

Reprint

ISSN 1997-2571 (Web Version)

# Journal of Innovation & Development Strategy (JIDS)

*(J. Innov. Dev. Strategy)*

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**Volume: 7**

**Issue: 3**

**December 2013**

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*J. Innov. Dev. Strategy 7(3): 1-6 (December 2013)*

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## NATURAL LIGHTING AND AIR VENTILATION OF THE REAL ESTATE MANAGEMENT: A STUDY ON DHAKA CITY

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Accepted for publication on 10 October 2013

### ABSTRACT

Asaduzzaman M, Islam MZ, Chowdhury S (2013) Natural lighting and air ventilation of the real estate management: a study on Dhaka city. *J. Innov. Dev. Strategy*. 7(3), 1-6.

A study was conducted on the natural lighting and air ventilation of the real estate inhabitants of Dhaka City with the objectives of assessing the real estate designing status. The results show that the mean inter-building space, the buildings of Gulshan and Japan Garden city are well planned as there are enough spaces from the adjacent structures being 37 and 29 feet respectively. In the buildings of Shakari bazar and Mirpur Pallabi, the situation is worst as most of the rooms of the buildings of those areas remain dark even during midday and even the air passage or ventilation facilities are very poor, as because the spaces were only 5-13 feet. Increasing the inter-building spacing (keeping necessary setback) and making the structural design as per RAJUK rules should be of priority concerns for the purpose. A coordinated plan for Dhaka city should be taken considering the techniques for ensuring planned environmental friendly constructions. Practice of using windows, skylights or other form of fenestration to bring light into the interiors of the buildings and increasing inter-building spaces for air circulation are the most demanding and challenging issues for the construction industry of Dhaka city.

**Key words:** *inter-building space, natural lighting, air ventilation, inhabitants*

### INTRODUCTION

Dhaka, the capital city of Bangladesh has been reported to face serious housing limitations as it is characterized by huge population and congested habitation structures. Allocation of housing facilities to meet the needs of growing people is an important component of administration strategy of a city. Office buildings, market places, residential areas, educational institutions, commercial areas all have been developed haphazardly in Dhaka city (BBS 2005; Anon. 2005; Küller 2004). While carrying out real estate development projects, urban development rules and building bye-laws are not strictly followed in most of the cases in Dhaka city. As a result, natural lighting and air circulation or flow is being hampered. Providing thermal comfort without excess space conditioning costs is one of the primary requirements of buildings. Therefore, thermal control is an important aspect in almost all buildings. Understanding heat transfer and the temperature distribution through building materials and assemblies is also important for assessing energy use, thermal comfort, thermal movements, durability, and the potential for moisture problems. Heat flow occurs through the building enclosure via opaque enclosure elements, is directly transferred into the building by solar radiation through windows, is carried along with air across the enclosure by unintentional leakage and ventilation, and can be generated within the building by occupants and their activities. The control of heat flow in buildings requires insulation layers compromise with few thermal bridges, an effective air barrier system, good control of solar radiation, and management of interior heat generation. So the performances of the real estate services with regard to the living conditions are not satisfactory and this is causing environmental pollution and serious damage to the environmental stability resulting gradually decreasing health condition of the inhabitants of Dhaka city. The natural ventilation is required to ensure building envelopes and apartment layouts designed to maximise natural ventilation and daylight. Sunlight is essential to ensure building envelopes and internal layouts minimise energy consumed for heating and cooling (Astrand 2006; Seraj 2003). It is beneficial for optimum winter sunlight to north facing windows of living areas and private open space, and appropriate shading to north and west facing glazing in summer (Anon. 1981).

In the context, the present studies were undertaken to assess the existing real estate management status regarding natural lighting arrangement and air ventilation facilities and to identify the measures for immediate action to be taken improve the existing situation.

### MATERIALS AND METHODS

The whole studies were conducted using several types of methods and materials as per nature of the research and the set target objectives leading to achieve the outputs. The methods included field level investigation selecting characteristic sites.

#### *Field Investigation Design*

The methods and materials followed in this study consisted technical survey using specific investigation guideline. A questionnaire has been formulated, formal and non-formal interviews have been held with different categories of people for authentic information. Questionnaires related to Base area of the buildings, no. of

storeys, Building height, inter-building space etc. have been collected by direct interview with the inhabitants of the buildings and direct measurements. Survey is also focused on areas like natural lighting status, air ventilation facility etc. The following surveys have been done for the study: i. Photographic survey, ii. Door to door survey, iii. Related organization information collection.

### **Selected Study Sites**

Based on previous statistics of real estate developments, some important locations/areas of Dhaka city have been selected for performing the study. The selected locations (Fig. 1) were Dhaka North City Corporation (DNCC) and Dhaka Cantonment Board (DCB).

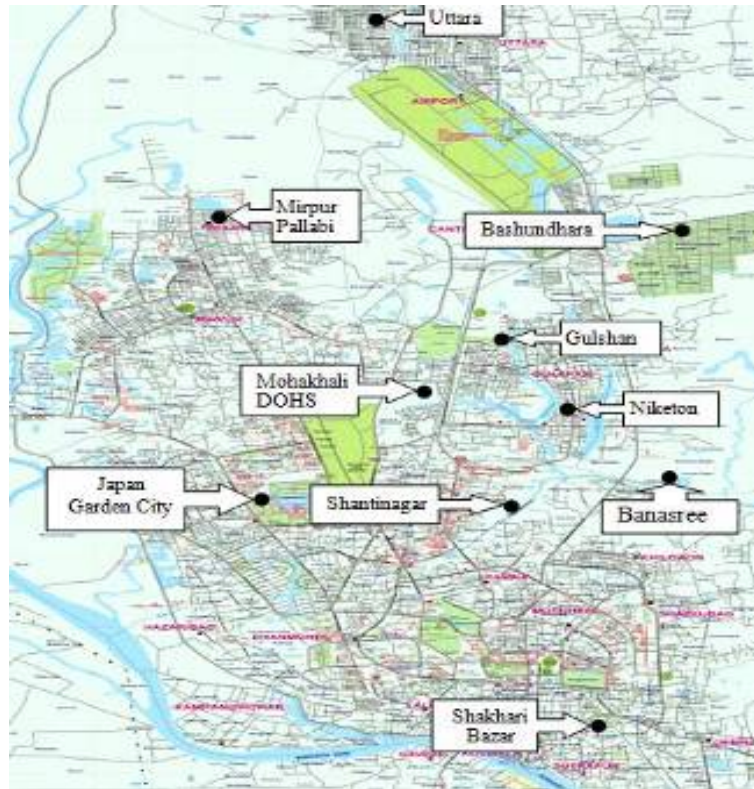


Fig. 1. Study locations

The specific study locations are Shakhari Bazar (Sutrapur), Mohakhali DOHS (Kafurul), Banasree Housing Society (Rampura), Japan Garden City (Mohammadpur), Mirpur Pallabi (Block- C) Residential area (Pallabi), Niketon Housing Society (P.S.- Gulshan), Gulshan Residential Area (Gulshan), Bashundhara (Badda) and Shantinagar (Paltan). The sites were selected as per recommended criteria on base: height/storey ratios and its components systems (WHO 2002; and Zaman 2006).

### **RESULTS AND DISCUSSION**

The study consists of practical field observation and field based data collection through structured and non structured questionnaires, formal & informal interviews with the inhabitants of existing buildings in some selected areas of Dhaka North and South City Corporation and Dhaka Cantonment Board. The relevant secondary data for this survey is mainly collected from different published & unpublished sources. The collected data are analyzed to address the main point of present inhabitants of Dhaka City areas with relation to their housing pattern and different essential amenities for comfortable and healthy living. Simple statistical methods such as averages and percentages are applied to compare different variables and then statistical graphs in term of table, Pie diagrams, bar chart are drawn to clearly point out the scenario.

#### **Existing Situations in the Selected Areas**

Questionnaires guidelines were related mainly to the base area of the buildings, number of storeys, building height and inter-building space etc. Data were collected by direct interview with the inhabitant respondents of the buildings and direct measurements. Survey was also focused on areas like natural lighting arrangements, air ventilation facilities, the initiative taken by the regarding department for proper maintenance of the buildings are also considered in the study. The results given in the Table 1 here summarizes the responses from questionnaire survey of all the ten sites (i. Shakhari Bazar, ii. Mohkhali DOHS, iii. Banasree, iv. Japan Garden City, v. Mirpur Pallabi, (Fig. 3 and 4) vi. Niketon, vii. Gulshan, viii. Uttara, ix. Bashundhara, x. Shantinagar) considered in our survey.

Table 1. Summary of respondents from questionnaire survey

SL	Location	Mean For				Score Unit Base 10	
		Base Area (sq ft)	Storey	Height (ft)	Inter - Building Space(ft)	Natural Lighting	Air Passage /Ventilation
1	Shakhari Bazar	1016.00	4.90	50.20	4.08	2.60	2.70
2	Mohakhali DOHS	2393.00	4.80	48.00	18.93	5.10	5.60
3	Banasree	1693.50	6.00	60.00	12.80	5.40	6.00
4	Japan Garden City	6137.50	16.00	144.00	29.30	5.10	5.60
5	Mirpur Pallabi	1217.00	5.00	50.00	10.15	3.40	3.80
6	Niketon	2540.00	8.40	84.00	13.68	5.80	6.20
7	Gulshan	3030.00	4.60	47.80	37.53	7.80	7.80
8	Uttara	2200.00	5.40	54.00	18.65	5.90	6.30
9	Bashundhara	2100.00	7.10	71.00	17.98	6.90	6.90
10	Shantinagar	4420.00	12.90	129.00	15.95	3.90	4.50

The results show that (Table 1 and Fig. 2) on the basis mean inter-building space; the buildings of Gulshan area Japan Garden city were found to be very well planned as there was enough spaces from the adjacent structure. These open spaces ensure adequate wind flow and sunlight passing during day time. Gulshan area, the inter-building mean space was 37 ft, the Japan garden city inter-building mean space being 29 ft. In Mirpur, Pallabi and Banasree, the inter-building mean space was 13 feet which was very much alarming. But in the Shakhari bazar (Fig. 5 and 6), the situation is worst. Most of the buildings have been constructed without keeping any setback (spaces adjacent to building) and some others have kept average inter-building spaces which were less than 5 ft. The buildings are not suitable for living at all which was also mentioned by many authors (Anon. 1993; RAJUK. 1995; REHAB 2006). A bar chart is presented in Fig. 2 show inter-building space of the study areas.

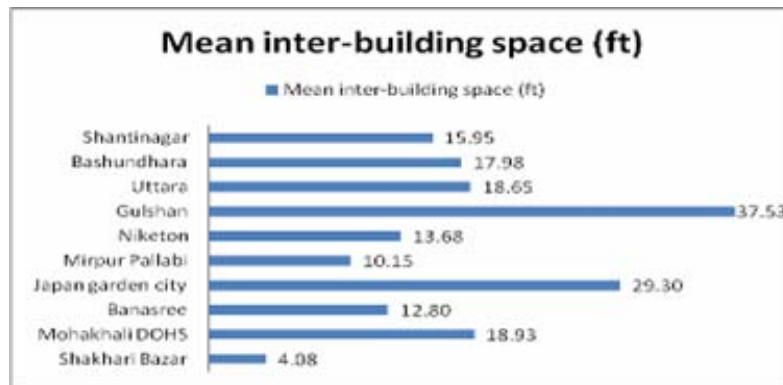


Fig. 2. Study about mean inter-building space for selected area



Fig. 3. Medium to large unit size multi-storied building at Mirpur area



Fig. 4. Smaller unit size building at Mirpur area



Fig. 5. Congested building space at Shakhari bazar with non-designed extensions surveyed in the research



Fig. 6. Views of building using diverse weak raw materials studied at Shakhari bazar

**Natural Lighting**

On the basis of mean results on natural lighting, the buildings of Gulshan and Bashundhara are very well planned as there is enough way to pass natural light during daytime. In Mohakhali DOHS, Japan Garden city, Niketon, Uttara, Shantinagar and Banasree, the natural lighting arrangement is average. But in Mirpur Pallabi and Shakhari bazar, the situation is the worst. Most of the rooms remain dark even during midday in those areas. A pie diagram (Fig. 7) is presented in Fig. 3 showing variation average lighting arrangements of the buildings of the study areas. The measuring score rates used in the study were inadequate 1-3: red, moderate 4-6: yellow and satisfactory 7-8 green.

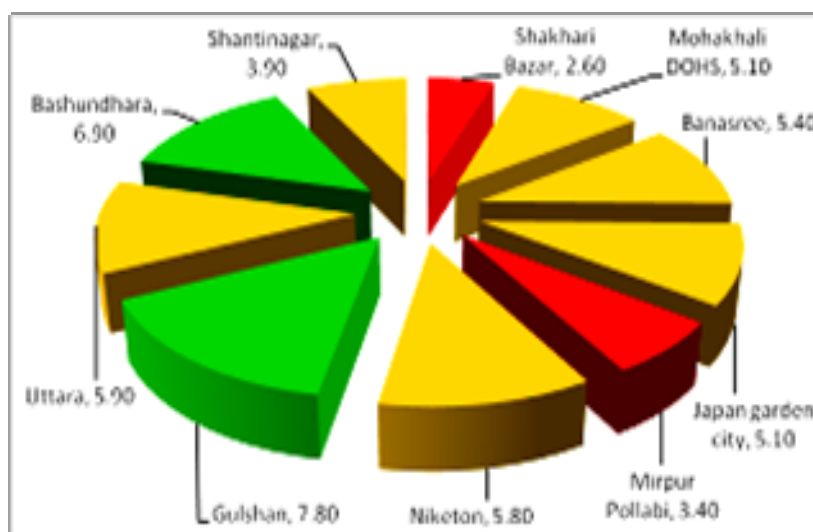


Fig. 7. Comment about mean natural lighting for selected area

Well-designed public areas contribute to the creation of a pleasant, safe and attractive living environment that is responsive to the specific character of the site and neighbourhood. Apartment developments will often be located in established areas as part of second-generation development as well as on previously undeveloped sites. Apartment developments also require private open space for each apartment. It is important that the role of each space is clear and that the boundaries between each different type of space are clearly defined.

**Air Passage or Ventilation**

On the basis of the results given in the Fig. 8 of mean air passage or ventilation, the buildings of Gulshan and Bashundhara are very well planned as there is enough way to enter air so that the buildings are very much convenient for living. In Mohakhali DOHS, Japan Garden city, Niketon, Uttara, Shantinagar, Mirpur Pallabi and Banasree, the air passage or ventilation is average. But in Shakhari bazar, the situation is the worst. During summer, the room temperature is very high in the area, so the inhabitants suffer a lot in hot and humid weather.

A bar chart is presented in Figure 4 showing variation average ventilation arrangements of the buildings of the study areas. The measuring score rates used in the study were inadequate 1-3: red, moderate 4-6: yellow and satisfactory 7-8 green.

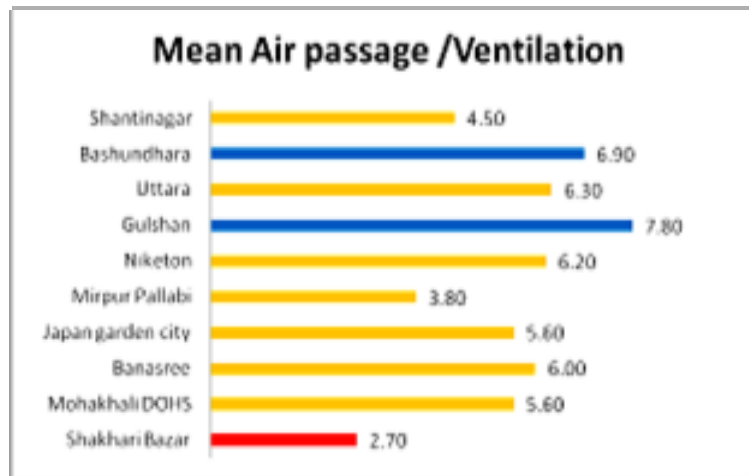


Fig. 8. Comment about mean air passage/ventilation for selected areas

#### ***Air Flow Distribution in Residential Apartments***

One of the most important elements for a healthy residential environment is the wind. It is important that the air pollutants are not stagnant but appropriately and swiftly diffused and removed by winds. The layout type of building and land cover in apartment complex are considerable variable for increasing of wind scarcity and comfortable air temperature. Therefore, it is indispensable to planning of apartment complex for a sustainable residential environment in the future. The air-mass flows and their distribution in a given building are caused by pressure differences evoked by wind, thermal buoyancy, mechanical ventilation systems, or a combination of these. But air flow is also influenced by the distribution of openings in the building shell and by the inner pathways.

#### **CONCLUSION**

In Dhaka city, problems with habitation arise as rural people tend to live in Dhaka. Due to lack of physical development, lack of facilities and unemployment problems in the rural areas, the rural people are attracted to Dhaka that has led to the problem of accommodating more people on less land. In place of taking into consideration the propensity of earthquake, pressure of existing infra-structure, transport, environment the government has allowed construction of multi-storied buildings without leaving adequate space in between the buildings. There are scarcities of houses in the large cities. Even if this problem is solved through construction of more houses, the problem would continue till the government changes its present policy of increasing the importance of the large cities and keeping blind eyes at creation of facilities and employment opportunities in the rural areas and smaller towns. The physical environment of the city has highly deteriorated due to the growth of multi-storeyed apartment buildings at close proximity. There are a lot of scopes for further research work in this sector. Saving Dhaka city from converting jungles of concrete should be priority concerns for the sake of inhabitants of Dhaka city. Awareness program is necessary to stop unauthorized construction. Our lack of knowledge about construction management and indifferent attitude towards development have turned most unhealthy and uncomfortable Dhaka city. So it is strongly recommended to ensure necessary number of windows, skylights or other form of fenestration for bringing light into the interiors of the buildings and to increase inter-building spaces for air circulation in the buildings of Dhaka city.

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