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A SPATIAL ANALYSIS ON THE PROVISION OF URBAN PUBLIC SERVICES AND THEIR DEFICIENCIES: A STUDY OF SOME SELECTED BLOCKS IN KHULNA CITY, BANGLADESH

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Abstract
In most of the cities in Bangladesh, there is a considerable lacking in providing public services comparing with the demand. This study aims to identify the deficiencies in providing public services in three selected blocks of Khulna city, Bangladesh. Blocks are considered here as an individual small administrative unit within the jurisdiction of Khulna City Corporation. First the study identified the spatial concentration of the services among the blocks. The comparative situation of the blocks in terms of public services was viewed by location quotient method and Gini coefficient and neighbourhood standard were consider to identify the deficiencies. The study found that two of the blocks are comparatively developed while the other one lag far behind the mean level of development of the city. Lastly on the basis of population and space standard, required facilities for each of the blocks were calculated.
Keywords: Urban Services, Defficiencies, Spatial Analysis, Khulna City.

1. Introduction

Developing countries like Bangladesh is characterized by highly rated urbanization which caused many urban populations deprived from some basic public facilities. However, some basic public services are essential to keep the urban life sound. People of rural areas come to the urban areas mainly by the pull factors-that is improved level of services in the urban areas. That, in terns, makes the urban area overcrowded and the existing services become inadequate to cope up with.

2. Background & statement of the problem

As Khulna city is the regional headquarter of the south-western part of Bangladesh-people and their activity is centered in Khulna. The urban population in Khulna city is also growing due to rural-urban migration encompasses with natural growth rate (Hossain, 1999). A good transport network linked the other small urban areas as well as remote rural villages and the people of these are become frequent to

urban facilities. Along these, the growing urban population creates pressure on the public services like school, play ground, health facilities, marketing facilities etc and thus disparity within the city are taken place (Jahan, 2000).

Disparity can also be seen between the planned and unplanned areas. In Khulna city, there are acute problem of parks and play ground, schools and health service facilities. The future urban growth strategy of Khulna city did not recognize the importance of additional requirements of public utilities and services (KDA, 2001). So it is the duty of planners to take account of the programmes and priorities along with resource allocation generated by the basic needs like health, education and recreation. Necessary steps should be taken to identify new locations of education, health or recreation facilities where needed according to population threshold and locational advantages which can put an impact on transportation, housing and city environment.

3. Objectives of the study

The specific objectives of the study are:

- To explore the existing public service provision in the study areas
- To identify the deficiencies of services in the study areas

4. Study area description

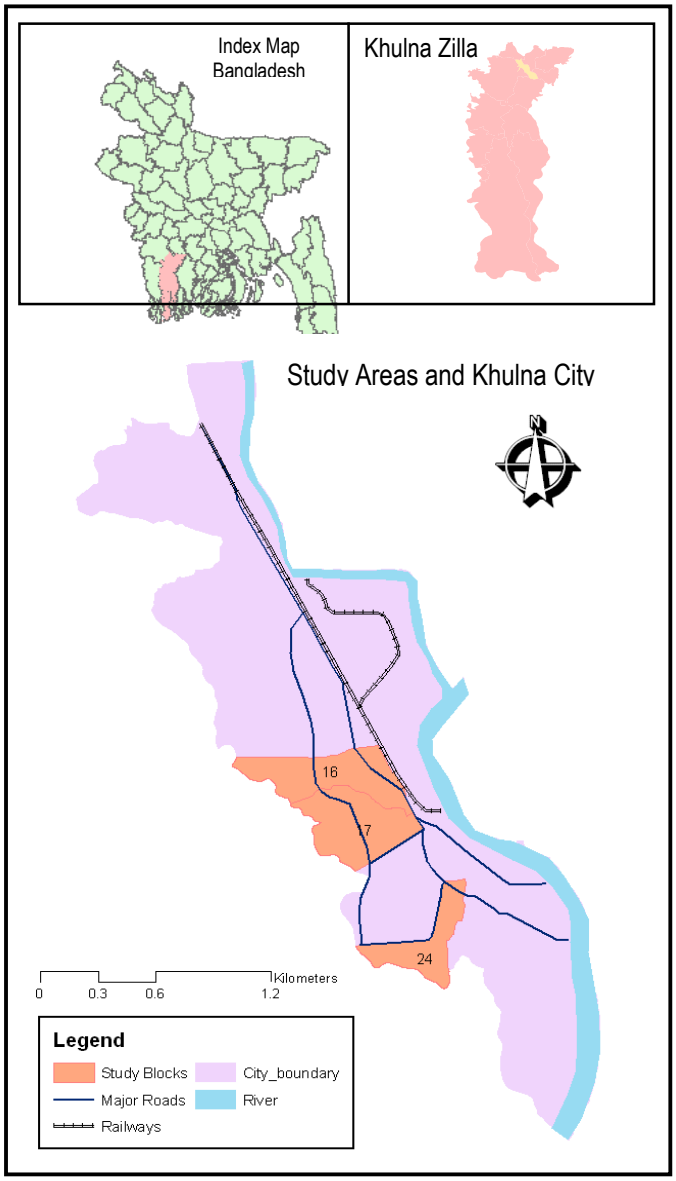
Among the 31 blocks of Khulna city, three blocks 16, 17 and 24 were taken for the current study. Block no 17 is semi-planned area. It has some planned areas like Sonadanga residential area. Population concentration in this block is increasing at a very high rate. Block no 24 of Khulna city have a planned residential area. This block is at the west side of the city and it was assumed that future growth of the city will be in this direction. In block no 17, road network is in irregular form, housing system is spontaneous, population density is too high than other planned areas like Nirala or Khalishpur residential area of Khulna city. These three areas can be the representative of the whole city. Public services in relatively planned areas are seems to be higher than the other areas but these are not adequate. The study areas are shown by map 1.

5. Methodology of the study

This study is solely based on secondary data. The location and number of the facilities were extracted from Khulna City Corporation and different reports conducted by Urban and Rural Planning Discipline (1999) and Khulna City Corporation. Then Location quotient analysis was done which is useful to

achieve information about the relative positions of different blocks with respect to a particular facility. If spatial disparity exists among the blocks, Lorenz curve is useful to have an idea about the degree of spatial disparity with respect to various public facilities (Beyene, 2005 andHossain, 1984). Deficiencies in public services can be identified by the determination of population threshold for facilities under consideration. There are various methods for the determination of population threshold for facilities.

Suppose, in case of parks and play ground, standard for recreational areas are to be taken into consideration (ASCE, 1986; pp 257-258).



MAP 1: MAP OF THE STUDY AREA IN CONTEXT OF BANGLADESH AND KHULNA CITY

6. Spatial distribution of public services in the blocks

Distribution of public services among the Blocks varies according to their relative location and importance. Table 1 shows the status of different public facilities among the blocks. It can be seen that all the blocks have the facilities but their number is not significant compared to the total number of Khulna city.

TABLE 1: DISTRIBUTION OF PUBLIC FACILITIES BY BLOCKS

Blocks	Primary School		Hospital /Clinic		Grave Yard		Parks/Play ground	
	No	%	No	%	No	%	No	%
Block 16	4	3.2	3	2.7	0	0	1	9
Block 17	2	1.6	2	1.8	0	0	1	9
Block 24	4	3.2	4	3.6	1	9	1	9

Source: URPD (1999)

However block no 16 and 17 have no Grave Yard. The percentage of Parks/play ground seems little bit higher but the fact is that there are deficiencies of this facilities all over the city. The small cumulative total makes the percentage higher.

7. Spatial concentration

Distribution of population is considered here to identify the concentration of public services in the blocks. To calculate the spatial concentration location quotient method is helpful. By the location quotient method it is easy to identify the extent in which the public facilities are established among those blocks. The location quotient (LQ) ratio, a measure designed to quantify and benchmark the degree of relative concentration of an activity in the analysis of area localization (LQ Technique in Planning III, 2007)

A location quotient is a way of measuring the relative contribution of one specific area to the whole. Let x_i and n_i denote a specific public facility and population size of the i^{th} area, respectively. Similarly, let x = no of similar facilities in the city and n = population size of the whole, respectively. The location quotient for the i^{th} area is defined as

$$\mathbf{L.Q. = (x_i/n_i)/ (x/n)} \qquad (1)$$

Where,

x_i= number of facility i in a given block
n_i = population of the concerned block
x = number of facility i in Khulna city
n = Total population of Khulna city.

To calculate the LQ value the number of existing facilities in study blocks and total number of these facilities in Khulna city is necessary. Table 2 shows the number of different facilities in each blocks and their total amount

TABLE 2: NUMBER OF FACILITIES IN DIFFERENT BLOCKS

Blocks	Primary	Hospital /Clinic	Grave Yard	Parks/Play ground	Population
Block 16	4 (125)*	3 (112)*	0 (11)*	1 (11)*	28561 (1227239)**
Block 17	2	2	0	1	47295
Block 24	4	4	1	1	35803

*Numbers represent the total number of facilities in Khulna City
** Total number of Population of Khulna City
Source: Khulna City Corporation, 2003 and URPD, 1999

Using the above formula, and table 02, location quotients for the selected public facilities for blocks has been prepared and presented in table 03. These quotients identify the concentration or deconcentration of public facilities in different blocks of Khulna city.

8. Interpreting Calculated Location Quotients

LQ < 1.0

A LQ that is less than 1 suggests that the concentration of a particular facility in a block is less than that of the city as a whole

LQ = 1.0

The value of LQ is 1 or close to 1 indicates self-sufficiency means a particular facility in a given block is exactly sufficient to meet the local demand.

LQ > 1.0

If the value of the quotient for a particular facility in a particular block exceeds 1 (one), concentration is indicated since the per capita availability of that facility in the block exceeds that of the city as a whole. (Florida State University and Jahan, 2000).

Table 1. Location quotient (L.Q.) for different facilities

Blocks	Primary	Hospital/Clinic	Grave Yard	Parks/Play ground
Block 16	1.4	1.2	0	3.9
Block 17	0.4	0.5	0	2.9
Block 24	1.1	1.2	3.1	3.3

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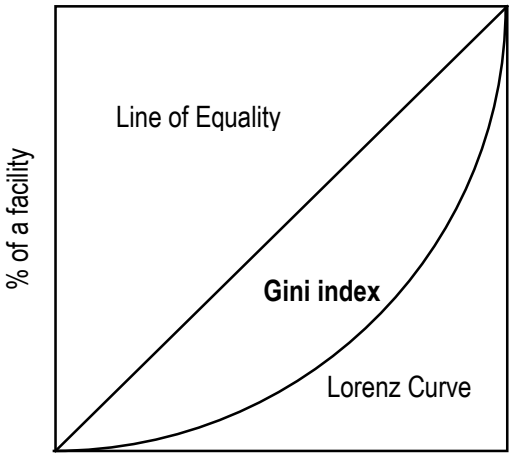
From the table 3, it can be seen that the LQ value of block 17 is less than 1 for primary and hospitals and 0 for Grave yard means there is a lack of these facilities in block 17. The value of primary school and grave yard for Block no 16 and 24 is little bit higher than 1 means the existing facility is quit sufficient but not adequate. The value of Grave yard and park is much higher does show only the relative sufficiency but the fact is that There are only 11 parks/play ground in the whole city and fortunately 3 of them is on the three study Blocks.

9. Spatial Disparity

The Gini coefficient is based on the Lorenz curve, a cumulative frequency curve that compares the distribution of a specific variable with the uniform distribution that represents equality (Epidemiological Bulletin, Vol. 22 No. 1, March 2001)



Source: Modified from http://en.wikipedia.org/wiki/Gini_coefficient

This equality distribution is represented by a diagonal line, and the greater the deviations of the Lorenz curve from this line, the greater the inequality. By putting commutative proportion of a particular facility in y axis and commutative proportion of population of the Blocks in x axis, the area of equality is being calculated. Using the formula (2) within the box, Gini co-efficient is calculated for each facility and presented in table 4

$$G = 1 - \sum_{i=0}^{k-1} (Y_{i+1} + Y_i)(X_{i+1} - X_i) \qquad (2)$$

Where,

Y = Cumulative proportion of the facility

X = Cumulative proportion of the population variable

G = Gini Coefficient

The Gini Coefficient ranges from 0 to 1, 0 representing perfect equality and 1 total inequality (Gini Coefficient, 2007). Here, the degree of spatial disparity is higher for Grave yard and Parks as their value is close to 1

TABLE 4: GINI COEFFICIENT OF THE FACILITIES

Facility	Gini Coefficient
Primary	0.24
Hospital/Clinic	0.19
Parks/Play ground	0.42
Grave Yard	0.68

10. Deficiencies and requirement of services in the study blocks

Spatial disparity in terms of public facilities are exists more or less in all the three Blocks. Among the facilities, graveyard is absent in Block no 16 and 17. So at least one grave yard is needed in each of these Blocks. Deficiencies of the other facilities are calculated from the service standard and then calculate the required facilities for each Block.

11.Standard for Measuring Deficiencies

There are various standard for measuring deficiencies or in providing public facilities. The standard used here are listed below

Primary School Each 800-1200 pupils required and distance from house not more than 0.805 Kilometer. If each Block considered as a neighborhood then the primary school should occupy 3.1 percent of total land

Hospitals/Clinics Clinics and Primary health care center should be 0.8- to 1.6 kilometer radius and hospitals more than 1.6 kilometers

Parks/Play Ground Neighborhood parks and Playground should serve 0.805 kilometer of radius

Sources: Rahman (1991), ASCE (1986) and Keeble (1969)

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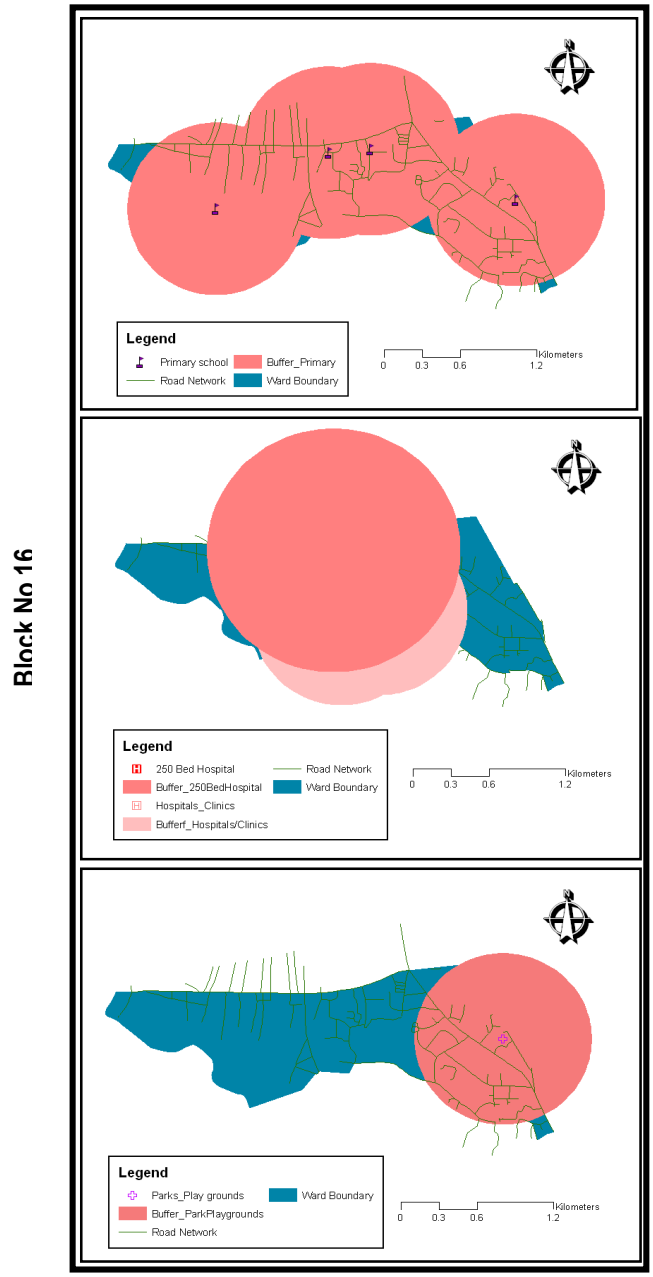
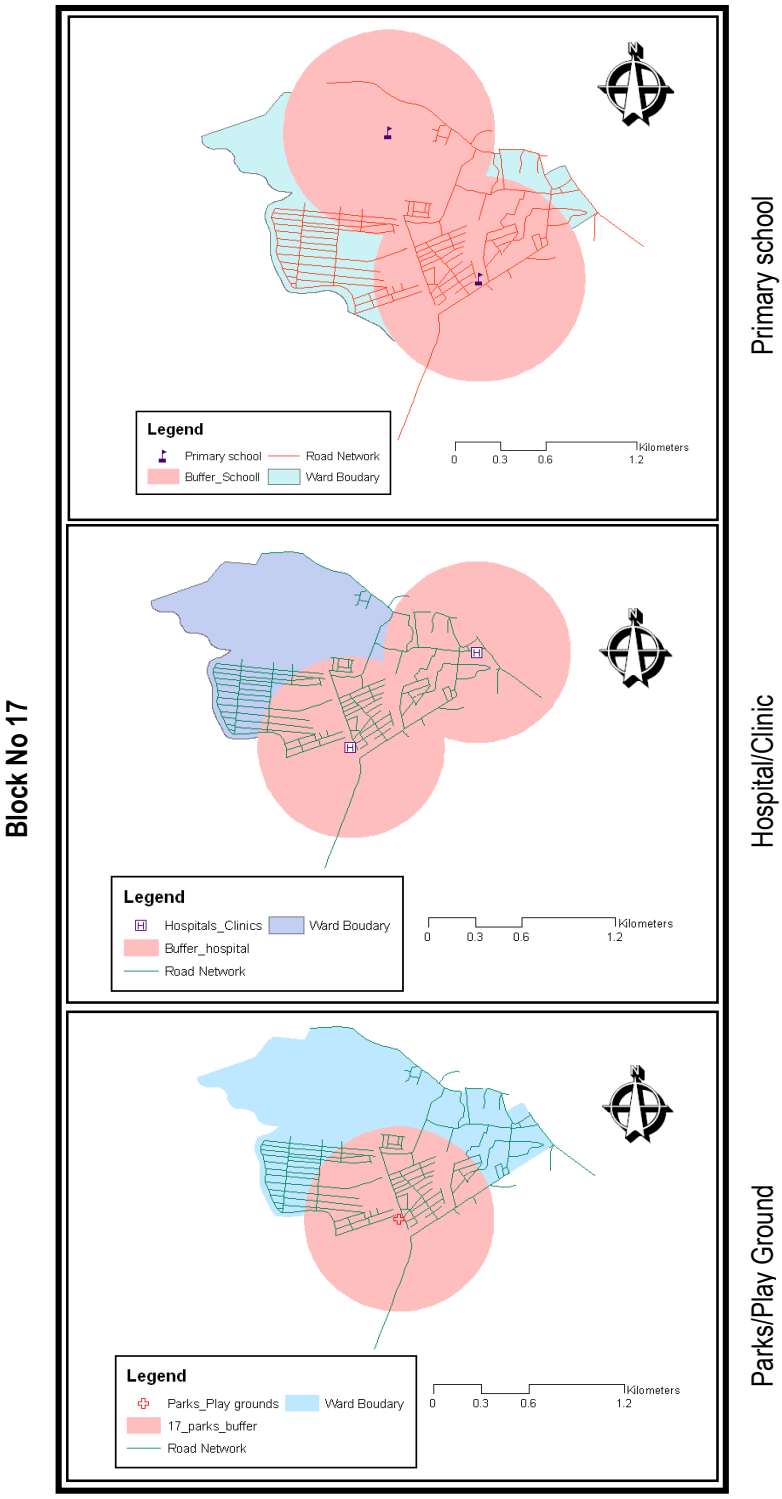
12. Deficiencies and requirement of different facilities in Block no 16, 17 and 24

Taking the 0-9 age group child into consideration in each Block the requirement of primary school is calculated. It is noted that Block 16 and 24 is fully sufficient and only Block 17 need two additional primary school. The space standard is followed here and shows the buffer zones and the uncovered areas in the maps. Map 2 shows the situation of Block 16 and map 3 and 4 show the Block 17 and 24 respectively.



MAP 2: UNCOVERED AREAS NEED ADDITIONAL FACILITIES IN BLOCK 16



MAP 3: UNCOVERED AREAS NEED ADDITIONAL FACILITIES IN BLOCK 17

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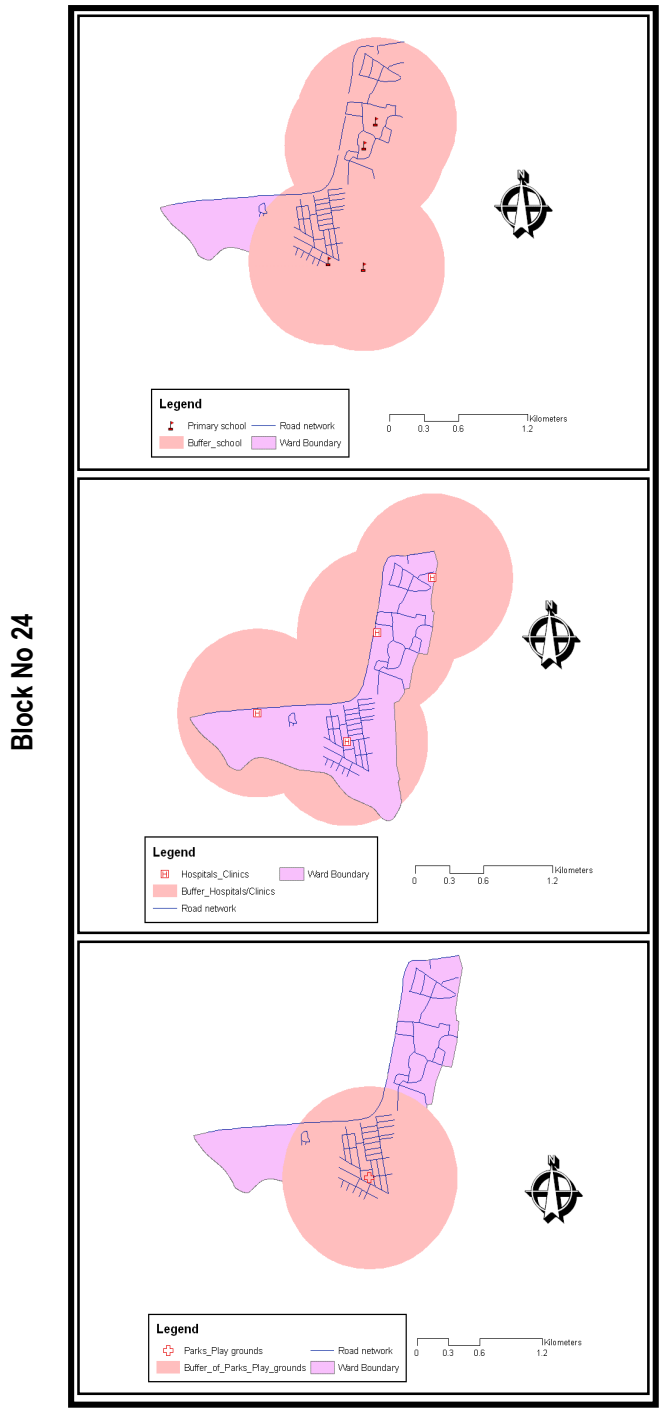

MAP 4: UNCOVERED AREAS NEED ADDITIONAL FACILITIES IN BLOCK 24

Besides, Population standard is considered only in primary school for calculating deficiencies along with the space standard. As for an example there is 4540 child in Block 17. So to fulfill the demand, there need extra 2 primary school. In this way requirement of different facilities in different Blocks are calculated (table 5)

TABLE 5: EXISTING FACILITIES AND TOTAL REQUIREMENT BY THE BLOCKS

Blocks	Primary School		Hospital /Clinic		Grave Yard		Parks/Play ground	
	Have	Need	Have	Need	Have	Need	Have	Need
Block 16	4	4	3	5	0	1	1	3
Block 17	2	4	2	4	0	1	1	3
Block 24	4	4	4	4	1	2	1	2

13. Scoring the facilities

By constructing scoring of the facilities exists and total requirement, the ratio of this two will help to understand the gap between the actual and required number of facilities in the Blocks. From the study is seen that the concentration of primary school is higher and so its demand in much lower that the other facilities. So primary school is given point 2 and hospitals/clinics given 5 and point 7 for grave yard and parks/play ground. Table 6 shows the points required

TABLE 6: POINTS FOR EACH FACILITIES IN DIFFERENT BLOCKS

Blocks	Primary School		Hospital /Clinic		Grave Yard		Parks/Play ground	
	Have	Need	Have	Need	Have	Need	Have	Need
Block 16	8	8	15	25	0	7	7	21
Block 17	4	8	10	20	0	7	7	21
Block 24	8	8	20	20	7	14	7	14

It is clear from the table 07 that large gaps exist in grave yard, parks and hospitals. The spatial disparity is very small in case of primary school in Block no 16 and 24 but in Block 17, there also need additional primary school. The ratios acquired by each activity is shown in table 7

TABLE 7: RATIO OF POINTS SCORED TO POINTS BY BLOCKS

Ratios	Primary School	Hospital/ Clinic	Grave Yard	Parks/ Play ground	Total
Block 16	1	0.6	0	0.33	1.93
Block 17	0.5	0.5	0	0.33	1.33
Block 24	1	1	0.5	0.5	2.8

14. Conclusion

The analysis about three Blocks indicates that some facilities are seems to sufficient but most other are lag far behind the mean level of development of the city in terms of that facility. The varying degrees of concentration and dispersion of different types of public facilities indicate that the existing planning efforts could not produce satisfactory results in terms of balanced development of different parts of the metropolitan area. However, there are some other determinants that show the way of development of any kind of facility like the quality, importance and transportation but in a simple view it was found that the distribution of services is not uniform or at least sufficient. It is now expected that the population of Khulna city will increase quite significantly during the next decade thereby multiplying the need for different types of public facilities. Since most of these facilities will be provided by the government, their availability and distribution must be planned carefully. Absence of proper planning of these elementary services might leads to a clustered pattern of development which will, in tern, leading to further deterioration in the living environment of the city.

REFERENCES

ASCE (1986). *Urban planning guide*, American society of civil engineers, New York, pp 257-258

Beyene, J and Rahim Moineddin, R., 2005. *Methods for confidence interval estimation of a ratio parameter with application to location quotients*, BMC Medical Research Methodology, Vol. 5, No. 32, URL http://www.biomedcentral.com/1471-2288/5/32, Explored on December 3, 2007

Epidemiological Bulletin (2001). Measuring Health Inequalities: *Gini Coefficient and Concentration Index*, Epidemiological Bulletin, Vol. 22 No. 1, March 2001

Gini coefficient, URL http://en.wikipedia.org/wiki/Gini_coefficient , Explored on November 18, 2007

Hossain, A. (1984). *Development of social service facilities in Tongi municipality: a planning approach*, Unpublished MURP Thesis, Department of Urban and Regional planning, Bangladesh University of Engineering and Technology, Dhaka.

Hossain, M. (1999). *A Comparative Study on Recreational Facilities in Residential Neighborhoods in Khulna City*, Unpublished BURP Thesis, Department of Urban and Rural planning, Khulna University, Khulna.

Jahan, S. D. (2000). Dhaka mohanogorite nagorik subidhadir prapotta: akti ward vitik bisleshan'. M. A. Mohit (ed.) *Nagor Shaily*, Department of Urban and Regional planning, Bangladesh University of Engineering and Technology, Dhaka, pp 7-8

KDA (2001). *Structure Plan, Master Plan and Detailed Area Plan for Khulna City*, Khulna Development Authority, Khulna, Bangladesh, PP 144-146

Keeble, L. (1969). *Principles and practice of town and country planning*, The estates gazette limited, London

Location Quotient Technique *Planning Methods III: Forecasting*, Department of Urban and Regional Planning, Florida State University, URL http://garnet.acns.fsu.edu/~tchapin/urp5261/topics/econbase/lq.htm, Explored on December 3, 2007.

Rahman, K. N. (1991). *Planning of urban community facilities: Islambagh Area,* Unpublished MURP Thesis, Department of Urban and Regional planning, Bangladesh University of Engineering and Technology, Dhaka.

Urban and Rural Planning Discipline (1999). *Environmental Maps and Workbook for Khulna City*, *Bangladesh*, Urban and Rural Planning Discipline, Khulna University, Khulna, Bangladesh, pp 53-65 and 120