be in favour of the present situation. Unfortunately, this attitude is perpendicular to the federal objective of distributing wealth, as real property inflates more and more out of the reach of middle and lower income classes.

To be fair, inflation in land and materials cost, and the scarcity of land and materials for purchase, as well as the scarcity of qualified labour are not the fault nor are they in the control of the contractor. He merely is taking advantage of the existing situation. Yearly price increase trends are summarized in Table 2-14.

Land prices have simply skyrocketed since 1978, as illustrated in Table 2-15. And land cost typically accounted for 25% to 30% of the total building cost in 1980. 1980 land prices are said to be double the 1978 prices for equivalent sites. Land prices as of 1980 are estimated to be more than M$20/ft^2 for premium land, M$7 to M$12/ft^2 for general housing land, and M$3 to M$5/ft^2 for land in suburban areas.

Many private developers who are seeking cheaper land have developed suburban hillsides neglecting proper land preparation for foundations. This has resulted in much damage from erosion, which is frequently reported in the newspapers after rains.

Although the supply of major building materials such as steel and cement seems to be increasing between 10% and 15% per year, increases are not keeping pace with the demand for these items (Table 2-16, Fig. 2-11). Steel and cement have been in especially short supply. In 1979, 12,000 tons of steel were urgently imported. To supplement the short supply of building materials, timber is being used increasingly as a building material, because it is locally available in large quantities at relatively low costs.

Table 2-14 Construction Cost - Inflation per year (Ministry of Federal Territory) during 1978~80

Average Land Cost	30 ~ 50%
Construction Materials Cost	15 ~ 20%
Labor Costs	15 ~ 50%
Increased new cost of Homes	20 ~ 30%

Table 2-15 Increase of Land Prices, 1978~79

	Location		1978	1979	Rate of Increase
Residential Area	TIONG NAM Settlement(Central Area)		29~33	35~40	20%
	MUKIM of SETAPAK and AMPANG		5~6.2	6.2~6.8	17%
Development Land	MUKIM of K.L	Land with Road Frontage	1.15-1.38	1.61	27%
		Interior Land	0.69-0.92	1.01-1.24	39%
		Non-residential Land	0.35-0.46	0.58-0.69	57%
	MUKIM of Batu		0.46-1.15	0.58-1.50	27%

Table 2-16 Output of Building Materials,1974~78

	1974	1975	1976	1977	1978
Bars for R.C.(10^4tons)	.19.5	17.4	18.1	19.0	24.0
Cement (10^4tons)	136.3	144.6	173.9	177.7	219.5
Cement Floor Tiles (10^4pieces)	75.2	50.6	58.0	87.2	141.4
Cement Roofing Tiles (10^4pieces)	244.4	239.3	210.7	229.9	362.1
Wooden Fittings (10^4m^3)	23.7	23.9	22.1	23.6	37.7
Plywood (10^4m^3)	5.3	6.3	8.9	8.9	9.7
Galvanized Sheet (10^4tons)	4.3	4.4	5.6	5.8	5.4

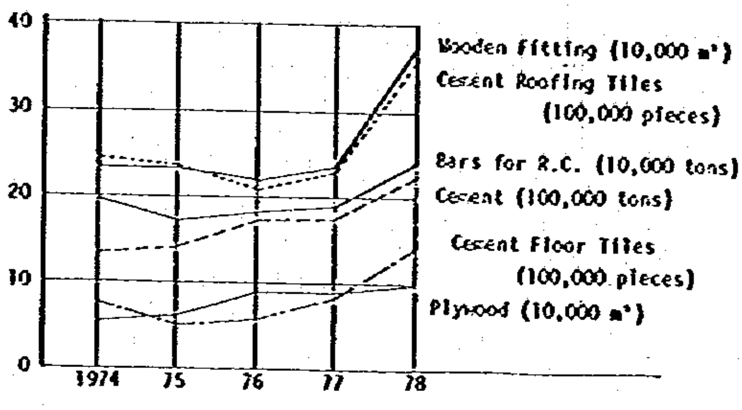


Fig. 2-11 Output of Building Materials,1974~78

Even though timber is an item exported in large quantities, the local construction industry demand for timber has sent its local price upwards the same percentage as the imported scarce construction commodities. During a six month period in 1979, reinforcing steel prices increased 16%, brick prices increased 15%, timber 20%, and floor tiles 37.5%. Cement, which accounts for roughly 16% of the cost of a finished project, increased 16%. Price trends for timber and R.C. piling works, and price increases in houses constructed of timber and R.C. are shown in Figs. 2-12 and 2-13.

The production supported by the 1st to 3rd Malaysia Plans was a major stimulus for the development of the construction industry. There does not seem to be any published account of the number of registered construction companies subsequent to 1974, but at that time the yearly increase in number of companies was nearly 19%, with the number of companies in 1974 reaching 1,541 (Table 2-17).

The number of construction workers continued to increase throughout the 1970's at a rate of 7% per year (Fig. 2-14). The supply of skilled construction workers has not kept up with demand, however, due to the emigration of skilled workers to Singapore, and other foreign countries where they receive higher wages. This, of course, has driven up the wages of skilled workers in Malaysia. Average skilled wages increased from M$20 per day at the end of 1978, to M$25 per day by mid-1979, which is about 50% per

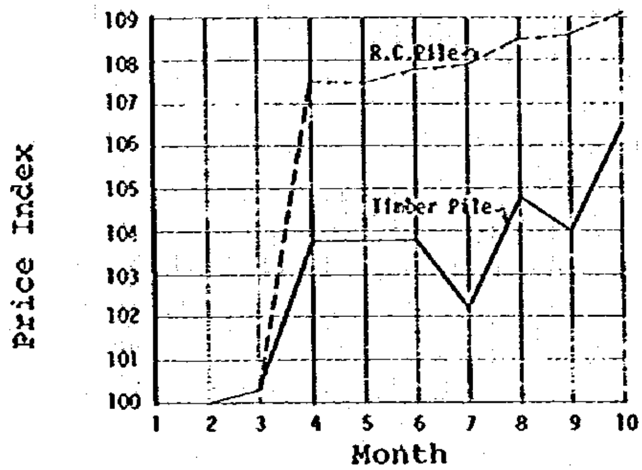


Fig. 2-12 Price Movement of Piling Works, (1980, 1~10)

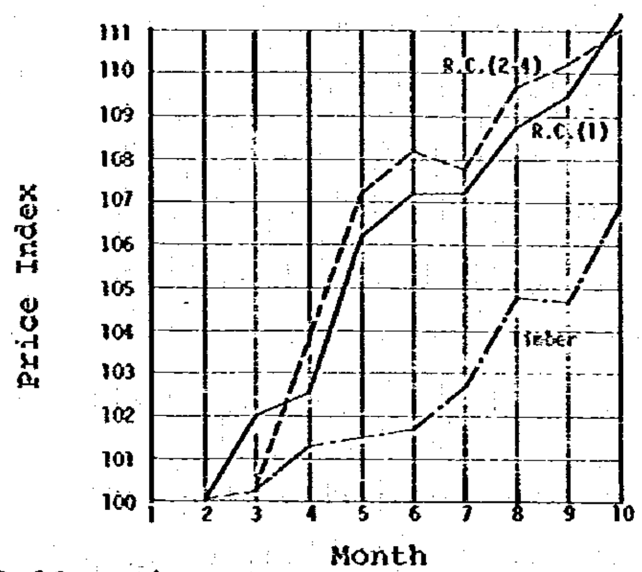


Fig. 2-13 Price Movement of Timber-and-RC-structure Houses (1980, 1~10)

Table 2-17 Number of Contractors, 1967~74

Year	Number	Increase (%) from Previous Year
1967	787	
1968	793	0.8%
1969	856	8.0
1970	895	4.6
1971	1,010	12.8
1972	1,164	15.2
1973	1,299	11.6
1974	1,541	18.6

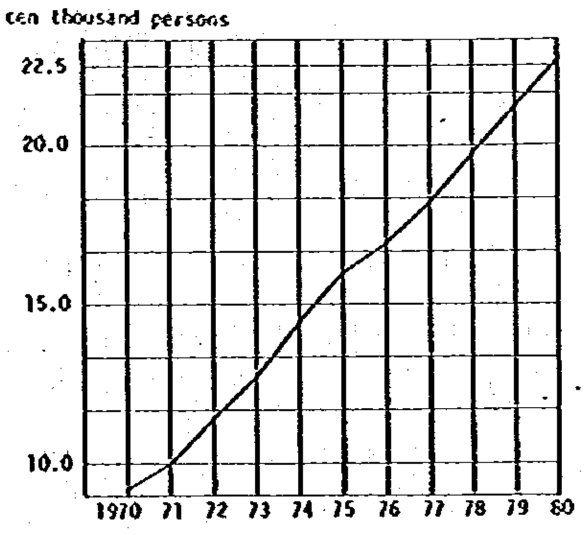


Fig. 2-14 Number of Workers engaged in Construction Works, 1970~1980

year. Average labour increases are estimated to be about 15% per year. These figures underline the need for establishment of a technical workers' (skilled construction workers') training school.

Another consequence of the shortage of skilled workers is a general slowdown in the normal progress of a project. Interest payable for financing the construction cost of prolonged work is becoming a significant factor in the overall cost-inflation of construction in Malaysia. Such slowdowns are not only a result of the lack of worker availability, or even totally the result of scarcities in materials. Complicated administrative procedures for acquiring land for building, permission to build, re-zoning of land, if necessary, etc. are a substantial source of project delay. And, of course, this delay is welcomed by contractors in so far as low-cost housing construction is concerned. It has been estimated that a normal housing project requires that some 25 different permits be obtained.

Another source of delay in low-cost housing development is the delay in providing infrastructure which is necessary for the sustenance of large communities within housing estates. This includes items such as roads, water facilities, power facilities and other necessary community support networks. These are expensive items which may or may not be contracted to the building contractor. Yet, they are mandatory in order for the communities to be occupied.