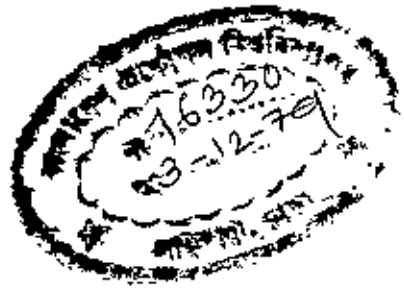
DEVELOPMENT COSTS IN ALTERNATIVE RESIDENTIAL LAND USE

-A STUDY OF PUBLIC HOUSING IN DACCA CITY



MD.HASAN JAHANGIR

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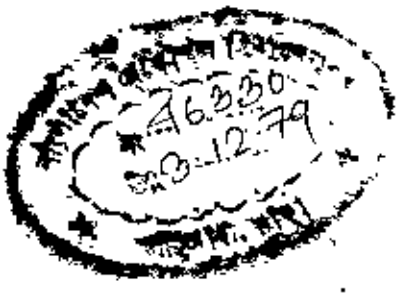

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B.Sc.Engg. (Civil)

THESIS

Submitted to the Department of Town and Regional Planning, University of Sheffield, U.K. and Department of Urban and Regional Planning, Bangladesh University of Engineering and Technology, Dacca, under joint Master's Degree programme in partial fulfilment of the requirements for the degree

of

MASTER OF URBAN AND REGIONAL PLANNING

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SUMMARY

After the war of liberation in 1971, Dacca, the capital city of Bangladesh became confronted with many problems associated with continuous migration of people from poverty stricken rural areas. One of the most serious and formidable of these problems is the difficulty in providing housing for the rapidly growing population.

Compounding the problem is a serious lack of buildable land. The city is surrounded on two sides (east and west) by low lying areas with an average of 10'-0" flooding and by the river Buriganga on the south. The city is expanding along its northern axis. So, the growth of the city will be bounded by limitation of land.

The present study is aimed at finding the type of residential development which can be made with minimum construction cost and yet minimize the use of land.

This study deals with the analysis of 10 on-going public housing projects of Dacca city in order to see the increased construction costs (at market price) of the multistoried buildings against land savings.

Analysis for all housing has been made but particular emphasis is given on low-income housing. Furthermore, most of the data concentrate on housing provided by Government for its employees, since they represent the only source of complete cost information for multi-storied low-income residential structure.

Three one-storied projects; one 4-storied; one 5 storied; 4 six storied and one 15 storied project are analysed for a total number of projects of ten.

As the total number of units are different in different projects and also the floor space per unit is different, the costs are converted to unity i.e. cost/sq.ft of floor space.

Regarding alternative type of development and land savings against increased costs of construction, the same number of people are provided in alternative types of developments separately keeping constant location, land cost, floor area per unit (750 sft) and average household size (6 persons).

Then with the unit cost per sq.ft of floor space obtained from the analysis of the actual projects, land savings and the increased construction costs in alternative types of development is determined in accordance with the Bangladesh standard of spacing between the buildings (1½ times (minimum) of the height of the building).

Cost trend of all the projects shows that cost is gradually increasing with the increase of the storey and floor space of the dwelling unit.

It is found that greater density can be achieved in multi-storied buildings but the construction cost is so high that low-income group of people can not afford it.

The construction cost of one storied semi-pucca house is found less and that of one storied bamboo structure is found lesser.

Title of the Thesis:- Development costs in alternative residential land use - A study of public housing in Dacca city.

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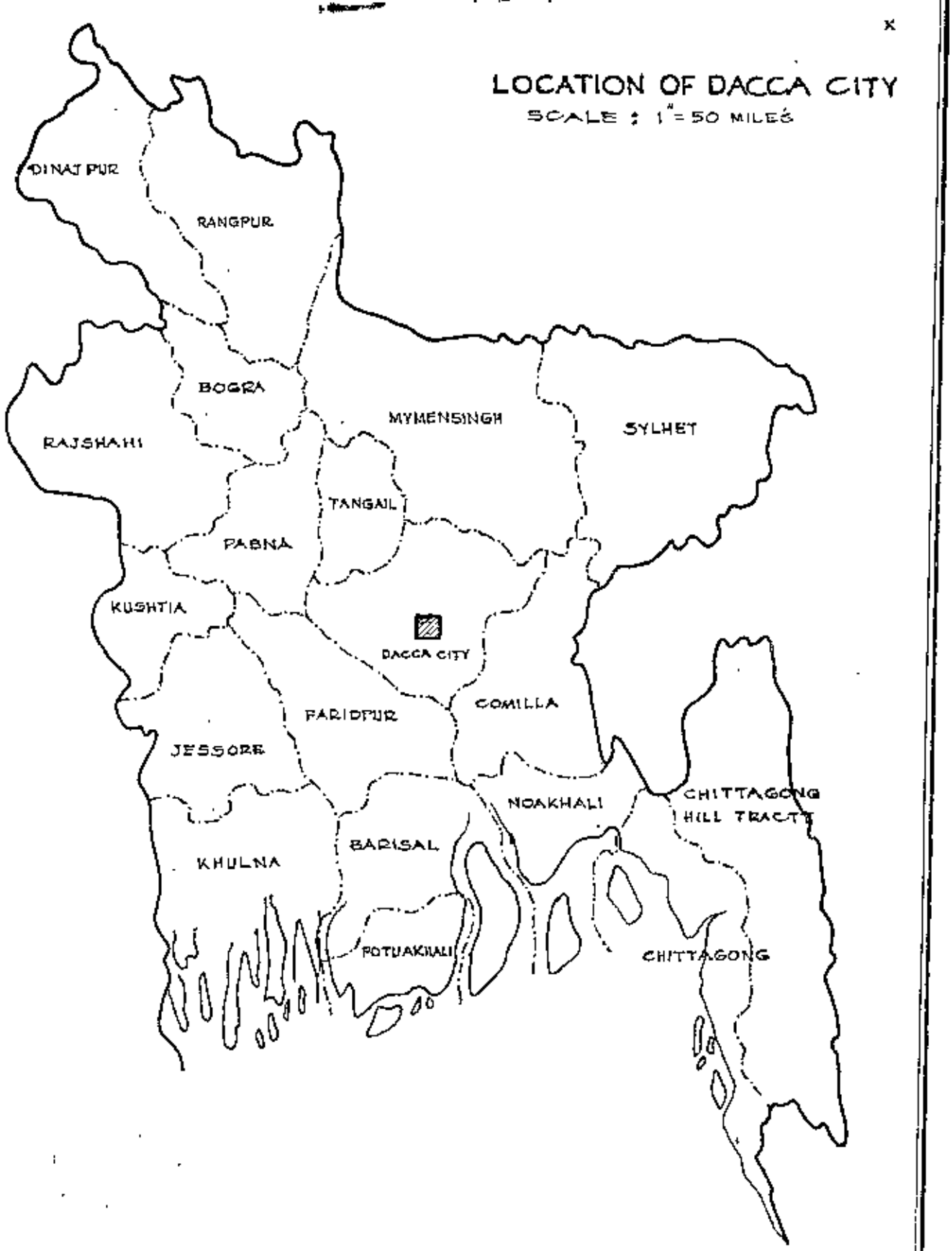

LOCATION OF DACCA CITY
SCALE : 1"= 50 MILES
DINAJPUR
RANGPUR
BOGRA
RAJSHAHI
MYMENSINGH
SYLHET
TANGAIL
PABNA
KUSHTIA
DACCA CITY
FARIDPUR
COMILLA
JESSORE
NOAKHALI
CHITTAGONG HILL TRACTS
KHULNA
BARISAL
PATUAKHALI
CHITTAGONG

MAP - 1.1

1. INTRODUCTION

1.1 Objectives

1.2 Methodology

1.3 Project studied

1.4 Scope and limitations

CHAPTER-1
INTRODUCTION

The housing situation of the urban areas of Bangladesh, particularly in Dacca city is deteriorating due to the increased rural migrants to the city. The population of the city increased about three times (from 1961 census) but the housing stock has not been increased at the same rate.

Due to the increased rural immigrants, the houses became overcrowded and in many cases unhealthy. So, tremendous pressures are being exerted not only on the housing and utility system etc. but also on the urban land as a whole.

Bangladesh, with a population of 78.7[1] million is one of the most densely populated countries of the world. The density of population varies from 1330 persons/sq.mile[2] to 4000 persons/sq.mile[3]. The present share of arable land per person is around one-fourth of an acre which is likely to be reduced to 1/8 acre/person by the turn of the century. Besides, Bangladesh is already on the threshold of urbanisation.

There exists in our country a widespread belief that construction of high-rise buildings would help to save the scarce resource of agricultural land.

In recent years the cities and towns are expanding in population and area, devouring more and more of valuable agricultural land. The objective of saving land from residential and other constructions is, therefore, apparently justifiable and construction of high-rise buildings is considered to be a proper approach.

Source: 1. Bangladesh Bureau of Statistics, Government of Bangladesh, "Statistical year book of Bangladesh" 1978, p-11.

2. Government of Bangladesh, "Habitat - National Report on Human settlements" 1976, p-5.

3. James, J.R, "Some Aspects of Town and country Planning in Bangladesh", Urban Development Directrate, Government of Bangladesh, 1973, p-5.

This is not a new idea. Some developed countries have previously followed this approach, started to develop a differing attitude (In U.K. most of the houses in New Towns are of 2 to 3 storied[1]). It has also been considered that high-rise buildings are socially and economically undesirable[2].

Bangladesh is a poor country with many problems. It is expedient to examine whether construction of high-rise buildings is justifiable or a costly mistake of experimenting with a solution, not known in the country, to solve the problems of land saving.

This is a very delicate issue and involves studies of various aspects of the house building industry and its social consequences. Within the scope of the present thesis, the adoptibility of high-rise or low-rise buildings in terms of cost and saving of space and the relative consequences will be examined.

The objectives of the thesis in the background of the above are given here.

1.1 Objectives

1. To study the least cost (per sq.ft. of floor space) of development in the case where development programme, site and standard is given.

2. To explore to what extent it is economically feasible to increase gross development density in order to reduce urban land consumption with the present construction technology and materials.

Source: 1. Osborn, F.J. and Whittick, A. "New Towns; Their Origin, Achievements and Progress", Leonard Hill, London. p-299.

2. Wedin C.S. and Nygren, L.G. "Introduction to Family Housing", 2nd Edition, 1975, p-89.

1.2 Methodology

To achieve the first objective, ten different types of on-going Government residential projects of the Dacca city are studied. As the different projects deal with the different floor space, land coverage, land values etc. analysis is based on unit cost for comparing between alternative type of developments.

To achieve the second objective, the following procedure is adopted.

(a) A fixed number of population with a fixed number of dwelling units of the same size are considered to provide them separately in different type of developments.

(b) Land value is assumed to be the same in all cases, considering the different type of developments are taken from the same locality.

(c) The land required for providing the same population in the same dwelling units are then determined in accordance with Bangladesh standards of building spaces.

(d) The total construction cost of the assumed dwelling units are then found out from the unit cost obtained earlier from the on-going projects separately for each type of development.

(e) The increased construction cost against land savings are then computed by comparing the alternative types of development.

1.3 Projects Studied

List of the projects studied with type of development are given below:

Project No.	Name of the project	Type of development (Building type)
1.	Squatter Resettlement at section XI, Mirpur	1 storied (Bamboo made wall with pucca floor; roof with corrugated Iron sheet)
2.	Demonstration project for a human settlement at Mirpur (Section-8)	1 storied (semi-pucca)
3.	Semi-pucca houses for low income people at Mirpur (SectionI,II and VI)	1 storied
4.	480 Flats at Mirpur	4 "
5.	M.L.S.S. Quarter's BUET.	5 "
6.	Low cost Government Quarter at Agargaon	6 "
7.	Construction of Multi-storied Government owned houses at Baily Road	6 "
8.	Construction of Buildings for the residents of Pallasey and Nilkhet Barrack at Mirpur	6 "
9.	Construction of Multi-storied Government owned houses at Baily Road. d	6 "
10.	Construction of Multi-storied Government owned houses at Baily Road.	15 "

1.4 Scope and Limitations

The scope of the study is limited in relation to the diversity of technical solutions to the problem of housing. This study deals with the analysis of on-going public housing projects in order to see the increased construction costs (at market price) of the multi-storied buildings against land savings, considering the coverage, height and spacing of the buildings. In most cities, generally a few factors such as income, land value, rate of urban population growth, the policy context of housing provision etc. dominate the housing situation. Together, these elements produce a wide diversity in the options open to developing countries in treating their housing problems.

Analysis for all housing has been made but particular emphasis is given on low-income housing. Furthermore, most of the data concentrate on housing provided by Government for its employees, since they represent the only source of complete cost information for multi-storied low-income residential structure. Moreover, the immediate issue how to increase the efficient use of urban land for housing is presently more serious with respect to Government housing. Past practice had been to develop 4 storied blocks of flats on large plots of land. At present 6-storied walk-up buildings are being constructed for the Government employees and there is a scheme of about Tk. 50.00 crores to construct 4477 flats in 10 to 15 storied blocks for the Government employees. There are two larger schemes of 45,000 and 24,000 flats respectively in public housing (Appendix-2). There is the provision to allot these buildings to the Government employees.

For this reason and also because most of the Government expenditure on housing is for its employees, a description of past and current programmes for the Government housing is included in Chapter-2.

If housing is to fulfill its potential of conferring a wide range of benefits to individuals and cities, it is essential for design standards to ensure that housing costs are within reach of low income families. Minimum requirements for lot size, for example, may allow more living space, but the resulting high cost of land may force households further to the outskirts of the city. So, the land value pattern and the housing standards are discussed in Chapter-3 and Chapter-4 respectively. Housing financing as well as Housing policy matters are not discussed in the study.

2. BACK-GROUND INFORMATION

2.0 Introduction

2.1 Dacca city - a brief description

2.2 Distribution of housing and planning functions in Bangladesh

2.3 Problems and programmes of housing for civil servants

2.4 How houses get provided

2.5 Existing pattern of rent payment

2.6 Agencies of public housing

2.7 Private housing.

CHAPTER-2
BACK-GROUND INFORMATION

2.0 Introduction

A brief description of Dacca city is given in this chapter. The distribution of housing and planning function in Bangladesh is also given to have an overall idea of the agencies involved in construction of Government employees housing, public housing etc.

With reference to section 1.4, the section 2.3, problems and programmes of housing for civil servants; section 2.4, How houses get provided; and section 2.5, the existing pattern of rent payment of the Government employees are discussed in this chapter, considering these might be useful to know the present Government employees housing problems and current efforts of housing construction.

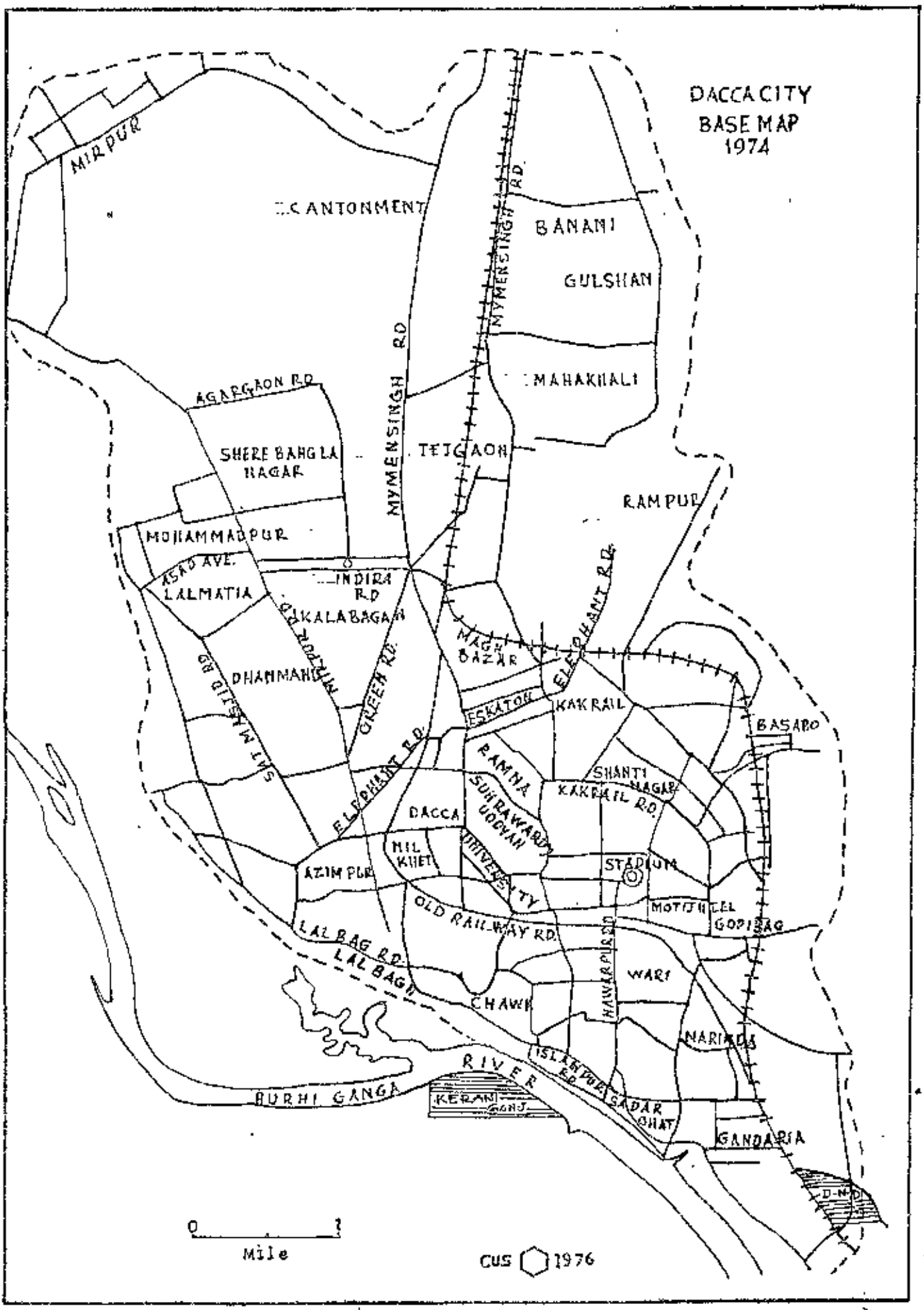
2.1 Dacca City - a Brief Description

The city of Dacca, lies in $23^{0}43'$ N latitude and $90^{0}24'$ E longitude. It stands upon the northern bank of the river, Buriganga.

It is a growing city. The city proper still extends lengthwise along the northern bank of the river Buriganga where new development areas - both residential and industrial stretch faraway. The city is expanding towards the north as the eastern and western side are low-lying.

The city areas are shown in map 2.1.a

According to the 1974 census, total population of Dacca city is 1,679,572 and out of it, 1,310,976 people are in Dacca pouroshava (municipality) 39,753 people are in Gulshan pouroshava, and 91,525 people are in Mirpur urban areas and others are in



SOURCE : CENTE FOR URBAN STUDIES; DACCA UNIVERSITY

MAP - 21.a

the adjacent urban areas of the city[1].

Annual increment of the population of Dacca city is given in Table 2.1.1.

TABLE 2.1.1 : ANNUAL INCREMENT OF THE POPULATION OF DACCA CITY[2]

Year	Population	Annual increment (in %)
1941	295,735	
		1.28
1951	335,928	
		5.18
1961	556,712	
		6.86
1974	1,679,572	

"The present land use structure of the city has been the results of successive un-connected physical development decisions, the earliest of which date back to the Mughal period when the city was first established"[3]

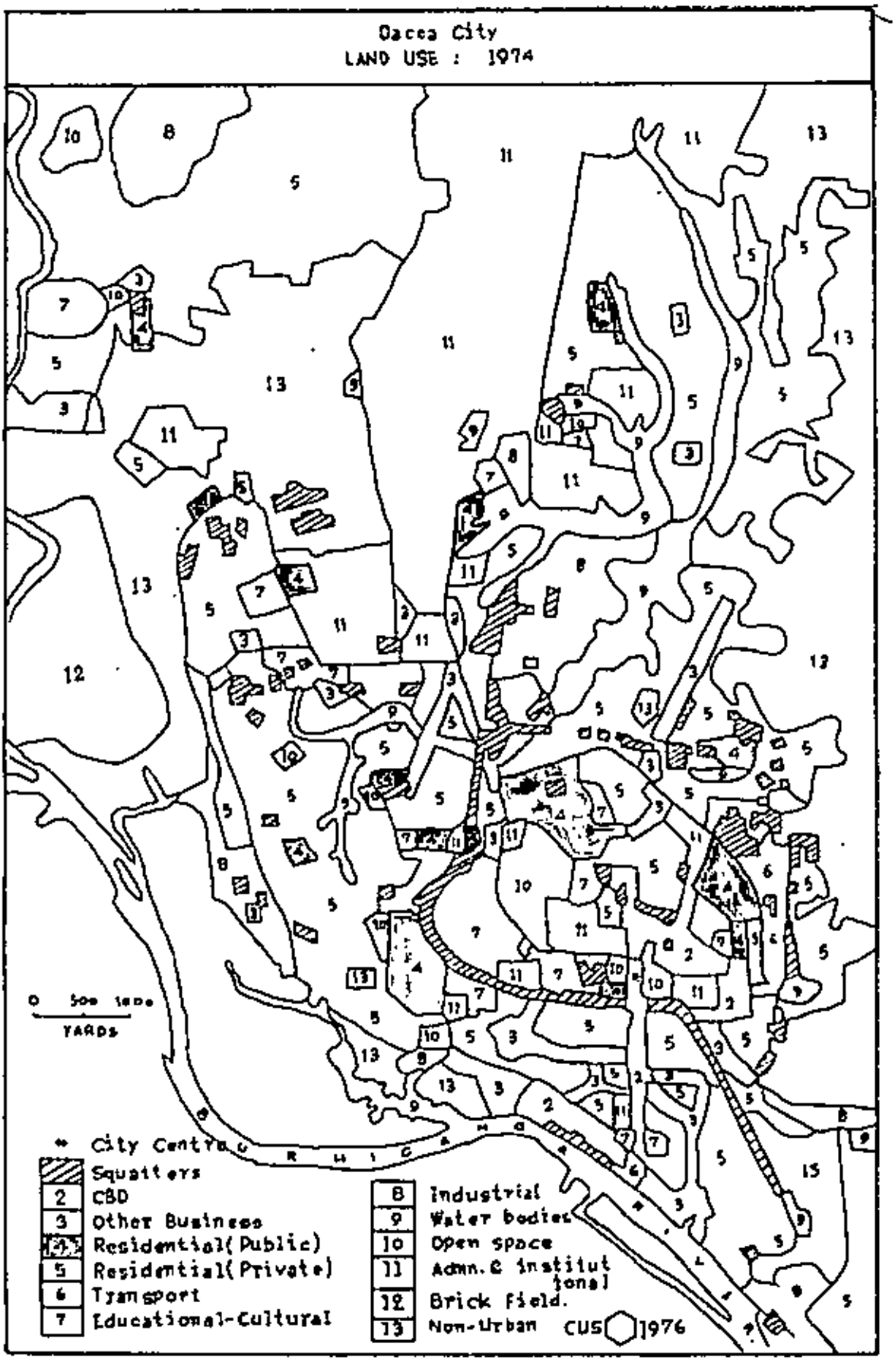
Map 2.1.b shows the land use (1974) of Dacca city. Both public and private residential areas are shown in the map.

The residential areas can be divided into (a) new residential areas and (b) old residential areas.

Source: 1. Census commission, Government of Bangladesh, "Bangladesh population census, 1974", Bulletin-2.

2. Census commission, Government of Bangladesh, "Bangladesh population census, 1974", Bulletin-2.

3. Centre for urban studies, University of Dacca, "Squatters in Bangladesh cities", Sept.1976,p-36.



SOURCE : CENTRE FOR URBAN STUDIES; DACCA UNIVERSITY .

MAP- 2.1b

The characteristics of the new residential areas are high class areas and higher income group of people are residing here and these are planned areas. These include Dhanmondi, Gulshan, Banani, Azimpur, Mirpur, Mohammedpur, Lalmatia, Maghbazar, Rampura and Motijheel etc.

The characteristics of the old city are building congestion and high density of population. Low income group of people are maximum in number there. It includes Nawabganj, Nazaribagh, Lalbagh, Bandaria etc.

The overall housing condition of the city is depicted in Table 2.1.2.

TABLE 2.1.2 : HOUSES BY CATEGORIES AS PERCENT OF TOTAL CENSUS HOUSES[1], 1973

Houses by categories (in percent)				
Pucca	Semi-pucca	Kutcha	Jupri	Others
36.74	24.33	27.55	10.96	0.72

No reliable data is available regarding housing backlog in the city. One estimate for 1974 was made for Dacca Paurashava in Habitat (National report on human settlement, 1976, p-113) which is not correct because the actual household size was 7.5 and it was estimated by 6 persons/house*.

Source: 1. Computed from the provisional result of Bangladesh Housing Census, 1973.

* In 1974, the population of Dacca Paurashava was 13,10,976 and the number of households was 1,75,149 (Village statistics, Bangladesh Population Census, 1974, p-42). So, the household size becomes 7.48, say 7.5 but in Habitat (1976 issue,p-113) the number of residences quoted 171,301 and Backlog of houses calculated 471,95 by considering 6 persons/house which is not representative.

2.2 Distribution of Housing and Planning Functions in Bangladesh

This section deals with the distribution of responsibilities for housing and planning of the public agencies in Bangladesh. Different functions are carried out by different public agencies. In the following table the public agencies involvement with the responsibilities of housing and planning are shown in accordance with the different components of house building.

TABLE 2.2.0 : DISTRIBUTION OF RESPONSIBILITIES FOR HOUSING AND PLANNING IN BANGLADESH

Subject	Urban Areas Dacca, Khulna Chittagong, Rajshahi	Other Urban areas of Bangladesh
A. Land		
1. Preparation of land use zoning and town development plans	Improvement Trust/ Development Authority	Urban Development Directorate; Municipality
2. Acquisition of land	Government; Improvement Trusts and Development Authority	Government, Public Works Department (P.W.D.)
3. Survey of land, construction of roads and drains	PWD, Roads and Highways, Improvement Trust, Municipality	Municipality
4. Disposal of Housing sites (all subsidised)	Improvement Trust, Housing and Settlement(H and S) Directorate	H and S Directorate
5. Control of private development activities, building permission	Improvement Trusts	Municipality
6. Slump clearance including redevelopment, and rehousing	Improvement Trusts	None

Subject	Urban Areas Dacca, Khulna Chittagong, Rajshahi	Other Urban areas of Bangladesh
7. Water supply and sanitation	Water supply and sewerage Authority (WASA), Public Health Engineering (PHE)	P.H.E Municipality
B. Finance		
8. Financing	House Building Finance Corporation (HBFC), Banks	HBFC, Banks
C. Administration		
9. Initiation of low cost housing projects	H and S Directorate	H and S Directorate
10. Estate Management	PWD, H and S Directorate	PWD, H and S Directorate
D. Design and Materials		
11. Design of Houses	PWD, H and S Improvement Trust	PWD, H and S Directorate
12. Procurement of Building materials	Directorate of Supply, Trading Corporation of Bangladesh (TCB)	Directorate of supply, TCB
13. Construction of Government houses	PWD	PWD

Source: Quium, A.S.M. Abdul, 'Financing of Urban Housing in Bangladesh', A Master Degree Thesis, 1978, p-28.

2.3 Problems and Programmes of Housing for Civil Servants

In 1970 the total ~~x~~ number of Government employees at Dacca was about 30,000[1]. After liberation, Dacca assumed a new dimension, being capital of an independent country, the number swelled to 51,000[2] due to expansion of the Ministries and creation of the new offices resulted in acute accommodation problem for the Government employees.

There are only 7448 flats and 666 dormitory accommodation[3] which were constructed earlier and now occupied by allottees. Against this meagre availability, there are 20,000[4] applications pending with the Ministry of Public Works and Urban Development for allotment in Dacca city alone.

There was a hope that quite a substantial numbers of houses would be available from among the abandoned properties, the facilities of which could be extended to the Government employees on rental basis. At least 5 to 6 thousand abandoned houses at Mirpur and Mohammadpur and 2 to 3 thousand in the remaining areas of Dacca city were expected to be available for the purpose but the idea did not materialise as the majority of those houses are being occupied by unauthorised persons. Thus the existing accommodation for the Government employees constitute only about 14% of the total requirement and the percentage of available accommodation may further decrease with the increase of job opportunities at the end of first five year plan (1973-78). To bridge the gap between the demand and availability, of residential units Government of Bangladesh decided to construct multistoried

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Sources: 1. Public Works Department, Government of Bangladesh, "Construction of Multi-storied Government owned houses at Dacca, Chittagong, Khulna and Rajshahi" - a report, 1978, p-2.

2. Ibid, p-2.

3. Estate Office, Government of Bangladesh.

4. Ibid.

buildings consisting of 4477 flats for low income groups at a cost of Tk. 50.00 crores. Accordingly the Hon'able Adviser, Ministry of Public Works and Urban Development suggested that such Government owned houses should be constructed at Dacca, Chittagong, Khulna and Rajshahi and constituted a Building sub-committee for preparation of the scheme. The sub-committee decided to construct multistoried building consisting walk-ups (6 storied) and high-rise (10-15 storied) with flats of different type such as 3-roomed flats, 2 roomed flats, flat-lets and dormitories. The sub-committee after due deliberation decided to construct 3-roomed units of gross floor area 858 sft., 2 roomed units,550 sft, flat-lets, 489 sft, and 350 sft. and 4 storied dormitory units of area 600 sft (150 sft/seat).

Distribution pattern was decided to be 60% of the dwelling units to be constructed in Dacca, 20% in Chittagong, 12½% in Khulna and 7½% in Rajshahi considering population density in the cities[1].

The percentage of these flats category-wise was also decided to be as under

3-roomed - 10%

2-roomed - 60%

Single space (flat-lets)

and dormitory accommodation - 30% and the following decisions were taken[2].

(a) The 3-roomed and 2-roomed units would be high-rise block flats (or apartment houses) within 10-15 storied construction.

(B) The flat-lets would be 6-storied walk-ups.

(c) The category-wise percentage and the city-wise distribution as decided by the sub-committee was accepted.

(d) However, in Rajshahi and Khulna, instead of 15 storied structures, 6 storied walk-ups could be built if the number of flats did not justify for 15 storied construction.

Table 2.3.1 and Table 2.3.2 show the Government housing units in Dacca city and Table 2.3.3 shows the existing housing units of different organisations in Dacca city.

Source: 1. Ibid, Public Works Department, p-3.

2. Ibid.

TABLE 2.3.1 : GOVERNMENT HOUSING UNITS IN DACCA CITY (1977)[1]

Sl.No	Class (considered according to floor space)	Unit
1.	Superior flat	66
2.	F and Kazli	48
3.	E	214
4.	New D	297
5.	Old D	225
6.	C	1826
7.	B	1786
8.	A	1090
		=5552
9.	Bungalow	48
	In addition to it	
	Temporary allotment	300
	Requisition house	148
	Dormitory	620 seats
	Hired accommodation	783
	Abandoned house	550
	Total:	7953
	(except Bungalow)	

Source: 1. Estate Office, Government of Bangladesh
and
2. Daily "The Dainik Bangla" 19th September issue, 1978.

TABLE 2.3.2: GOVERNMENT HOUSING UNITS IN DACCA CITY (1978)[1]

Sl. No.	Class	Units
1.	Government owned flats	6578
2.	Housing and Settlement Directorate placed flats at Government accommodation's disposal	490
3.	From Baily Road	350
4.	From Pike para	120
		7448
5.	Requisition House (from Provincial Government)	236
6.	Requisition house (from Central Government)	87
7.	Hired house	850
8.	Abandoned house	1058
	Grand Total:	9679
9.	Bachelors Hostel (Dormitory)	666 seats

Source: 1. Estate Office, Government of Bangladesh.

TABLE 2.3.3 EXISTING HOUSING UNITS OF DIFFERENT ORGANISATIONS IN DACCA CITY (Nov., 1978)

Sl.No.	Name of the Organisation	Total housing unit
*1.	Public Works Department	7448
**2.	Housing and Settlement Directorate	2410 flats plus (15809 nucleus houses)
3.	Pubali Bank	35
4.	Sonali Bank	128
5.	Bangladesh Bank	468
6.	House Building Finance Corporation	190
7.	Management Development Centre	29
8.	Bangladesh Jute Research Institute	108
9.	Power Development Board	168
10.	Water Supply and Sewerage Authority	98
11.	Bangladesh Railway	1228
12.	Engineering University (including Halls+)	857
13.	Dacca University (excluding Halls)	474
14.	Sugar, Food and Allied Industries Corporation	3
15.	Bangladesh Council for Scientific and Industrial Research	99
16.	Water Development Board	35
17.	Dacca Polytechnic Institute	634
18.	Dacca Medical College (including Hostel)	291
19.	Dacca Paurashava	*137
	Total:	30,641

* Directorate of Accommodation.

**Housing and Settlement Directorate

+ Number of residential rooms have been considered as no. of units.

Others: From Provisional results of Urban Housing Study,1979 Housing and Environmental Research Cell, Dacca.

2.4 How Houses Get Provided

The Government servants are to apply for housing accommodation through respective department to the Directorate of Accommodation, under the Ministry of Public Works and Urban Development. The applications are considered according to serial number. Two types of houses are provided — one is Government owned and another type is hired accommodation. The entitlement of Government owned as well as hired accommodation is stated below (Table 2.4.1 and Table 2.4.2).

TABLE 2.4.1: GOVERNMENT OWNED HOUSES — ITS ENTITLEMENT

Entitlement	Basic (with special pay) pay
Bungalow	Ministers' and Hon'ble Judges
Superior flat	Tk. 1951 and above
F class	Tk. 1351 - Tk. 1950
E "	Tk. 951 - Tk. 1350
New D "	Tk. 651 - Tk. 950
Old D "	Tk. 501 - Tk. 650
C "	Tk. 351 - Tk. 500
B "	Tk. 220 - Tk. 350
A "	Class IV (M.L.S.S.) (Rent free accommodation)

Source: Estate Office,
Directorate of Accommodation
Government of Bangladesh.

TABLE 2.4.2 : HIRED ACCOMMODATION - ITS ENTITLEMENT

Class	Minimum Plinth area (sq.ft)	Rent allowed (Tk.)	Basic (with special) pay (Tk.)
A	2039	1500	Tk. 2350 and above
B	1410	1125	1500 - 2349
C	841	900	1150 - 1499
D	608	525	850 - 1149
E	360	300	585 - 849
F	240	225	415 - 584

Source: Estate Office,
Directorate of Accommodation
Government of Bangladesh.

2.5 Existing Pattern of Rent Payment

The Government of Bangladesh in the New National Pay Scale, (July, 1977) introduced XXI grades with new scales of pay for the Government servants (Appendix-4). The rent payment system of the Government employees are stated as below:

1. A person who is provided with residential accommodation by the Government shall not be entitled to house rent allowance.

2.(a) If he is an any New National Grade and Scale from I to XIII - the deduction from basic pay is 7½% (more in addition to case-I).

(b) If he is in any New National Grade and Scale from XIV to XVIII - 5% of pay.

(c) If he is in any New National Grade and Scale from XIX to XXI - Nil.

3.(a) 35% of Basic pay will be given as house rent for Dacca Narrayanganj, Chittagong and Khulna.

(b) 30% for other District towns with a minimum of Tk. 75.00.

(c) 25% for other places with a minimum of Tk. 60.00.

2.6 Agencies of Public Housing

The public agencies involved for the development of housing in Dacca city are Housing and Settlement (H and S) Directorate and Public Works Department (PWD); both are working under the Ministry of Public Works and Urban Development. Their functions and allocation policies are stated below.

Housing and Settlement (H and S) Directorate

It became a full fledged Directorate in 1970 and before that it was acting as a special housing and settlement wing of C and B department from 1958. There were 16 schemes under the "development of Urban land and construction of Public Housing" programme which aimed at construction of nucleus houses for the refugees and development of housing plots for the general public in the Metropolitan city as well as in these cities and towns where there were large concentration of refugees from India as a consequence of partition. These schemes were started from early 1960 and most of them are complete or at the final stage of completion. It developed 17 Housing Estates and constructed about 26,000 nucleus houses and developed about 10,000 housing plots throughout the country. In Dacca city it has 10390 nucleus houses; 3748 residential plots; 4304 semi-pucca tin-shed houses at present and also other types of commercial and industrial plots as shown in the Table - 2.6.1.

The H and S Directorate has also the schemes of constructing 24,000, flats at Mirpur for low-and middle income families; construction of 15,000 flats at district headquarters and a very ambitious scheme of "establishment of a new city at Koraniganj, Dacca".

The list of H and S Directorates on-going (1978-79) schemes for Dacca city are given in Appendix-2.

Table 2.6.2 shows the investment of H and S Directorate in Dacca city from 1971-72 to 1978-79.

TABLE 2.6.1: H AND S DIRECTORATE'S HOUSING SITUATION IN DACCA CITY (1978)[1]

Name of Housing Estate	Nucleus houses	Residential plots	Commercial and Industrial plots	Flats	Shops	Semi-pucca tin-shed houses	Other tin-shed transferred from D.C	Total housing unit **	Remarks
Mohammedpur and Lalmatia	2286	1824 568	11 101	642	161	-	215		*1152 flats are under construction ** except plots and shops.
Mirpur	8104	1356	19	616	294	4304	900	18219	
Total	10390	3748	131	1258+ * 1152	455	4304	1115		

Source: 1. Official Documents of Housing and Settlement Directorate, Government of Bangladesh.

TABLE 2.6.2: INVESTMENT ON HOUSING BY HOUSING AND SETTLEMENT DIRECTORATE IN DACCA CITY[1]

(Taka in lacs)

Sl.No.	Type of project	Year							
		1971-72	72-73	73-74	74-75	75-76	76-77	77-78	78-79*
1.	Construction of public housing								
	1st phase	0.70	10.00	15.00	40.00	75.00	60.00	70.00	-
	2nd phase	0.28	1.00	10.00	20.00	10.00	25.00	-	-
2.	1152 flats	-	246.00	207.00	175.00	280.00	180.00	103.00	95.00
3.	Squatter settlement at Mirpur	-	-	-	-	-	0.06	30.00	50.00
4.	Twin house	-	-	-	-	-	0.01	25.00	20.00
5.	Building Research Institute (BRI) and others	-	-	-	-	-	-	28.00	-
6.	Survey investigation and extension of building	-	-	-	-	-	-	18.50	-
7.	Construction of 1520 flats	-	-	-	-	-	-	-	400.00
	Total	0.98	259.00	232.00	235.00	365.00	265.07	274.50	565.00

Source: Computed from office document of H and S Directorate, Government of Bangladesh

* Subject to revision by the Planning Commission.

Allocation Policies (H and S Directorate)

Deputy Commissioner of settlement allocates flats and plots. There is no definite allocation policy but generally the following categories of families get preference:

1. Freedom fighters
2. Sufferers of Independence
3. Fixed income group (Public servants) and
4. 'Shaheed' (Martyr) Families

Earlier the cost of the constructed buildings was fixed in such a way that the whole cost (including interest) could be amortized over a period of 30 years but now it has been decided for 50 years due to rise in construction cost. Government servants can also get a flat but the allottee can never be the owner of the house that is its ownership is not transferred.

But in the case of nucleus houses, ownership is transferred to the allottee after the payment of cost which is payable in monthly instalments over a definite period (say 15 to 20 years). Ownership of the plots is also transferred after the full payment of its cost either at a time or in five years on the basis of instalments.

Public Works Department (PWD)

In mid 1977, the former Building Directorate of the then pronvincial Government of East Pakistan and the public works department of the then Central Government of Pakistan were merged together as public works department (PWD).

The functions of this department are the construction of Government servant's housing, Government offices, and institutional buildings. The source of finance is Government budgetary allocation.

This department could not meet the housing needs satisfactorily. The rent that the allottees pay as a form of 7½% of the basic pay plus the house rent allowance (35% of the basic pay for Dacca) is not sufficient for the recovery of cost and the projects rely on heavy Government sub-sidy. At present PWD has 7448 housing units in Dacca city. The list of on-going schemes (1978-79) of PWD in Dacca city are given in the Appendix-3.

The actual expenditure on housing of both H and S Directorate and PWD are shown from 1971-72 to 1978-79 as bar chart (Fig.2.6.5). The amount of expenditure of 1978-79 are subject to final approval by the Planning Commission.

Table 2.6.3 shows the investment of PWD on housing in Dacca city from 1971-72 to 1978-79.

Table 2.6.4 shows the total Government investment on public housing (H and S + PWD) and Fig. 2.6.5 shows it in bar diagram.

TABLE 2.6.3: INVESTMENT ON HOUSING BY PUBLIC WORKS DEPARTMENT (PWD) IN DACCA CITY[1]

(Taka in lacs)

Sl. No.	Type of project	Year							
		1971-72	72-73	73-74	74-75	75-76	76-77	77-78	78-79*
1.	Staff quarters in Dacca	0.009	0.005	5.00	2.00	31.75	15.88	1.00	-
2.	Houses for Pallassey and Nilkhet barrack people	1.47	14.33	30.00	20.00	200.00	429.65	292.60	230.00
3.	Gas connection plus pilot precast project	-	5.00	5.00	2.05	64.00	38.63	7.00	14.30
4.	Clas III and Class IV employees housing	11.00	7.24	7.50	2.00	8.00	7.47	3.00	4.60
5.	Bangladesh Government press's employees quarters	-	2.00	4.35	1.00	12.00	10.00	5.00	7.36
6.	'Banghabhaban' employees quarters	0.046	1.50	4.06	1.00	-	-	-	4.60
7.	Extension of boundary wall, with other projects added together	4.11	21.93	28.26	69.2	243.05	213.63	420.00	532.77
	Total	16.64	52.01	84.17	97.25	558.80	715.26	728.63	793.73

Source: 1. Computed from offics documents of PWD, Government of Bangladesh.

* Subject to revision by the Planning Commission.

TABLE 2.6.4 : TOTAL PUBLIC INVE TMENT IN HOUSING (H AND S + PWD) -(DACCA CITY)[1]

(Taka in lacs)

1971-72	72-73	73-74	74-75	75-76	76-77	77-78	78-79*
17.62	311.01	316.17	567.25	923.80	980.26	1003.13	1358.73

Bar diagram (Fig. 2.6.5) shows that Public Works Department is gradually giving emphasis on the construction of the Government employees housing.

Source: 1. Computed from Table 2.6.2 and Table 2.6.3

* Subject to revision by the Planning Commission.

Total Public Investment in Housing (DACCA CITY)

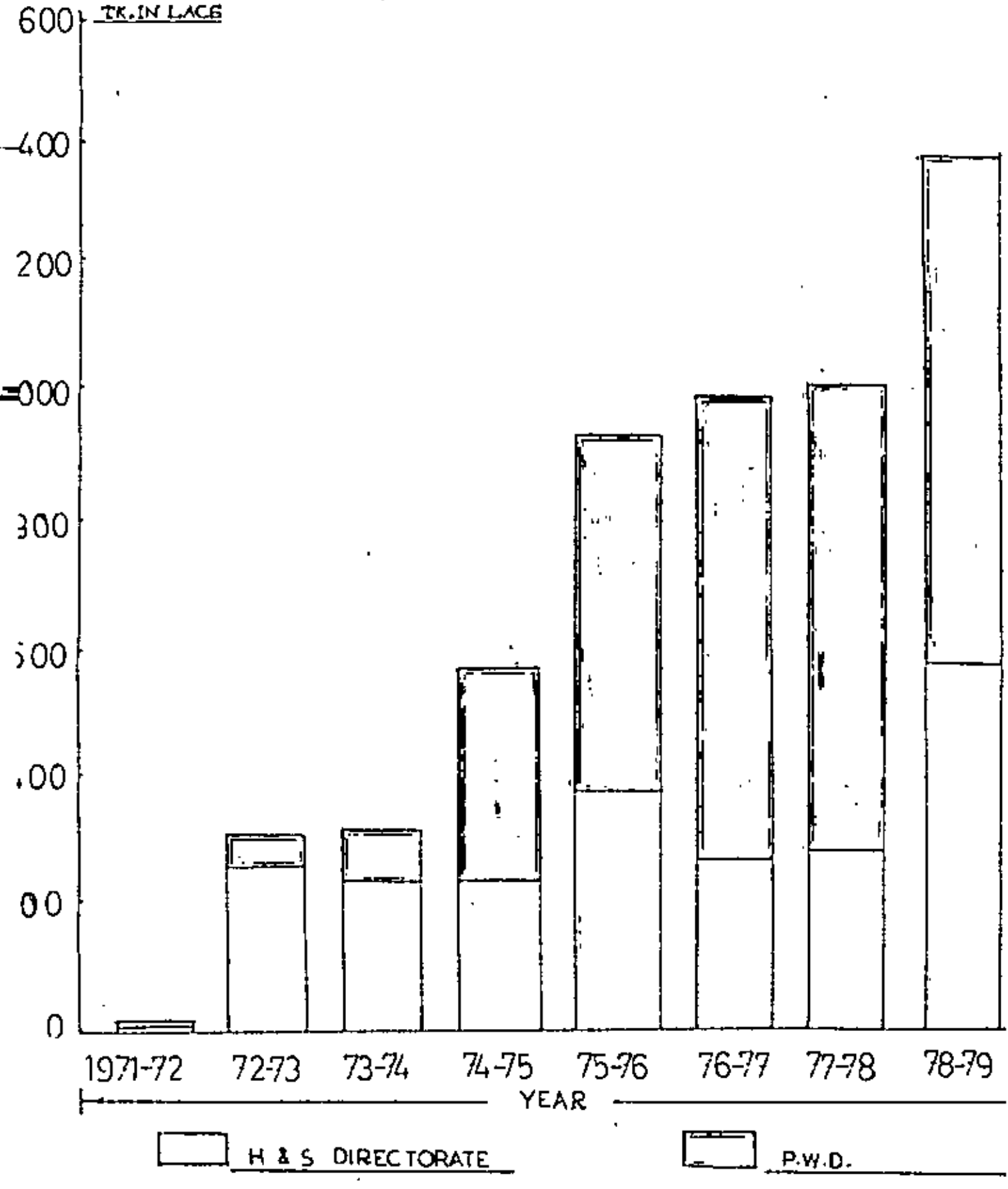

FIG. 2.6.5

2.7 Private Housing

From the visual observations, it can be said that only the upper-middle and the middle income group of people are developping plots and constructing residential buildings in and around the Dacca city.

Total number of housing units in Dacca Paurashava was 171,301 in 1974[1] and the total number of public housing units in Dacca city (covering almost all the public agencies) in 1978 was 30,641 (See Table 2.3.3). By

By deducting the public housing units from the total units, the extent of building private housing can be judged.

Source: 1. Government of Bangladesh, 'Habitat-National Report on Human Settlements' 1976, p-113.

3. LAND LEVEL AND LAND VALUE

3.1 Introduction

3.2 Land level (Dacca city)

3.3 Land type and foundation cost

3.4 Land acquisition system in Bangladesh

3.5 Land value pattern of Dacca city

CHAPTER 3

LAND LEVEL AND LAND VALUE

3.1 Introduction

The contour of the land of the different parts of Dacca city is different. Some areas are situated at higher elevation than flood level and require no earth filling for housing construction. There are also some low lying areas which require earth filling for housing construction and involves extra filling cost. So land level as well as land value pattern of the different parts of the city is discussed in this chapter to know the development cost of land in different parts of Dacca city.

3.2 Land Level (Dacca city)

The major part of the Dacca city is situated on the southern part of the larger Madhupur tract which extends to the north upto the old Brahmaputra river in Mymensingh district.

"The Madhupur tract is believed to be a river terrace formed during the late Tertiary and Pleistocene time"[1].

The surface of Dacca city is almost flat. The major part of the city lies between 20 to 25 ft. above Sea level and is usually free from flood; the normal flood level being 18½'[2]. The northern part of the city is relatively higher than the southern part.

Fig. 3.2.1 shows the land levels of the different parts of Dacca city. It shows that part of Ganderia, Mohammadpur, Mirpur and Moghbazar, Tejgaon and Kurmitola, the land levels

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Source: 1. Khan, A.M.M. Amanat Ullah, "Land value patterns in Dacca city" Oriental Geographer, Vol. 19, January - July, 1975-76.

2. Housing and Settlement Directorate, Government of Bangladesh, "Establishment of new city at Karanigonj, Dacca" 1970, p-12.

are above 18 ft. from Sea level. Another part of Mirpur, Mohammadpur and Gendaria lie within 10 to 18 ft. level.

Goran and Major part of Kamalapur on the eastern and western side of the city lie below 10 ft. level.

These low lying lands can be reclaimed to above flood level and may be used for residential development.

There are three large areas which may be reclaimed for housing construction.[1]

They are:-

(a) An area of approximately 285 acres at Gendaria and Postogola, between the railway and the new Narayanganj Road. Most of this land is between the 10 ft. and 15 ft. contours. The average flood level is 18 ft 6 ins. and the land would have to be raised to about 20 ft.

(b) An area of approximately 1540 acres just east of the new Narayanganj Road and between the Demra Road on the north and the Narayanganj Road on the south; the height varies between the 8 ft. and 15 ft. contours. At present this area is known as the D-N-D (Dacca, Narayanganj, Demra) irrigation project area. It is under the control of Water Development Board (WDB)

At present departmental(WDB's) housing is being constructed over an area of 34 acres within this zone and at adjacent to Jatrabari area. About 1350 flats (4 to 5 storied) are supposed to be constructed there.

(c) Opposite Dacca, on the south bank of the Buriganga river, an extensive settlement has developed at Jinjira. There are important market, boat building and warehousing along the

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Source: 1. Dacca Improvement Trust, "Master plan for Dacca" Minoprio, Spencely and Macfarlane Dec., 1959, p-22.

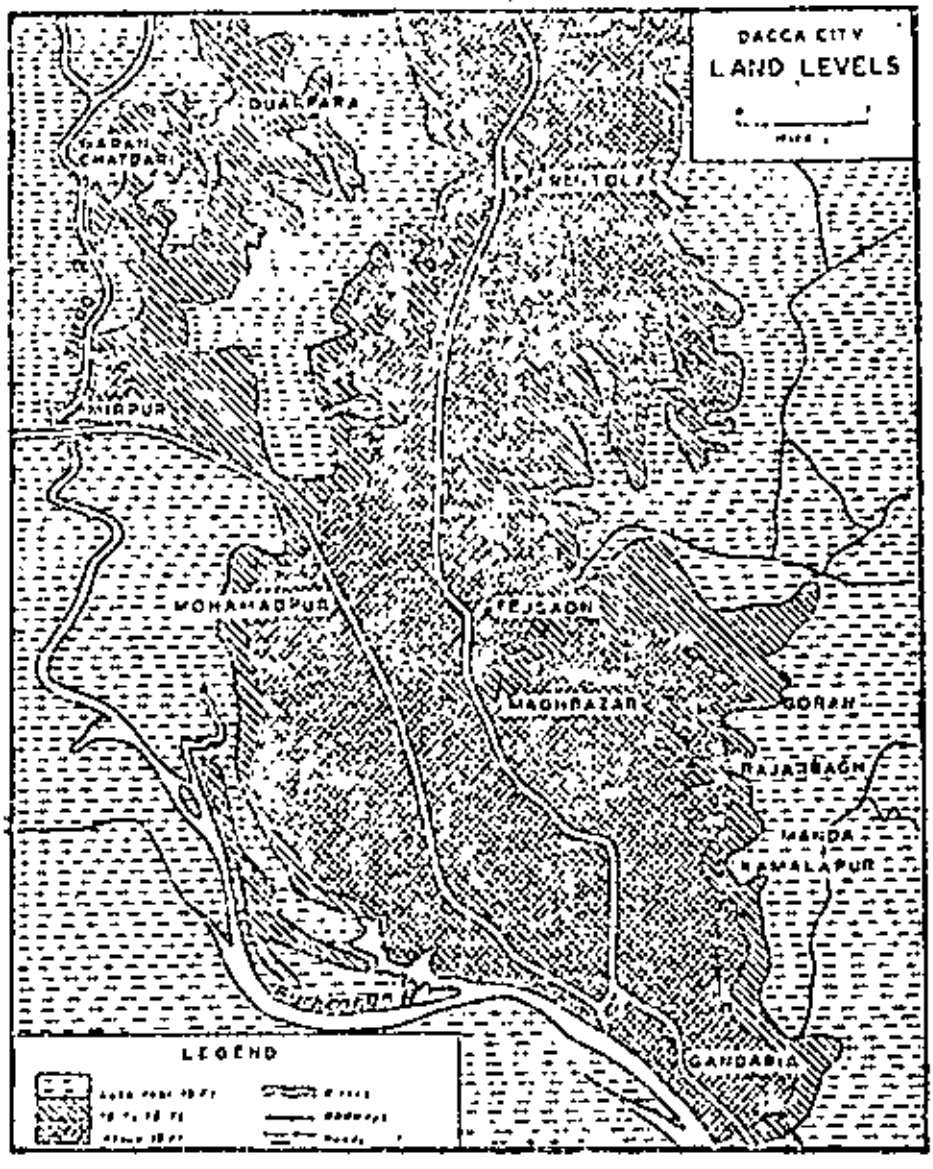

FIG.- 3.2.1

SOURCE : KHAN, A.M.M. AMANAT-ULLAH, "LAND VALUE PATTERNS IN DACCA CITY," ORIENTAL GEOGRAPHER, VOL. 19 & 20 JAN-JUL 1975-76.

water front. The population of Jinjira in 1974 was 103,000 with a density of 124,80 persons per sq. mile.

The communication between Jinjira and Dacca is by ferry boat only, and there are no bridges across the river.

At present the major part (including Jinjira) at the Keranigonj island is under the active consideration of the Government to esteblish a new a city. In this connection, Housing and Settlement Directorate, Government of Bangladesh prepared a feasibility report, "Establishment of a new city at Keranigonj, Dacca" in 1978. The provision for three bridges are kept across the river Burigange.

Map 2.1.a shows these areas clearly.

The current efforts of polder development are going on at Mirpur, Section XI as shown in the Map 3.2.a for the resettlement of squatters. But the cost associated with it is much.

For resettlement of 2660 families, about 60 acres of land would be k filled above flood level[1] to 20.5 ft. (public works datum).

The maximum rate for manual cutting and filling is estimated at Tk. 200,00 per 1000 cft. and for mechanical land filling, it is Tk. 600.00 per 100 cft.

So, in this project (Mirpur squatter resettlement projects), total cost of land filling estimated = ₤ 1,440,000 = Tk.2,16 crores (Exchange rate 1 ₤ = Tk. 15.00).

Alternative to land filling, the construction of an embankment around the site with storm-water pumping facilities are proposed and accepted by the Government. The total cost of embankment (around 87 acres of land) is estimated at the cost = ₤ 452,662 = Tk. 67.899 lacs (Exchange rate 1 ₤ = Tk. 15.00).

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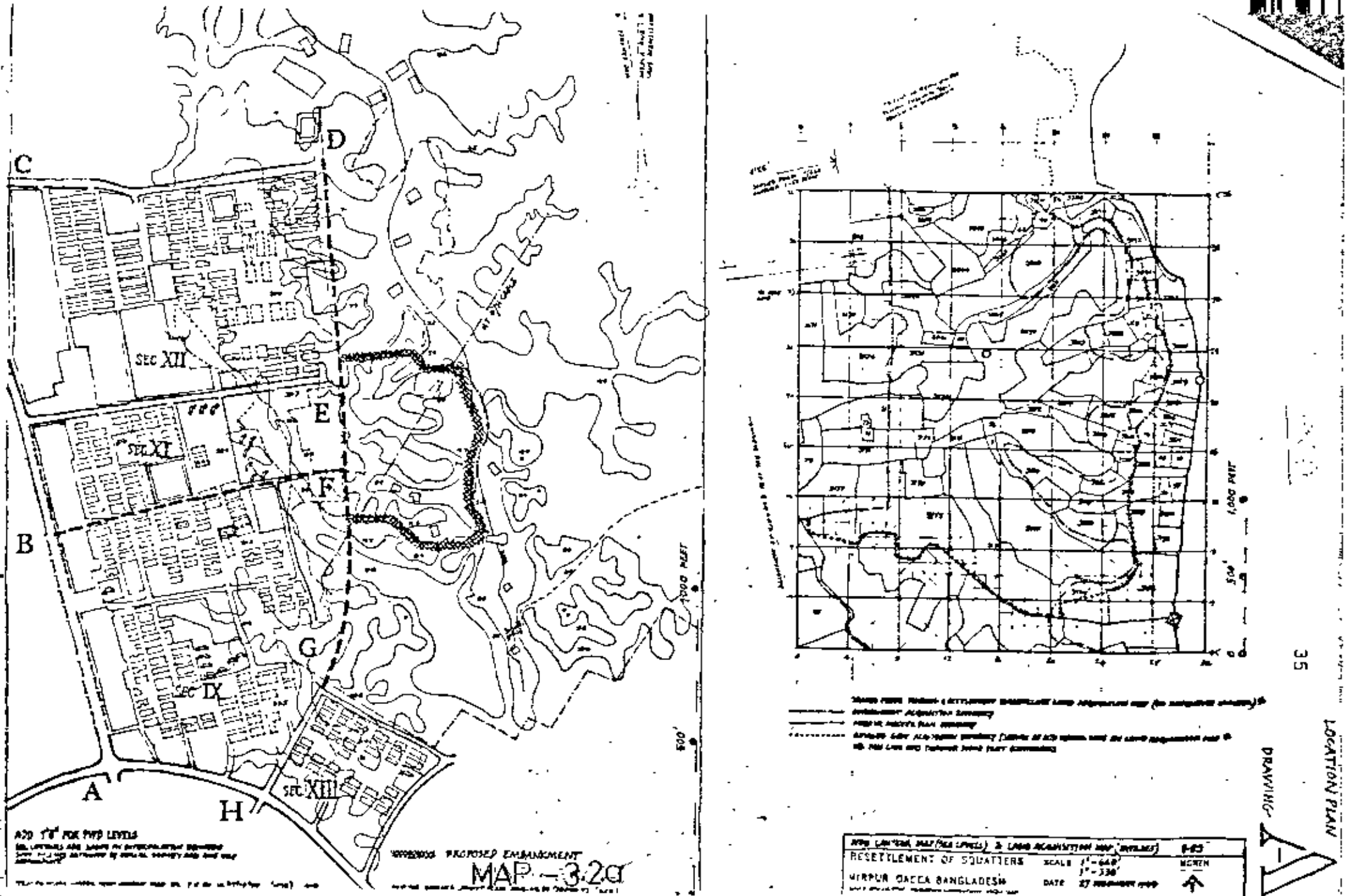
1. Source: H and ₃ Directorate, Government of Bangladesh "A report on squatter resettlement at Mirpur" by David Etherton and A. Christopher Lewin, January, 1978.



SOURCE : DAVID ETHERTONS REPORT 1978. H & S DIRECTORATE

3.3 Land Type and Foundation Cost

Foundation of buildings depend on the bearing capacity of the soil.

The function of the foundation is to transmit the weight of the structure onto the natural ground.

The various types of foundations of the buildings are discussed below with their construction costs.

If a stratum of soil suitable for sustaining a structure is located at a relatively shallow depth, the structure may be supported directly on it by a spread foundation.

However, if the upper strata are too weak the loads are transferred to more suitable material at greater depth by means of piles or piers.

Spread foundations are of two types. If a single slab covers the supporting stratum beneath the entire area of the super structure, the foundation is known as a mat or raft.

If various parts of the structure are supported individually, the individual supports are known as spread footings and the foundation is called a footing foundation.

A footing that supports a single column is called an individual footing; one that supports a group of columns is a combined footing, and one that supports a wall is a continuous footing[1].

In 5 storied buildings in Dacca normally pile foundation is not required. The bearing capacity of the soil is sufficient (Design capacity is about 1 ton per sq.ft. on average).

Source: 1. Terzaghi, Karl and Peck, R.B., "Soil Mechanics in Engineering Practice, John Wiley and Sons, London 1956, p-407.

But in low-lying areas, the bearing capacity of the soil is less and mat or raft foundation and even pile/pier may be required and in that case the cost of the foundation will be increased.

It is observed from the PWD's projects that upto 5-storied load bearing buildings, the cost per sq.ft. of floor space in ground floor is about Tk. 140.00[1] and if Reinforced cement concrete (R.C.C.) structure is made the cost is increased to about Tk. 170.00 per sq.ft. of floor space. If pile foundation (concrete) is done, it increases further by about Tk.20.00 per sq.ft.

3.4 Land Acquisition System in Bangladesh.

The Government is to acquire quite a good amounts of land for residential development and so the land acquisition system is discussed here.

The following resolution (Memo. No. AL-16/76/1012-Regn. dt. 29.12.76 of the Sec. XXIV; Land Administration and Land Reform Division) reveals the present system of land acquisition in Bangladesh.

1. Functions of the Land Allocation Committees:-

Functions of the central Land Allocation Committee should be to advise Government on all policy matters concerning acquisition of land for public purposes or in public interest. The Committee may also be consulted in all matters regarding promulgation and amendment of land Acquisition laws, modification of rules and procedures thereunder and also on such matters as the Government may think fit. Individual cases of land acquisition need not come to the central Land Allocation Committee, as a routine matter.

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1. PWD's schedule, Circle-I, Dacca
   Government of Bangladesh, and also after a discussion with PWD's officials.

2. There is no necessity to have a committee at the Divisional level. The existing Divisional Land Allocation Committee should, therefore be treated as dissolved. The Divisional Commissioner will exercise general supervision over the land acquisition work in the districts. He may call for the records of any particular case and issue such directive as he thinks fit.

3. The District Land Acquisition Committee will perform all the functions of land allocation in consultation with the requiring agencies. The Addl. Deputy Commissioner (Rev.) should be included as a member in the existing District Land Allocation Committee. The entire responsibility of determining the necessity and the quantum of land which should be acquired for a particular project, should rest with the Depty Commissioner irrespective of the amounts of land involved. In case of controversy, the Deputy Commissioner may consult the Divisional Commissioner and take appropriate decision. The Divisional commissioner may also refer controversial cases to the Secretrary, Land Administration and Land Reforms Division who will decide the same in consultation with the Secretary of the concerned Ministry.

4. The existing procedure for submitting proposals by the requiring bodies should be followed. Moreover, the concerned agencies should notified their requirement of land for a project well ahead of the working season, so that the necessary formalities may be completed in time. In all cases the compensation money should be deposited in full before the land is scheduled to be handed over to the requiring body.

5. The district committees should follow the guidelines for ensuring strict economy in the case of land as laid down in resolution No. AL-16/76/399-Regu. dated 27.4.76.

6. In case of allocation of land for acquisition <u>within the city of Dacca</u> approval of the Ministry of Land Administration and Land Reforms should be obtained by the District Land Allocation Committee, Dacca. The Dacca city for this purpose shall comprise the following police stations namely, Kotwali, Lalbagh, Ramna, Sutrapur, Keranigonj, Tejgaon, Gulshan, Mohammadpur, Mirpur, Saver, Tongi, Joydebpur, Narayanganj, Fatullah, Bandar, Siddhirgonj, and Narshingdi.

The District Land Allocation Committee, Dacca will also have to obtain prior clearance from the D.I.T. and Urban Development Directorate.

Compensation:

Three consecutive years average sale price is considered in paying compensation against the acquired land[1].

The main problem is that when compensation is paid to the owner, the price of the surrounding land increases by that time due to lengthy formalities and thus delay. So, naturally the compensation received by the owner, in many cases, is not upto the market price. In most cases the owner can not buy the similar plot in the same locality with the compensated money.

3.5 Land Value Pattern of Dacca City

Extensive studies on land value pattern of Dacca city have not been conducted before. Mr. A.M.M. Amanat-Ullah Khan of the Geography Department, Dacca University conducted one study on it at 1970 price and he pointed out the following major factors in Dacca that are influencing the land value.

i. Topography

High valued lands (about Tk. 25 lacs per acre) are those that lie above flood level such as Dhanmondi, Mohammadpur, Gulshan and Tejgaon etc. Low lying areas which are subject to flooding during monsoon are low valued (about Tk. 6 lacs per acre).

ii. Accessibility

The accessibility of a site with respect to activity locations, i.e., shopping, residence place of work, recreation etc. is very important regarding land value. So, the central places where activities are more, land prices are also more and the land prices are comparatively less in peripheral sides where activities are comparatively less.

Source: 1. Land Acquisition Department, Dacca Collectorate, Government of Bangladesh.

iii. Land use

The value of a piece of land is mostly determined by the use of it. Fig. 3.5.2 shows it clearly.

iv. Age of the locality:

Localities like Lalbagh, Armanitola, Shakhari Bazar, Nawabganj, Nazaribagh, Banglabazar etc. were developed long before and perhaps due to congestion in buildings, traffic, narrow roads etc. the land value of these localities are low compare to new residential areas.

v. Plot Size

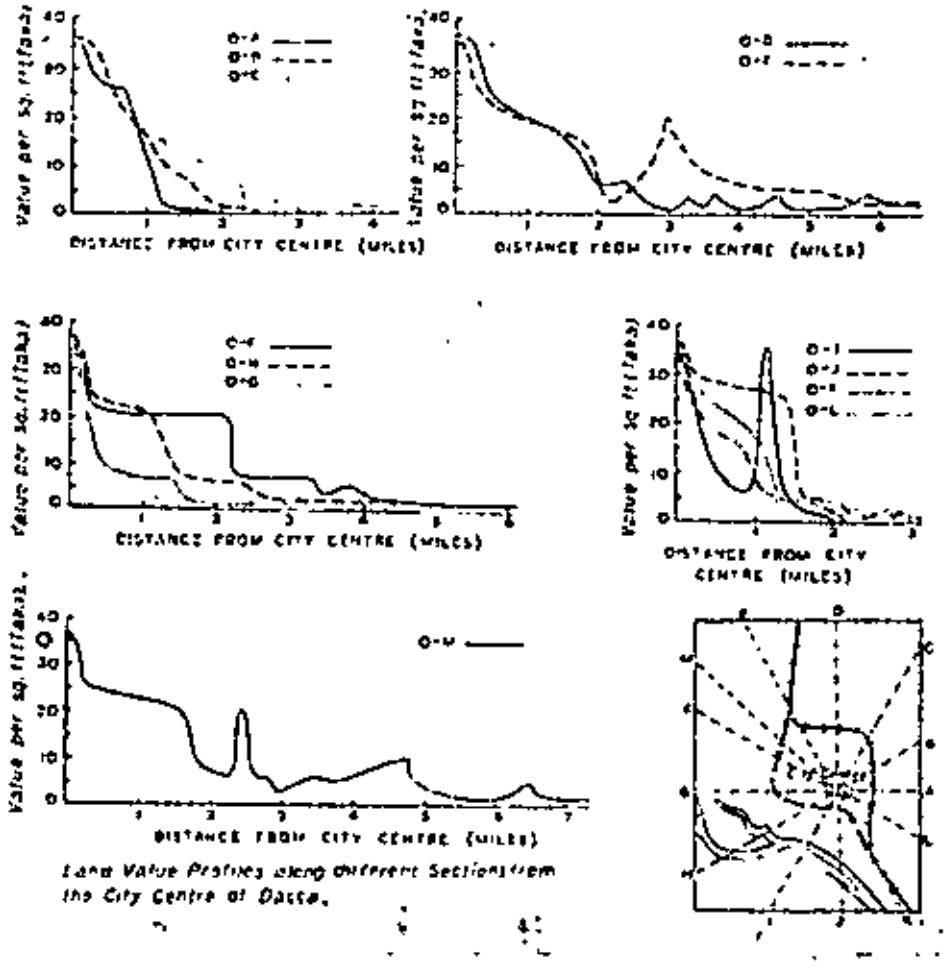
(We) can compare Motijheel and Islampur in the case of commercial area and Gulshan and Mirpur in the case of residential area. In Motijheel the commercial plots are larger than Islampur and in Gulshan the residential plots are larger and the value also differs accordingly. Fig. 3.5.2 shows it clearly. One kata (720 sq.ft) plot costs about Tk. 60,000.00 at Motijheel; Tk. 40,000.00 at Islampur; Tk. 30,000.00 at Gulshan and Tk. 10,000.00 at Mirpur.

vi. Effect of Planning

The effect of planning is also a strong factor in determining the land value. A new planning proposal increases the land values of that area. For example, land values of the two sides of "Rampura-Buddha" road increased about 40% with the new road proposal of Rampura-Buddha-Gulshan.

Mr. Amanat-ullah-Khan drew some land value profiles for Dacca city (in 1970 price) in different directions which is given here (Fig.3.5.1) to see the trend. Of course land prices are now increased much due to inflation of money. After analysing the profiles he found the following characteristics[1].

Source: 1. Khan, A.M.A. Amanatullah, "Land value patterns in Dacca city" Oriental Geographer, Vol.19 and 20 Jan-Jul, 1975-76.



Land Value Profiles along different Sections from the City Centre of Dacca.

Land value profiles (Dacca City)

FIG—3.5.1

SOURCE : IBID, KHAN

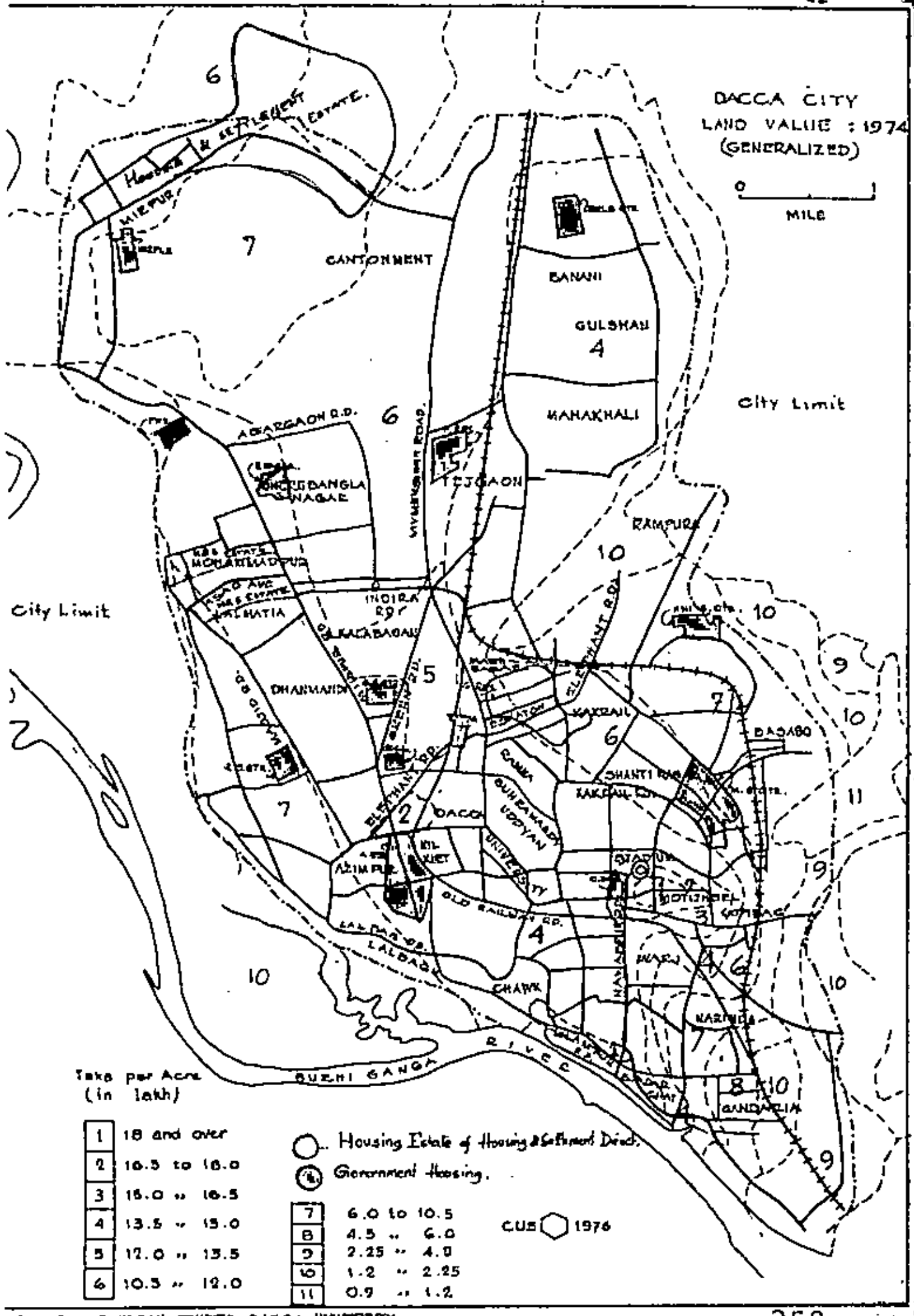


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FIG -3.5.2

1. "It has two peak value zones at Motijheel and Eskaton.

2. The long indentations of the surrounding low lying area present low values.

3. Low land values are encountered in all directions within a short distance from the city centre excepting the northern sector.

4. Planned commercial areas rise abruptly as high value areas.

5. Planned residential neighbourhoods show uniform values.

6. The most highly valued residential lands lie between section OA and OE".

Fig. 3.5.2 shows the generalized land value (1974) of Dacca city. The respective contour line shows the respective area of same value.

The land values of the following areas are given below:-

Area	Land value per acre (Tk. in lac)	
	1974+	1978*
Motijheel, Stadium areas	15 to 18	30 to 40
Wari, Wilkhet, Ramna	15 to 16	25 to 30
Newabpur Chawkbazar Sadarghat	13 to 15	20 to 25
Kalabagan Green Road	12 to 13.5	15 to 20
Sher-e-Bangla Nagar	10.5 to 12	15 to 20
Part of Mirpur Cantonment, Mohammadpur	6 to 10.5	10 to 20
Ganderia	1.2 to 6	6 to 12

+ From Fig. 3.5.2 : * Estimated from duscussions with the local people.

Land value can also be guessed from house rent pattern of the city. Fig. 3.5.2(B) shows the generalized house rent (1974) pattern of Dacca city. The inflow of money from the middle-east is the principal cause of the rapid rise in land value.

Land value increases due to land speculation. Land speculation is possible because,

1. Under the pressure of urbanization, demand for land grows faster than supply.

2. There is uncertainity as to where (and when) urban land development will take place.

The speculator may obstruct development and increase costs by buying land ahead of urban development, with holding the land until the price is right and then selling it.

Rise of land values due to land speculation, can be arrested by:

1. Lowering capital gains tax

Lowering of capital gains tax on land would reduce speculation by reducing profits and returning those profits to the communities responsible for them.

2. Reduction of uncertainity surrounding development can be achieved by, for example, providing information about land use trends, construction trends, economic/population growth to all possible investors.

Low lands can be developed by earth filling or constructing embankment with pumping system (as discussed in detail at section 3.2) for residential development.

The cost of earth filling (Mechanical) is Tk. 600.00 per 1000 cft. But the most important thing is that the lower income group of people can not even afford the land cost and not to speak of the overall construction cost of the building.

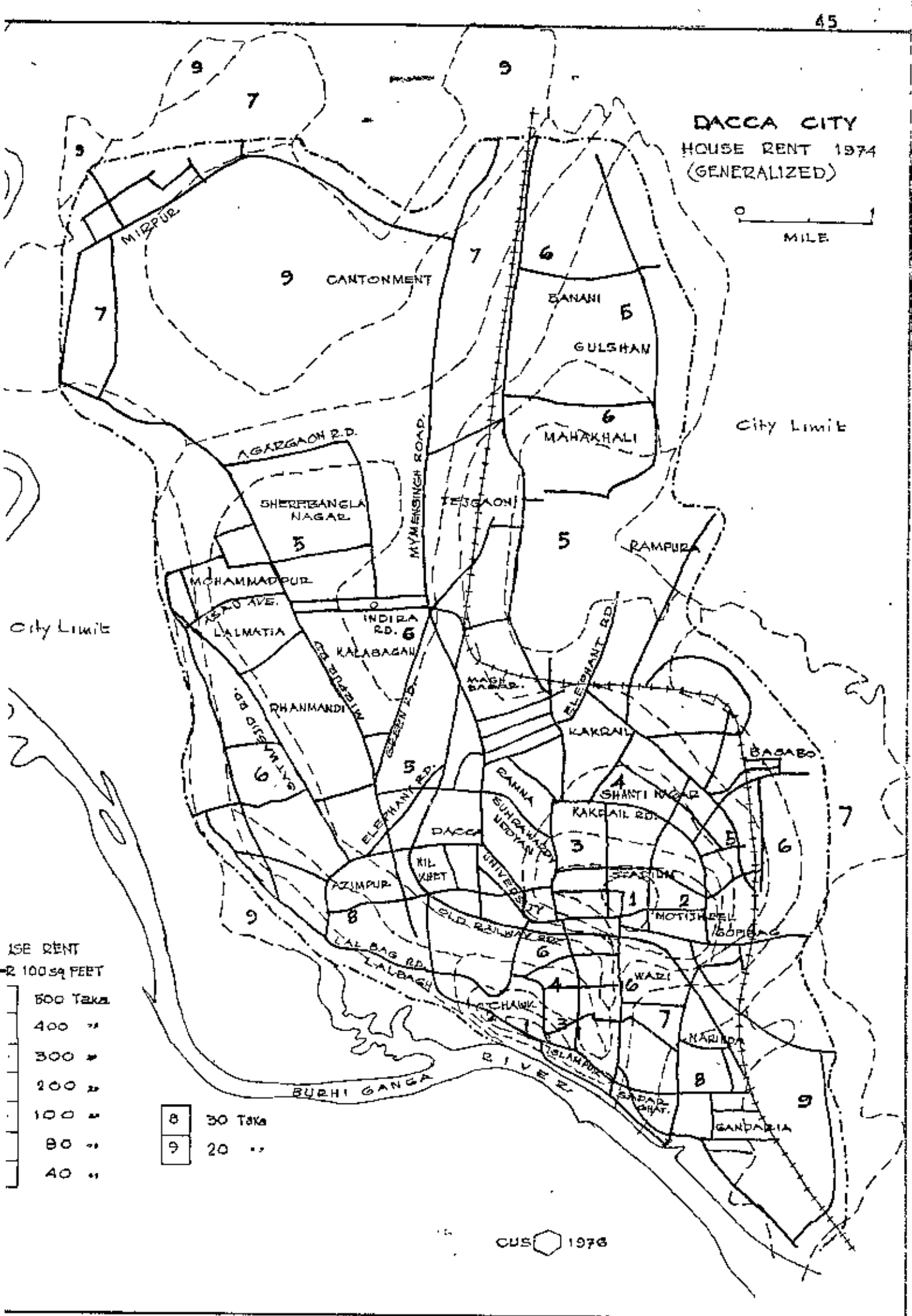

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FIG – 3.5.2.B

If Tk. 10.00 lacs (Tk. 1 Million) per acre is supposed to be the land value, (including filling cost), the cost per sq.ft. of land become Tk. 23.00.

Even for a space of 200 sq. ft. with simple interest rate of even 8% per annum for 15 years, one is to repay Tk. 56.22 per month which is too much for the lower income group of people whose earnings are, say Tk. 300.00 per month. If construction cost of the structure is included, it will increase further.

4. EMPIRICAL ANALYSIS AND DISCUSSION

4.1 Introduction

4.2 Present Technology and Building materials in Bangladesh

4.3 Residential density

High Population densities in relation to social behavior

4.4 Low-rise construction — its advantages and disadvantages

4.5 High-rise construction — its advantages and disadvantages

Multi-storied flats in Bangladesh — a step towards private sector

4.6 Housing codes and Minimum Standards

4.7 Analysis of the projects studied

CHAPTER 4
EMPIRICAL ANALYSIS AND DISCUSSION

4.1. Introduction

The subject of housing is vast. Technical solutions to any problem of housing are also diverse. The present technology applied as well as building materials in housing construction in Bangladesh are discussed in this chapter to give an idea on housing construction procedure as well as building materials so that comparative costs of the different materials can be visualized in minimising cost.

The effect of high population densities, particularly high density in a room is very significant on social behaviour. So it is also discussed in this chapter.

Low-rise as well as high-rise construction with its advantages and disadvantages is also discussed with experiences of other countries, which is the burning issue regarding land saving and minimisation of cost.

Housing codes and standards are also discussed so that minimum level of construction procedure can be adopted in order to minimise the cost.

4.2 Present Technology and Building Materials in Bangladesh

Reinforced concrete is the normal construction material used in public housing in Bangladesh. If a building is constructed upto 5 storied, load bearing wall (brick) type construction procedure is followed. If it is constructed above five storied, reinforced concrete frame structures are used. No pre-cast or pre-stressed concrete is used. Sometimes mechanical vibrators are used.

But the middle and the low class groups cannot afford to build a pucca (see the Glossary) house due to high rise in price of materials, so the technology they follow is different. They use straw, bamboo, tiles, corrugated iron sheet, mud, etc. as their building materials.

Factors affecting choice

The factors affecting choice of building materials are:-

(a) Availability : Considering quality, quantity and good condition, one is to choose the alternative building materials.

(b) Previous experience with the materials : Previous experience with the materials saves labour on site, economic in use of materials and helps in speeding up of the building process.

(c) Site location : If the location of the site is not easy accessible and nearer, the choice may vary considering the breakage or other misuse of the materials.

(d) The availability and ability of local labour : If the building material is a newly introduced one, the skilled labours may not be available. So the choice may very with the ability of local labours.

(e) Cost(including local taxes and transport costs) : The builders are likely to choose the materials with quality as well as minimum cost.

(f) Contract methods : Contractors may submit tenders for different materials differently stretching over a price range and so the question of alternative choice arises.

(g) Appearance(Aesthetic, external beauty) : Colour and texture will effect the builders choice together with the overall character of the material.

(h) Availability and quality of supervision: : The lack of effective supervision may limit the design of the house with a particular material.

(i) Durability and climatic conditions: The builders will choose the materials which are durable and resistant to climatic conditions.

(j) Height : If the developer wishes to construct a one-storied house, he may use corrugated iron sheet as roof material, bamboo as wall material or a building. But if it is a multi-storied house, naturally he may choose a building.

Advantages and Disadvantages of some commonly used Roof Materials in Bangladesh

Advantages and disadvantages of some commonly used roof coverings in Bangladesh are given below:

1. Reinforced Concrete Slab: It is a good roof material and it lasts long. But it is costly and heavy in weight leading to extra foundation cost. It requires expert design and supervision in casting.

2. Corrugated Iron Sheet: It is comparatively light and easy to handle and also salvageable after hurricanes. But it corrodes fairly rapidly in humid climate. It is very hot to live under it.

3. Corrugated Asbestos Sheet: It is light and cool to live under. It is relatively cheap and easy to handle. But it is brittle and may crack. Added organic fibers can increase its resistance against brittleness. It has low resistance to impact.

4. Clay Tiles: It has less deterioration. It is also cheaper and aesthetically pleasing. But its manufacture must be under skilled supervision so that under-burning may be avoided. Considerable labour cost is associated in fixing. Vibration in hurricane winds may cause cracking.

5. Thatch: It is a local material. It can be simply and speedily erected and repaired. But there is the risk of fire. It can become infested with insects and vermin. It requires constant maintenance and its deterioration in many areas is rapid due to heavy rain.

Among the roof materials that are discussed here, Bangladesh is to import cement, Corrugated Iron sheet and Asbestos and it involves huge foreign currency. Local building material - bamboo can be used in wall and clay tiles in roof to minimise the cost of shelters particularly for low-income group of people.

Rates (Prices) of Building Materials

The prices of building materials have increased so much since liberation (1971) that it is quite impossible for the low-income group of people to construct a building. The prices of sand, cement and mild steel rod were not high before liberation of Bangladesh but after liberation the prices jumped suddenly due to the devaluation of taka. The prices of building materials increased more than 600 per cent by 10 years from 1968 to 1978. Table 4.2.3 shows the 10 years Government rate of building materials with percentage increase from base year (1968) and Fig. 4.2.1 shows the percentage increase in bar chart. The value of one U.S. Dollar equivalent taka from 1972 to 1978 is given

in Table 4.2.2 in connection with it to show the devaluation of take due to which the prices increased significantly. The income of the people is not increased much - it increased bout 10 to 15 per cent roughly. The prices of other commodities increased by about 4 to 5 times.

TABLE 4.2.2 U.S. $ -TK. EXCHANGE RATE (1972-78)[1]

Period	Official	Unofficial
	($ 1.00 = Tk.)	
December 1972	Tk. 8.0782	Not available
" 73	" 8.1617	"
" 74	" 7.9534	Tk. 20.00
" 75	" 14.9436	" 22.00
" 76	" 14.7794	Not available
" 77	" 15.1104	Tk. 24.00
June 78	" 15.0053	" 22.00
16th Nov. 78	" 15.4900	" 24.00

Government rates of some of the major Building materials on which Government projects are going on are given ~~below~~ in the Table 4.2.3. (for last 10 years from January, 1968 - Nov.1978) to show the rapid increase in prices particularly after liberation of Bangladesh. Fig. 4.2.1 shows the percentage increase of building materials in 10 years from 1968 to 1978.

Source: 1. Bangladesh Bank, Government of Bangladesh.

TABLE - 4.2.3 RATE OF SOME OF THE MAJOR BUILDING MATERIALS (JANUARY, 1968 - NOVEMBER, 1978)[1]

Sl.No.	Description of items	Unit of rate	For all districts except Barisal and Patuakhali: 1 Jan. 1968 - 14 Sept. 1973 (In Tk.)	15 Sept. 1973 - 14 Dec. 1975 (IN Tk.)	% increase	15 Dec. 1975 - Nov. 1978 (In Tk.)	(On going) % increase in 10 years
1	2	3	4	5	6	7	8
1.	1st class bricks or picked jhama	per 1000 Nos.	110.00	250.00	227.27	650.00	590.90
2.	1st class or picked jhama bats	100 cft	93.50	212.50	227.27	552.50	590.90
3.	Cement	per bag(1 cwt)	11.00	55.00	500.00	70.00	636.36
4.	M.S.rod/sections	per cwt (per ton)	80.00 (1600.00)	300.00 (6000 .00)	375.00	375.00 (7500.00)	468.75
5.	Sand (best local) F.M.-1.8	100 cft	50.00	120.00	240.00	150.00	300.00
6.	C.I. sheet (24 SWG)	1 bundle(2 cwt) (per ton)	220.00 (2200.00)	450.00 (4500.00)	204.54	1000.00 (10000.00)	454.54

Source: 1. Documents of Public Works Department, Government of Bangladesh and Government of Pakistan.

TABLE - 4.2.3 (CONTINUED)

1	2	3	4	5	6	7	8
7.	Burma teak wood	per cft	50.00	120.00	240.00	300.00	600.00
8.	Chittagong teak wood	per cft	60.00	80.00	133.33	200.00	333.33
9.	Sal, Jarul, Telsu, Silkari wood	"	50.00	70.00	140.00	90.00	180.00
10.	Kathal, Jam, Garjan, Sundari wood	"	40.00	50.00	125.00	70.00	175.00
11.	Gemar, Teak, Chambal, Chaplish wood	"	50.00	60.00	120.00	100.00	200.00
12.	Oil bound distemper (paint)	per gallon	55.00	150.00	272.72	222.00	403.63

Percentage increase of Building materials (1968-74-78)

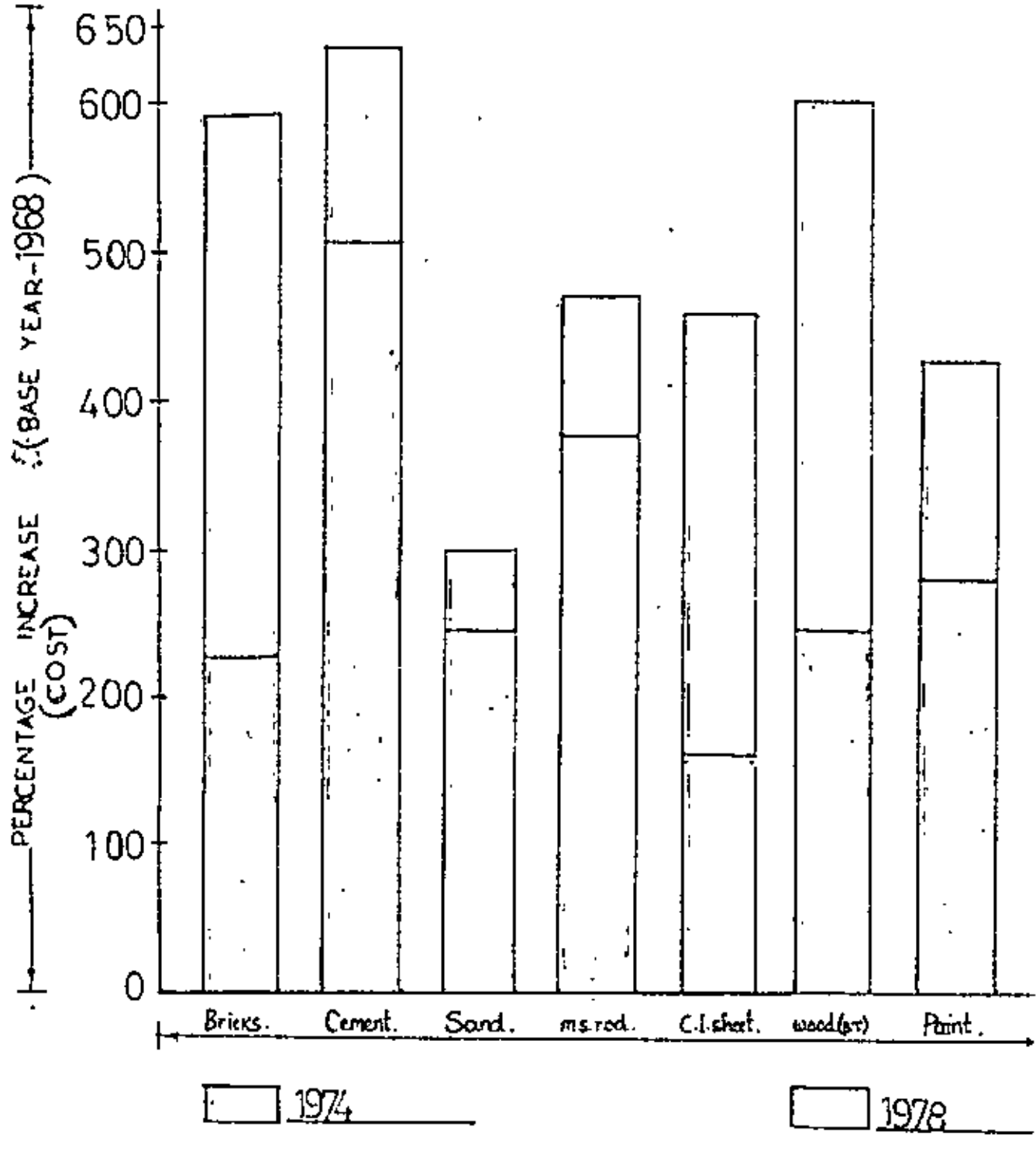

FIG — 4.2.1

SOURCE : PUBLIC WORKS DEPARTMENT.

4.3 Residential Density

Residential density should be such that human comfort and welfare in that particular area can be maintained. The residential area should be free from noise, congestion on roads etc.

The density of the people should be such that other provisions such as place of employment, schools, shops, open spaces etc may be of the required amount.

The measurement and control of density for this reason is essential.

Residential density can be measured in terms of houses per acre, habitable rooms per acre and persons per acre.

"The land included in the density calculation may be the whole area of the town, in which case the resulting density is usually called 'overall density', the whole of the land in a predominantly residential area, known as "gross neighbourhood density", or the land included in house plots, known as 'net residential density"[1]

Rolf Jensen in 'High Density Living' defines net residential as "the number of persons accommodated on a given site which will usually include a part of any perimeter roads"[2]

Houses per acre, is not a satisfactory measure of density because houses may vary between the two-room cottage and the twenty-room mansion etc.

Again density measured by 'occupancy rate' or number of persons per habitable room is not an exact measurement because "it fails to take account of the sizes of rooms, which may materially affect the number of persons who can live comfortably in a house"[3].

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1. Keeble, Lewis, "Principles and Practice of Town and Country Planning' The Estate Gazette Ltd., London 1969, p-143.
2. Rolf. Jensen, "High Density Living", Leonard Hill, London, 1966, p-15.
3. Ibid, Keeble, p-143.

so, to measure the density as persons per acre is the suitable method, Keeble concludes.

Very low-intensity sub-urban development, say 4½ houses to the acre, (say 16 persons to the acre), means large investment for roads and utilities, long travel distances to commercial and civic centers and to work, the latter almost entirely by car. Very low density means long travel distances for workers. Bangladesh, being one of the densely populated countries, very-low intensity development should not be done here.

The upper limit of density is set by the problems of congestion in central city areas. Zoning regulations often set this upper limit. The lower limit is set by municipalities which some times desire to attract the wealthy and exclude the poor.

High Population Densities in Relation to Social Behavior

The effect of high population densities, perticularly high density in a room is very significant on social behavior. It is observed that airborne infection, tension, anxiety, aggressiveness etc. develop much in crowded areas.

"In the American studies the crowded areas had the highest rates of adult crime, prostitution, illegitimacy, infant mortality, tubereulosis, broken families, non-family living arrangements and population turnover"[1].

From the visual observations it can be said that the rate of adult crime is more in Battapara and Demra squatter resettlement areas in Bangladesh.

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1. Wedin, C.S. and Nygren, L.G. "Introduction to Family housing" 2nd Edition, 1975, p-89.

Wadin and Nygren quoted,

> "We already know that if our populations go on increasing at their present rate, uncontrollable aggressiveness will become dramatically increased. This has been proved conclusively by laboratory experiments. Gross overcrowding will produce social stresses and tensions that will shatter our community organisations long before it starves us to death..." [1].

In Bangladesh, in planning squatter resettlement projects at Mirpur, 9 ft by 10 ft i.e. 90 sq.ft hut provision is kept for each family. The same effect of overcrowding may also happen here. In designing buildings for low-paid employees, room dimensions should be fixed in accordance with the minimum space standard to avoid such overcrowding.

4.4 Low-rise Construction - its Advantages and Disadvantages

By low rise construction, it will mean the buildings upto five storied for which load bearing wall (brick) type construction is sufficient and no Reinforced concrete frame structural construction is necessary. Moreover upto five storied it is assumed that a lift is unnecessary, even though in developed countries a lift is generally required for buildings with more than three stories. Some may argue for 6 storied walk-up buildings as low-rise but it is too much for the 5th floor dwellers to climb up and down with their children without a lift.

In Honkong, the resettlement blocks in low-income areas are 6 to 7 stories with a lift. In Bangladesh 6 storied buildings are constructed at Daily road, Dacca, without a lift because it involves scarce foreign exchange to import lift. However, it has both advantages and disadvantages.

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1. Wadin, C.S. and Nygren, L.G. "Introduction to Family Housing" 2nd Edition, 1975, p-89.

Houses with gardens provide:

1. Safe and private areas for play
2. Space for erection of storage sheds
3. Better spaces for clothes drying and domestic cleaning
4. Areas for gradening including cultivation of crops which add to the family income,
5. Space for other outside activities
6. More privacy
7. Cheaper foundation cost than high rise buildings.

Moreover, no lift cost is required which amounts to 4 to 5 percent (approx.) of the construction cost of the building, etc.

But as the expension is horizontal, houses with gardens require more land and the cost of garden per sq.ft becomes about Tk.40.00 to Tk. 70.00 depending on land value.

Low-rise experience of other countries may help in realising its advantages and disadvantages.

In England and Wales the overall percentages of houses and flats from 1945 to 1975 were houses 65% and flats 35%. Enquires among men and women serving in the 1939-45 war showed a 95%to 98% preference for houses. Very few surveys have shown a preference of less than 90%[1].

Osborn and Whittick wrote, "It should not be supposed that the preference for houses on the ground is a British pecularity. Research study in France in the sixties showed that 85% of flat dwellers regard a pavillion,private garden space as their ideal, even though many of them saw no hope of attaining it. Our own experience convince us that the same is true of the great majority in all European countries, in North America, in Australia and in Japan"[2]

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1. Osborn, F.J and Whittick, A. "New Towns - Their origin, Achievements and Progress," Leonard Hill, London, 1977,p-13.
2. Ibid.

4.5 High-rise Construction - its Advantages and Disadvantages

In this study, "high-rise" refers to six storied buildings and above, therefore necessiteting a lift, and requiring reinforced concrete frame-structured construction.

It also has advantages and disadvantages. The primary advantage is:less land is required in comparison to low-rise buildings to provide higher density.

But the disadvantages are:

1. The cost of the foundation as well as super structure are much larger due to the combined footing, pile foundation and the frame-structured construction etc.

2. Requirements of equipment which are not normal in low buildings such as:

   (a) refuse disposal equipment
   (b) fire hydrants
   (c) In some cases mechanical ventilation equipments
   (d) Lifts etc.

3. Evidance suggests that the maintenance costs will be higher on the tall buildings for

   (a) the maintenance and repair of lifts
   (b) mechanical ventilation
   (c) vaccum cleaning system, if any,
   (d) possible refuse disposal and laundry equipment, if any
   (e) cleaning of the common parts of building

4. Social problems include:

   (a) lack of privacy due to form of access
   (b) exposure of tenants and visitors to noise, traffic disturbance and weather as with the access balcony
   (c) lack of childrens' play space
   (d) in the case of frequent power failure, which is the norm in Bangladesh, reliance on lifts presents obvious difficulties.

5. Special arrangements will be required for:

(a) sanitation, plumbing and water supply
(b) electrical installation
(c) refuse disposal system
(d) telephone and TV installation
(e) fire protection etc.

A brief look at the experience of other countries with high-rise building may help in realising its advantages and disadvantages.

In Stockholm, it was reported in 1973, there were 25000 empty flats in the famous new suburbs and in the USA crimes of violence are many times more in high-rise than in low-rise dwellings[1].

Osborn and Whittick quoted the writing of the eminent Greek architect Dr. Constantine Doxiadis,

> "We are committing architectural crimes ..... High-rise buildings work against Nature, by spoiling the landscape; against Man, especially children, against society ...."[2] .

Moreover, C.G. Wedin and L.G. Nygren wrote,

> "High-rise structure in center cities where land cost is high, provide more living space on a given area of ground. To date, high-rise living has suffered from a series of problems; namely, excessive noise from waste disposal, laundry, stair way structure and maintenance, elevators and auto parking. A more personal problem is the provision of play space for children and furnishing toilets for their use at ground level"[3].

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1. Ibid, Osborn and Whittick, p. 112.
2. Ibid.
3. Ibid, Wedin and Nygren, p-84.

Multi-storied Flats in Bangladesh - a Step Towards Private Sector

In 1977, the Government of Bangladesh took steps to encourage people at private sector to construct multi-storied buildings (4 storied) at Mohammadpur and Mirpur area. The Housing and Settlement Directorate has been selling plots for such purpose on co-operative basis. The land price was fixed at the rate of 2 lacs per bigha at Mirpur and 2½ lacs* per bigha at Mohammadpur. The plot sizes were 5 katas+, 10 katas, and 1 bigh. The buildings are to be constructed 4 storied and 4 persons together are to form a co-operative.

House building and Finance Corporation (HBFC) agreed to give loans on simple interest basis at the rate of only 5 percent to construct the building. The loan is to be repaid after 25 years. The amount of the loan will be given at 95% of the construction cost of building against land upto 800 sq.ft. and 90% of construction cost of building against land upto 1500 sq.ft. This loan is to be sanctioned for 4 storied (minimum) self-sufficient flats in Dacca, Narayanganj, Chittagong and Khulna and 3 storied self sufficient flats (minimum) for other towns.

But the response was not very satisfactory. The comments of the persons who were interested to build were that the net income from the flat per annum would be negligible after deducting corporations loan, holding and conservancy tax of the Paurashava etc.[1]. Moreover, after 5 years, capital gains tax would be imposed on it. These are the reasons for their dis-encouragement.

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1. "Bahutala Flat Nirman Shamassha"
   The Daily "Dainik Bangla", 28th July issue, 1977.

* + Lacs, Kata, Bigha - please see Glossary.

A rough estimate of the cost and potential return from each storey under the possession of each person of the co-operative is made below.

(a) Considering 5 katas[+] plot
i.e. 720x5 = 3600 sq. ft.

Let the floor space of the building in one storey = 1000 sq.ft

(b) Land cost @ Tk. 2 lacs/bigha[*] = Tk. 50,000.00 for 5 katas

(i) Therefore land cost/shear for each person = Tk.50,000÷4
= Tk.12,500.00

(ii) Construction cost @ Tk.130.00/sq ft[++]
of floor space for 1000 sq.ft.
= 1000x130 = Tk.1,30,00.00

Total =Tk.1,42,500.00

(c) Assuming loan = 90% of the construction cost from the House Building Finance Corporation for 25 years at 5% interest.

(d) So, deducting 10% equity i.e Tk. 142,500.00x0.10=Tk.1,42,50.00
the present principal cost becomes = Tk. 1,28,250.00

(e) Now the constant payment can be calculated by the formula,

$$R = \frac{rP}{1 - \frac{1}{(1+r)^t}}$$

where R = end of period payment
r = rate of interest
P = present sum of money
and t = number of interest period

+ 1 kata = 720 sq.ft.

* 1 bigha = 1/3 acre

++ Assuming Public Works Department's schedule Government of Bangladesh.

(f) At 5% interest for 25 years,

$$\text{Monthly payment} = \frac{\frac{0.05}{12} \times 128250}{1 - \frac{1}{(1+\frac{0.05}{12})^{300}}}$$

$$= 0.0058459 \times 128250$$

$$= \text{Tk. } 749.73$$

Say, Tk. 750.00/month.

(g) House rent for 1000 sq.ft dwelling unit at Mirpur can be expected = Tk. 1000.00 per month.

So, deducting monthly payment and various forms of taxes, the profit may be substantial.

Construction of multi-storied flats even at a concessional rate may not gain a momentum due to the following reasons[1] -

(i) Construction is not being considered profitable by private developers (after the subtraction of repayment instolment of the corporation and various taxes on housing very little remains as income).

(Of course, capital appreciation on property, especially in a country with high inflation would make this a good investment).

(ii) Loanees are required to investment 10% of the total cost of the Building before obtaining the loan. For a middle income family this 10% cost of a multistoried flat (minimum 4-storey) is too much to invest.

(iii) People of our country (especially the lower income groups) do not like to go into heavy debts. Perhaps they do not like it, but it often happens.

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1. Ibid, Quium, p-38.

(iv) Construction of a multistoried building for people out of the building profession, by individual effort is very difficult.

(v) Renting out of flats is a must for the loanee. But many people do not like the bitter job of housing management. People generally want to construct a house for his own living".

4.6 Housing Codes and Minimum Standards

In many developing countries, density is largely determined by housing codes and by-laws. In Bangladesh, at present no housing codes exist. This thesis is primarily concerned with the areas covered in point-3 as discussed below.

Housing Codes

A housing code is an "application of state police power put into effect by a local ordinance setting the minimum for safety, health and welfare of the occupants of housing"[1]. It covers the three main areas:

1. The supplied facilities in the structure, that is toilet, bath, sink, etc. supplied by the owner.

2. The level of maintenance, which includes both structural and sanitary maintenance, leaks in the roof, broken banisters, cracks in the walls etc.

3. Occupancy, which concerns the size of dwelling units and of rooms of different types, the no. of people who can occupy them and other issues concerned on the whole with the usability and amenity interior space"[2].

Only recently Government of Bangladesh formed a committee to formulate the building codes to the context of Bangladesh.

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1. Weding, C.S. and Nygren, L.G., "Introduction to Family Housing", 2nd Edition, p-34.

2. Ibid.

In low-cost public housing the bed room size is kept 10'x10' (minimum) in Bangladesh[1].

Regarding the use of land in relation to building height, coverage and housing density, no attempt has yet been made in Bangladesh to find out the exact spacing between the buildings. Though in the Western countries, attempts have been made by a few persons (such as Walter Segal, P.A. Stone) to theoretically determine the spaces between buildings considering daylight angle (see Appendix-1) in Winter Solstice. But it has the limitations in practical applicability and it is not representative.

As Bangladesh also has not yet developed any standard of spacing between the buildings, considering the privacy and wind, it keeps 1½ times spacing[2](minimum) between the buildings in public housing projects.

So, in the later chapter, the projects are analysed in accordance with the normal practice of keeping spaces between the buildings in Bangladesh.

Minimum Standards

Bangladesh has not yet developed her minimum housing standards. However, existing floor space, its demand and need for the rational standard is discussed in the next chapter (Chapter-5). The minimum standards of the Latin America, Caribbean Area and United States for the low cost housing (for low income group of people) is given in the Appendix-8.

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1. Mohammad, G., Deputy Chief Architect, Housing and Settlement Directorate, Government of Bangladesh.
2. Ibid.

These standards are not the "desireble standards", but rather are intended to meet only the minimum basic needs of families of low income. Their purpose is, however, to provide these families with a dwelling which is structurally safe, reasonably durable and which will not require excessive maintenance or repair during the life of the mortgage. They are also intended to provide a decent, environment and to serve as a guide to improving, at least on a temporary basis, sub-standard areas which lack even the minimum of amenities[1]

Application

The types of projects or dwellings to which these minimum standards apply include the following.

(a) Upgrading of squatter areas and controlled squatter development projects.

(b) Single family detached, semi-detached or row house projects.

(c) Multi-family dwellings.

Different types of housing standards are discussed in the Appendix-8.

4.7 Analysis of the projects is made in the following way:

1. Building coverage = $\frac{\text{building area} \times 100}{\text{Total plot area}}$

= (in percent)

2. Total cost of development = total land cost + total construction costs

(including all ancillary facilities)

3. Total cost/sft of floor space = $\frac{\text{total cost of one dwelling unit}}{\text{total floor space}}$

4. Net density provided = $\frac{\text{total family accommodated} \times 6}{\text{total plot areas (in acres)}}$

= persons/acre (assumed 6 persons/family)

Example of computation of one analysis (Project-2)is shown in Appendix-5.

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1. Agency for International Development,"Proposed Minimum Standards" Ideas and Methods exchange No.64,1975,p-6.

5. GENERAL OBSERVATIONS AND FINDINGS

5.1 Project Findings - Discussion

5.2 Existing Floor Space in Dacca

5.3 Demand of Additional Floor Space

CHAPTER 5
GENERAL OBSERVATIONS AND FINDINGS

5.1 Project Findings - Discussion

All the projects are analysed in accordance with the current price level (1978) at market price. Though Project 3 and Project 5 were completed earlier in 1972-73 and 1974-75 respectively, the costs of the respective projects have been converted to 1978 price level using increased costs of the building materials, the computation sheets are attached with the respective project (Appendix-7).

Three one storied projects (two semi-pucca i.e C.I sheet roofing on brick wall and one C.I. sheet roofing with bamboo-made wall (Project 1) and pucca floor); one 4 storied; one 5 storied; 4 six storied and one 15 storied project are analysed for a total member of projects of ten.

Table 5.1.1 shows the synopsis of the analyses of the projects. It shows that total number of units are different in different projects and also the floor space per unit is also different but the family accommodated per unit is assumed to be of national average-sized each i.e 6 members in each family in each unit. So, for the sake of comparing the costs of the different types of projects, the costs are converted to unity. i.e the total costs (land cost plus construction cost) are analysed to cost per sq.ft of floor space per housing unit.

Total land studied in different projects are different and the land prices are also different. In some projects substantial land fill required while other projects were built on high land. Land prices of course, varied with the location. (Land value pattern of Dacca city is discussed in detail in Chapter-3).

In Bangladesh, spacing between buildings are maintained 1½ times of building height (minimum) considering privacy and wind. So, with this Bangladesh standard of spacing, alternative development costs comparison against land saving is made later on.

TABLE 5.1.1 SYNOPSIS OF THE ANALYSES OF THE PROJECTS INVESTIGATED

Project No.*	1	2	3	4	5	6	7	8	9	10	Total average
Storey	1	1	1	4	5	6	6	6	6	15	
Total no. of units	2660	1000	1124	480	120	504	204	624	92	44	6852
Persons provided in all units	15960	6000	6744	2880	720	3024	1224	3744	552	264	41112
Total land (acre)	19.78	11.02	15.79	17.38	2.00	10.66	2.67	12.00	2.67	0.98	94.87
Cost of Land+land dev.(Tk.in lacs)	44.43	23.02	94.74	109.88	60.00	170.56	80.10	120.00	80.10	29.40	812.23
Total construction cost(Tk. in lacs)	68.47	108.38	300.84	479.84	108.07	507.89	221.231	921.79	162.54	95.12	2974.17
Total (land + construction)cost (Tk. in lacs)	112.907	131.40	395.584	589.72	168.077	678.457	301.33	1041.79	242.64	124.52	3786.41

* Name of the projects are given in Section 1.3, p-4.

TABLE 5.1.1 (CONTINUED)

Project No.	1	2	3	4	5	6	7	8	9	10	Total/ average
Total cost per unit (Tk. in lacs)	0.04	0.13	0.35	1.22	1.40	1.34	1.47	1.66	2.63	2.83	1.30
Net floor space per unit (sq.ft)	90	210	560	550	560	450	489	550	858	858	517.5
Coverage (in %)	27.77	43.74	45.75	10.35	20.50	11.87	16.23	12.18	10.56	6.25	20.52
*Cost/sq.ft. of floor space (Tk.)	47.16	62.57	62.84	233.37	250.11	299.14	302.06	303.54	307.39	329.83	
Cost/sq.ft. of floor space (average)		57.52					303.03				
Net density per acre	807	545	428	167	360	284	459	312	207	270	383.9
Units/acre	134.5	90.74	71.18	27.74	60	47.27	76.40	52	34.45	44.9	
Floor area/acre (sft)	12105	19055	39860	15257	33600	21271	37359	28600	29558	38524	

* Cost at market price.

Source: Computed by the researcher.

Table 5.1.1 shows the coverage comparison. One storied houses show more coverage i.e 43.74% in Project 2 and 45.75% in Project 3 and gradually decreasing as the storey increased. The 6-storied buildings show the coverage 11.87%; 16.23%; 12.10%; and 10.56% i.e on average it is 12.69% and the 15-storied project uses only 6.25%. The coverage comparison of one, six and fifteen storied development is also shown in Table 5.1.2.

TABLE 5.1.2 COMPARISON OF 1, 6 AND 15 STORIED DEVELOPMENT

Storey	1	6	15
Coverage (%)	44.74 (avg.)	12.69(avg.)	6.25

Table 5.1.2 shows that

1. Site coverage decreases by 32.05% from 1 to 6 storey
2. Site coverage decreases by 6.44% from 6 to 15 storey.

Next let us examine density. It can be seen from Table 5.1.1 that one storied projects have the maximum net density per acre i.e. 807 persons, (Project 1) and 545 persons (Project 2). Of course the floor space provided in Project 1 and Project 2 are very low (only 90 sq.ft and 210 sft for 6 members) and below minimum standard (minimum standard is discussed in detail in section 4.6 and also in Appendix-8). But 6 and 15 storied projects show the higher density in terms of floor area.

High density may create many social problems as is discussed in section 4.3. All other projects (Table 5.1.1) show the reasonable net densities with respective floor space per dwelling unit.

Now the main point of discussion comes about cost and land saving. Table 5.1.3 shows the comparison of 1, 6 and 15 storied unit cost (cost per sft of floor space).

TABLE 5.1.3 COST COMPARISON OF 1, 6 AND 15 STORIED DEVELOPMENT

Storey	1	6	15
Cost/sft/of floor space (Tk.) (cost includes land + const. costs)	57.52 (avg.)	303.03 (avg.)	329.83

Also, Table 5.1.1 shows the cost trend of all the projects which shows that cost is gradually increasing with the increase of the storey and floor space of the dwelling unit.

Now regarding alternative type of development and land saving against increased costs of construction, let us provide the same number of people (say 1800) in three alternative types of developments separately i.e. in one six and fifteen storied building types; keeping constant location, land cost, floor area per unit (say 30'x25' i.e 750 sft) and average household size (6 persons). Then with the unit cost per sq. ft. of floor space obtained from analysis of the actual projects, it will be possible to determine how much land can be saved and how much will be the increased construction costs in alternative types of development in accordance with the Bangladesh standard of spacing between the buildings ($1\frac{1}{2}$ times (minimum) of the height of the building).

Land for roads or access lanes and other service facilities are assumed to be covered within the provision of space maintained between buildings at the rate of $1\frac{1}{2}$ times of the height of the building.

But this assumption is approximate for one and two-storied buildings as this provision will hardly cover the space for access roads in these cases and if it is measured strictly, the study will become very complex. So, analysis is made with above mentioned spacing in order to make a general comparison among the all types of developments. Of course higher density can be achieved in changing the orientation of the buildings even maintaining 1½ times spacing. Fig. 5.0 shows a type of lay-out with internal open space. The building-frontage is towards the surrounding 60 ft wide road. Total area is 250'x200' and the open space is 160'x120'. The coverage is about 38%. If, even 4-storied buildings are constructed with each 40' height, the road width will cover the 1½ times spacing, and in this case with road front-ward the buildings will be accommodated more.

Computation Procedure

A. Let a = storey-height
b = breadth
c = length of the building

So, 1. spacing = 1½a

2. Total plot area required for a building
= c(b + 1½x height) sq.ft. (see Fig. 5.1.0)

3. So, in one acre, the maximum dwelling units can be accommodated

$$= \frac{1 \text{ acre} \times 4840^{*} \times 9^{**}}{\text{total plot area (in sq.ft)}}$$

= (number of units)

---

* 1 acre = 4840 sq.yds.

** 1 sq.yard = 9 sq.ft.

4. So, total land required for 300 dwelling units

$$= \frac{300}{\text{no. of dwellings units that can be accommodated in one acre}}$$

= (total no. of acres)

B. Cost Computation

Say, cost of land/acre = X (Taka)

∴ Total cost of land = no. of acres × cost of land/acre

= no. of acres × X (Tk.)

Cost/sq.ft of floor space = y (Tk.)

∴ Cost of one dwelling unit = 750 y (Tk.)

(Total floor space as assumed earlier)

∴ Total construction cost of 300 dwelling units

= 300×750 × y (Tk.)

C. Increased Construction Cost

= Total construction cost of alternative type of development − total construction cost of 1 storied development.

D. Land saved in multistoried buildings

= Total land required in one storied development − total land required in alternative type of development

* Detail calculations are shown in the Appendix-5.

** Here, in computation (in Appendix-5) calculation is shown by assuming that land value is the same @ Tk.30 lacs/acre considering the development is done at the same location.

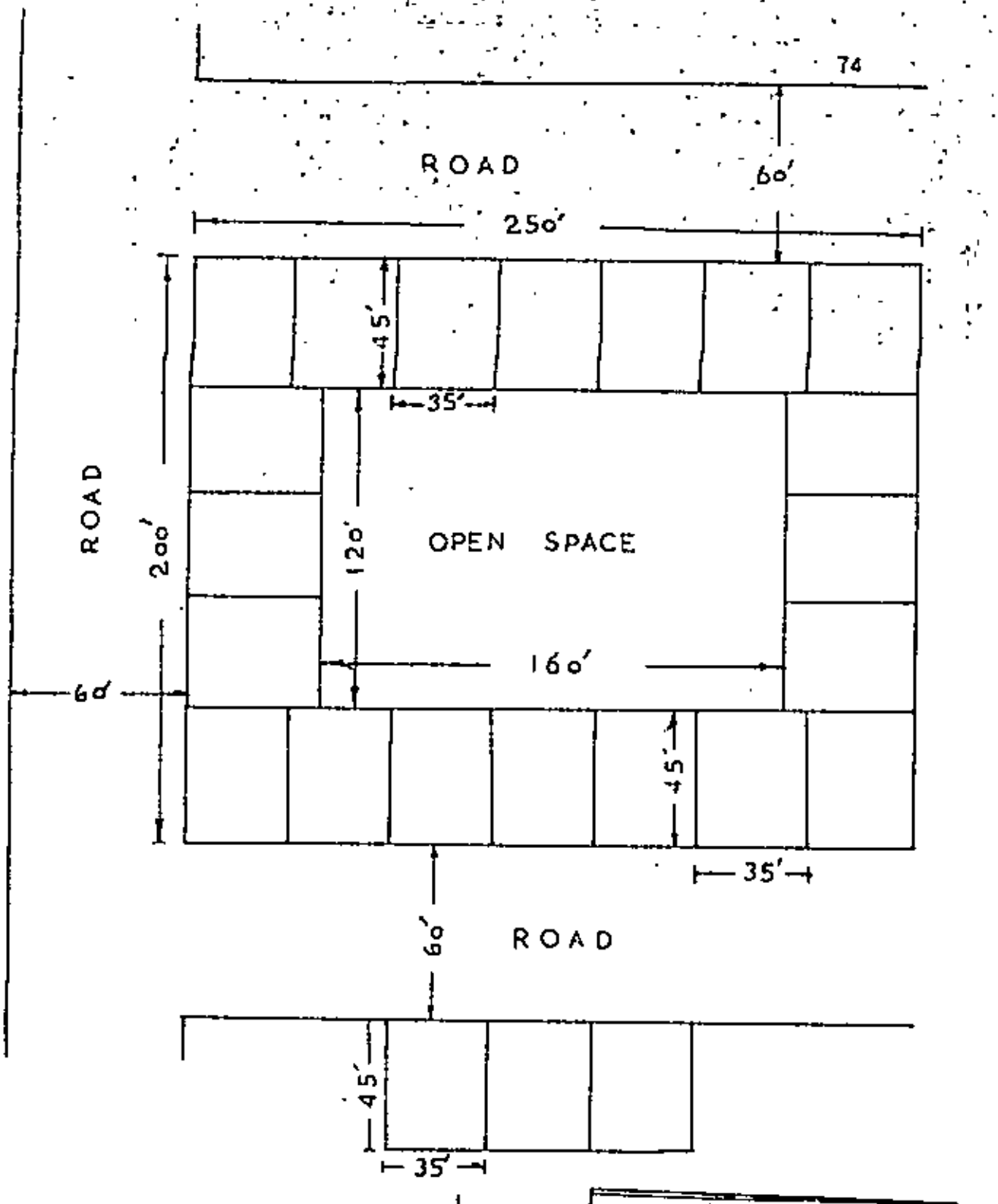

FIG-5.0 RELATION BETWEEN SITE AREA AND BUILDING HEIGHT

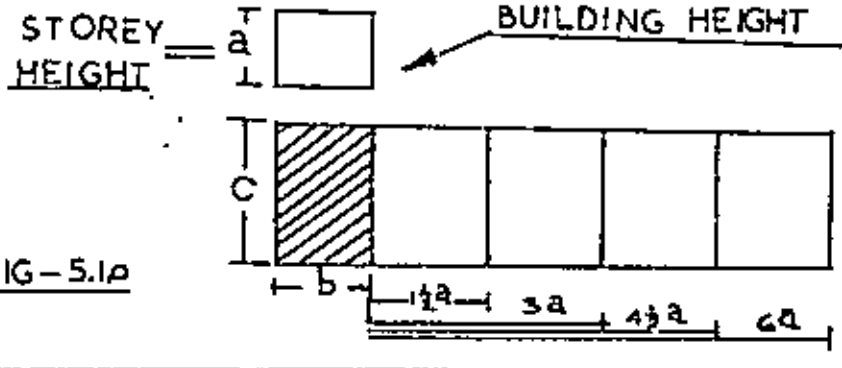

FIG-5.1b

But if it is to vary (as discussed in detail in section 3.5), the results will be obtained increasing (for higher value then the assumed rate @ 30 locs/acre)or decreasing (for lower value then the assumed), following the similar trend as revealed in the computations.

Table 5.1.4 and Table 5.1.5 shows the synopsis of the findings.

It can be seen what results other countries got in alternative cost calculations.

U.K. Example

F.J Osborn and A. Whittick wrote in their book "New Towns" (p-64) that "the Town and Country Planning Association (TCPA) in 1958 challenged the then Minister of Housing and Local Government (Lord Brooke) to have alternative costs figures examined. He accepted the challange, and the TCPA submitted calculations of the comparative public costs (in capital and subsidies) of providing 1000 dwellings of 850 sq.ft. of floor-space: (a) in 12-storey city flats at 40 an acre and (b) an acre and (b) half in a city of 20 an acre, and half in a new towns at 14 acre.

The alternative costs were shown to be:

for scheme (a) £ 18,09,000 and for

scheme (b) £ 6,44,000

Again on 15000 houses in a new town of 50,000 with (plus) 15,000 houses at low density in a city centre, (i.e total 30,000) asagainst 30,000 flats all in the centre, the saving would be £ 34,950,000"1.

---

1. Ibid, Osborn and Whittick, p-64.

TABLE 5.1.4: LAND REQUIREMENT AND CONSTRUCTION COSTS OF ALTERNATIVE TYPE OF DEVELOPMENTS: (FOR PROVIDING 1800 PEOPLE IN 300 DWELLING UNITS (EACH 750 SFT) WHERE LAND PRICE IS TK. 30 LACS PER ACRE)

Storey	1 (semi-pucca	4	5	6	15
Total land requirement (acre)	8.26	4.39	4.13	3.96	3.44
Total construction cost (Tk.in lacs)	129.42	502.58	562.74	681.81	742.11

Source: Computed by the researcher.

TABLE 5.1.5 LAND SAVING AND INCREASED COST OF CONSTRUCTION IN ALTERNATIVE DEVELOPMENTS FOR THE ABOVE CASE.

	If instead of 1-storied development - development is made as below (semi-pucca)			
Storey	4	5	6	15
Land saved (acre)	3.87 (46.85%)	4.13 (50%)	4.30(52.05%)	4.82(58.35%)
Cost of total land saved (Tk. in lacs)	116.10	123.90	129.00	144.60
Increased construction cost (Tk. in lacs)	373.16	433.32	552.39	612.69
Net loss per acre land saved (Tk. in lacs)	66.42	74.92	98.46	97.11
Net loss/acre land saved - its equivalent land that can be purchased(acre)	2.21	2.49	3.28	3.23

Instead of semi-pucca 1-storied, if 1-storied Bamboo made development is done: Tk. saved = Tk. 34,67,250.00 for the above 300 units

Source: Computed by the researcher.

5.2 Existing Floor Space of Residential Accommodation in Dacca

The total floor space used by a house-hold in 14 urban areas in Bangladesh has been calculated in an urban housing demand survey (1974) by Institute of Statistical Research and Training, University of Dacca. Dr. Mahbub-ud-din Ahmed, in that survey report, mentioned the following (Table -5.2.1) for Dacca[1].

TABLE - 5.2.1 EXISTING AVERAGE FLOOR SPACE (ALL ROOMS-COMBINED EXCLUDING THE DETACHED LATRINE AND KITCHEN) PER PERSON BY INCOME CLASS

Average floor space in sq. ft. of income class						
Low	Lower middle	Middle	Upper middle	Upper	Income Not Reporting	All class
32.08	43.93	57.59	86.37	77.34	82.20	47.93

Income classes and their relative sizes were calculated as shown in Table 5.2.2.

TABLE 5.2.2 INCOME CLASSES AND THEIR RELATIVE SIZES[2]

Class	Lower	Lower middle	Middle	Upper middle	Upper
Size (in %)	53.89	30.51	10.44	3.83	1.33
Annual income (Tk.)	upto 2399	2400-5999	6000-11999	12000-23999	24000 and above

1. Ahmed, Dr. Mahbub-ud-din "Urban Housing Demand Survey in Bangladesh", Institute of Statistical Research and Training, University of Dacca, 1974, p-39.

2. Ibid, p-40.25

Mr. M. Ahmed also calculated the average floor area for the income classes of all the 14 urban centres including Dacca as given in Table 5.2.3.

TABLE 5.2.3 AVERAGE FLOOR SPACE PER PERSON[1]

Income class	Low	Lower middle	Middle	Upper middle	Upper	All classes
Area (sq.ft.)	37.55	48.93	63.11	90.54	94.41	48.98

"The overall average floor area comes to 48.98 sq.ft. for Bangladesh towns whereas the British local authority houses per persons floor space is 100 sq.ft.* Even after making allowance for the external kitchen and w.c. it would not be wrong to suggest that on average Bangladesh urban houses in 1970 are atleast three times as crowded as the British local authority houses are. Even the richest urban people of Bangladesh live on average in half of the space of the British working class people accommodation in the local authority houses"[2].

5.3 Demand of Additional Floor Space

About 50% of the total households of Bangladesh urban areas informed the investigators that their present accommodation was not sufficient. The percentage of households stating to be in need of additional accommodation varied from area to area. But it was highest in Dacca (71%). The existing plus demanded space (called desired norm) is 80 sq.ft. for the entire urban area with variation between cities and towns. Chittagong city's desired norm averaged to 88 sft. Dacca and Mymensingh have the next lower norms about 84 sq.ft. The desired norm rises with rising household income except Mymensingh[3].

* The present day 5-person house built by local authorities averages about 900 sq.ft. in area, including the general stor. Sir Parker Morris Housing Committee report in 'Houses for To-day and To-morrow' - Department of Environments HMSO,1961,p-3

1. Ibid, p - 40
2. Ibid, Ahmed, p-40.
3. Ibid, Ahmed, p-46.

6. SUMMARY AND CONCLUSION

CHAPTER 6

6.1 Summary and Conclusion

The study was made on Dacca city regarding public residential development with different types of 10 Government housing projects to see what type of development saves land and minimise construction cost.

Out of 10 projects, three one-storied, one four storied; one five storied, four six storied and one fifteen storied projects are analysed.

The location, floor space, storey, dwelling units, coverage etc. of the different projects were different so all the costs (land plus construction costs) are analysed in terms of unit price, that is cost per sq.ft. of floor space.

Total land requirements for providing 1800 people in 300 dwelling units (each 750 sq.ft) were

8.26 acres for 1-storied type of development
4.39 acres for 4-storied
4.13 acres for 5 storied
4.96 acres for 6 storied, and
3.44 acres for 15 storied type of development. The building construction costs were, Tk. 129.42 lacs for 1-storied, Tk.502.58 lacs for 4-storied, Tk. 562.74 lacs for 5-storied, Tk.681.81 lacs for 6 storied, and Tk. 742.11 lacs for 15-storied type of development.

The land saving and increased cost of construction in alternative type of developments for the above mentioned case are obtained as below. If instead of 1-storied semi-pucca development, 4-storied development is made, land saved is 3.87 acres (i.e 46.85%) but increased cost of construction becames Tk. 373.16 lacs more. On the other hand the cost of land saved (3.87 acres) is only Tk. 116.10 lacs and it means net loss

against per acre land saved is Tk. 66.42 lacs in construction with which another 2.21 acres of land (with the same price as assumed @ Tk. 30 lacs per acre) could be purchased.

Similarly for 5-storied development 4.13 acres of land (i.e 50%) can be saved (instead of 1-storied semi-pucca type of development) but increased cost of construction becomes Tk. 433.32 lacs whereas total land that is saved (4.13 acres) costs only Tk. 123.90 lacs. It means net loss against per acre land saved is Tk. 74.92 lacs in construction with which another 2.49 acres of land could be purchased.

Exactly in similar way for 6-storied development land saved is 4.38 acres (i.e 52.05%) which costs Tk. 129.00 lacs but the increased cost of construction becomes Tk. 552.39 lacs which means net loss of Tk. 98.46 lacs against per acre land saved with which 3.28 acres of land could be purchased.

Similarly for 15-storied type of development 4.82 acres (i.e 58.35%) land can be saved which costs Tk. 144.60 lacs but the increased cost of construction becomes Tk. 612.69 lacs which means net loss of Tk. 97.11 lacs in construction against per acre land saved with which another 3.23 acres of land could be purchased.

Land cost is the minor variable. The greater cost associated in multi-storied buildings is due to the construction cost. It can also be understood in the following way.

Say, A_4 = Total land required for 4-storied buildings(acre)

B_4 = Construction cost for 4-storied buildings

L_v = Land value/acre

and A_5 = Total land required for 5-storied buildings(acre)

B_5 = Construction cost for 5-storied building

L_v = Land value/acre

Let in both the cases land value L_v remains the same.

If it is assumed that

$$B_4 + A_4 L_v = B_5 + A_5 L_v$$

Then $L_v(A_4 - A_5) = B_5 - B_4$

$$\therefore \quad L_v = \frac{(B_5 - B_4)}{(A_4 - A_5)}$$

But $(B_5 - B_4)$ i.e the increased construction cost is very high then $(A_4 - A_5)$ as can be seen from the results obtained.

So, the study reveals that in true sense land can not be saved (considering in terms of money) if multi-storied buildings are constructed. But the land savers may argue that money is not the concern, but land is the concern. In that case it is also true that land can be saved quite a good amount, by constructing multi-storied high-rise buildings land savers may also argue that with the increase in population say after 20 or 30 years land may not be available if horizontal expansion is made, although the price of land is paid several times.

Land savers may argue that if horizontal expansion is made, the cost of ancillary facilities will be more and if the density is kept more, in more compact space the length of the ancillery system (i.e water supply, sewerage lines etc.) will be reduced. But U.K. example shows that it is not so (Table 6.1.1)

TABLE 6.1.1.4 OVERALL TOWN DENSITY[1]

Population	15 persons/acre		20 persons/acre	
	Area	Radius	Area	Radius
30,000	2000	0.997	1500	0.864
50,000	3333	1.287	2500	1.115
60,000	4000	1.410	3000	1.221
100,000	6667	1.821	5000	1.577

Source: 1. Ibid, p-74.

Osborn and Whittick quoted, in their book, 'New Towns',

> "a town of 50,000 at 15 persons/acre has an area of 3333 acres and if roughly circular, a radius of about 1.28 miles. It is a tempting fact that if the density is increased by a third, to 20 an acre, the population can be increased (also by a third) to 66,666 while the radius is not increased at all." [2]

Table 6.1.1 shows the total acreage requires and respective milege for 15 persons/acre (gross) and 20 persons per acre (gross).

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2. Osborn, F.J. and Whittick, A., "New Towns; Their Origin Achievements and Progress," Leonard Hill, London, 1977, P - 74.

If construction cost can be minimised, and land value can be lowered, the problem of housing shortage could be somewhat solved.

The Government is investing huge money in importing building materials. On the otherhand if technology could be developed to use locally available indigenous building materials (such as bamboo, clay etc.) particularly for low-income group of people, huge foreign exchange could be saved*.

The study reveals that if instead of 1-storied semi-pucca buildings (300 units), one-storied bamboo made shelters (300 units)are made (roof with C.I. sheet and floor pucca) the construction cost** can be reduced to Tk. 34,67,250.00 (Table 5.1.5).

However, the cost of construction for multi-storied buildings can be minimised a bit if,

1. standard of the building is minimised by setting minimum dimension of rooms and other spaces.
2. lower quality of floor finishing is made.
3. buildings are constructed upto walk-up distance of 5-storey, then lift cost and other costs associated with high-rise buildings (as discussed in Chapter-4) can be avoided.

For the low-income group of people, it is better to construct houses with bamboo wall, floor pucca and roof with C.I. sheet. For the middle-income group of people, considering the population density and its probable increment in next 20 years, if buildings upto 5-storied are constructed, the associated costs of the high-rise buildings (such as lift cost and other costs as discussed in section 4.5) could be minimised.

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* Foreign exchange associated with projects studied is Tk.5,79,79,576.00 (Documents of PWD and H and S Directorate).

** Cost/dwelling unit (750 sq.ft) = Tk.35,370.00 for Bamboo made and Tk. 46,927.50 for semi-pucca building.

APPENDICES

APPENDIX-1

Control of the Height and Spacing of Buildings to Secure Adequate Day Lighting

It should be ensured that when a new building is erected it will receive an adequate amount of daylight and it should not make any obstruction to the neighbouring buildings for them to receive sufficient daylight. Numerous attempts have been made to devise codes of control to ensure that these needs are fulfilled.

In U.K. a method was devised by the Ministry of town and country planning shortly after the war by means of a series of daylight indicators on the basis of certain simple assumptions[1] that

1. "Daylight making an angle of less than 45 deg. with the face of a building provides negligible illumination, and may be ignored.

2. The remaining light may be obstructed to some extent provided that the building receives not less than a certain proportion of that available on an entirely unobstructed site.

3. Provided an adequate total amount of light received by a building, it does not matter whether it comes over obstructions, past them or partly over and partly past them".

The standard indicators consist of two main groups, one for testing permissible heights from plot boundaries and centre lines of roads (A and B type), the other for making tests between buildings on the same site (C and D type). A and B are used to ensure that when adjoining sites come to be developed the day-lighting standards of the buildings erected on them shall not be prejudiced. B and D are used for residential buildings, A and C for non-residential buildings.

The four groups each consists of four indicators based upon different angles of elevation; the greater this angle is, the wider is the horizontal angle through which the access of daylight is measured.

Source: 1. Keeble, Lewis, "Principles and Practice of Town and Country Planning"
The Estate Gazette Ltd., London, p-392.

The angles of elevation are as follows[1]:

$A_1 = 60^\circ$	$A_2 = 55^\circ$	$A_3 = 50^\circ$	$A_4 = 45^\circ$
$B_1 = 45^\circ$	$B_2 = 35^\circ$	$B_3 = 30^\circ$	$B_4 = 20^\circ$
$C_1 = 40^\circ$	$C_2 = 35^\circ$	$C_3 = 30^\circ$	$C_4 = 25^\circ$
$D_1 = 25^\circ$	$D_2 = 20^\circ$	$D_3 = 15^\circ$	$D_4 = 10^\circ$

The indicators are calibrated for heights upto 100 feet, but calibrations for greater heights can of course be added when necessary. The requirements for non-residential buildings are less important than for residential buildings.

Source: 1. Ibid, p - 392.

APPENDIX-2

Housing and Settlement Directorate's on-going schemes (1978-79)[1] in Dacca city

Sl. No.	Name of the scheme	Total expenditure A = Approved U = Unapproved (Tk. in lacs)	Cost/unit (Tk.)
1.	45000 flat houses and shelter in Bangladesh (1152 units at Mirpur, Dacca).	A - 1515.00	Tk.1,22,850.00 (approx.)
2.	Twin-Quarters for low-income group of people at Mirpur (1124 units conversion to 562 units)	U - 93.00	-
3.	Squatter resettlement at section XI at Mirpur (2660 units)	A - 116.13	Tk. 1651.00 (Tk.16,548.00 as conversion cost)
**	NEW SCHEME		
1.	Multi-storied buildings with 24000 flats for low-and middle income group of people (1520 units at 1st phase in Dacca)	U - 20300.00	Tk.1,05,000.00 (approx.)
2.	480 flats at Mirpur (part of 1152 flats)	U - 480.00	Tk.1,22,850.33 (approx)
3.	1000 units for human settlements: Demonstration scheme, Dacca	U - 151.00	-

Source: 1. Annual Development programme (ADP); H and S, Directorate Government of Bangladesh.

APPENDIX-3

Public Works Departments (PWD) on-going (1978-79)[1] Housing Schemes in Dacca city

Sl. No.	Name of the scheme	Total expenditure A=approved U=unapproved (Tk. in lacs)	Cost/unit (Tk.)
1.	Multistoried low cost Govt. housing 4477 units in Dacca, Chittagong, Khulna and Rajshahi	A - 4989.33	Tk. 1,76,683.00 (approx.)
*2.	Housing for Palassey and Nilkhet Barrack people (1388 units)	A - 292.00 U -1985.64	
3.	Additional room in each flat of class III and IV employees of Government press	A - 7.78 U - 49.00	
4.	3rd floor over 2nd floor of the staff Quarters' in Dacca	A - 327.84 U - 747.00	
5.	Additional one floor over 2nd floor (Sher-e-Bangla Nagar, Eskaton, Motijheel Colony)	A - 419.00	
6.	Hostels for Joint Secretaries and Secretaries in Sher-e-Bangla Nagar	A - 63.95	
	NEW SCHEME		
1.	Housing for employees of the President's house	A - 60.06	
2.	Conversion of Hotel Elisium (at Ratkhola Road) to officers hostel	A - 114.68	

Source: 1. A.D.P. (PWD)
Government of Bangladesh.

* 10% more spent over the approved money (as on Nov. 1978).

APPENDIX-4

New National Grades and Scales (Dec.20, 1977) of Pay of the Public Servants, Government of Bangladesh

Grade	Scales
I	Tk. 3000 (fixed)
II	Tk. 2850 (fixed)
III	Tk. 2350-100-2760
IV	Tk. 2100-100-2600
V	Tk. 1650-75-2325
VI	Tk. 1700-75-2225
VII	Tk. 1400-75-2000
VIII	Tk. 1150-65-1800
IX	Tk. 900-55-1265-65-1610
X	Tk. 750-50-900-E.B-55-1230-60-1470
XI	Tk. 625-45-985-E.B-55-1315
XII	Tk. 470-35-645-E.B.45-915-55-1135
XIII	Tk. 425-30-575-E.B-40-735-50-1035
XIV	Tk. 400-25-525-E.B-30-825
XV	Tk. 370-20-470-E.B - 25-745
XVI	Tk. 325-15-430-E.B.-20-610
XVII	Tk. 300-12-396-E.B-10-540
XVIII	Tk. 275-10-375-E.B-15-480
XIX	Tk. 250-6-280-E.B.-8-360
XX	Tk. 240-6-282-E.B-7-345
XXI	Tk. 225-6-315

APPENDIX-5

Computation of the Increased Cost and Land saving

Assumed total population = 1800
So, total dwelling units = 300
(@ 6 persons in one unit)

(Let us) say, a dwelling unit of (one-storey) 30 ft x 25 ft (i.e. 750 sft) and storey-height is 10 ft. Also it is assumed that in 6 and 15-storied buildings, dwelling unit size will remain the same. So, only height will be increased by 10 ft per storey and so on.

1. for one storey dwelling unit of 10 ft height, spacing will be required between buildings

$$= 1\frac{1}{2} \times 10$$
$$= 15 \text{ ft.}$$

So, total building (30'x25') will require in total (similar lay-out of the building as of Fig. 5.2.1.6) the area

$$= 30x\ (25 + 15) \text{ sq.ft.}$$
$$= 30 \times 40$$
$$= 1200 \text{ sft.}$$

So, in one acre, the maximum dwelling units can be accommodated in accordance with the space standard,

$$= \frac{4040 \times 9}{1200}$$
$$= 36.3 \text{ dwelling units}$$

Therefore, total land required for 300 dwelling units =

$$= \frac{300}{36.3}$$
$$= 8.26 \text{ acres}$$

2. Similarly for 4-storied building of 750 sft. floor space and 4x10 = 40. ft height,

the spacing = 1½x40

= 60 ft

Area required/building (of 4 dwelling units)

= 30x(25+60)

= 30x85

= 2550

∴ Total 4-storied building/acre = $\frac{4840x9}{2550}$

= 17.08

i.e. total dwelling units/acre = 68.32

∴ 300 dwelling units require land = 4.39 acres

3. Similarly 5-storied similar dwelling unit type/buildings of requires

spacing = 1½x50

= 75 ft

Area requires = 30x(25+75)

= 30x100

= 3000 sft.

Therefore, total building/acre = $\frac{4840x9}{3000}$

= 14.52

= 72.6 dwelling units per acre

∴ Total land required for 300 dwelling units

= $\frac{300}{72.6}$ = 4.13 acres

4. 6 storied building requires

spacing = 1½x60

= 90 ft

Area requires/building = 30x(25+90)

= 30x115

= 3450 sft

Total building/acre = 12.62

∴ Total dwelling units/acre = 75.75

Therefore, 300 dwelling units require = 3.96 acres.

5. Similarly 15-storied building requires

spacing = $1\frac{1}{2}$x150

= 225 ft.

Area required/building = 30x(25+225)

= 30x250

= 7500 sft.

∴ Total building/acre = 5.80

∴ Total dwelling units per acre = 5.80x15 = 87.12

Therefore,300 dwelling units require = 3.44 acres

Now Cost Analysis

Case-I For 1-storied type of development

Assuming land price in all the cases are Tk. 30,00000.00 per acre.

Total land = 8.26 acres

Total dwelling unit = 300

Floor space/unit = 750 sft.

From table - 5.1.1

Cost/sft = Tk. 57.52 (avg.)

∴ Cost/unit = 57.52x750

= Tk. 43,140/-

Therefore Total cost for 300 units = Tk.1,29,42,000.00

Case-II For 4-storied type of development

Total land required = 4.39 acres

Total units = 300

Floor space/unit = 750 sft.

From Table 5.1.1

Cost/sft of floor space = Tk. 223.37

∴ Cost/dwelling unit = 223.37x750

= Tk. 1,67,527.50

Therefore, costs of 300 dwelling units = Tk. 5,02,58,250.00

Case-III For 5-storied type of development

Total land required = 4.13 acres
Total units = 300
Floor space/unit = 750 sft

From Table 5.1.1

Cost/sft = Tk. 250.11
∴ Cost/unit = 750x250.11
= Tk. 1,87,582.50
Cost of 300 units = Tk. 5,62,74750.00

Case-IV For 6-storied type of development

Total land required = 3.96 acres
Total units = 300
Floor space/unit = 750 sft.

From Table - 5.1.1

Taking average cost,
Cost/sft = Tk. 303.03
∴ cost/unit = 750x303.03
= Tk. 2,27,272.50
Therefore cost of 300 units = Tk. 6,81,81,750.00

Case-V For 15-storied type of development

Total land required = 3.44 acres
Total units = 300
Floor space/unit = 750 sft
From Table - 5.1.1
Cost/sft =Tk. 329.83
Cost/dwelling unit = 750x329.83
= Tk. 2,47,372.50

Therefore, cost of 300 dwelling units = Tk. 7,42,11,750.00

Now,

Case A. If instead of 1-storied development; 4-storied development is made

Land saved = 8.26 - 4.39
= 3.87 acres

Total cost of land @ 30 lacs/acre
(for 3.87 acres) = Tk. 1,16,10,000.00

Increased cost of construction
= Tk. 50250250.00-Tk.12942000.00
= Tk. 3,73,16,250.00

So, in saving 3.87 acres of land,net loss = Tk. 2,57,06,250.00
(increasec cost-land cost)

∴. Net loss for one acre = Tk. 66,42,441/80
that is the price of 2.21 acres of land.
So, it is seen that one acre of land is saved at the cost of 2.21 acres of land.

Case-B If instead of 1-storied development, 5-storied development is made

Land saved = 8.26 - 4.13
= 4.13 acres

Total cost of 4.13 acres of land
@ 30 lacs/acre
= Tk. 1,23,90,000.00

Increased cost of construction
= Tk.5,62,74,750.00 - Tk.1,29,42,000.00
= Tk. 4,33,32,750.00

So, in saving 4.13 acres of land,net loss = increased cost-land cost = Tk.3,09,42,750.00
∴. Net loss for one acre saved = Tk. 74,92,191.20 that is the cost of 2.49 acres of land.

Case-I If instead of 1-storied development 6-storied development is made

Land saved = 8.26 - 3.96

= 4.30 acres

Total cost of land for 4.3 acres = Tk. 1,29,00000.00

@ 30 lacs/acre

Increased cost of construction

= Tk. 6,81,81,750.00 - Tk. 1,29,42,000.00

= Tk. 5,52,39,750.00

∴ Net loss for 4.30 acres land saved

= Tk. 4,23,39,750.00 (increased construction cost - land cost)

Therefore loss per acre saved = Tk. 98,46,453.40

i.e. price of 3.28 acres of land.

Case-II If instead of 1-storied development 15-storied development is made

Land saved = 8.26 - 3.44

= 4.82 acres

Total land cost @ 30 lacs/acre = Tk. 1,44,60,000.00

Increased construction cost = Tk. 7,42,11,750.00

- Tk. 1,29,42,000.00

= Tk. 6,12,69,750.00

Net loss in construction in saving 4.2 acre

= Tk. 4,68,09,750.00 (increased cost-land saved cost)

∴ Net loss per acre = Tk. 97,11,566.30

i.e. price of 3.23 acres of land.

So, it is seen that one acre of land is saved at the cost of 3.23 acres of land.

Case-E Now (let us) see how much money can be saved if instead of 1-storied semi-pucca building type of development; (as of project-2), one storied-bamboo made shelter (as of project-1 of squatter resettlement project) type of development is made with roof with C.I. sheet and floor pucca.

Total dwelling units = 300

Floor space/unit = 750

From Table - 5.1.1

for project-1 (Bamboo made)

Cost/sft. = Tk. 47.16

∴ Cost/dwelling unit = 750x47.16
= Tk. 35,370.00

Therefore cost of 300 units = Tk. 1,06,11,000.00

From project-2 (semi-pucca)

Cost/sft = Tk.62.57 (From Table 5.1.1)

∴ Cost/unit = 750x62.57
= Tk. 46,927.50

∴ Cost of 300 units = Tk. 1,40,78,250.00

Therefore Amount saved = Tk. 1407,8250.00 - Tk. 1061,1,000.00

= Tk. 34,67,250.00

Analysis of Project-2

Name of the project: Demonstration project for a human settlement programme

Total residential area = 11.02 acres studied

Plot size = 16'x30'

Shelter = 10'x21' i.e. 210 sft.

(1-storied semi-pucca house)

Total families accommodated = 1000

$$\text{Building coverage} = \frac{210\times1000\times100}{11.02\times4840\times9} = 43.74\%$$

Costs:

Land cost @ Tk. 1 lack per acre = Tk.11.02 lacs

Land development cost

(11.02x4840x9x5 cft

= 2400,156 cft

@ Tk. 500 per thousand cft) = Tk. 12.00 lacs

Shelter costs with all ancillary facilities = Tk. 108.38

= Tk. 131.4 lacs

$$\text{Cost/dwelling unit} = \frac{131.4\times1000.0000}{1000} = \text{Tk. } 13,140.00$$

$$\therefore \text{Cost/sft of floor space} = \frac{13,140}{210} = \text{Tk. } 62.57$$ (at market price)

$$\text{Net density provided} = \frac{1000\times6}{11.02} = 545 \text{ persons/acre.}$$

APPENDIX-6

List of current (1978) rates of a few more materials are given below

Miscellaneous items — List of rates of materials at current price (1978)

Sl.No.	Description of items	Unit of rate	All districts except Barisal and Patuakhali (Tk.)	Barisal (Tk.)	Patuakhali (Tk.)
1.	Lime (slaked)	per mnd.	40.00	40.00	40.00
2.	Stone lime	per mnd.	100.00	100.00	100.00
3.	Sunamgonj sand (Sylhet, F.M.-2.5)	% cft	375.00	500.00	525.00
4.	Synthetic enamel paint	per gallon	398.00	398.00	398.00
5.	Plastic emulsion paint	" "	358.00	358.00	358.00
6.	Marble chips	per bag	100.00	100.00	100.00
7.	Marble dust	" "	75.00	75.00	75.00
8.	White cement	" "	150.00	150.00	150.00
9.	Distemper	per gallon	222.00	222.00	222.00
10.	Stone shingles (Jaflong/Bholagonj)	% cft	600.00	700.00	725.00
11.	Pea gravels	% cft	475.00	550.00	575.00

Source: Public Works Department, Govt. of Bangladesh.

Sl.No.	Description of items	Unit of rate	All districts except Barisal and Patuakhali (Tk.)	Barisal (Tk.)	Patuakhali (Tk.)
12.	Bitumen	per ton	2400.00	2400.00	2400.00
13.	Coal	" "	1200.00	1200.00	1200.00
14.	18" W.C. with 3 gallons C.I. cistern, fitting, fixing, supplying complete (Shanks or Twyford)	Each	1332.00	1335.00	1336.00
15.	Do, European type Commode Complete (Shanks or Twyford)	Each	3940.00	3940.00	3940.00
16.	Supplying, fitting, fixing white glazed vitreous chine squatting Urinals, complete with one gallon automatic flussing cistern (Shanks or Twyford)	Each	1585.00	1587.45	1589.00
17.	Supplying, fitting, fixing white glazed vitreous W/H basin (Shanks or Twyford) of 22" x 16" complete	Each	1040.00	1040.00	1040.00
18.	G.I. pipe a. 2" dia	per rft	18.70		
	b. 1½" dia	Do	16.00	Same	Same
	c. 1¼" "		14.85		
	d. 1" "		11.00		
	e. ¾" "		12.92		
	f. ½" dia		12.65		

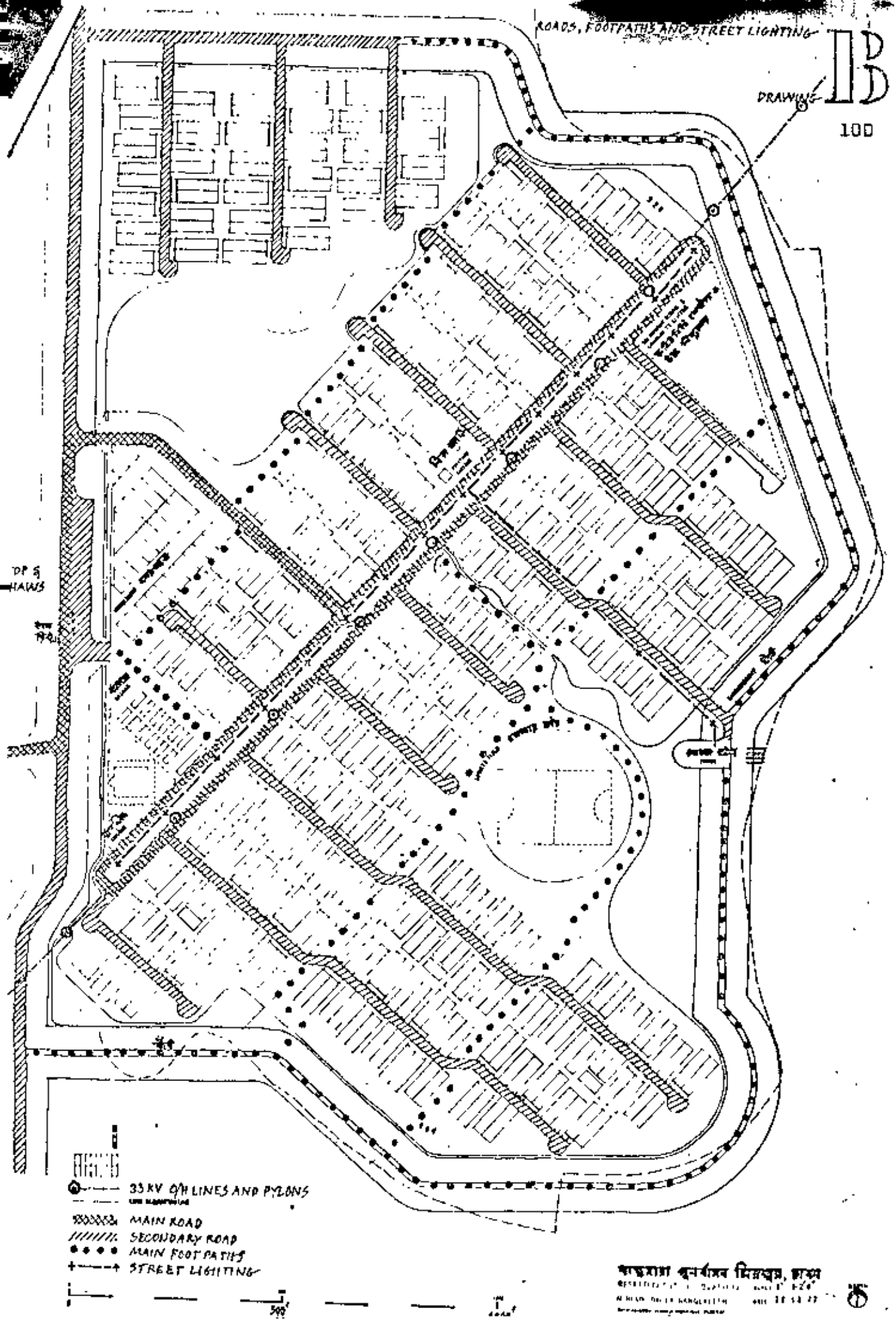
APPENDIX-7

Cost Abstract

Project-1: Mirpur Squatter Resettlement

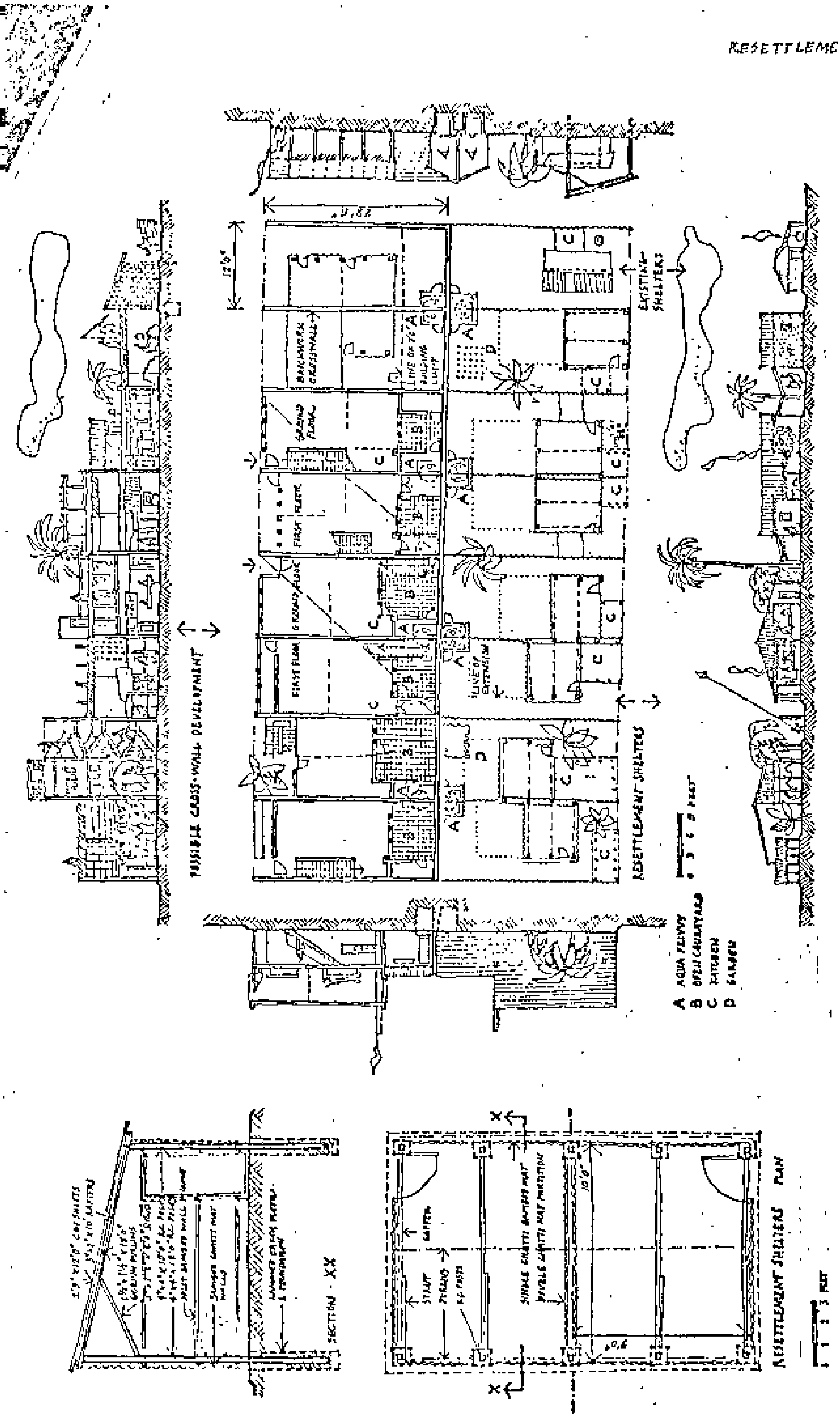
1. Land cost @ Tk. 45000/acre for 19.78 acres	= Tk.	8,90,100.00
2. Construction of trench latrines and ground kitchen	=	2,89,800.00
3. Sinking of tube-wells	=	2,25,000.00
4. Administrative shed (C.I. roofing and Torja walling)	=	1,00,000.00
5. Construction of bore hole latrines with pucca platforms	=	4,06,000.00
6. Site improvement for 19.78 acres (40 acres costs Tk. 71,86,300.00)	=	35,53,625.00
7. Internal road @	=	7,50,000.00
8. Work charge establishment	=	2,28,202.00
9. Contingency	=	4,56,404.00
	Tk.	68,99,131.30

10. Cost of each shelter = Tk. 1651.00 (not included in above estimate)


ROADS, FOOTPATHS AND STREET LIGHTING
DRAWING
100
33 KV O/H LINES AND PYLONS
MAIN ROAD
SECONDARY ROAD
MAIN FOOT PATHS
STREET LIGHTING

RESETTLEMENT SHELTERS

DRAWING

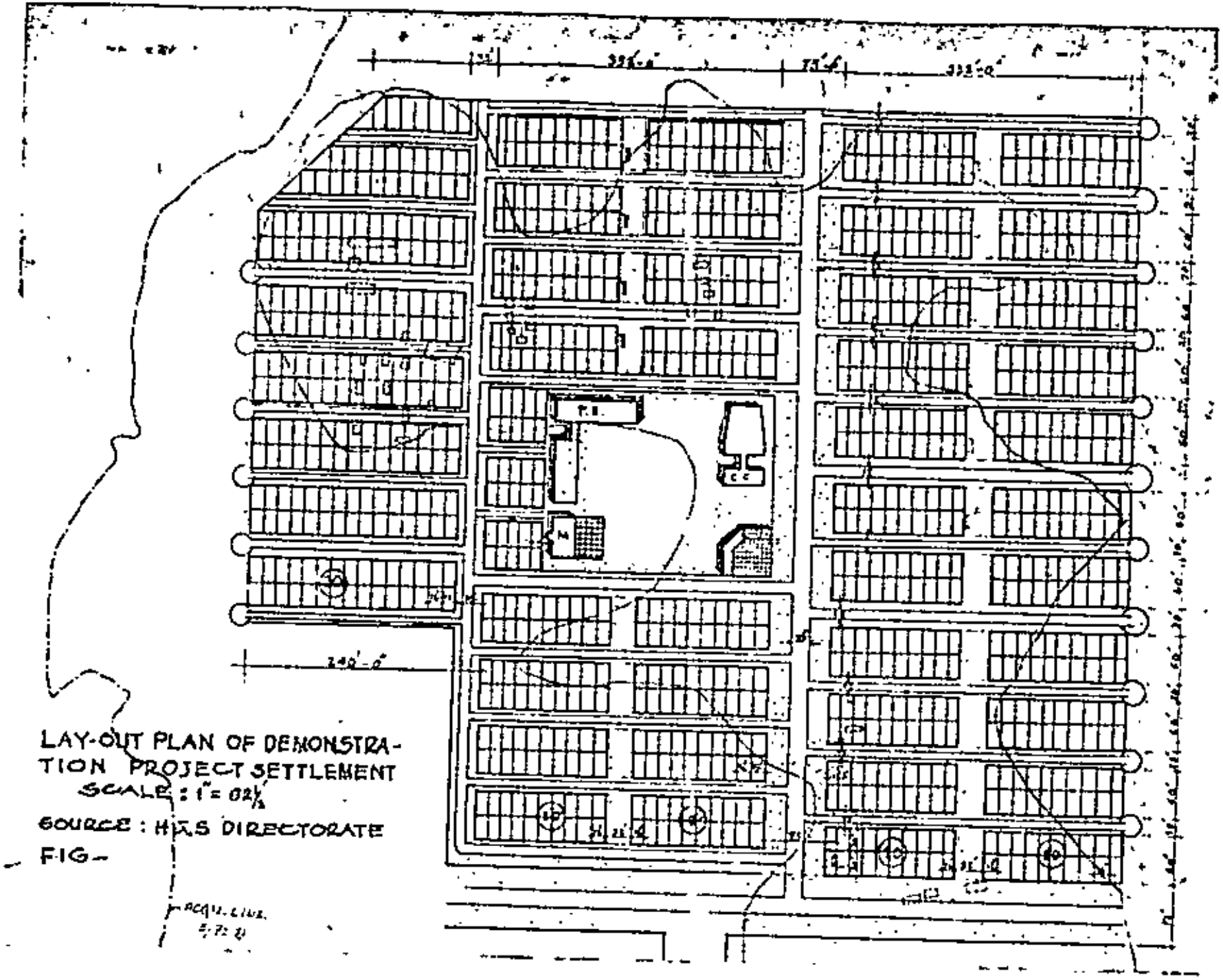


Cost Abstract

Project-2: Demonstration project for a human settlement

		Taka in lacs
1. Land acquisition: 20 acres @ Tk. 1 lac/acre	=	Tk. 20.00 lacs
2. Land Development		
a) 20x4840x9x5		
= 43,56,000 cft @ Tk. 500/% cft	=	21.78
b) Inspection Vehicles equipment, L.S.	=	3.00
3.A. Civil Engineering works and others:		
a) Community Centre: 500 sft. (Clinic)		
b) Primary School : 1000 "		
c) Corner shops d) Mosque : 600		
2100 sft @ Tk. 40/sft	=	0.84
e) Temporary staff quarters (Tin shed) : 1000x210=210,000 sft @ 20/sft	=	42.00
f) Neucleus House (Tin shed)		
B. Street lighting: 2 miles @ Tk. 3 lacs/mile	=	6.00
C. Water supply installation: 10,000 sft @ Tk.50/rft	=	5.00
D. Sewerage works: 10,000 rft @ Tk. 40/rft	=	4.00
E.a) Bath-room cum toilet : 1000 Nos. @ Tk. 2000/Each	=	20.00
b) Pucca surface drain : 4000 sft @ Tk.22/sft	=	0.88
f. Katcha drain : 8000 sft @ Tk. 5/sft	=	0.40
g. Cross Culverts : 10 Nos. @ Tk. 5000/Each	=	0.50
H. Roads:		
a) 4" Khoa consolidation over a brick flat soling 120,000 sft @ Tk.5/50 per sft	=	6.6
b) 1½" thick bitumen Carpetting 80,000 sft @ Tk.4/sft	=	3.2

		Tk. in lacs
4. Plung/Surveying etc. L.S.	=	6.50
5. Contingency 5%	=	5.73
6. P/L Establishment @ 2½%	=	2.86
7. Misc. expenditure	=	7.39
8 Unseen	=	0.32
		Tk. 151 lacs.



LAY-OUT PLAN OF DEMONSTRATION PROJECT SETTLEMENT
SCALE : 1" = 02½'
SOURCE : H&S DIRECTORATE
FIG-

Cost Abstract (1972-73 price)

Project-3: Semi-pucca houses for low-income people at Mirpur.

1. Construction of one twin-unit Semi-pucca house at Mirpur	= Tk. 4506.00
2. Sanitary and water supply	= Tk. 563.25
3. Construction of kutcha approach road	= Tk. 30.00
4. Contingency etc.	= Tk. 254.96
	Tk. 5354.21
	= Cost/unit of the house.
.'. Cost for 562 units	= 5354/21x562
	= Tk. 30,09,066.00
.'. Cost of (562x2)	
i.e. 1124 units	= Tk.60,18,132.00

Computation of costs in 1978 price from 1972-73 price

(From Table 4.2.3)

1. C.I. sheet increased -454.54%
   Bricks " -490.90%
   Sand " - 300.00%
   Cement " - 636.36%

∴ On average the building materials increased = 495.45%

∴ For one unit

1. Construction cost = 4506×4.95
   = Tk. 22,304.70
2. Services facilities including approach road @ 15% = 3,345.60
3. Contingency @ 5% = 1,115.23

Tk. 26,765.53

∴ Cost of 1124 units = 26765.53 x 1124
= Tk. 3,0084,855.00

Land cost @ 200000/bigha (not included in the estimate)

Cost Abstract

Project-4: 400 flats at Mirpur

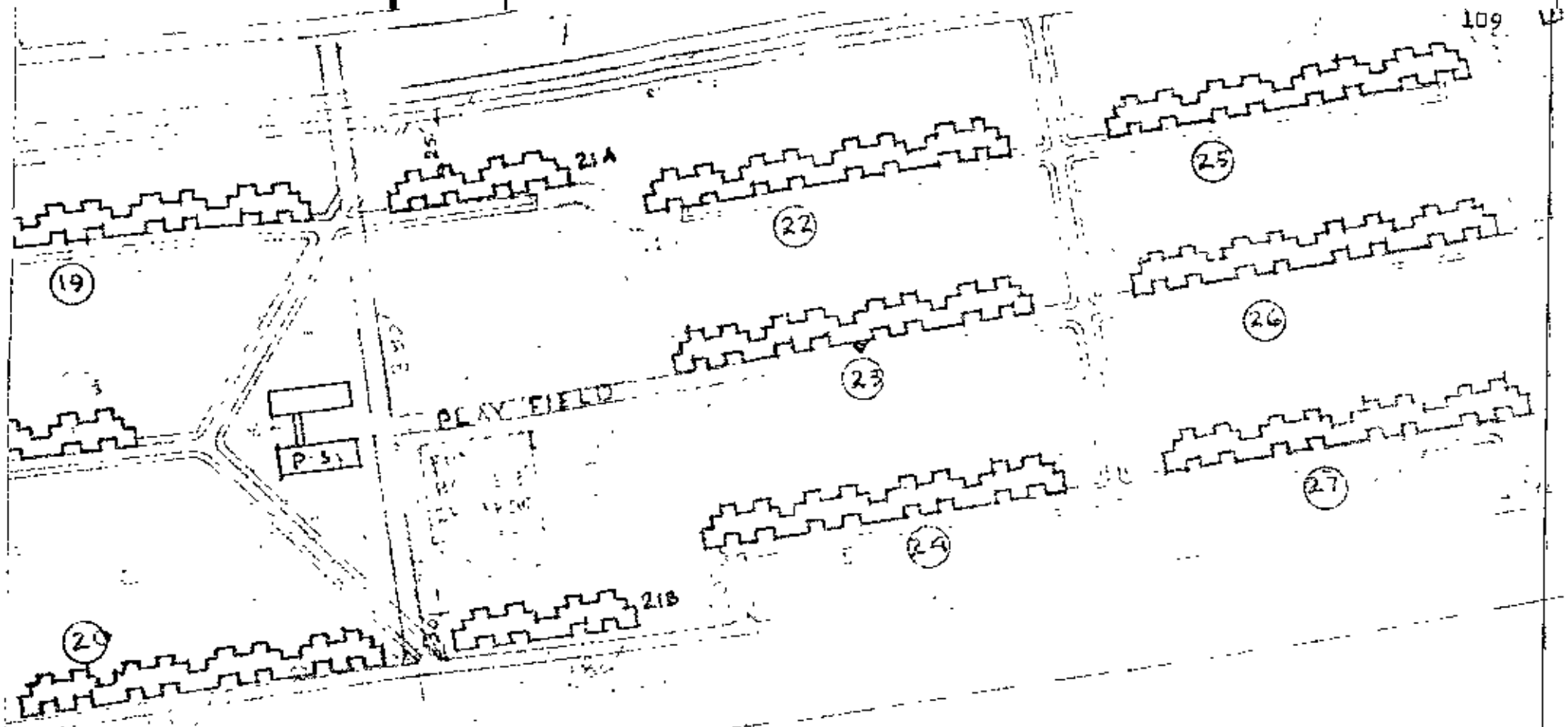
1. Land cost @ 2 lacs/bigha (not included in the estimate)

2. Land development: For 20 acres:
   20x4840x9x2 = 17.42 lacs; cft
   @ Tk. 400.00 per ½ cft = 6.96

3. Civil Engineering works and others:-
   (a) i. Multistoried flat = 369.60
   (b) Street lighting 1.00 mile
   @ Tk. 3.00 lacs/mile = 3.00
   (c) Water supply installation with necessary water tanks, pumps, motors pipes etc. complete 12,000 rft
   @ Tk. 50.00 per rft = 6.00
   (d) Sewerage installation with necessary pits manhole cover etc. complete
   10,000 rft @ Tk. 40/per rft = 4.00
   (e) Drainage works:-
      i. Pucca surface drain 5000 rft
      @ 20/rft = 1.00
      ii. Kutcha drain 6000 rft @ Tk. 5.00
      per rft = 0.30
   (f) Roads:
      i. 6" thick khoa consolidation over brick on edge pavement over a brick flat soling and the top will be furnished with 1½" thick bituminous carpetting (20 ft wide); 1,75,000 sft @ Tk. 16.00 per sft = 12.00
      ii. 4" thick khoa consolidation over brick flat soling and the top will be finished with 1½" thick bituminous carpetting (10 ft wide)
      1,00,000 sft @ Tk. 10/per sft = 10.00

3. Culverts:
   15 Nos. @ Tk. 15,000/each = 2.25

4.	Planning, Surveying and other engineering Works L.S.	= 2.00
5.	W/C. establishment and contingency 7½%	= 31.28
6.	Over head expenses 7%	= 29.19
7.	Misc. expenditure	= 2.42
	Total : Tk.	480.00 lacs



PART-LAY-OUT PLAN OF 480 FLATS AT MIRPUR

SCALE -1"= 82'-6"

Total New buildings-15 ; each - 32 flats (4-storied)
Study area = 17.30 acres (appx.)

E. (CAL) M.C.D (U.K), A.M.T.P.I (LONDON), A.M.I.E. (PAK)

PLANNER, URBAN DEVELOPMENT DIRECTORATE

SUPERINTEN

Cost Abstract (1974-75 price)

Project-5: M.L.S.S. quarters of Engineering University, Dacca.

1. Cost of one Building = Tk.2,79,771.62 (1st estimate)
   (1975 price) (But had to pay 20% above while paying bill*) i.e. plus
   Tk. 55954.32 = Tk.3,35,725.94

2. Water supply, sewerage etc. facilities
   (1975 price) = Tk. 50,000.00

3. Electrification (1975 price) = Tk. 50,000.00

Tk.4,35,725.94**

= Cost of 10 units (flats) in a building each of 560 sq.ft.

4. Land cost (1978 price)
   = Tk.10,00000.00 per bigha i.e. Tk. 30,00000/acre

---

* Office of the Engineering Section, BUET.

** These costs include labour charges, contingency, overhead charges etc.

Computation of costs at current price (1978) from 1974-75 price.

1. Major building materials increased on average (From Table 4.2.3)

Sand - 125%	
Cement - 127.27%	= 159.31% (on average)
Bricks - 260%	
M.S. Rod -125%	

2. Service facilities (Water supply, sewerage etc) - assumed 15% of construction cost.**

3. Electrification - assumed 15% of construction cost.**

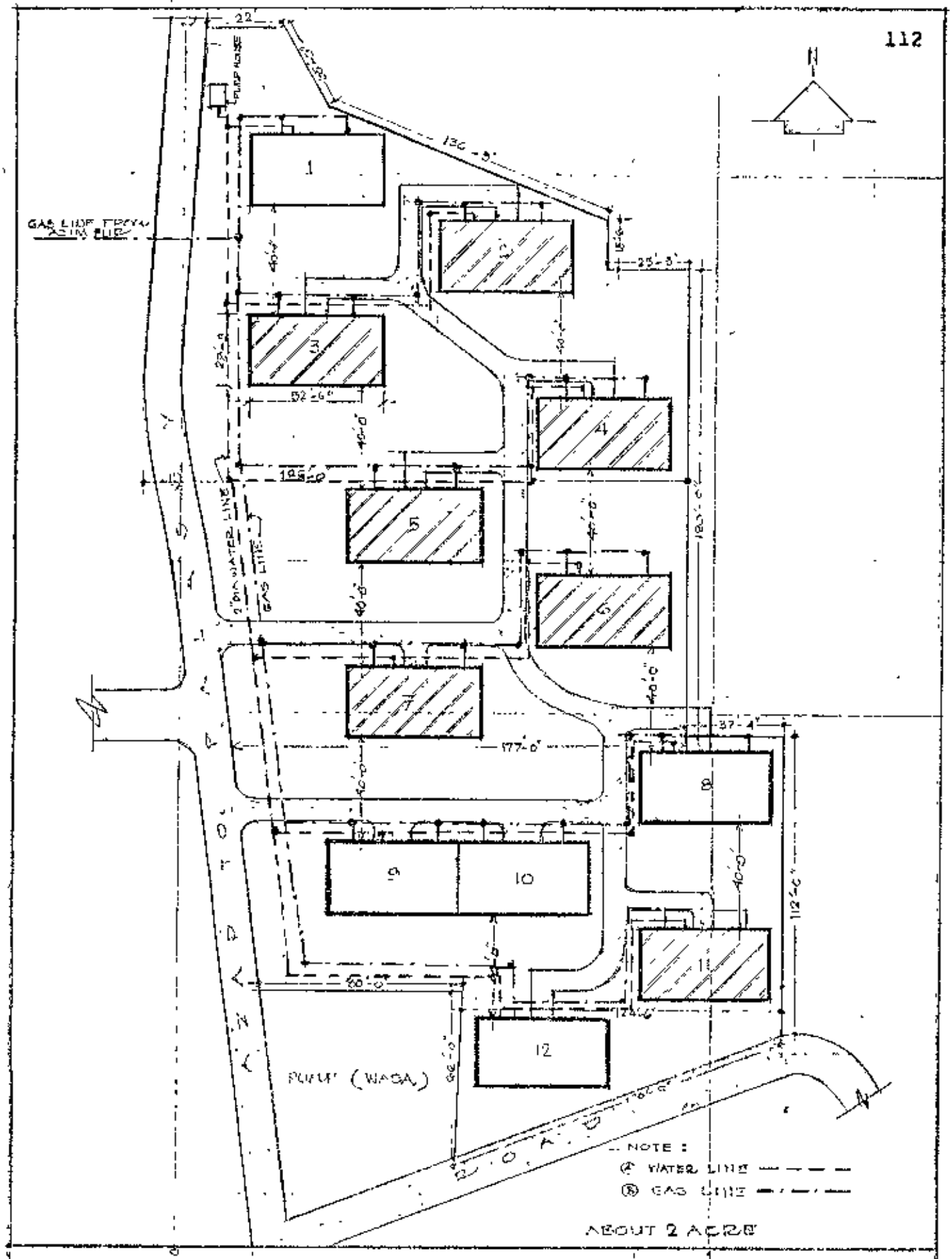
∴ Construction costs for 10 flats (1978 price) in a building

a) Tk. 435725.94 x 1.59 = Tk. 6,92,804.24
b) Services costs @ 15% = Tk. 1,03,920.63
c) Electrification costs @ 15% = Tk. 1,03,920.63

Total costs =Tk. 9,00,645.50

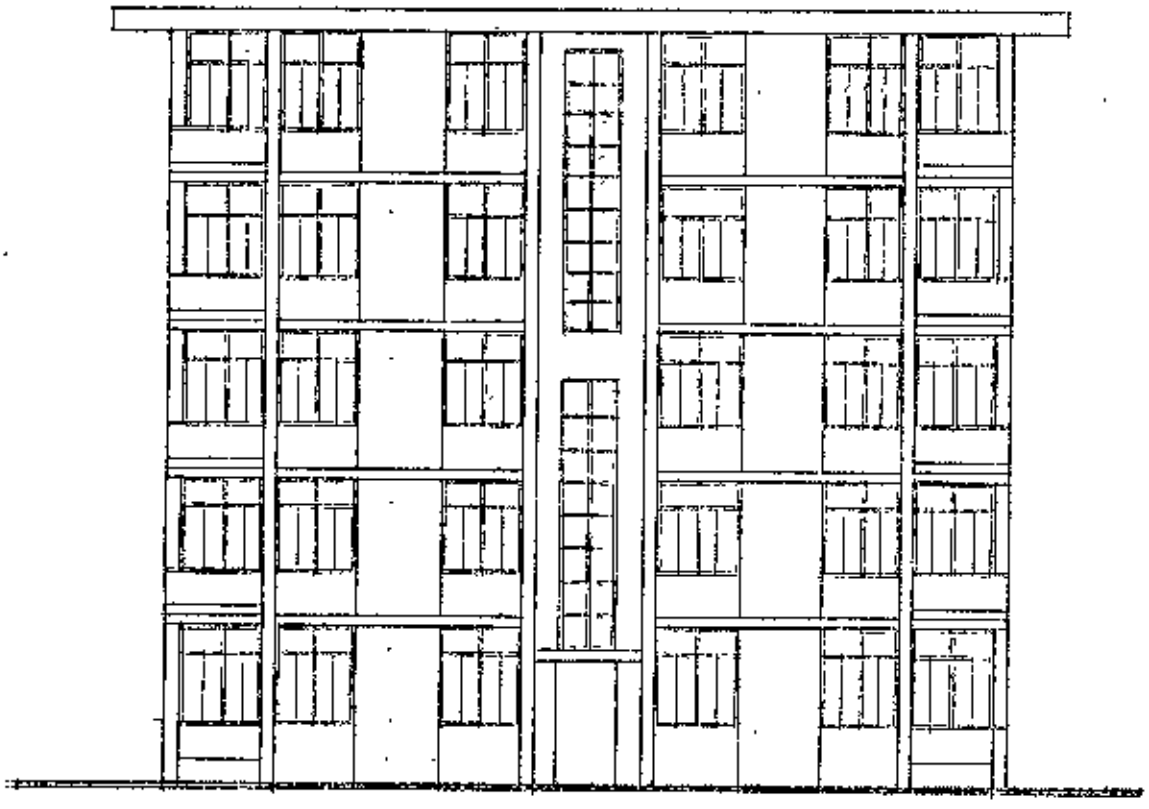
Therefore cost/flat (each of 560 sq.ft net) = Tk. 90,064.55 in 1978 price

** Public Works Department's project proforma.

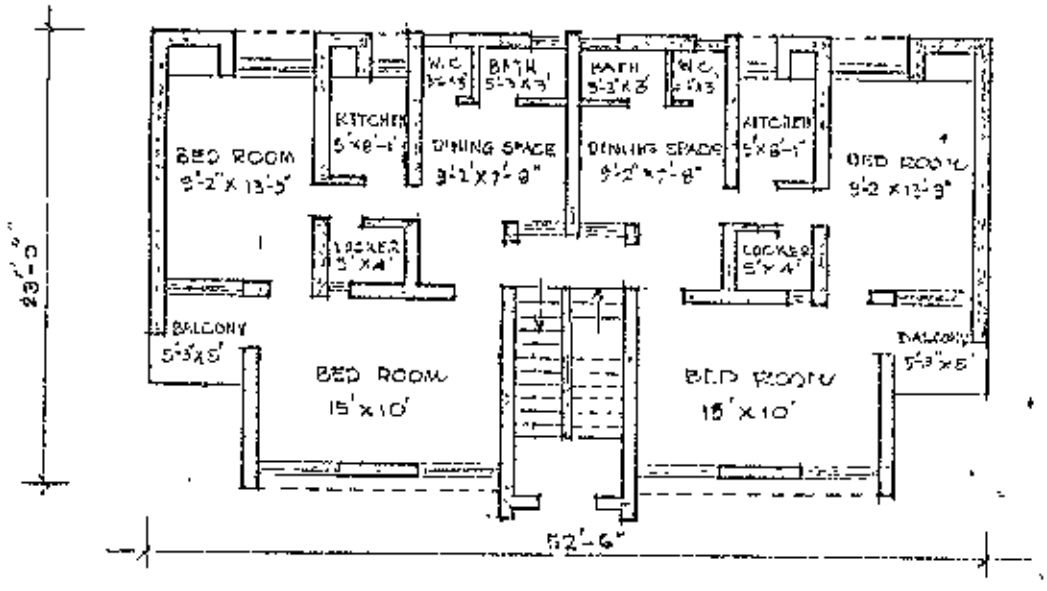


LAY-OUT PLAN OF M.L.S.S. QRTS AT DHAKESHWARI.
B.U.E.T. DACCA.
SCALE : 1" = 50'-0"

SOURCE : ENGG. SECTION BUET. DACCA.



SOUTH ELEVATION



PLAN (SCALE: 1" = 12'-0")

PROPOSED EXTENSION OF BUILDING NO 1, M.L.S.S. QUARTER'S AT DHAKESHAWARY, B.U.E.T. DACCA.
SCALE: 1"=12'-0"

SOURCE : ENGG. SECTION BUET. DACCA.

Cost Abstract

Project-6: Low-cost Government Quarter at Agargaon, Dacca.

1. Construction of 6-storied R.C.C. framed buildings (6 units)		
a. Ground floor @ Tk. 160 sft i.e. 160x450	= Tk.	72000.00
b. 1st floor @ Tk. 105 i.e. 105x450	= Tk@	47250.00
c. 2nd floor @ Tk. 110.00 i.e. 110x450	=	49500.00
d. 3rd floor @ Tk. 115.00 i.e. 115x450	=	51750.00
e. 4th floor @ Tk. 120.00/sft i.e. 120x450	=	54000.00
f. 5th floor @ Tk.132.00/sft i.e. 132x450	=	49400.00
		Tk.3,33,900.00
2. Internal water supply and sanitary		
a) @ 15% on 3,33,900.00	=	50,085.00
b) Water supply lines L.S.	=	12,500.00
c) Sewer lines L.S.	=	7,500.00
Total =		Tk.403,985.00
3. a) Internal Electrification @ 15% on Tk. 3,33,900.00	=	50,085.00
b) External overhead lines L.S.	=	5,000.00
c) Electrical Sub-station L.S.	=	12,500.00
4. Construction of underground electric pump shed L.S.	=	37,500.00
5. Construction of compound wall L.S.	=	5,000.00
6. Construction of compound road L.S.	=	10,000.00
7. Construction of drain L.S.	=	4,000.00
		Tk.5,28,070.00

8. Contingency @ 5%	= Tk.	26403.50
9. W/Establishment charges @ 2½%	=	13,201.00
10. Overhead charges @ 7%	=	36,964.90
Total	= Tk.	604,639.40
	6 units.	

∴ Cost/unit = Tk. 100773.23

∴ Construction cost/sft = Tk. 223.94

Cost Abstract

Project-7: Construction of Multi-storied Government-owned houses at Bailey Road.

1. Construction of 6-storied R.C.C. framed Buildings (6 units)		
a) Ground floor @ Tk. 160/sft	= Tk.	78,240.00
b) Ground floor @ Tk. 160/sft	=	51,345.00
c) 2nd floor @ Tk. 110/sft	=	53,790.00
d) 3rd floor @ Tk. 115/sft	=	56,235.00
e) 4th floor @ Tk. 120/sft	=	58,680.00
f) 5th floor @ Tk. 132/sft	=	64,546.00
	Tk.	3,62,838.00
2. a) Internal sanitary and water supply @ 15% on 3,62,838.00	=	54,426.00
b) Water supply lines L.S.	=	12,500.00
c) Sewer lines L.S.	=	7,500.00
3. a) Internal Electrification @ 15% on Tk. 3,62,838.00	=	54,426.00
b) External overhead lines L.S.	=	5,000.00
c) Electric Sub-station L.S.	=	12,500.00
4. Construction of underground electric pump shed L.S.	=	37,500.00
5. Construction of compound wall L.S.	=	5,000.00
6. Construction of compound road L.S.	=	10,000.00
7. Construction of compound drain L.S.	=	4,000.00
	= Tk.	5,65,690.00

8. Contingency @ 5%	=	Tk. 28,284.00
9. Work establishment charges @ 2½%	=	14,142.00
		Tk.6,08,116.00
10. Overhead charges @ 7%	=	42,568.00

∴ Cost of 6 units=Tk.6,50,684.00

∴ Cost/unit = Tk. 1,08,447.00

Cost Abstract

Project-B: Construction of Buildings for the residents of Pallassey and Nilkhet Barrack at Mirpur.

1. Family accommodation for Government employees (6-storied walk-up) with R.C.C. framed structure.		
a) Ground floor @ Tk. 160/sft 52x2x550x160	=	Tk. 91,52,000.00
b) 1st floor @ Tk. 105/sft	=	60,06,000.00
c) 2nd floor @ Tk. 110/sft	=	62,92,000.00
d) 3rd floor @ Tk. 115/sft	=	65,78,000.00
e) 4th floor @ Tk. 120/sft	=	68,64,000.00
f) 5th floor @ Tk. 132/sft	=	75,50,400.00
Total = 624 flats		Tk. 424,42,400.00
2. Internal sanitary and water supply arrangement @ 15%	=	72,56,010.00
3. Internal Electrification @ 15%	=	72,56,010.00
		Tk. 569,54,420.00

Total area studied = 12 acres

Each Flat = 550 sft.

Each building = 6-storied

Class III = 612 flats

Class IV = 12 "

624 flats

Total Buildings = 52

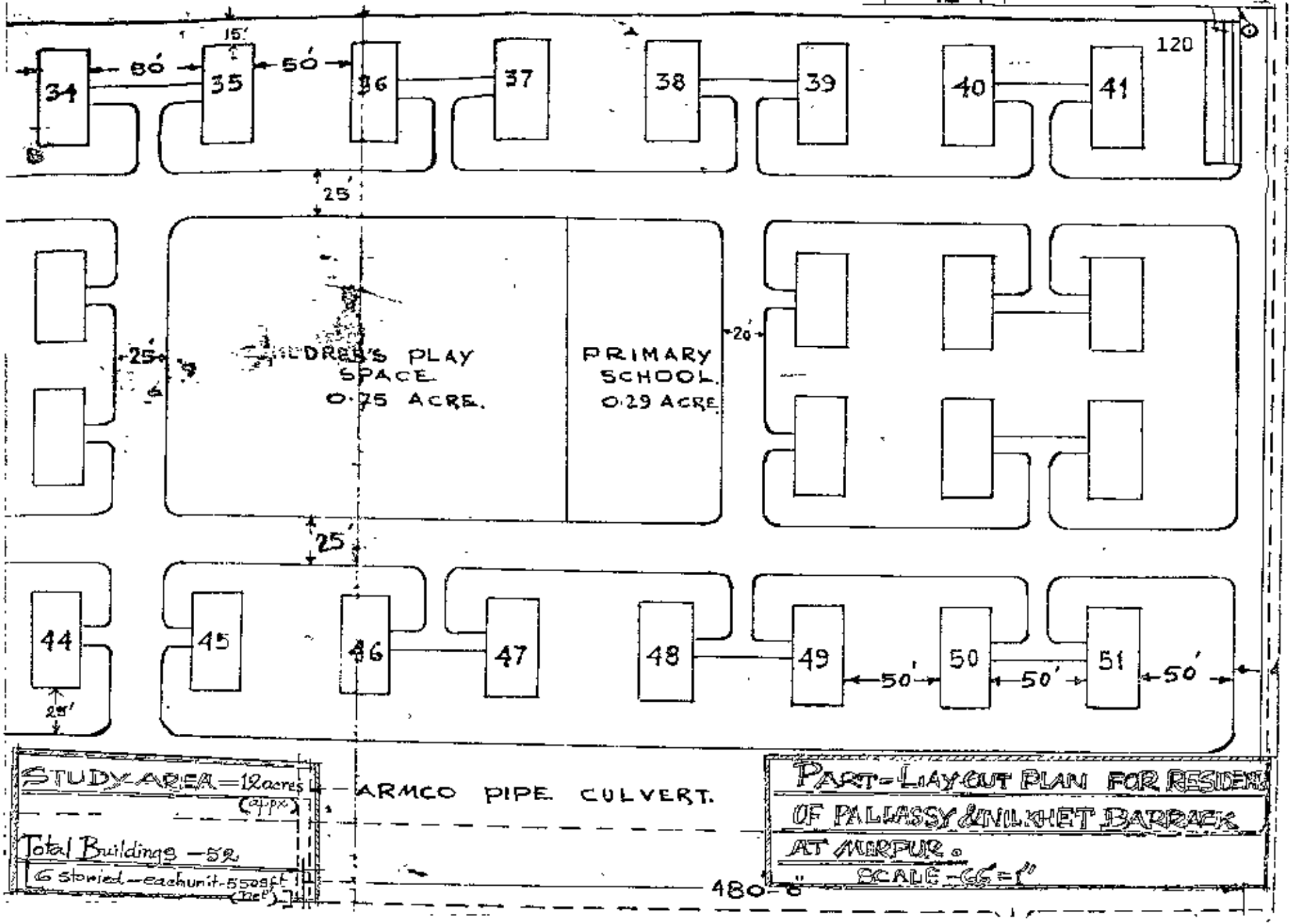
2 flats in each floor.

4. External (sewerage arrangement)	= Tk.	6,95,000.00
5. External water distribution lines	=	7,10,000.00
6. External electrification	=	30,12,500.00
7. Gas installation	=	1,56,000.00
8. Site improvement	=	1,09,31,695.00
9. Construction of Roads (internal)	=	61,35,590.00
10. Construction of compound wall	=	5,06,880.00
		2,35,51,665.00
	=	8,05,06,085.00
11. Contingency @ 5%	=	40,25,304.00
12. W/Establishment @ 2½%	=	20,12,652.00
13. Overhead charges	=	56,35,425.00
		9,21,79,467.00
14. Land cost @ 10,00000/acre 12x10,00000/-	=	1,20,00,000.00
		10,41,79,467.00

= Cost of 624 flats.

∴ Cost/dwelling unit = Tk. 1,66,951.00

i.e. only construction cost/sft = Tk. 268.58


34
35
36
37
38
39
40
41
15'
80'
50'
120
25'
CHILDREN'S PLAY SPACE 0·75 ACRE.
PRIMARY SCHOOL 0·29 ACRE.
25'
20'
25'
44
45
46
47
48
49
50
51
50'
50'
50'
25'
STUDY AREA = 12 acres (appx.)
Total Buildings — 52
6 storied — each unit - 550 sq ft (Net)
ARMCO PIPE CULVERT.
480'-0"
PART-LAY-OUT PLAN FOR RESIDEN
OF PALLASSY & NILKHET BARRACK
AT MIRPUR.
SCALE - 66 = 1'

Cost Abstract

Project-9: Construction of Multi-storied Government owned houses at Bailey Road

1. Construction of 6-storied R.C.C. framed building complete (6 units)		
a) Ground Floor in/c. foundation-858 sft @ Tk. 160/sft	= Tk.	1,37,280.00
b) 1st Floor - 858 @ Tk. 105/sft	=	90,090.00
c) 2nd Floor - 858 sft @ Tk. 110/sft	=	94,380.00
d) 3rd Floor - 858 sft @ Tk. 115/sft	=	98,670.00
e) 4th Floor - 858 sft @ Tk. 120/sft	=	1,02,960.00
f) 5th Floor - 858 sft @ Tk. 132/sft	=	1,13,256.00
	Tk.	6,36,636.00
2. a) Internal sanitation and water supply @ 15% on Tk. 6,36,636.00	=	95,495.00
b) Water supply lines L.S.	=	12,500.00
c) Sewer mains L.S.	=	7,500.00
3. a) Internal Electrification @ 15% on Tk. 6,36,636.00	=	95,495.00
b) External overhead lines L.S.	=	5,000.00
c) Electric sub-station L.S.	=	12,500.00
4. Construction of underground water reservoir, electric pump and pump shed. L.S.	=	37,500.00
5. Construction of compound wall.L.S.	=	5,000.00
6. Construction of compound Road.L.S.	=	10,000.00
7. Construction of compound drain.L.S.	=	4,000.00
	Tk.	9,21,626.00

8. Add for contingency @ 5%	= Tk.	46,081.00
9. Add for work Establishment charges @ 2½%	=	23,041.00
		9,90,748.00
10. Overhead charges @ 7%	=	69,352.00
		Tk.10,60,100.00
	= Cost of 6 units	

∴ Cost/unit = Tk. 1,76,683.00

11. Land cost @ 10,00,000.00/bigha (not included in the estimate)

Cost Abstract

Project-10: Construction of Multi-storied Government owned houses at Bailey Road.

1.	Construction of 15 storied R.C.C. framed building with raft foundation complete (15 units)		
	a) Ground floor in/c. foundation -858 sft at the rate of 275.00/sft	= Tk.	2,35,950.00
	b) 1st floor - 858 sft @ Tk. 105/sft	=	90,090.00
	c) 2nd floor - 858 sft @ Tk. 110/sft	=	94,380.00
	d) 3rd floor - 858 sft @ Tk. 115/sft	=	98,670.00
	e) 4th floor - 858 sft @ Tk. 120/sft	=	1,02,960.00
	f) 5th floor - 858 sft @ Tk. 125/sft	=	1,07,250/00
	g) 6th floor - 858 sft @ Tk. 130/sft	=	1,11,540.00
	h) 7th floor - 858 sft @ Tk. 135/sft	=	1,15,830.00
	i) 8th floor - 858 sft @ Tk. 140/sft	=	1,20,120.00
	j) 9th floor - 858 sft @ Tk. 145/sft	=	1,24,410.00
	k) 10th floor- 858 sft @ Tk.150/sft	=	1,28,700.00
	l) 11th floor- 858 sft @ Tk. 155/sft	=	1,32,990.00
	m) 12th floor- 858 sft @ Tk. 160/sft	=	1,37,280.00
	n) 13th floor- 858 sft @ Tk. 165/sft	=	1,41,570.00
	o) 14th floor- 858 sft @ Tk. 177/sft	=	1,51,866.00
		Tk.	18,93,606.00
2.	a) Internal sanitary and water supply arrangement @ 15% on Tk. 18,93,606.00	=	2,84,040.00
	b) Water supply distribution lines L.S.	=	12,500.00
	c) Sewer mains L.S.	=	7,500.00
		Tk.	21,97,646.00

3. a) Internal Electrification @ 15% on Tk. 18,93,606.00		= Tk.	2,84,040.00
b) External overhead lines	L.S.	=	5,000.00
c) Electric Sub-station	L.S.	=	18,500.00
4. Cost of lift	L.S.	=	2,50,000.00
5. Construction of underground water reservoir, electric pump and pump shed	L.S.	=	50,000.00
6. Construction of compound wall	L.S.	=	5,000.00
7. Construction of compound road	L.S.	=	10,000.00
8. Construction of compound drain		=	5,000.00
			Tk.28,19,186.00
9. Add for contingency @ 5%		=	1,40,959.00
10. Work establishment charges @ 2½%		=	70,480.00
			Tk.30,30,625.00
11. Overhead charges @ 7%			2,12,144.00
			Tk.32,42,769.00
12. Land cost @ Tk.10 lacs/bigha for 0.90 acres (not included in the estimate).		= Cost of 15 units.	

∴ Cost/unit = Tk.2,16,184.00

Only construction cost/sft = Tk. 251.96

APPENDIX-8

Housing Standards

Different types of housing standards are discussed below.[1]

A. Standards group A - Squatter areas including core houses:

Sl. No.	Item	Requirements
1.	Housing Lots	50 to 60 percent of the total area of development
2.	Density:	
	(To control the sanitary, physical and social standards of the living environment within the range of reasonably desirable and economically maximum use of the available land)	200 persons/acre (net) (maximum) 100 - 120 persons/acre(gross) (maximum)
3.	Lot area:	
	To provide an area sufficient in size and of reasonable proportion to allow the erection of single family dwelling and have remaining sufficient area for normal domestic activities such as children's play, cultivation of a 'kitchen garden' drying space for laundry etc.	1075 sq.feet (minimum)
4.	Building lines (Setbacks):	
	(To provide circulation around the dwelling, to allow adequate light and ventilation to the dwelling, [illegible] provide area for necessary external domestic activities and off-street children's play; to prevent the spread of fire from one dwelling to another; and to allow access to the rear yard for service of sanitary facilities and for fire fighting equipment.	Front (between dwelling and street right of way) a minimum of 10 feet. Rear 10 feet (minimum) Side: 4 feet (minimum)

Source: 1. Agency for International Development, Office of the International Affairs, Washington D.C. "Proposed Minimum standards" Ideas and Methods exchange No.64,1975.

Sl. No.	Item	Requirements
5.	Distance between building on on the same site:	
	Between dwelling and ancillary structure	8 feet
	Between two ancillary structures	4 feet
6.	Space Standard:	
	(To provide reasonable space per occupant, conducive to both physical and mental health)	270 sq. ft. (minimum) for a family of 5 persons. (i.e. 54 sq.ft/person)
B.	Standards-Group B. - Detached, Semi-detached and Row Housing	
1.	Housing lots:	50 to 60 percent of the total area of development
2.	Density:	
	Maximum number of dwellings Detached dwellings	18.4 dwellings per net housing acre.
	Row dwellings	40.0 " "
	Persons/acre Detached dwellings	92 persons/acre (net)
	Row dwellings	200 persons/acre (net)
3.	Lot Frontage: (minimum)	
	Detached dwelling	40 feet
	Semi-detached "	30 "
	Row-dwelling (one-storey)	20 "
	For lots of irregular shape	15 "
4.	Lot area	
	Detached dwelling	2355 sq.ft. (minimum)
	Semi-detached "	1605 sq.ft. "
	Row-dwelling	1075 sq.ft. "

Sl. No.	Item	Requirements
5.	Distance between buildings	
	(Between buildings front-to-front path, or common area	2½ times the total building height.
6.	Space standards:	
	(for a family of 5 persons)	350 sq.ft. (gross) (dwelling area)
7.	Minimum room sizes:	
	For single use	
	Living room	120 sq. ft.
	Dining "	80 " "
	Bed room - 1st	100 " "
	Bed room - 2nd	85 " "
	Bed room - 3rd	75 " "
	Other living areas	75 " "
	(All of the above to have a minimum lateral dimension of 8 feet)	
	Kitchen	60 " "

C. Standards - Group - - Multi-Family Housing

Sl. No.	Item	Requirements
1.	Density	405 persons/acre (net) (maximum)
2.	Building height	Should not exceed 1.75 times the distance from the face of the ground floor of the structure to the further side of the street right-of-way on which it fronts.
3.	Maximum Lot coverage	Should not exceed 40 per cent.
4.	Room sizes	Same as (group-B)
5.	Distance between buildings	Same as(group-B)

GLOSSARY

Pucca house	A house constructed with brick, sand and cement
Kutcha house	Other than a building
Kata	One kata means 720 sq.ft.
Bigha	One-third of an acre = 33.33 decimals
Lac	One hundred thousand
Crore	Ten million
Bangladeshi	The people of Bangladesh
'Kaaba'	The holy mosque of the Muslims at Mecca
Bahu-tala flat nirman shamassha	Problem of the construction of multistoried flats.
Paurashava	Municipality
Jupri	Shacks
Shaheed	Martyr
Bangabhaban	Governor's house
Kathal	Jack fruit
Jam	Blackberry

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