

Problems and Prospects of Tall Buildings in Developing Countries

Experience from Bangladesh

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Construction of tall buildings is a relatively new phenomenon in Bangladesh. Recent years, however, have witnessed an ever increasing trend towards construction of buildings which can be classified as "high-rise" (9 stories or more). Like many of the other developing countries, most of its tall buildings are located in its capital city Dhaka; the tallest one being Bangladesh Bank Building, a 30-storied building based on reinforced-concrete shear wall-frame interaction structural system. The present paper gives a brief account of tall building development in this country. It relates the present trend of high-rise construction with the prohibitive land price and high population density in the capital city. Although the present study foresees construction of a large number of 20-30 storied buildings in the Dhaka city in the near future, it has been felt that unless the building and land regulations are amended to reflect the special needs of these buildings, they are likely to lead to degradation of the urban environment. Particular attention has to be given to traffic problems, parking facility, recreational facility, fire safety and set-back rules while conceiving any new high-rise construction project. In addition, a stricter enforcement of the rules and better quality control in its labour-intensive construction practice is deemed essential. Efforts have been made to review the present and future trend of high-rise development in Dhaka. Discussion has been made on population and physical growth of Dhaka city. Various problems and prospects of high-

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rise development, both commercial and residential, have been discussed mainly from the point of urban planning and design. In conclusion, a set of policies is recommended to promote balanced urban development in Bangladesh.

CURRENT STATE OF TALL BUILDINGS IN BANGLADESH

The history of tall buildings in Bangladesh is only three decades old. The trend that started in 1963 with the construction of 11-storied WAPDA building at Motijheel, the central business district (CBD) of the capital city Dhaka, has currently gained a tremendous momentum. Although tall buildings are being constructed in few numbers in other cities of the country, almost all the existing and under-construction tall buildings of the country are located in the capital city. In Dhaka, there are about 60 such notable buildings clustered mainly at the Motijheel commercial area and in places like Eskaton, Mohakhali and Banani. If one compares the number of tall buildings in the capital city with the size of the greater Dhaka with a present population of about 7.0 million, the insignificant proportion of the tall buildings with respect to the overall scenario becomes evident. The growth of tall buildings in Dhaka city with time has been shown graphically in Fig. 1.

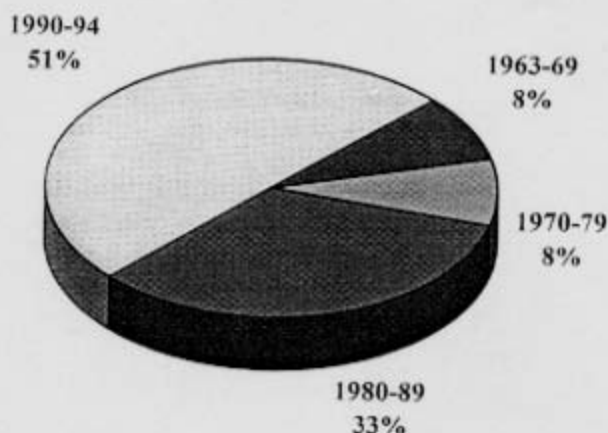


Fig. 1. Growth of tall buildings with time in Dhaka city (100% = 60 tall buildings).

It is evident from the figure that a steady increase in the number of tall structures has taken place in the recent years. Whereas in the sixties and seventies, on an average five high-rise buildings were constructed in Dhaka city, in the eighties about twenty tall buildings were constructed. Construction of tall structures attained its peak in the nineties, and, in the last four years more than 50% of the total number of tall buildings of the capital city has been constructed. The trend of going high is still there. At present the 2nd Annex Building of Bangladesh Bank is the tallest existing building in Bangladesh. This building has been shown in Fig. 2 (background). The building that can be seen in the left side of the figure is the 21 storied Sena Kalyan Bhaban. Like all other tall buildings in Bangladesh, the main structural components of these two buildings are made from structural concrete. The most prestigious tall building is, perhaps, the 9 storied Jatiya Sangsad Bhaban (National Parliament Building). This grand building, standing very prominently off the Manik Mia Avenue, is shown in Fig. 3.



Fig. 2 Tallest building in Bangladesh: 30 storied Bangladesh Bank Annexe Building (in the background) at CBD Motijheel, Dhaka.

INTERACTION OF URBANISATION WITH POPULATION GROWTH

The problems of urbanisation in Bangladesh, as in all developing countries, are intensified by high population growth and rural-urban migration. For Bangladesh the problem is further aggravated by limited land supply in urban areas, lower land utilisation and lack of proper policy and planning of landuse. The evergrowing urban population is creating an increasing demand for space. This rapid influx of population to the (capital) city results in sky-rocking land prices and provides some stimulus to construction of tall buildings.

During the last four decades, metropolitan Dhaka has recorded a phenomenal growth in terms of population and area. Dhaka at present is one of the fastest growing metropolises in the world. After the war of independence of 1971, Dhaka's provincial capital status was raised to national capital overnight and its population increased manifold in the subsequent decades. The land area and population of Dhaka is usually

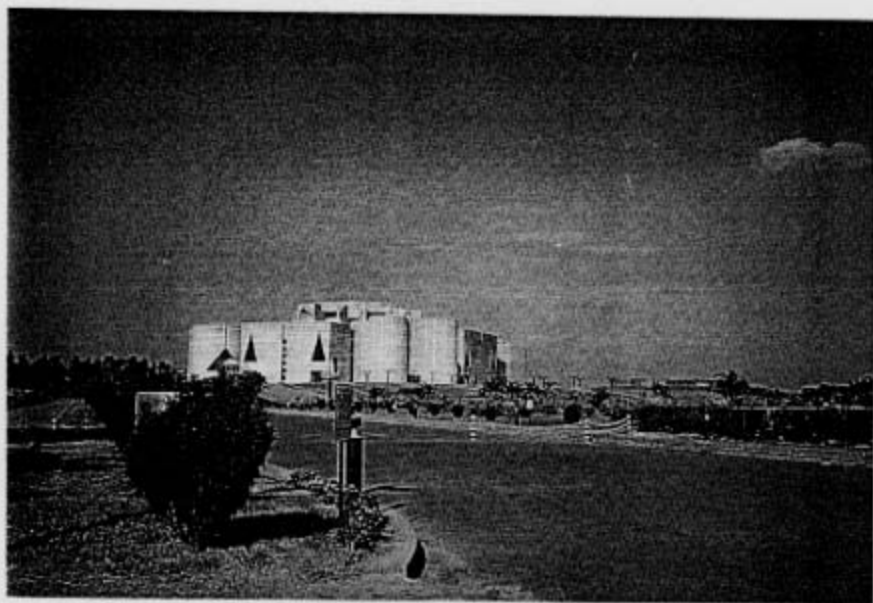


Fig.3 Most prestigious tall building in Bangladesh: 9 storied Jatiya Sangsad Bhaban (National Parliament Building) off Manik Mia Avenue, Dhaka.

expressed in terms of two boundaries. One is Dhaka City Corporation (DCC) boundary and the other one is the larger boundary of Rajdhani Unnayan Karttripakkhya (RAJUK). The present area under DCC is 265 km² with a population of 6.23 million. The present Rajuk area is 1528 km² with a population of about 7 million.

Figures 4, 5 and 6 show, respectively, the population, area and population density of Dhaka city between 1951-2001. At present the Dhaka metropolitan area consists of the inner city which is almost built-up and surrounding areas which are semi-builtup. During the period from 1981 to 1991, the greater Dhaka population grew at an average rate of 5.5% from about 2.8 million to 4.6 million. During the same period the built up area increased from 104 sq. km (39% of the city area) to 114 sq. Km (43%). The estimates of 1993 show that the population of greater Dhaka city is about 4.8 million. The surrounding areas of Savar, Tongi, Narayanganj, Keraniganj and the fringes contain a further 2.2 million people, for a total Dhaka conurbation population of about 7.0

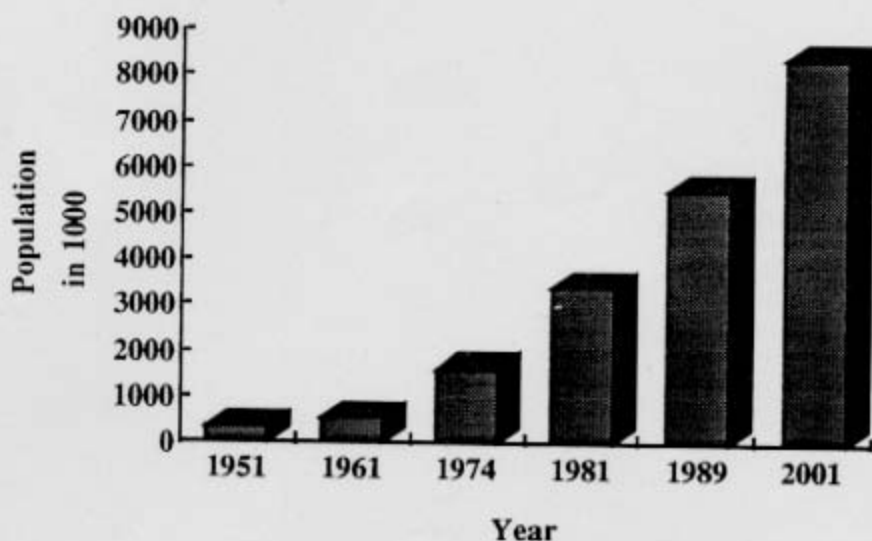


Fig. 4 Population of Dhaka city: 1951 - 2001.

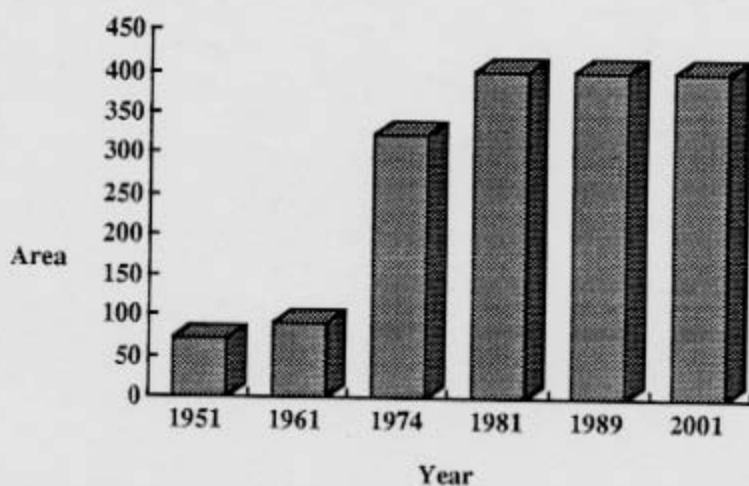


Fig. 5 Area of Dhaka city: 1951 - 2001.

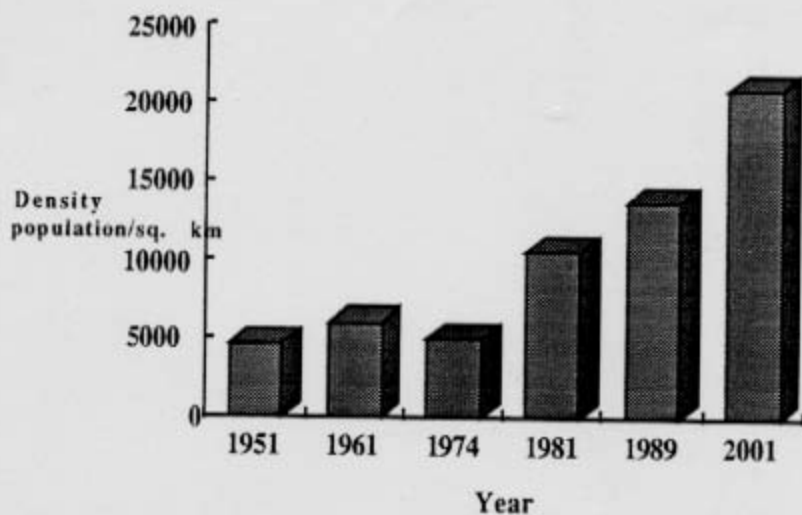


Fig. 6 Population density of Dhaka city: 1951 - 2001

million. The actual population of 2001 will be higher because Dhaka will grow beyond the assumed 1981 statistical metropolitan area boundary by the year 2001. This additional population in the coming decade will add new dimensions to the urban fabric of metropolitan Dhaka. The main reasons for the huge anticipated increase of Dhaka population in the coming decade is due to unbalanced urbanisation and presence of primacy in the city size distribution pattern. Compared to other developed and developing countries, it is evident that, although the overall extent of urbanisation in Bangladesh is not much, the average growth rate in the major cities is very high.

LAND USE, LAND USE ECONOMY AND LAND VALUE

The trend towards construction of tall buildings in Bangladesh is very much connected with the very high price of land in the main commercial and business districts of the country. Since land value is very high in inner city areas, population density should be increased by adopting multi-storied construction. In less developed areas, where commercial value is less, tall buildings are virtually non-existent. The overall picture of the land use type in the cities of Bangladesh may be viewed with respect to its capital Dhaka and that has been shown in Fig. 7. It is evident from the figure that only 39% of the total land of the capital is in urban use, while 61% has rural or semi-rural use. Since many parcels of inner city land is under utilised or vacant, they may be put to proper use for balanced urban growth.

High-rise buildings are constructed to ensure economical use of land in areas where land is scarce and its cost is high. Individual plot holders can save a lot of land by going in for multi-storey buildings. However, the savings in a given sector of land depend on the gross densities in number of dwellings per acre including the land required for common amenities like parks, playground, schools, shops, road etc. The maximum height of buildings and the number of stories that can be constructed are regulated by Floor Area Ratio (FAR). Therefore, increase in FAR will increase high-rise buildings and is a critical factor in the increase of land values.

Dhaka has experienced an unprecedented increase in land value since the early seventies. In the past decade Dhaka has mainly developed along the two main axes towards the north of Dhaka. Due to huge increase in the population of Dhaka, the pressure on land for residential use has been very high. Since the sixties until today RAJUK has provided only about seven thousand plots at subsidised rate mainly for the middle and upper income groups. The value of land in Dhaka city, mainly in the central area, has increased at a rate much higher than the rate of any other

commodity. While between 1969 and 1979 the cost of living in Dhaka has increased 4 folds, the price of high class residential land has increased approximately 25 to 35 times. Another source quotes that the land prices in Central Dhaka has soared from Taka 3/sq. m. in 1950 to more than Taka 8,000 /sq. m. in 1990.

USAGE OF HIGH-RISE STRUCTURES IN BANGLADESH

Needless to say, the gradual proliferation of tall buildings in the cities of Bangladesh, like the developed world, is in response to the corporate need for both face to face communication and expansion of business operation. This philosophy has remained, all over the world, despite the extraordinary technical advances made over the last 50 years in both transportation and communications. During the last two decades, metropolitan cities have attempted to expand vertically to meet the problems of urban population explosion, scarcity of land and spiralling land prices in cities and towns.

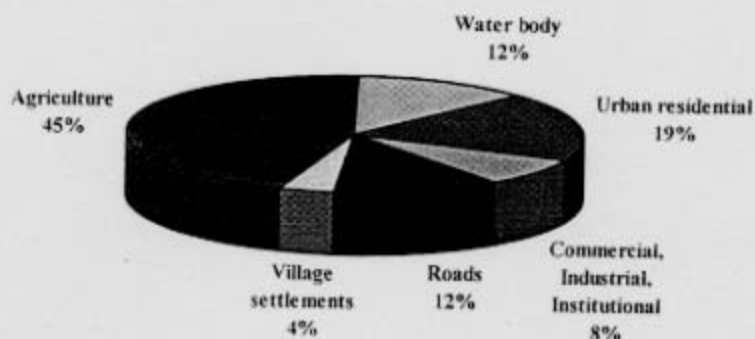


Fig. 7 Landuse types of Dhaka.

In Bangladesh, high-rise buildings have established an efficient setting for corporate business enterprise. They act as a significant source of revenue and a business focus for the entire metropolitan area. The high-rise buildings have, however, enjoyed only limited success in residential and manufacturing uses. At present, high-rise buildings for residential purposes are being seriously considered in an effort to provide a sensible answer to urban housing problems. However the suitability of such propositions, in the context of conditions prevailing in developing countries like Bangladesh must be studied in great depth before adopting high-rise buildings for residential purposes.

Because of the great size and height, the development of tall buildings usually involves active interaction of public and private decision makers. Successful public and private collaborations usually revitalise the urban environment. Thus, the tall building development in the form of office towers, hotels and residential apartment buildings has the potential of becoming a critical part of revitalisation in Dhaka and other cities of Bangladesh.

Dhaka city itself has started getting benefit from the concentration of business space and business activity that high-rise development is generating in Bangladesh. It has already been mentioned that land value is greater in the business district areas of Dhaka city. It appears that high-rise structures further increase those values. Like most cities, tall buildings of Bangladesh increase concentrations and these concentrations can generate higher tax returns.

Tall buildings provide easy access, proximity of support facilities of offices, accommodation to office staff where land is limited and ensure higher rate of return on investment. Because of the above mentioned reasons the high-rise structures are clustered in the business district and central city areas where land value is highest. On the other hand, developers are reluctant to construct high-rise structures in other locations of the country because those places lack in access facilities, supporting services are absent and, most importantly, rate of return on investment is usually very low.

It is worth mentioning here that, in Bangladesh, tall buildings usually serve as institutional buildings including government and commercial office buildings, hotels etc., and as residential buildings for upper-middle and high income groups.

MATERIALS AND STRUCTURAL SYSTEMS USED

All the tall buildings in the country use reinforced concrete elements as the primary structural members. Although only plain and mild steel were used as reinforcement in the construction of tall buildings in the

past, in the last 6-7 years a gradual switch-over to hot-rolled deformed bars or cold-twisted ribbed bars has been noticed. This has made possible the use of higher grade steels (having yield stress between 345 to 415 MPa) in the design and construction. The concrete strength used is relatively low (about 20-30 MPa) and admixtures and plasticizers are rarely used. Usually local sand and stone chips are used as aggregates in concrete.

In Bangladesh, the wages of skilled labour are very low. Consequently, the method of construction is still labour-intensive. Manual labour is used in most cases for placing concrete. Bamboo scaffolding is very common. However, some of the recent buildings have used tubular steel scaffolding. Although prestressed concrete, which was introduced in Bangladesh more than 30 years ago, is quite popular in highway bridges, it is yet to be used in high-rise construction in the country.

The early tall buildings were all designed as moment-resistant reinforced concrete framed structures. However, most of the buildings in the 20-stories range built during the last 12 years use systems based on shear wall-frame interaction. Flat plates are becoming increasingly popular in office buildings. Column spacings around 6 m. are commonly used. Most of the consultants have access to computers and use of computer in analysis, particularly for lateral loads, is quite common. For some of the buildings with unsymmetrical plan form, design has been based on three-dimensional analysis including torsion.

Pile foundations are the most popular for buildings above 15 stories. Precast reinforced concrete piles and cast-in-situ piles with driven casing and enlarged base have been used, but bored cast-in-situ piles around 40-50 cm. diameter appear to be the most popular now. Rafts are used in most buildings but individual pile caps interconnected with beams have also been used. Basements, usually provided for car parking are being increasingly used, particularly in office buildings.

PROSPECTS AND PROBLEMS OF TALL BUILDINGS

It is almost inevitable that high rise construction will increase in future in Bangladesh. In fact, in a fast growing metropolis like Dhaka where, land is scarce and land value is high, there is no other obvious option but to go for tall structures. In a country where expatriate consultants and contractors are being inducted in almost every field of technological activity, it is interesting to note that all the tall buildings in Bangladesh have been planned, designed and constructed by local architects and engineers. But high rise buildings, both commercial and residential, of Bangladesh have already revealed their merits and demerits in the very

short time that they have been serving the community. Some of the advantages of tall buildings are given below:

- It increases land use density leading to proper utilisation of inner city land.
- If properly designed and constructed it can increase the user efficiency for both commercial and residential use.
- It can bring positive effect on city form.

However, in the absence of proper urban planning and design, high rise buildings of Bangladesh are responsible, in many instances, for several problems leading to disadvantages for Dhaka and other city dwellers of Bangladesh. It may be mentioned here that until recently Bangladesh did not have a Building Code of its own. The absence of Building Code encouraged careless construction and lapses in planning. Some of the disadvantages that the tall buildings have demonstrated are listed below:

- Unplanned tall structure destroys the harmony in sky line.
- It put pressures on utility services like water supply, gas and electricity.
- It increases traffic congestion and parking problem.
- It creates problems of light and ventilation for adjacent small structure.
- Fire fighting problem in the building.
- Problem related to inadequate number of lifts.
- Problems due to inadequate parking space.
- Lack of community space.
- Lack of children's play area.
- Socio-psychological problems.

In this connection, reference can be drawn to Fig. 8, where 18 storied apartment buildings at Eskaton has been shown. Like most of the other high-rise apartment complexes in Bangladesh, these buildings are too closely situated for privacy and comfort. Here, apartment buildings have been built with space as little as 6 meters between them, with a width to height ratio at ground level of 9:1.

Among many other poorly designed buildings, Faridpur Mansion in the Kakrail area in the capital (shown in the background of Fig. 9) is one. The upward expansion of this building at the heart of the city went unabated until 13 stories were constructed. The ineffectiveness of the enforcing agencies is clear from this incidence. The infill walls of the top floors were stripped off and occupation in these levels has stopped. A court order prevents the concerned organisations from demolishing this

unauthorised and structurally unsafe building. In the meanwhile, this tall building continues posing hazard to everyone in the vicinity of the structure.



Fig. 8 Closely situated apartment buildings.

CONCLUSIONS AND RECOMMENDATIONS

This paper examines the prospects and problems of high rise construction in Dhaka in the light of physical growth of Dhaka, population increase, land value, land use and from the point of view of urban planning and design. It is viewed here that high rise development for commercial use will increase in the future years. But development of high rise apartment blocks should be more carefully examined. Under the present socio-economic condition, construction practice, cost of construction and occupant culture, it seems more appropriate to go for walk up (5-6 storey) residential buildings. Moreover it is seen from recent studies that many inner city urban land is still under utilised which can be put to proper use by careful urban planning and design. It is advocated that more planning control, building control, zoning, condominium law, and rules for high-rise construction should be formulated and implemented through co-ordinating agencies.



Fig. 9 Structurally unsafe tall structure in busy area.

The performance of various agencies related to the provision of essential utilities like electricity, gas, water, sewerage, etc. have to be improved in line with the growing number of high-rise dwellers. Concerted efforts by the planners, architects, engineers and administrators are needed for a planned and economical high-rise expansion of the cities of Bangladesh.

In the wake of the existing situation, the following points may be put forward in an effort to have a better future of tall buildings in Bangladesh:

- Proper rules and regulations for high rise construction should be formulated and implemented.
- In the case of apartments, exclusive apartment law should be enacted and implemented by RAJUK and other concerned agencies.
- Zoning law for Dhaka city in terms of use, class and height class should be formulated and strictly enforced.
- Particularly in inner city high cost areas, vacant land tax and punitive tax for very low rise construction may be enacted.
- Building rules related to lift, parking and fire fighting should be strictly monitored and enforced by concerned agencies.
- In commercial areas low rise structures should be totally discouraged by appropriate measures.
- In high-rise/high density zones, co-ordination between utility agencies should be increased to plan in advance for high capacity utility mains.

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