SECTION 11 FINANCIAL AND ECONOMIC STUDY

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FINANCIAL AND ECONOMIC STUDY

11. 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 forming the primary step. As the second, the economic aspects of the project are indirectly studied as based on the results of the aforementioned financial studies.

It should be noted that 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.

Three development models are selected for financial cost analysis from among the 36 development models studied in Section 10 (see Table 10-20) by reason of their adoptability and representative characteristics. They are Development Models 13, 26 and 34 representing low-rise housing on Type A ground, medium-rise housing on Type B ground, and high-rise housing on Type B ground, respectively.

Development Model No.	Type of Structure	Type of Ground	Development Density
Model 13	Low-Rise	Type A	100 Persons/Acre
Model 26	Medium-Rise	Type B	200 Persons/Acre
Model 34	High-Rise	Type B	250 Persons/Acre

In the analysis of the three development models, financial benefits are investigated using 2 basic conditions, i.e. ① on the basis of a low-cost price policy for lower income groups, and ② on the basis of real commercial prices which are estimated based on distance from the central business district, serviceability of the housing structure and projected supply-demand curves.

11.1 Financial Study
- Method of Analysis and Results -

11.1.1 Conditions for Analysis

The following conditions have been established for the financial study:

(1) Construction Completion Schedule

Time schedules for the construction of housing structures are given in Table 10-13 of Section 10. That is, for Type A ground construction will be completed in one year, and that for development on Type B ground in 2 years.

(2) Rental Prices

Rents in 1980 figures for low-cost public housing units are fixed as shown in Table 2-3 of Section 2. However, the rent for 3-room flats located further than 3 miles from the centre of Kuala Lumpur is not defined. As the majority of ex-mining land is located further than 3 miles from the centre, the rent for 3-room flats has

been set in the present study at M$62 per month, a figure based proportionately on rents for flats within and further than 3 miles.

Rents for houses constructed on a commercial basis are fixed at M$200 per unit per month after the present market price in Kuala Lumpur.

(3) Selling Prices

Selling prices in 1980 figures for low-cost public houses are shown in Table 2-20 of Section 2. A weighted average selling price of M$11,310 per unit is obtained from Table 2-20 for low-cost houses.

The selling price for houses constructed commercially is determined by using the same ratio as that in the case of rentals, i.e. M$11,310 x $\frac{200}{62}$ ≈ M$36,480. A selling price of M$36,480 per unit is used in the financial study. This price is in reasonable agreement with the present situation in Kuala Lumpur.

(4) Time Frame for Disposal by Rent or Sale

Low-cost houses are assumed to be rented or sold immediately upon completion of construction. Houses constructed on a commercial basis are considered to be occupied or sold within two years after construction, i.e. 50% in the 1st year with the remaining 50% in the 2nd year.

(5) Development Costs

In accordance with the results of analyses in Section 10, the following development costs are employed for each model.

	Per Unit (1980)	Per 100 Acre (1980)	Per 100 Acre (1981)*	Per 100 Acre (1982)*
		(M$1000)	(M$1000)	(M$1000)
Model 13	M$10,833	21,666	23,291	—
Model 26	M$14,746	58,983	—	66,335
Model 34	M$16,918	84,589	—	96,702

* Costs for 1981 and 1982 are based on 1980 cost using annual price escalation rate of 7.5%

(6) Maintenance Costs (Rent Only)

Based on the budget and expenses of the Housing Management Unit of Kuala Lumpur, maintenance costs for 1980 are fixed as M$414/unit/year. Future maintenance costs are determined by employing an annual escalation rate of 3.4%. The rate of 3.4% is obtained from the average price escalation rate of service prices between 1970 and 1979.

(7) Interest Rates

Two different rates of interest, namely 7.5%/year and 3.0%/year, are used in the study to evaluate the influence of interest rates on the project.

11.1.2 Results of Financial Study

In accordance with the conditions explained in Sub-Section 11.1.1 above, 24 cases have been established for the 3 development models in the financial study. A series of financial studies is performed for these 24 cases under a 100 acre development scheme. Table 11-1 explains the conditions and financial feasibility of these 24 cases.

Typical examples of the financial study are shown in Tables 11-2a and 11-2b. Results of Case 1 (Sale) are shown in Table 11-2a and those of Case 24 (Rent) are shown in Table 11-2b. The results of other cases are included in Appendix I, Volume 2. Financial analysis of the aforementioned 24 cases was executed based on the assumption that the residual value 20 years after completion of the project is 25% of the initial development cost adjusted by a factor of 3.4% per year for price escalation. The figure 3.4% is the assumed price escalation rate, calculated from average price escalations over the past 10 years for service prices in Malaysia.

The feasibility of each case and the financial balance 20 years after completion of the project are listed in the right-hand column of Table 11-1. According to the results shown in this table, 14 of the 24 cases are 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.

Table 11-1 Projected 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 11-2a Example of Financial Analysis

Case	Structure	Ground Condition	Interest Rate	Ownership	Price Policy
1	Low-Rise	Type A	3.0%	Sale	Low-Cost

M$1,000

Year		Expenditure			Revenue			Financial Balance
Project	Calendar	Construction & Maintenance Payment	Interest Payment	Total Expenses	Revenue	Interest Income	Total Revenue	
1	1981	23,291	349	23,640	0	0	0	-23,640
2	1982	0	709	709	26,140	899	27,039	2,689
3	1983	0	0	0	0	202	202	2,891
4	1984	0	0	0	0	217	217	3,107
5	1985	0	0	0	0	233	233	3,341
6	1986	0	0	0	0	251	251	3,591
7	1987	0	0	0	0	269	269	3,860
8	1988	0	0	0	0	290	290	4,150
9	1989	0	0	0	0	311	311	4,461
10	1990	0	0	0	0	335	335	4,796
11	1991	0	0	0	0	360	360	5,155
12	1992	0	0	0	0	387	387	5,542
13	1993	0	0	0	0	416	416	5,958
14	1994	0	0	0	0	447	447	6,405
15	1995	0	0	0	0	480	480	6,885
16	1996	0	0	0	0	516	516	7,401
17	1997	0	0	0	0	555	555	7,956
18	1998	0	0	0	0	597	597	8,553
19	1999	0	0	0	0	641	641	9,195
20	2000	0	0	0	0	690	690	9,884
21	2001	0	0	0	0	741	741	10,626

Table II-2b Example of Financial Analysis

Case	Structure	Ground Condition	Interest Rate	Ownership	Price Policy
24	High-Rise	Type B	7.5%	Rental	Commercial

M$1,000

Year		Expenditure			Revenue			Financial Balance
Project	Calendar	Construction & Maintenance Payment	Interest Payment	Total Expenses	Revenue	Interest Income	Total Revenue	
1	1981	1,219	46	1,265	0	0	0	-1,265
2	1982	96,702	3,721	100,423	0	0	0	-101,688
3	1983	2,288	7,712	10,000	7,440	256	7,696	-103,993
4	1984	2,366	7,888	10,254	14,880	512	15,392	-98,855
5	1985	2,446	7,506	9,952	14,880	512	15,392	-93,416
6	1986	2,529	7,101	9,630	14,880	512	15,392	-87,654
7	1987	2,615	6,672	9,288	14,880	512	15,392	-81,551
8	1988	2,704	6,218	8,922	14,880	512	15,392	-75,081
9	1989	2,796	5,736	8,532	14,880	512	15,392	-68,222
10	1990	2,891	5,225	8,116	14,880	512	15,392	-60,947
11	1991	2,990	4,683	7,673	14,880	512	15,392	-53,228
12	1992	3,091	4,108	7,199	14,880	512	15,392	-45,036
13	1993	3,196	3,498	6,694	14,880	512	15,392	-36,338
14	1994	3,305	2,849	6,154	14,880	512	15,392	-27,101
15	1995	3,417	2,161	5,578	14,880	512	15,392	-17,288
16	1996	3,534	1,429	4,963	14,880	512	15,392	-6,859
17	1997	3,654	651	4,305	14,880	512	15,392	4,227
18	1998	3,778	142	3,920	14,880	829	15,709	16,016
19	1999	3,906	146	4,053	14,880	1,713	16,593	28,556
20	2000	4,039	151	4,191	14,880	2,653	17,533	41,898
21	2001	4,177	157	4,333	14,880	3,654	18,534	56,099
22	2002	4,319	612	4,481	14,880	4,719	19,599	71,217
		-47,778						118,995

11.1.3 Equilibrium Prices

Among the 24 cases analysed above, financial equilibrium prices are calculated for four cases on Type B ground with a low-cost price policy. The equilibrium price for each case is calculated by ① fixing an arbitrary rental or selling price and ② calculating the financial balance 20 years after construction. This exercise is continued until the financial balance is achieved. The equilibrium price is the rental or selling price which progress to a financial balance of zero within the given time figure. The process by which the equilibrium price is obtained is explained in Figs. 11-1a to 11-1d. Details of the relevant calculations are included in Appendix I of Volume 2.

The equilibrium prices thus obtained for Type B ground are tabulated in Table 11-3. It will be noted that cases using an interest rate of 3.0% are omitted for simulation of equilibrium prices since the rate of 3.0% is utilised primarily as a sensitivity test and not as a realistic figure. Ratios of equilibrium prices to low-cost policy prices for the above cases are as follows:

Case 13	1.37
Case 15	2.37
Case 17	1.56
Case 19	2.71

Ratios between the equilibrium price and development cost are calculated and shown in Table 11-4. It is clear that the equilibrium price is linearly correlated with the development cost at a stable ratio of 1.12 in all cases.

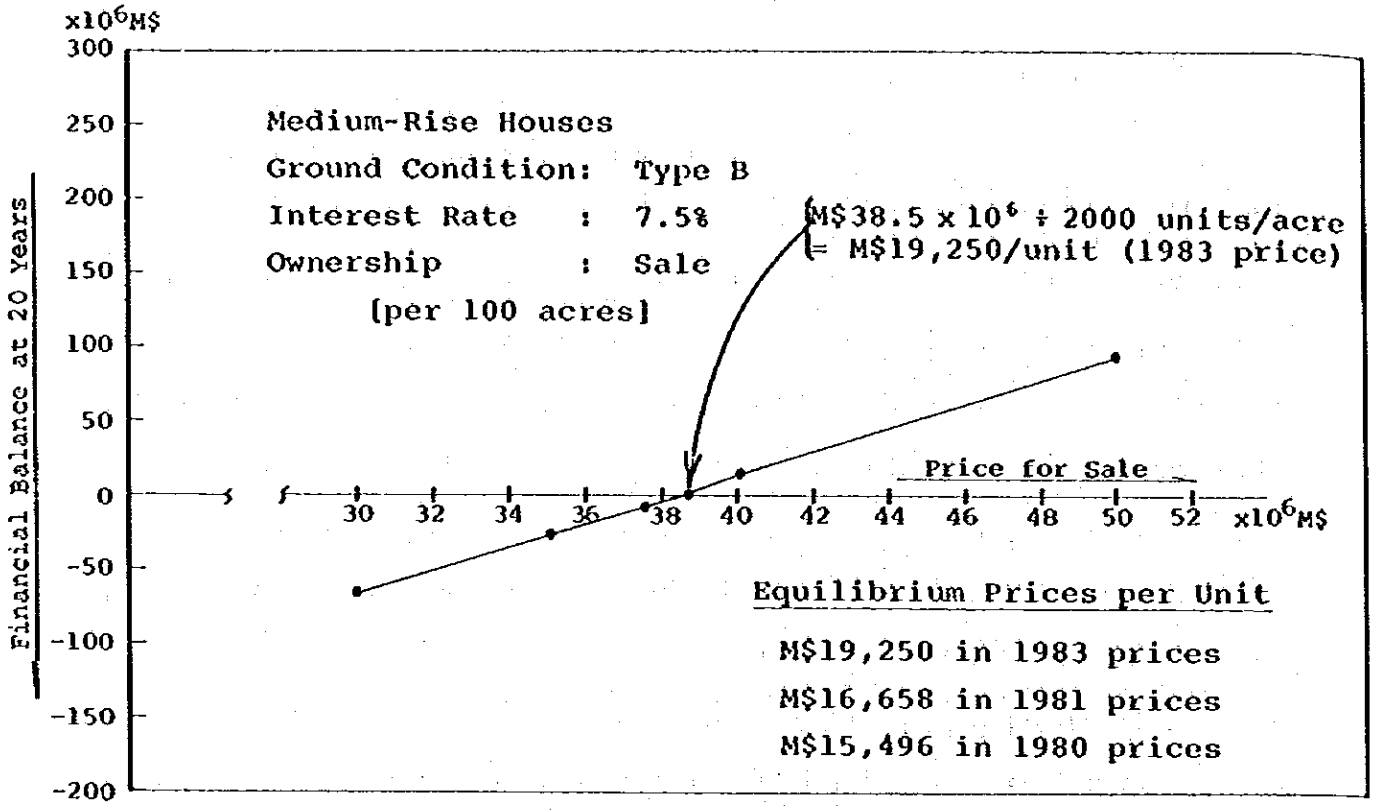

Fig. 11-1a Financial Equilibrium Prices (1)

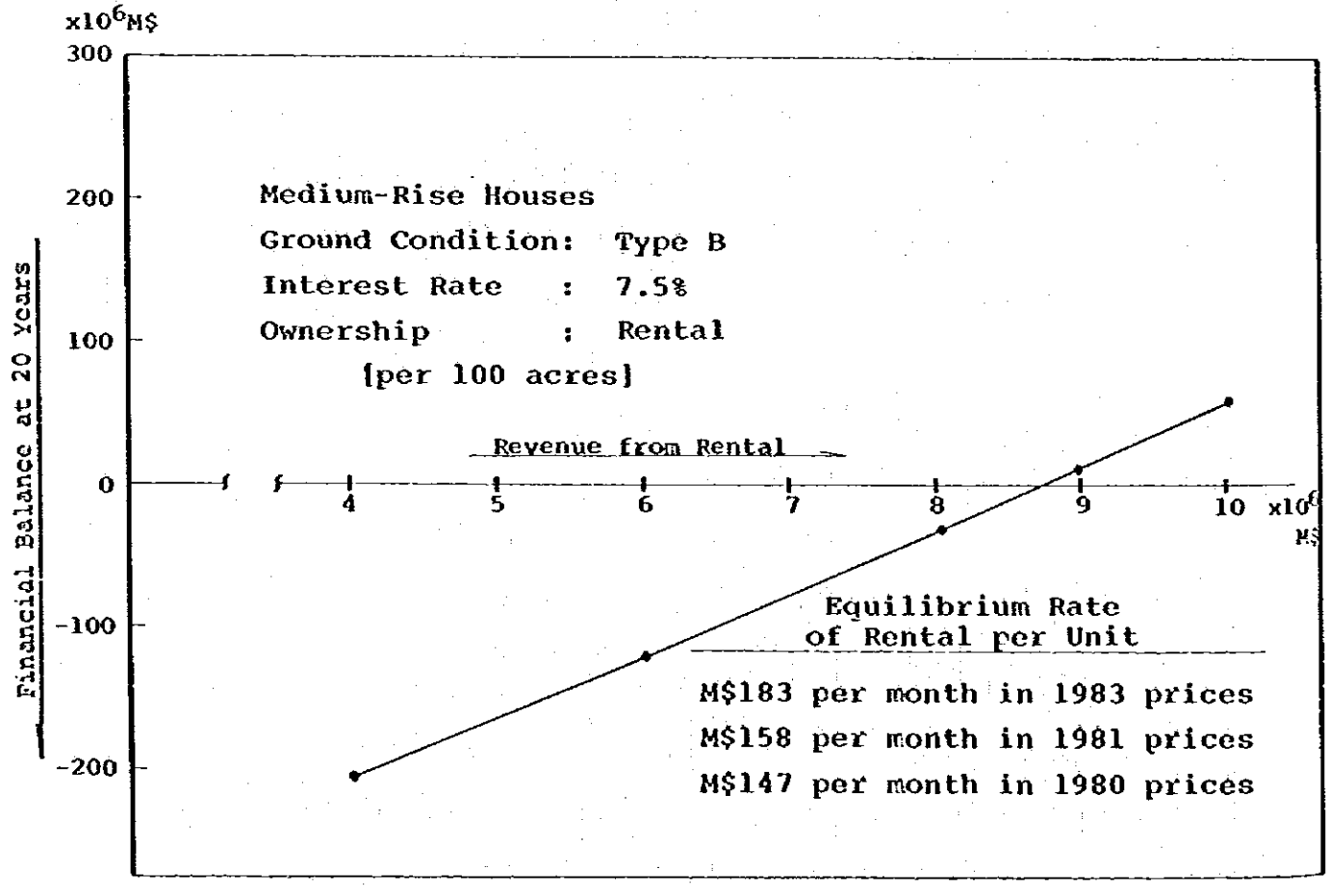

Fig. 11-1b Financial Equilibrium Prices (2)

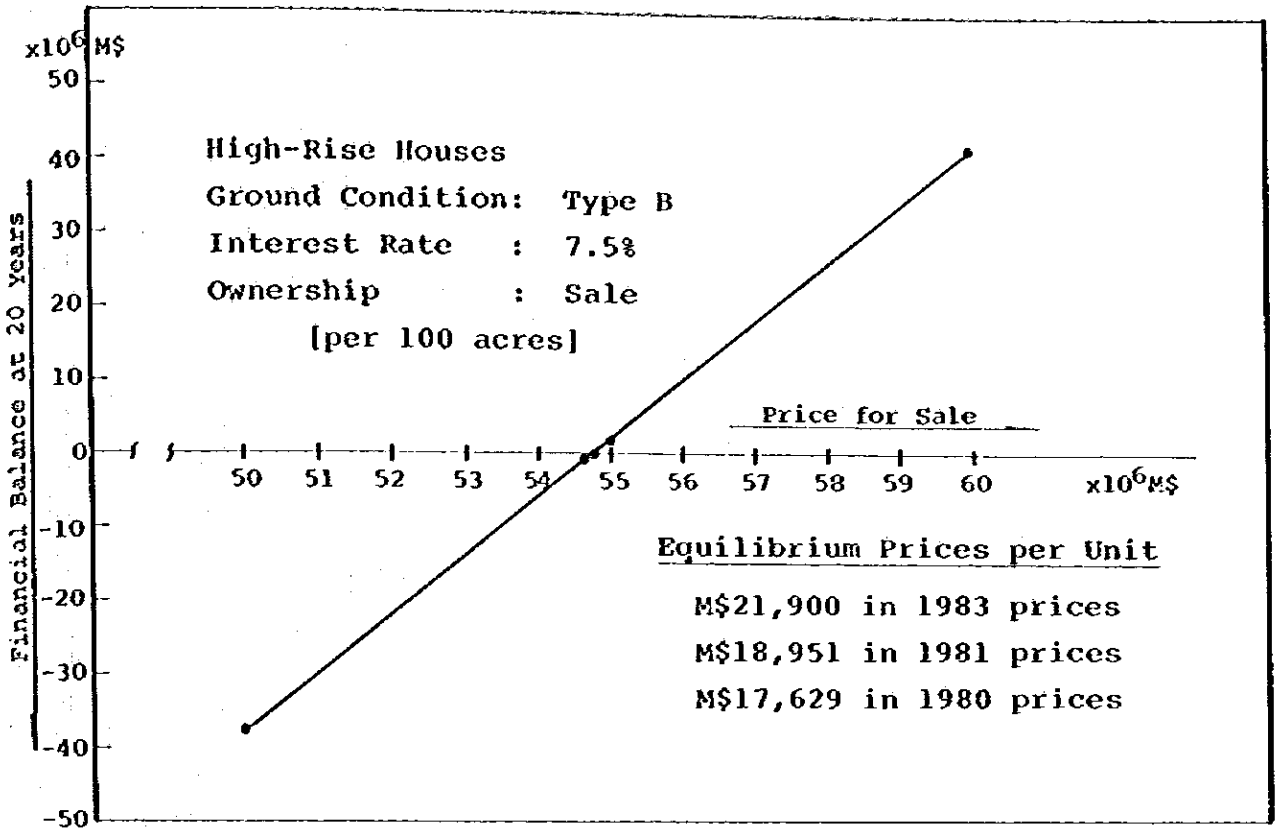

Fig. 11-1c Financial Equilibrium Prices (3)

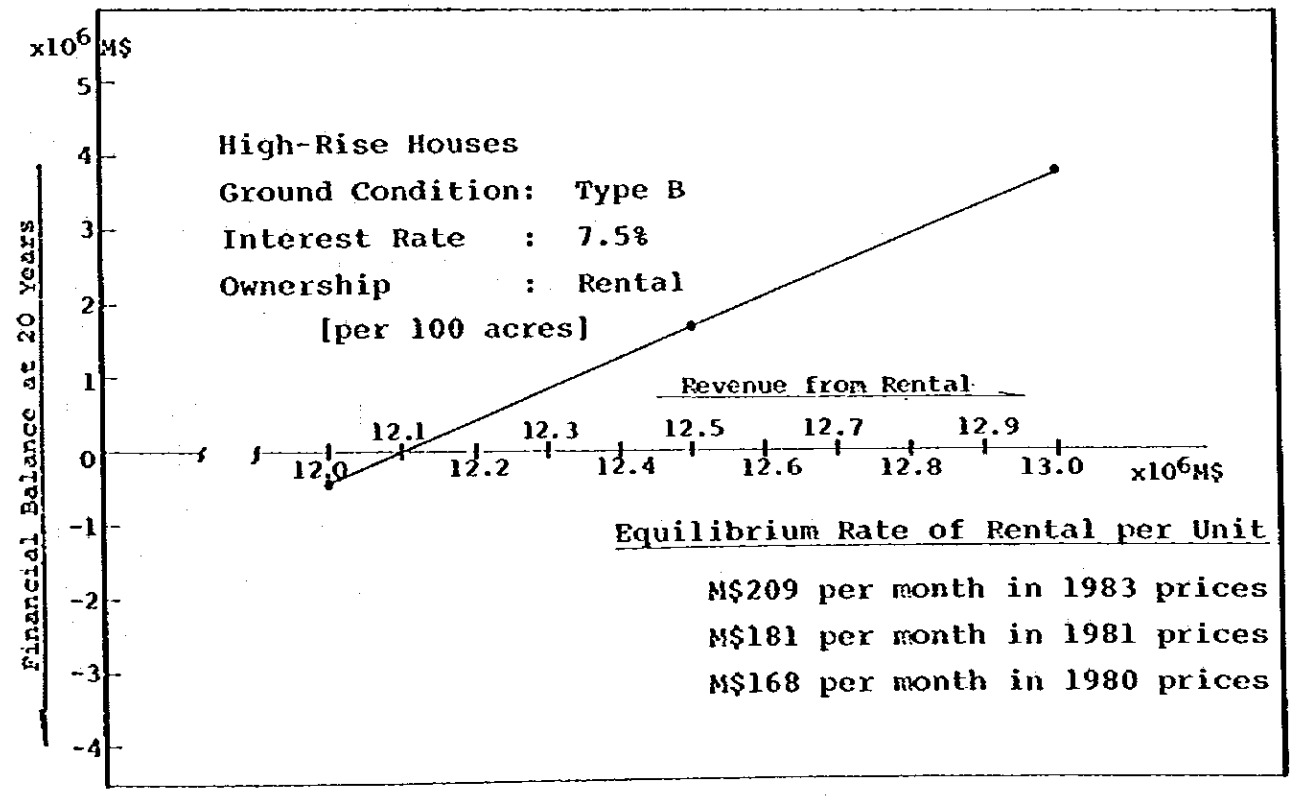

Fig. 11-1d Financial Equilibrium Prices (4)

Table 11-3 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

Table 11-4 Evaluation of Equilibrium Prices for Sale

Case No.	Case 5	Case 13	Case 21
Development Model No.	Model 13	Model 26	Model 34
House Structure	Low-Rise	Medium-Rise	High-Rise
Ground Condition	Type A	Type B	Type B
(A) Total Project Cost (M$1,000)	23,291	68,724	97,921
(B) Number of Units	2,000	4,000	5,000
(C) Population (persons)	10,000	20,000	25,000
(D) Development Cost per Unit (A)/(B) (M$)	11,646	17,181	19,584
(E) Equilibrium Price for Sale per Unit (M$)	13,070	19,250	21,900
(F) Ratio between Development Cost and Equilibrium Price (E)/(D)	1.12	1.12	1.12

Interest rate: 7.5%/year

11.2 Breakdown of Development Costs

Composition of development costs are analysed in the present section with a breakdown being given in the following pages.

The cost analysis provided in Section 10 is based on prices current in 1980. However, at the time of the execution of the project, some amount of price escalation is anticipated. Therefore, it is necessary that a price contingency be provided to allow for the escalatory trend of prices in Malaysia and the variance of estimates. Total development cost is arrived at by adding 15% to the direct cost, a figure which is determined by the consideration on price escalation of materials, civil works, structures and foundation works.

Breakdowns of development costs are provided for Development Models 13, 26 and 34 and are shown in Tables 11-5a to 11-5c, respectively. The development cost of each model is further divided into local and foreign currency portions. Comments regarding the composition of the development costs follow:

(1) The foreign currency portion of the total cost for the above development models is estimated at between 21 and 22%. As these percentages are relatively low, it is probable that the secondary multiplier effect is quite high.

Table 11-5a Breakdown of Development Cost for Development Model 13 (Low-Rise Houses on Type A Ground)

	100 acre (1,000M$)			Per Housing Unit (M$)		
	Total Amount	Local Currency	Foreign Currency	Total Amount	Local Currency	Foreign Currency
1. Civil Works	19,696	15,335 (78)	4,361 (22)	9,848	7,668 (78)	2,180 (22)
1) Building	16,090	12,588 (78)	3,502 (22)	8,045	6,294 (78)	1,751 (22)
·Architectural Works	14,670	11,736 (80)	2,934 (20)	7,335	5,868 (80)	1,467 (20)
·Electrical Works	1,420	852 (60)	568 (40)	710	426 (60)	284 (40)
·Mechanical Works		(50)	(50)		(50)	(50)
2) Foundation		(85)	(15)		(85)	(15)
3) Land Development	3,606	2,747 (76)	859 (24)	1,803	1,374 (76)	429 (24)
·Land Improvement	468	351 (75)	117 (25)	234	176 (75)	58 (25)
·Infrastructure	2,968	2,226 (75)	742 (25)	1,484	1,113 (75)	371 (25)
·Landscaping	170	170 (100)	- (0)	85	85 (100)	- (0)
2. Administration & Supervision	985	985 (100)	- (0)	493	493 (100)	- (0)
3. Physical Contingency	985	768 (78)	217 (22)	493	384 (78)	109 (22)
4. Price Contingency	3,250	2,529 (78)	721 (22)	1,625	1,264 (78)	361 (22)
Total	24,916	19,617 (79)	5,299 (21)	12,458	9,808 (79)	2,650 (21)

* Figures in parentheses indicate percentage

Table 11-5b 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.

Table 11-5c Breakdown of Development Cost for Development Model 34 (High-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	77,103	59,653 (77)	17,450 (23)	15,421	11,931	3,490
1) Building	66,825	51,595 (77)	15,230 (23)	13,365	10,319 (77)	3,046 (23)
·Architectural Works	59,425	47,540 (80)	11,885 (20)	11,885	9,508 (80)	2,377 (20)
·Electrical Works	3,550	2,130 (60)	1,420 (40)	710	426 (60)	284 (40)
·Mechanical Works	3,850	1,925 (50)	1,925 (50)	770	385 (50)	385 (50)
2) Foundation	3,005	2,554 (85)	451 (15)	601	511 (85)	90 (15)
3) Land Development	7,273	5,504 (76)	1,769 (24)	1,455	1,101	354
·Land Improvement	1,031	773 (75)	258 (25)	206	155 (75)	52 (25)
·Infrastructure	6,043	4,532 (75)	1,511 (25)	1,209	906 (75)	302 (25)
·Landscaping	199	199 (100)	- (0)	40	40 (100)	- (0)
2. Administration & Supervision	3,855	3,855 (100)	- (0)	771	771 (100)	- (0)
3. Physical Contingency	3,855	2,968 (77)	887 (23)	771	594 (77)	177 (23)
4. Price Contingency	12,722	9,796 (77)	2,926 (23)	2,544	1,959 (77)	585 (23)
Total	97,535	76,272 (78)	21,263 (22)	19,507	15,254 (78)	4,253 (22)

* Figures in parentheses indicate percentage.

(2) Among direct costs of development, the cost for superstructures claims 82% for Development Models 13 and 26, and 81% for Development Model 34.
In consideration of the land acquisition cost being almost zero, the cost ratio for buildings is accordingly high with the cost ratio for land improvement being proportionately low.

(3) For medium- and high-rise buildings, the share of the cost for ground improvement is relatively low with the same being relatively high for low-rise buildings.

11.3 Evaluation of Financial Study Results

Results of the financial study are evaluated in the present section with comments addressing items of major importance.

11.3.1 Size of Structures and Ground Types

In the case of Development Model 13 (Sale), the project is found to be financially feasible even under the low-cost policy price conditions. This is mainly due to the cheaper construction cost of low-rise structures. On the other hand, in Development Models 26 and 34, the project is unfeasible. This is primarily a result of the higher construction cost of superstructures for medium- and high-rise buildings.

Types of foundation ground also influence the feasibility of the project, but the degree of influence is less than that of the size of structures. For example, costs for improvement of Type B, C and D grounds are 3 to 6% of the total development cost for medium-rise housing and are 1 to 3% for high-rise housing.

11.3.2 Interest Rates

In the present study, interest rates of 3% and 7.5% are adopted. 7.5% is the rate presently employed by the governmental long term housing fund in Malaysia. 3% is selected for purposes of sensitivity tests and is the rate extended by the Overseas Economic Cooperation Fund of Japan. In neither case do interest rates act as vital to project feasible. However, it is clear that the lower the interest rate, the more agreeable the response to the project.

11.3.3 Rental or Sale

As seen in Development Model 13, the selection of rental or sale as a mode of ownership has vital meaning for project feasibility. In the case of rental, maintenance costs are calculated for total services including personnel expenses as usually adopted in housing supplied by the Malaysian Government. By contrast, maintenance costs have not been considered in cases where sale is indicated.

11.3.4 Low-Cost Policy and Commercial Prices

The low-cost policy price is about 32% of the commercial price. Therefore, price policy also plays a vital role in the feasibility of the project. As regards the commercial price, all cases are feasible. However, it will be seen that with the exception of cases 1 and 5, low-cost policy price projects are not feasible. It will further be seen through the analysis that the equilibrium point is near the low-cost policy price in the case of sale, whereas in the case of rental, it is much nearer to that of the commercial price.

11.4 Economic Study of the Project

11.4.1 Economic Price

Although, detailed economic cost/benefit analysis is not performed here, it is reasonable to assume that the commercial price is to coincide with the economic benefit. As noted at the beginning of this section, 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. However, it is clear that economic benefits are higher than the addition of the net development costs and some added value.

In the Development Models analysed above, it is seen that construction costs for superstructures constitute a very high

proportion of the total cost. It can also be seen that the equilibrium price is about 1.12 times the total development cost, thus indicating reasonable estimates for the same. Furthermore, the commercial prices employed in the financial study are considered to be appropriate when compared with results of the study on the present situation in Kuala Lumpur. Therefore, it is known that the point of intersection between the demand and supply curve for housing exists near the commercial price and that the project produces a substantial amount of social surplus.

11.4.2 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, it is concluded that 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.

11.4.3 Social Welfare Aspects

As revealed through the financial analysis, all low-cost projects, except for the sale of Type A ground, are not financially feasible unless the low-cost policy price is adjusted to meet the equilibrium price. In this case, it is necessary to take into consideration the various aspects of social welfare with due comparison to other social welfare policies.

In this regard, an excess value per unit divided by the number of inhabitants per unit is shown in Table 11-6. Although the project is not feasible by simple evaluation, if M$3,698 per person for Case 13 and M$5,793 per person for Case 17 are provided as a social welfare transfer, a substantial number of people can enjoy a life style of significant standard.

Furthermore, upon consideration of value-added factors which will be produced by the constructive social involvement of the inhabitants of the housing developments in question, it becomes more probable that the project is economically feasible. However, further analysis of the social welfare effect of this project together with the other social welfare projects is requisite.

Table 11-6 Present Excess Value per Inhabitant

Development Model No.	Structure	Ground Condition	Interest Rate	Commercial Price (M$)		Low-Cost Policy Price (M$)	
				Sale	Rent	Sale	Rent
Model 13	Low-Rise	Type A	3.0%	23,642	11,239	1,068	-1,600
			7.5%	22,999	9,830	420	-6,530
Model 26	Medium-Rise	Type B	3.0%	21,548	9,811	-1,209	-2,875
			7.5%	20,575	6,618	-3,698	-10,548
Model 24	High-Rise	Type B	3.0%	19,571	8,680	-2,086	-3,516
			7.5%	18,480	4,760	-5,793	-12,407

11.4.4 Price Policy

As mentioned in the previous section, financial analysis indicates that all the projects under the present low-cost price scheme, except for the sale of low-rise houses on Type A ground, are not financially feasible unless the low-cost policy price is adjusted to meet the equilibrium price. Should the difference between the low-cost policy price and the equilibrium price not be compensated by utilization of the low-cost fund and/or the establishment of a social welfare fund, some adjustment in the low-cost policy price may be necessary. In this case, the equilibrium price discussed above will act as a guideline. However, in the case where the equilibrium price is not in accordance with the low-cost housing policy, application of prices or rents varying with the level of the income of inhabitants may be required.

11.4.5 Multiplier Effects

(1) 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 significant. Transfer of technology and accumulation of technical know-how will also be expected through the execution of the project.

(2) 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 the economical development of Malaysia. This multiplier effect is one important factor in making the proposed project feasible.

11.5 Conclusions and Suggestions

11.5.1 Conclusions (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

11.5.2 Suggestions for Future Activities

Some concluding remarks are prepared for future action on 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 follwoing actions should be carried out immediately, especially in the Federal Territory so that more land can be released to ease the housing shortage:-

* Invrstigation 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.

GLOSSARY

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BS: British Standard

BSCP: British Standard Code of Practice

c_h: coefficient of consolidation in horizontal direction, a soil parameter related to the time rate of consolidation

c_u: undrained shear strength

c_v: coefficient of consolidation in vertical direction, a soil parameter related to the time rate of consolidation

de: effective drainage diameter for sand drain

e: void ratio, ratio between volume of voids and volume of solid particles

Economic Cost: cost, based on the terms of economic concept, generally calculated from the financial cost, by adjusting each component with the portion of transfer payment

FELDA: Federal Land Development Authority (Government of Malaysia)

ft: foot or feet, 1 ft = 0.30479 m

in: inch(es), 1 inch = 0.02539 m

JKR: Jabatan Kerja Raya (Public Works Department)

KL: Kuala Lumpur

lb: pound(s), 1 lb = 0.45359 kgf

L.L.: liquid limit, water content of a remolded soil at transition between liquid and plastic states (determined by standard laboratory test)

Malaysian pikul: unit for weight, 1 Malaysian pikul = 60.48 kgf

MARA: The Majlis Amanah Rakyat

Mile: 1 mile = 1.60931 km

MS: Malaysian Standard

M$: Malaysian Dollars (M$ 1 ≒ 100 Japanese yen)

Multiplier Effect: Total effect on the economy, Mainly through the demand market, accruing from the investment of the initial fund

N: blow counts per 30cm penetration in standard penetration test

Nsw: required half turns for 1 m penetration in Swedish sounding

Opportunity Cost: highest rate of return of specified commodity among the various possible usages

P: consolidation pressure

$\bar{P}$: average consolidation pressure

Preloading: a method for the densification of soft cohesive soils under a load placed in advance of construction of the permanent structure

P.I.: plasticity index, difference between liquid and plastic limits

Qa: allowable bearing pressure of the ground

q_c: static point resistance (or cone resistance), average pressure acting on a conical point in the standard static penetration test

Slime: mixture of fine grained soils and water which is produced through tin-mining operations

Tailing area: area for the deposition of tailings which are produced through tin-mining operations

Tin-in-concentrates: Tin content of tin concentrates as stated by the reporting authority or as calculated on the basis of a chemical assay (before any deduction is made by the smelter), or as estimated by the ITC Secretariat. Tin-in-concentrates generally includes the tin content of mixed concentrates.

t_{50}: time required to achieve 50% consolidation

t_{90}: time required to achieve 90% consolidation

ε: modulus of deformation, conventional modulus defined in the standard Menard pressuremeter test

σ_p': preconsolidation pressure, maximum vertical effective past pressure

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