

Research Report

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Md. Kamruzzaman,
Graduate Student
Department of Civil Engineering & Architecture
Faculty of Engineering
University of the Ryukyus, Japan.

POTENTIAL OF HIGH DENSITY WALKUP APARTMENTS IN DHAKA CITY

Md. Kamruzzaman

Graduate Student, University of the Ryukyus, Japan

E-mail: k068658@eve.u-ryukyu.ac.jp

Abstract

Dhaka, the capital city of Bangladesh, is currently the 11th largest urban agglomeration in the World. It is the main seat of trade, commerce, higher education, health facilities and employment. Consequently, it has had to absorb massive local migration, resulting in stress on residential and infrastructure services. As housing cannot keep pace with the population increase, the problems of shortage of accommodation and growth of squatter and slum settlements are acute. Thus there is an increasing need of utilizing lands more efficiently with appropriate housing type. Residential lands of Dhaka city are mostly occupied by the middle income group. The major problem for middle class housing is accessible and affordable land. Land for housing is in extremely short in supply. As a result, marginal lands can be developed at great cost. It is the necessity to consider the affordability issue of the urban majority to accommodate them within the city. The current trends of low density high rise apartment contribute less to solve the huge housing lack. This research study aims to validate the feasibility of high density walkup apartments in Dhaka. It urges with the principle that unless the general economy, technological state, affordability and life style of vast majority of the urban population are considered, high rise housing will not be a responsive housing scheme. The city dwellers of middle income group are considered for affordability analysis as the demand of housing concerns mostly the middle income group. It emphasized affordability by examining the issues from the viewpoint of living space, floor area ratio, height, density and cost. The rise in construction cost with the building height is prominent where construction is labor-intensive. The inclusion of the costs of developed land, render high rise housing solutions inaccessible even for households well above the median income. These figures prove that high-density walkup apartments are the feasible and sustainable alternative in Dhaka city.

Keywords: Affordability, Density, High Rise, Walk-up Apartment, Dhaka.

首都ダッカにおける高密中層集合住宅の可能性（概要）

モハメド・カムルジャマン（琉球大学理工学大学院博士課程）

バングラデシュの首都ダッカは、現在、世界で11番目の人口密集都市であり、国の交易、商業、高等教育、保健施設、生産活動の中心的役割を果たしている。そして、それは地方労働者の集中と、それに伴う住居及び社会インフラの問題を起こしている。住宅供給が人口増加のペースに対応しきれないため、深刻な住宅不足と不法居住や劣悪環境での居住という事態が発生している。そこには適正な住居形態に伴う土地の有効活用の必要性が増大している。本研究の目的は、ダッカにおけるエレベーター設備を持たない階段式高密中層集合住宅の可能性を検証することにある。

ダッカ市の住居地域の多くは中産層によって占められている。中産層向け住宅の主要問題は土地取得とその適正価格にある。住宅地の土地供給は極めて不足している。その結果、都市周辺地域の価格は極めて高価格で開発されている。従って、問題は、多くの都市市民を如何に都市地区に経済的に無理無く住まわせる事ができるかにある。現在建設が盛んに行われている高層低密住宅はこの問題に解決に寄与しているとはいえない。現在の大多数の都市市民の経済事情、生活様式、建設技術等を総合して、高層集合住宅は彼らの需要に適した形式とはいえないであろう。住宅需要の多くは中産層のものであり、多くの住宅の形式の選択は彼らの経済性の分析に基づくものではない。そこには、生活空間、容積率、建築高さ、密度そしてコスト等の側面からの考察が必要である。特に現場作業に多くを頼る高層建築の建設でのコスト上昇は著しい。さらに地価の上昇を伴えば、平均収入以上の世帯にとっても住宅取得は難しくなる。このような状況を総合してダッカにおけるこれからの持続可能な都市市民のための住宅形式は、高密中層の集合住宅にその可能性があるものと推測される。

1. Introduction

Housing production, access and affordability and maintaining existing stock in habitable condition still remain some of the most intractable problems facing many cities of the World. In spite of national and international efforts aimed at developing appropriate shelter policies and strategies, no effective remedy has been found to cure housing ills (UNCHS, 1995, 1996). Nowhere is this contradiction seen more vividly than in the cities of the developing countries where population growth has exceeded their capacity and ability to provide basic shelter. Many developed countries, particularly in Europe and Great Britain, adopted the use of high rise buildings to meet their demands for housing after the World War II. This pattern was soon followed by other nations facing similar pressures for affordable housing. However, drawbacks of such action were soon evident. This led to the adoption of options like Low-Rise High-Density (LRHD) housing, which was advocated to be suitable from economic and social points of view (Rahman, 2001). Taking present trends of constructing high rise apartments as a case study, this study is an attempt to examine the aptness of walkup apartments in terms of affordability of middle class dwellers within the metropolitan area of Dhaka city. It begins by giving some background of housing situation in Dhaka city, housing parameters of the privately build high rise apartments followed by an affordability analysis. The study looks into the suitability of high density walkup apartments in terms of savings in cost and land use in the study area.

This report focuses on housing problems in Dhaka (Fig. 1), a city that has experienced tremendous population growth since the 1970s. Basic shelter is denied to a vast majority of middle and lower middle-income households, and the cost of housing is pricing more and more middle income households out of the housing market as well. The demand of housing concerns mostly the middle and lower income groups in Dhaka. The lower income group can not enter into the formal housing market due to lack of economic resources and housing for this ever-increasing segment of urban dwellers is difficult to manage (Kamruzzaman and Ogura, 2006a). Thus the study concentrates on Middle Income Group (MIG) who occupies the highest segment of residential land in Dhaka. The focus of the study was on the following three main objectives:

- Affordable floor area per households to estimate the increase in housing density;
- Optimum building height to reduce the construction cost as cost raises with height;
- Appropriate housing form considering the Floor Area Ratio (FAR), plot coverage, density and affordability of the huge city dwellers.

The materials presented here are based on field survey conducted in 2006. The field survey was conducted in different locations of residential neighborhoods within the metropolitan area of the city. The parameters considered in the study included floor area, height, plot coverage, density, land cost, construction cost, dwelling unit cost. Quantitative data collected through secondary sources and it included books, government documents such as published statistics, economic surveys, journals and reports.

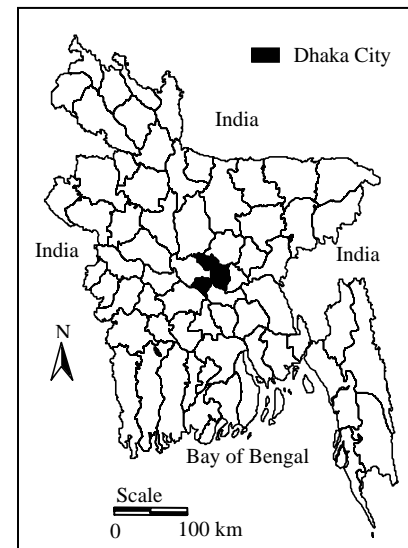


Fig. 1: Map of Bangladesh

2. Dhaka City: An Overview of Population Growth and Housing Condition

Dhaka, the capital of Bangladesh, is one of the fastest growing mega cities in the world. The city, its municipalities and adjoining urban areas, account for about 34% of the total urban population of Bangladesh (BBS, 2001). The expansion of the job market and consequent large-scale rural-urban migration played a significant role in the escalation of the cities population. Presently, Dhaka city has a population of over 12.5 million having an area of 1464 sq. km (Fig. 2). Private sector housing is one of the fastest growing sectors in the economy of Bangladesh and it concentrates its activities mostly in Dhaka. The conversion of Dhaka from an ordinary town to a metropolis is manifest in the transformation of the nuclear house into high rise apartments. Inadequate supply of developed land and high construction costs are the major constraints in most new formal sector residential construction in Dhaka. The issue of efficient utilization of residential land for urban housing development has always been central to urban planning. This is particularly so considering the fact that the utilization of residential land vis a vis appropriate housing type has exposed the plight of the urban majority of middle class dwellers in Dhaka.

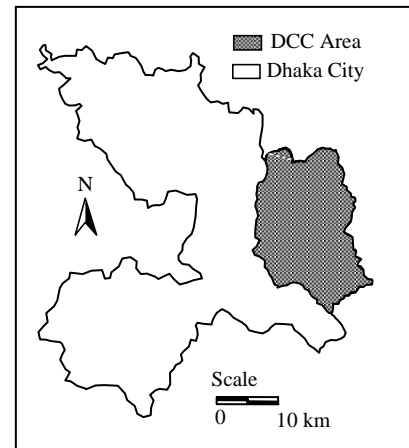


Fig. 2: DCC & Dhaka City

Population Growth

The UN International Economic and Social Affairs Department identified Dhaka as a mega city in 1987. With a population of only 2,068,353 in 1974, the city's population increased to 3,440,147 in 1981 and more than tripled to 6,487,459 in 1991 due primarily to rural urban migration. According to the 2001 census, the population of Dhaka mega city was 9,912,908 with an annual growth rate of nearly 4.33% (BBS, 2001). The population of Dhaka City Corporation (DCC) in 2001 census was 5,378,000 (BBS, 2003, p. 96).

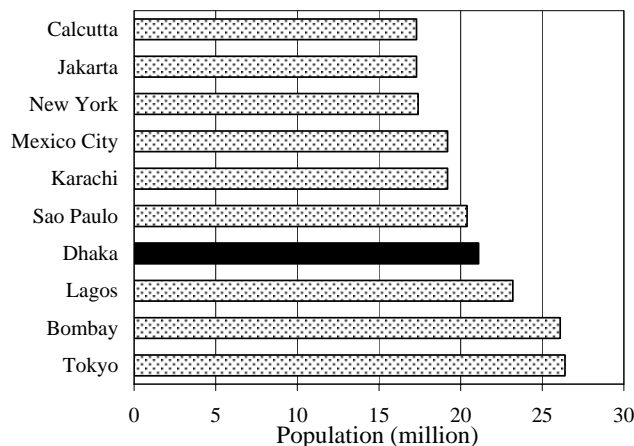


Fig. 3 Top Ten Populous Cities in 2015

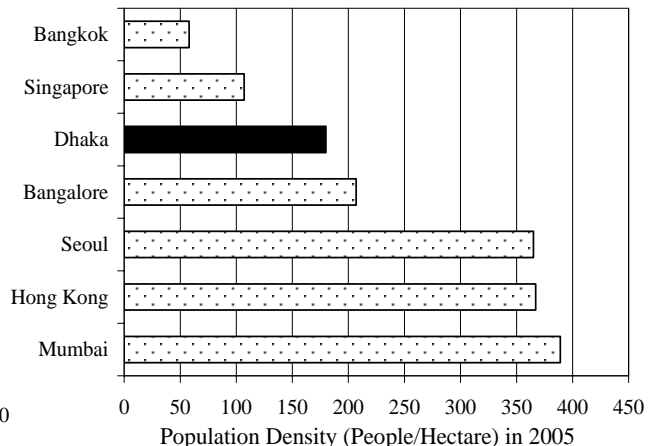


Fig. 4 Ave. Built-up Densities in Some Asian Cities

The projections for city populations (Fig. 3) illustrate that by 2015, the urban agglomeration of Tokyo will be the most populous, followed by Bombay, Lagos and Dhaka (21.1 million) (UN, 1999). At the same time Dhaka has the one of the leading built-up density among the Asian cities (Fig. 4).

Population Density

Population density of Dhaka mega city was found to be 4795 persons/sq. km in 1991 and approximately 8573 persons/sq. km in 2004. Table 1 represents the timeline of population density in Dhaka city and Fig. 5 shows the distribution of population in DCC area. However, the population density of DCC area is more than three times of the mega city area, as in 1991 it was 15,333 persons/sq. km against estimated present density of 18,055 persons/sq. km (Kamruzzaman and Ogura, 2006b). The gross population density in the mega city area is 8,573 persons/sq. km, but this figure hides the reality to a large extent. Less than 40 percent of the mega city area has been urbanized. By 2015, Dhaka's projected population of 21.1 million will fill most of the designated metropolitan area as a result of urban migration, extensions in the peripheries and fresh urbanization. DCC comprises only 24% (Fig. 2 & 5) of the mega city, a total of 360 sq. km, but within this small area it has to accommodate a population of nearly 6 million, plus another million or so for daily commuters.

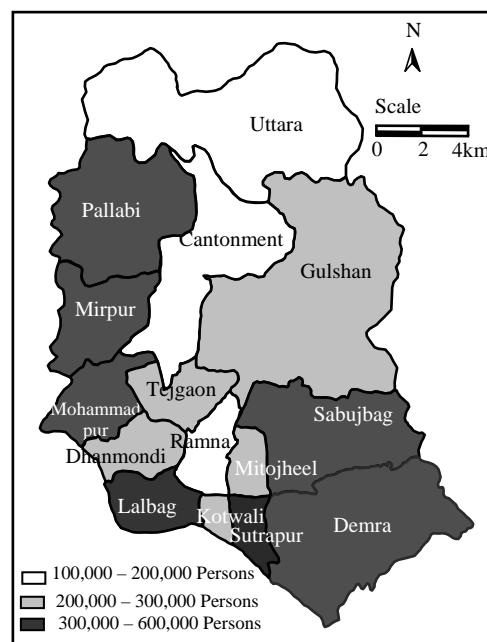


Fig. 5 Population Distribution in DCC Area

Table. 1 Population Density in Dhaka City

Year	Population	Total Area (sq. hectare)	Gross Density (people/hec.)
1951	411,279	8,545	48
1961	718,766	12,445	58
1974	2,068,353	33,579	62
1981	3,440,147	50,962	68
1991	6,487,459	135,287	48
2001	9,912,908	146,400	68

Source: BBS, 1997, 2001

Housing Situation

The housing situation in Dhaka is not at all satisfactory. The overall supply of housing units in Dhaka city has been inadequate compared to the increasing demands, which is due to rise in population. This has resulted in overcrowding with high occupancy rates and high room density. The unsatisfactory housing situation is further reflected in the total and per capita availability of floor space of the main living area. Average total floor space for an urban household is only around 30m² and per capita floor space averaged 5.1m² in 1991, while in the densely populated slums, a floor area per capita as small as 1.2 to 1.5m² is a common feature (Islam, 1996).

According to the proposed National Housing Policy 2004, the current nationwide housing requirement stands at 2 million, increasing at a rate of 372,000 dwelling units/year. The urban housing need was 658,000 units/year between 1993-2000 including requirements for new

dwellings, replacements and backlog; 60% of it for the poor. Dhaka, a city of 12.5 million people increasing at 5% rate, had an annual requirement of 218,000 dwelling units up to the end of the century which included 80,000 new dwellings; 102,000 replacement units and 35,000 backlog units (BCL et.al., 1996). This may now stands at above 250,000. Nearly two thirds of these were required for the poor (Rahman, 2005).

High Rise Apartments by Developer's

The Government of Bangladesh cannot cater to the housing needs of its citizens on its own due to paltry fiscal capacity. Thus, the formal private developers' are being popular to the upper and middle class as housing provider and growing rapidly. Developers started housing projects in Dhaka in the late seventies. During the 1970s there were fewer than 5 companies engaged in the housing sector. In 1988, there were 42 such developers working in Dhaka and in 2004 the figure has increased to about 250. During the last 20 years the private developers delivered 700,000 to 800,000 unit apartments in Dhaka. According to the database of Real Estate and Housing Association of Bangladesh (REHAB) (2004), developers are supplying an average of 6,000 apartment units each year. High land prices in urban areas have caused multi-family units to become the predominant house-type. This sector has produced close to 3 percent of the houses over the last few years. Developers' are supplying apartments to sale to the affordable buyers, who represents a very minute part of the city dwellers and thus the ultimate contribution in the present housing crisis is also very little.

Housing Cost

There are basically five elements in the shelter sector that have to be financed. These are land, on-site infrastructure, the superstructure, design and management costs, and interest payments on capital. Affordability calculations considering the middle class dwellers to own a house for each of the five sectors of finance in the housing program are reported here, mostly on the basis of REHAB estimation. In this study, we consider two vital elements i.e. land and construction cost for the analysis.

Land

Because of the exponential increase in population in Dhaka, land prices have escalated during the last few decades. There is an active land market that prices land according to the characteristics of different location, distance from main centers and physical quality of the site.

Table. 2 Costs of Developed Land

Location	US\$* per sq. m
High income areas such as Gulshan, Banani	440 to 660
Middle income areas such as Dhanmondi	330 to 440
Other Dhaka neighborhoods	220 to 330
Mirpur and other suburban areas	154 to 220
Undeveloped land at 20 to 30 km from CBD	3.7

* US\$ 1 = (approx) 68 Taka (2006 Value)

Present land for development within the metropolitan area of Dhaka is estimated by REHAB (2003) and is shown in Table 2. With a minimum plot area of 2100 sq. ft (~195m²) in urban areas, a building plot in the lowest income area would still exceed Tk. 3 million (US\$ 44,118) which the upper middle class can barely afford.

Construction Cost

REHAB provided the following construction costs per sq. m at different levels of quality. Figures presented in Table 3 show that the construction costs for a small 300 sq. ft (~28m²) house, excluding land cost, would be in the order of Tk. 150,000 (US\$ 2206). Such a house would be quite affordable at a median income level. The inclusion of the costs of developed land makes such housing solutions inaccessible even for households well above the median income. Therefore, high-density multi-family developments are the most feasible alternative.

Table. 3 Costs of Construction

Type of Construction	US\$ per sq. m
High quality construction (multi-family)	158.3 to 190
Middle quality construction (multi-family)	134.5 to 158.3
Simple construction (multi-family)	103 to 134.5
Single story low-cost house	71.25 to 95

Source: REHAB, 2003

Cost of Apartment Units

Cost of a dwelling unit in the private developers' apartment varies mostly due to size and location. The sale price of new residential real estate varies per neighborhood and depends mostly on construction quality and land prices. Table 4 is the REHAB estimates of 2003.

Table. 4 Costs of New Apartments Units

Location	US\$ per sq. m
High income areas such as Gulshan, Banani	380 to 538
Middle income areas such as Dhanmondi	316.6 to 380
Other Dhaka neighborhoods	293 to 316.6
Smaller lower middle income pockets in other areas	237.5 to 253.3

Source: REHAB, 2003

3. Middle Class Dwellers

The first issue in defining the beneficiaries of the private developers' apartments is to ascertain the 'target group'. In the context of Dhaka city, the target group of private developers' apartments is the portion of city dwellers who find themselves incapable of entering the formal housing market. The only detailed figure of the cities population of different income groups and their approximate residential land coverage is available in Table 5, based on records from Islam, (1996). Although the data is old, the situation has not changed much for the better and it is, therefore, still relevant to provide a broad picture of the housing conditions of Dhaka.

Table. 5 Land Coverage by Income Groups

Income Groups	Approximate Coverage of City's Residential Land
Higher Income Group	15%
Middle Income Group	65%
Low Income Group	20%

Source: Islam, 1996

Households Income

Data on household incomes of the MIG are notoriously difficult to compile since most households and individuals have several sources of income, both formal and informal. Therefore all household income data are approximations. BBS (2001) shows that among the

lower and middle-income groups, primary earners contribute 70% of household income, and each house hold has 1.45 numbers of earners. A study jointly conducted by Asian Development Bank (ADB), Government of Bangladesh (GOB) and Local Government Engineering Department (LGED) of Bangladesh in 1996 on urban poverty measured the monthly households’ income presented in Table 6.

Table. 6 Income Distributions of Households in Dhaka

Income Group	Income Range (per Month)	Households (Percentage)	Cumulative Households (%)
Destitute	US\$ 0 – 13.89	2	2
Hard-core Poor	US\$ 13.90 – 38.89	18	20
Moderately Poor	US\$ 38.89 – 74.04	35	55
Lower middle	US\$ 74.09 – 148.15	20	75
Middle	US\$ 148.16 – 518.52	20	95
High	US\$ 518.53 & Plus	5	100

Source: ADB-GOB-LGED (1996)

4. Affordability Analysis

Key determinants of affordable housing besides the community service index and the number of floors per structure are the total amount of built-up area and built-up space (Rahman, 2001). Floor Area Ratio (FAR) rises on a gradually flattening curve with the increase in floors as building-to-building distance increases to ensure required light and ventilation. The effect of increasing the height of building based on density varies considerably. For a fixed floor area, density can be increased by reducing the total living space area and space provided for community services, and by increasing the number of floors.

Floor Area and Density

Social and economic factors like the household income, status and household size of the family determine the size and design of housing units. Room number depends mainly on the socio economic status and also the size of the family. From the survey of 194 dwelling units of 50 apartments (Fig 6), around 90% of dwelling units have a floor area

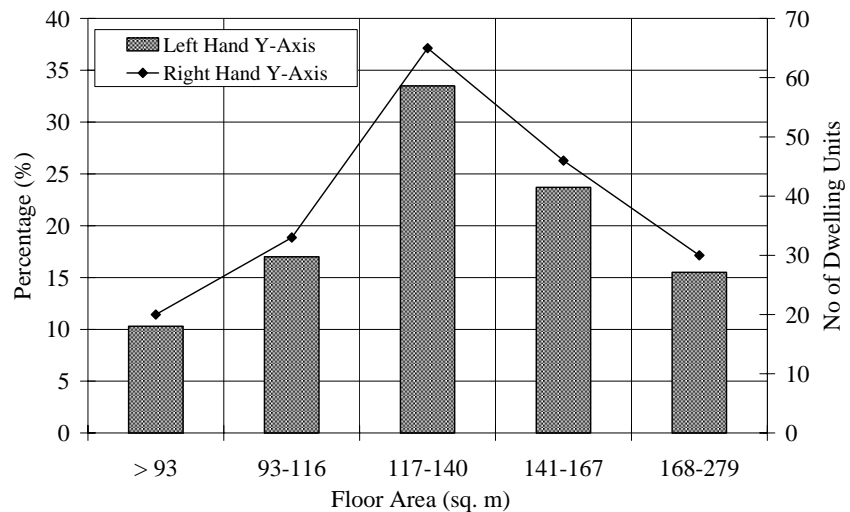


Fig. 6 Floor Area of Developers' Apartments

over 1000 sq. ft (~93 sq.m). Hence private developers are constructing oversized apartments which seem to be beyond the affordable limit of the middle class. In addition, public buildings are usually constructed with a floor area not exceeding 93 sq.m. (K.zaman and Ogura, 2006c).

There are high rise apartments of 10 to 24 storey in practice. Average sixteen storey buildings are more in Dhaka. Considering average household size of 4.8 and average floor area of 100m², the housing density is calculated as shown in Table 7. By this process, a maximum of 60% density can be increased. Plot coverage is usually not more than 67% and it results an average density of 4180 persons/ha with a FAR is as high as 10.7.

Table. 7 Housing Densities in Developers’ Apartments in Dhaka

No. of Storey	Plot Area (hector)	67% Plot Coverage (hector)	Built up Area (hector)	Floor Area Ratio	No. of Dwelling Units*	Person Housed	Density (person/hector)
10	8	5.36	53.6	6.7	5360	25728.0	3216.0
12	8	5.36	64.32	8.0	6432	30873.6	3859.2
14	12	8.04	112.56	9.4	11256	54028.8	4502.4
16	9	6.03	96.48	10.7	9648	46310.4	5145.6
Total	37	24.79	326.96		32696	156940.8	4180.8

*Size of each dwelling unit is 100 m²

Floor Area and Affordability

Density varies with the amount of space per household, and hence with affordability for the occupants. For a fixed floor area, density can be increased by reducing the total living space area and space provided for community services, and by increasing the number of floors. Again, if the issue of affordable floor space is considered then it needs to relate the household income, floor area and density to find out an optimum level. To determine the affordable floor space of MIG peoples, annual household income and house price to income ratio are considered. According to report of Government of Bangladesh (GOB), 1996 house price to income ratio is 18.93. It means a median income household needs 18.93 years annual income to own a house. A median floor space cost of US\$ 300 per sq. m. is considered at a typical location of

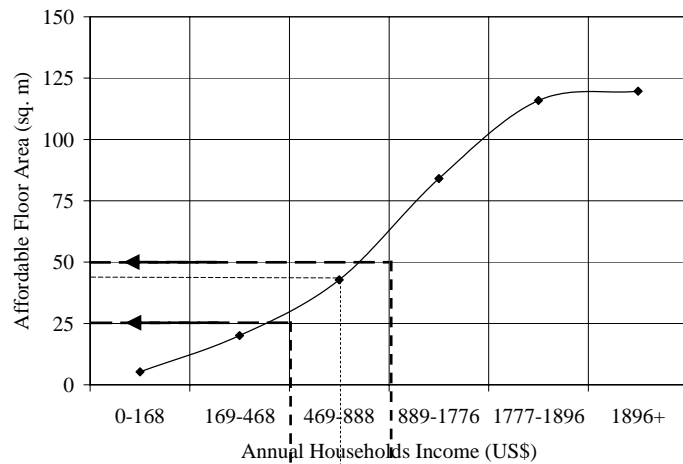


Fig. 7 Households Income and Affordable Floor Area

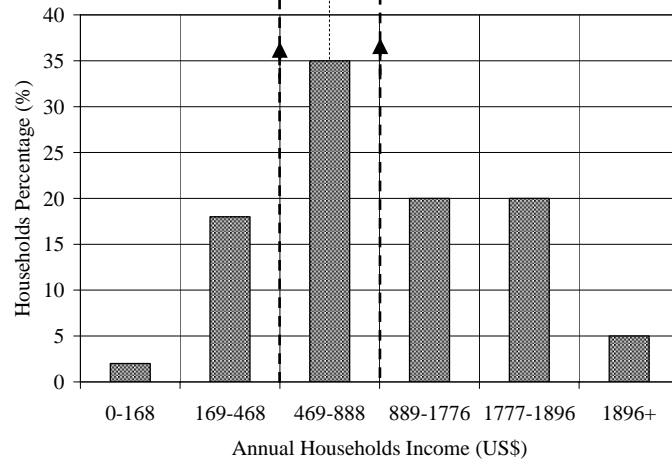


Fig. 8 Households Income Distribution

median land price. By dividing the 18.93 years annual income to unit cost of floor area, an affordable floor area to all income group can be determined without considering the effect of building height. Fig. 7 represents the affordable floor space graph. In Fig. 8, the annual income distribution to all income groups are shown. The projection of income distribution of urban majority well explores the affordable floor area in Fig. 7. It appears from the Fig. 7 and 8 that a floor space of 40-45m² is within the affordable limit of the urban majority.

Building Height & Affordability

From a cost consideration, increasing FAR is counter-productive (Correa, 1988); as buildings become taller, they also become more expensive to construct. Thus, a higher FAR is of marginal relevance to the majority of the urban population from a purely economic perspective. Increasing number of floors cannot gain much when the total living space is high (Stone, 1970). For units of 25m², the net site density increases by 50% with a 1:4 rise in FAR.

In this section an attempt has made to develop a relation between building height and affordability of MIG of Dhaka city. Generally, the construction cost increases with the increase in building height and land cost decrease with increase in building height. Rahman (2001) established the relation between apartment unit cost with building height and is presented in Fig 9. It was pointed out that (without considering the effect of floor area, i.e. for a constant floor area of 45 m²) the inclusion of land cost with construction cost reduces the total unit cost up to a level of 4 storey. Afterwards the trend of dwelling unit cost appears to be upward. Fig. 10 shows the income distribution of different income groups over a time period of 18.93 years as the house price to income ratio in Dhaka is so. Hence the projection from the Fig. 10 to Fig. 9 considering the income level of urban majority, it reveals that cost of buildings of 5 to 6 storey, merge within the income level of urban majority and affordable to the said income group.

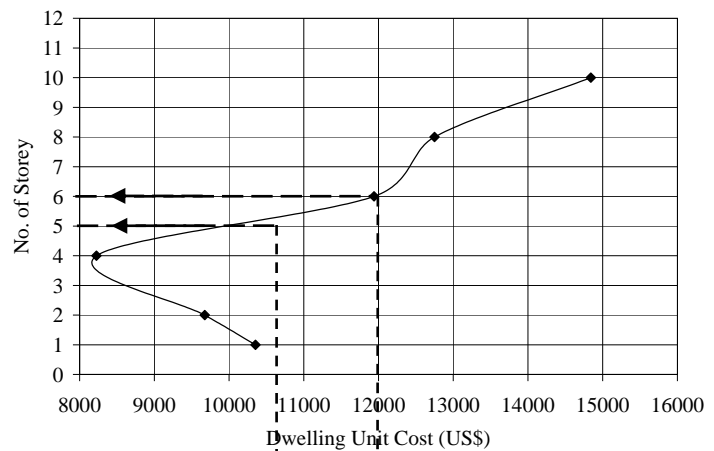


Fig. 9 Cost Variation of Apartment Units with Building Height

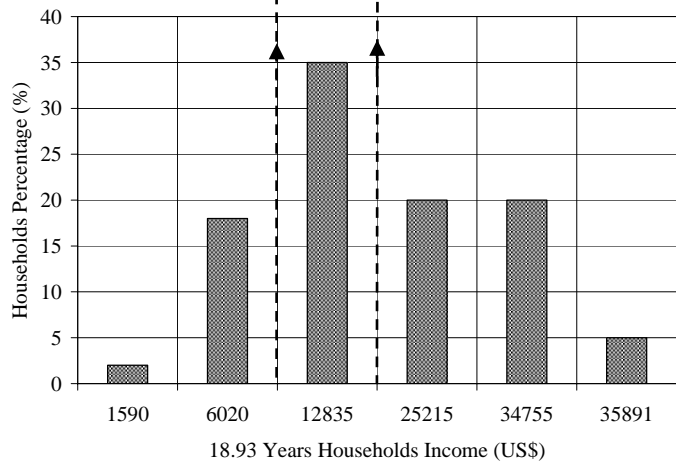


Fig10 Households Income Distribution

5. Conclusion

It has been shown that the net population density can be increased to a maximum of 60% despite the cost of apartment unit is not affordable. Using the plot coverage of 75%, it is possible to increase the built-up floor area. The FAR increases the built-up floor area, thus increase the number of housing units that can be well suited in Dhaka. In order to have more housing units, a maximum plot ratio of 3.8 is proposed. This will result in five floors which is the highest level for walk-up apartments without introducing the use of a lift. Table 8 shows the proposed typology combination that would increase the built-up area significantly by applying different FAR.

Table. 8 Proposals for Affordable Density and Building Height

No. of Storey	Plot Area (hector)	75% Plot Coverage (hector)	Built up Area (hector)	Floor Area Ratio	No. of Dwelling Units*	Person Housed	Density (person /hector)
2	8	6	12	1.5	2667	12800.0	1600.0
3	8	6	18	2.3	4000	19200.0	2400.0
4	12	9	36	3.0	8000	38400.0	3200.0
5	9	6.75	33.75	3.8	7500	36000.0	4000.0
Total	37	27.75	99.75		22167	106400.0	2800.0

*Size of each dwelling unit is 45 m²

Table 8 demonstrates how, using different floor area ratios, more built-up area can be achieved. The plot ratios used give a maximum of five floors with a total built-up area of 99.75 ha. This is about 3.6 times the plot coverage of 27.75 ha. The combination of different floor levels would create very good architectural forms. In addition, there would be enough natural lighting and ventilation.

Considering the population growth of the city, undoubtedly there is increasing need to utilize this land more efficiently with appropriate housing type. Residential lands of Dhaka city is mostly occupied by the MIG. The major problem for middle class housing is accessible and affordable land. Land for housing and other urban development purposes is in extremely short supply. As a result, marginal lands can be developed at great cost. It is the necessity to consider the affordability issue of the urban majority to accommodate them within the city. The current trends of low density high rise apartment contribute less to solve the housing lack. From the analysis presented above, a floor area of 45m² will be a sustainable answer to the vast majority and with building height of 5 storeys that eventually forms walkup apartment, to reduce the cost and affordable to the MIG.

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