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Locational Attributes of Playgrounds in a City: Need Assessment Approach on Zone 2 in DNCC, Bangladesh

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ABSTRACT
Dhaka is a city of 400 years that are huge in the amount of population. For this over populated city service provision is a challenging task. Dhaka city lacks in public facilities such as open space, playgrounds, parks etc. This research has tried to evaluate the scarcity of playgrounds in zone 2 of Dhaka North City Corporation, Bangladesh. The study aims to assess the network system of the existing playgrounds and need for the playgrounds facilities. Cluster Sample Technique was conducted in the DNCC zone two and Ward wise questionnaire survey were conducted among the households who have young aged members in family. The sample size were 300 and the Sampling method was cluster sample technique. The deficiency of playgrounds is analysed in this research in accordance to planning standard. As per DMDP and DAP, 152.80 acre are deficit land. According to this master plan for Dhaka city there needs 160.40 acre of land for playgrounds, but zone-2 has only 7.60 acre of land for playgrounds. The demand and locational distribution of playgrounds in the study area are also explored in this research. Basically, the whole research has tried to execute and make link between playgrounds and its service zone that are assessed with various analysis.

Keywords:-Playgrounds, need assessment, planning standard, service area, demand-supply

INTRODUCTION
Rapid urbanization, migration & population growth have trended towards emergency growth of city. They create unplanned development to meet housing demand of huge population in a city. In case of Dhaka city, huge number of population and its upward increment hampered the convenience and the quality of living of city dwellers. It's really tough to fulfilling the demand of urban services and facilities of Dhaka city [6]. Playground is a major urban facility and play space design must be an essential component in the urban planning process [6, 9]. It's an important feature of a city that provides recreational facility to the city dwellers. Urban civilized area demands open space and playground. Playground is a bridge between man and nature. Playground provides recreational facilities in a low financial cost. It provides diverse opportunities. During passive recreation, use of resource of landscape is influenced by their characteristics [6]. Having a well-designed play environment for the age range is important in engaging children and youngsters in active sports and recreational activities [8,10]. The outdoor public places with trees and vegetation, these more natural environmental settings are also found to

support children's imaginative play and the development of positive relationships [3,11]. It has thus been proposed that early childhood centers and primary schools should have close access to natural outdoor recreational spaces to enhance learning and social intervention [7]. There are no universally accepted levels of physical activity among young children [5].

There is slightly a relation between location choice and population. That's why there have to have follow the planning standard. Future population is also a consideration for providing service. As the research is done with the analytical work over playgrounds, some of the related criteria is explored like, network, optimum location, population and planning standard etc. Network analysis of existing hospitals connecting with the localities may find the efficient ways for service provision. Geographic Information System (GIS) is an effective tool for determining vehicle response routing and solving the vehicle shortest path routing problem [1,2,12].

In Dhaka city, basically the scenario of availability of playgrounds is miserable. According to demand, there is very a smaller number of playgrounds in Dhaka. Government faces many difficulties in the provision of the services because the high rate of population growth and urbanization. Unplanned growth and inefficient allocation of resources carries away towards the scarcity of playgrounds. Defective arrangement or planning and routing system of playground facilities have failed to serve maximum people. So, with the assess of planning standard and population data demand for playground facilities have been found out and its optimum distribution and suitable networking have been achieved with

fundamental use of GIS application.

METHODOLOGY

The research study executed a two stage multilevel mixed method design to assess the locational Attributes of Playgrounds in DNCC and different level of need assessment of it. Firstly it engages household survey and field survey to collect information. The area and playgrounds in ward no 2, 3, 4, 5,6,7,8 & 15 of Dhaka City Corporation area are taken as a case study area to establish the efficiency of this approach. Total 300 households of the study area were selected for survey in cluster Sample Technique. Ward wise sampling has been adopted. Questionnaire has been conducted for the residents of the area and young generation that means playground users of the study area. A survey questionnaire to accomplish the following tasks: (i) compile a comprehensive inventory of existing play space; (ii) understand user perception and needs; and (iii) evaluate demand and adequacy in the provision of play space were executed. Secondly it engages a geographic information system (GIS) for network analysis for playground consists of two methods. One is service area assessment and another is nearest facility analysis to determine which are nearest to one another.

STUDY AREA

Ward 2, 3, 4, 5, 6, 7, 8 and 15 of Dhaka North City Corporation (DNCC) is situated in Jointly Pallabi and Mirpur thana and within Dhaka Metropolitan Development Plan (DMDP) area. Total area of zone 2 of DNCC is 21.317 sq. km. It lies between 23°48'15"N 90°22'00"E/23.8042°N 90.3667°E. It is surrounded respectively in the north, in the south, in the west and in the east by the

ward 1, 9 & 10 of Dhaka North City Corporation (DNCC). The study area is bounded by Begum Rokeya Sarani on western side, the road from Mirpur 10 to Navy colony on southern side and Cantonment road on eastern side consisting of Mirpur section 10, 11, 12 & 13 and Pallabi. Rupnagar and Bhashantek. The most important features and land marks of this area are Police Staff College, National Center for Special Education, homeopathic medical College and hospital, Navy Colony etc. Basically, belonging to Pallabi Thana, this area has planned as well as unplanned area. Mirpur section 10, 11, 12, 13 and Pallabi, Rupnagar R/A are planned area. The unplanned areas are Baighartek, Lalmati, Balurghat. Manikdi, Bhasantek etc.

The study area is a built-up area with mostly residential development except on the both side of western embankment along Turag River. A review of the existing land use pattern of this area shows that residential development is the most dominant land use. The prominent neighborhoods of the study area are: Mirpur cantonment, Mirpur section 1,2,6,7, Pallabi part 1 and extension, eastern housing, Rupnagar, UttorBishil etc.
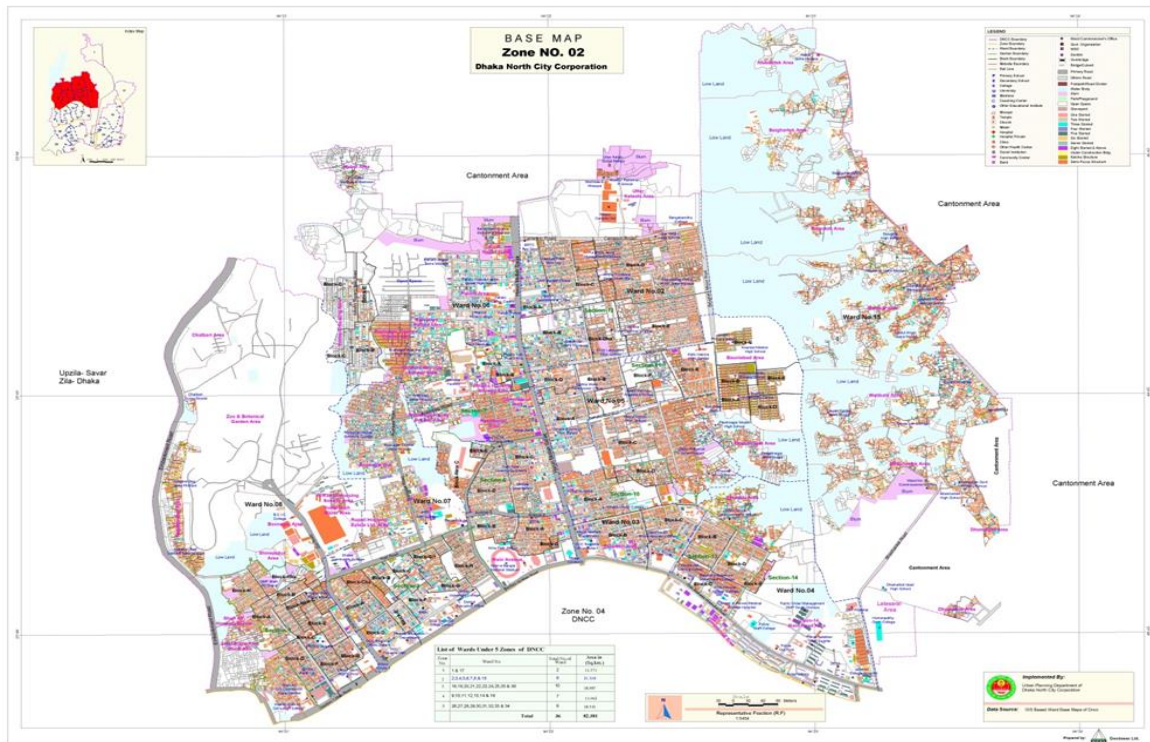
LAND USE
It is predominantly a residential area although several other significant use also visible in that area. The study finds that among existing land use pattern of this area residential development is the most dominant land use. The prominent neighborhoods of the study area are: Mirpur cantonment, Mirpur section 1,2,6,7.

Table 1:-Percentages of land use of Zone 2 of Dhaka North City Corporation

Land use	Percentages of Area
Agriculture	0.19%
Commercial	6.65%
Community Facilities	2.50%
Education and Research	2.49%
Health Facilities	0.17%
Industrial	3.56%
Institutional	0.78%
Miscellaneous	1.69%
Mixed Use	9.67%
Residential	63.20%
Restricted	3.80%
Transportation & Communication	0.03%
Under Construction	5.26%
Total	100.00%

Source: Modified by Authors, 2019; Data source: RAJUK, 2016

Most of the land is used as residential purpose in this study area. There are 63.20% residential areas.

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Map 1:-*Land use map of zone 2*
Source: Dhaka North City Corporation, 2019

EXISTING CONDITION OF PLAYGROUNDS IN THE STUDY AREA

There are many play-lots in various sizes. But, for this research in selecting playgrounds a criterion has been considered. Those playgrounds that are open for all to use and not restricted are detected by observation survey and nine playgrounds have been selected from that survey. Among those playgrounds, some are Eidgah, Primary School playgrounds, open parks, small play-lots etc. But, as all those playgrounds are used for playing, all of them are considered as playgrounds for this research. Those nine playgrounds are described in below after showing some data about those playgrounds in Table 2.
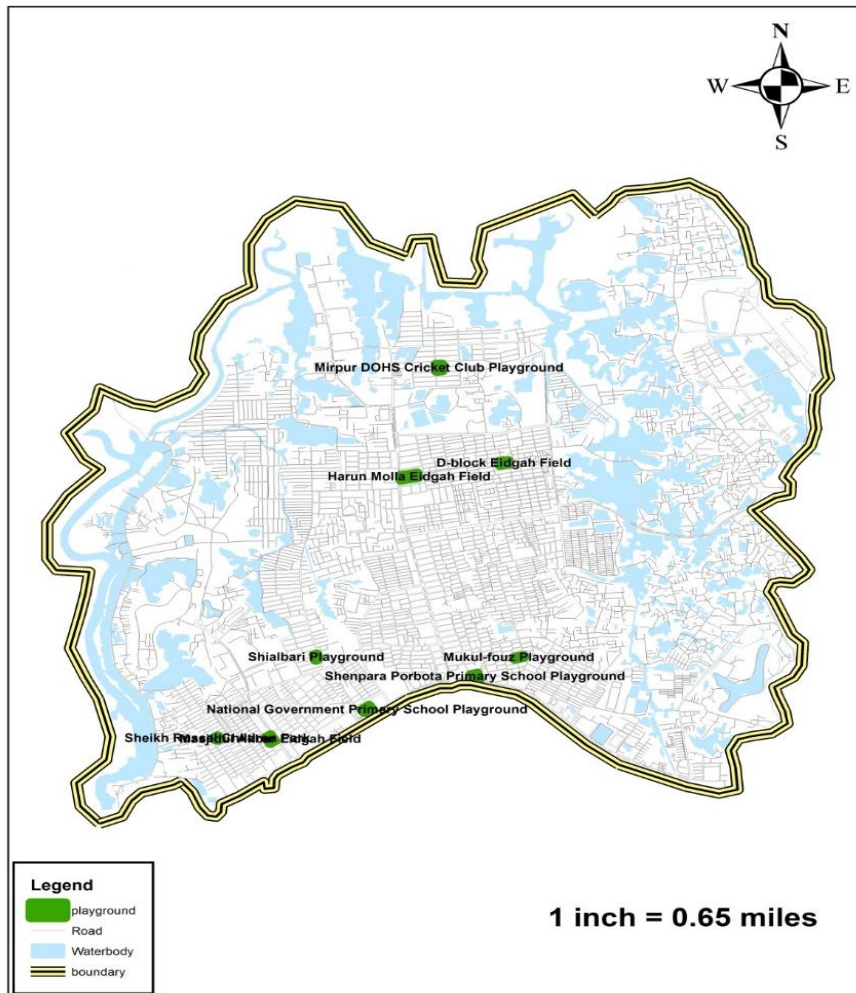
Table 2:-*List of playgrounds in zone 2 of DNCC*

Serial No.	Name of Playgrounds	Location	Total area (sq. meters)
1	Shialbari Playground	Ward 7	1601.88
2	National Government Primary School Playground	Ward 7	4228.40
3	Masjidul Akbar Eidgah Field	Ward 8	3890.43
4	Sheikh Russel Children Park	Ward 8	1543.16
5	ShenparaPorbota Primary School Playground	Ward 3	3200.39
6	Mukul-fouz Playground	Ward 3	1821.63
7	Harun Molla Eidgah Field	Ward 2	7325.36
8	D-block Eidgah Field	Ward 2	3229.67
9	Mirpur DOHS Cricket Club Playground	Ward 2	3880.52

Source: Field Survey, 2019

From this table, it has been clearly shown that the large playground is Harun Molla Eidgah Field located in ward 2 with total area of 7325.36 sq. meters. On the other hand, the small playground is Sheikh Russel Children Park located in ward 8 with total area of 1543.16 sq. meters.

So, these are the nine playgrounds that are selected for this research with the criterion of 'Not Restricted and open for the locality'. The locational allocation and networking system are discussed next in analytical part of this research.

Map 2:-*Map of Playgrounds in zone 2 of DNCC*
Source: Prepared by Authors, 2019

RESULT AND DISCUSION
Need Assessment of Playground According to Planning Standard
The Indian Town Planning Institute recommends that:
a)   A play lot of 2000 to 5000 sq. ft. shall be required as children's playground for about 100-200 families,
b)   A neighborhood playground- the area is determined either as 4-7 acres or 1

acre per 2000 population,
c)   A play field which should be provided for 4-5 neighborhoods, area will be 12-20 acres or 1 acre for 2000 population.

But various planning standard of Bangladesh are used to calculate the deficiency of playground in the study area. It's a comparative evaluation of deficit of

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playground. This calculated with the basis of planning standard, population and existing services. Deficit calculation are given in below-

Total Population in zone 2= 1002501
Total area of Playgrounds in zone 2= 7.60 acre.

Table 3:-Deficit calculation of playgrounds according to various planning standard

Serial No.	Department/Institution/ Plans	Planning Standard for Playground	Needed Playground (in Acre)	Deficit (in Acre)
1.	Private Residential Land Development Project Rules, 2004	4 acre per 50000 population or 8 acre per 100000 population (.08 acre/1000 population)	80.20	72.60
2.	DMDP (1995) and DAP (2010) for Dhaka City	4 acre per 2500 population (0.16 acre/1000 population)	160.40	152.80
3.	Neighborhood in Dhaka City according to DAP (2010)	1 acre per playground per 12500 population Quantity: Minimum 2 playgrounds (0.16 acre/1000 population)	160.40	152.80
4.	RMDP, 2004	1.5 acre per 1000 population	1503.75	1496.15
5.	KMDP, 2000	2 acre per 1000 population	2005.00	1997.40
6.	Barishal Master Plan, 2010	1 acre per 1000 population	1002.50	994.90
7.	Sylhet Master Plan, 2010	2 acre per 25000 population (0.08 acre/1000 population)	80.20	72.60
8.	DAP for Chittagong City, 2008	5 acre per 10000 population in city/urban area (0.5 acre/1000 population)	501.25	493.65
9.	Rangpur Master Plan	1.5 acre per 3000 population (0.5 acre/1000 population)	501.25	493.65
10.	District Towns Infrastructure Development Project (DTIDP), 2004	2 acre per 25000 population (0.08 acre/1000 population)	80.20	72.60
11.	Upazila Towns Infrastructure Development Project (UTIDP), 2008	3 acre per 20000 population (0.15 acre/1000 population)	150.38	142.78
12.	UDD & LGED	3 acre per 20000 population (0.15 acre/1000 population)	150.38	142.78
13.	Purbachal New Town Project, 1995	0.07 per 1000 population	70.18	62.58

Source: Prepared by Authors, 2019; Data Source: RAJUK, 2016

It is clearly shown that there is a huge lacking of playground area. As per DMDP and DAP, 152.80 acre are deficit land. According to this master plan for Dhaka city there needs 160.40 acre of land for playgrounds, but zone-2 has only 7.60 acre of land for playgrounds.

Ward Wise Playground going Population
The field survey explained the playground users and the highest in number is the age group of 16-20 and their percentage is 31.64%. That means, this age grouped users visit most to playground. From the following graph it is clearly shown that among 177 playground users (Out of 300

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sample 177 samples go to the playground and rest of the sample do not go to the playground), highest number of playground going members are from ward 2 that is 12.33%. Less number of people is from ward 15.
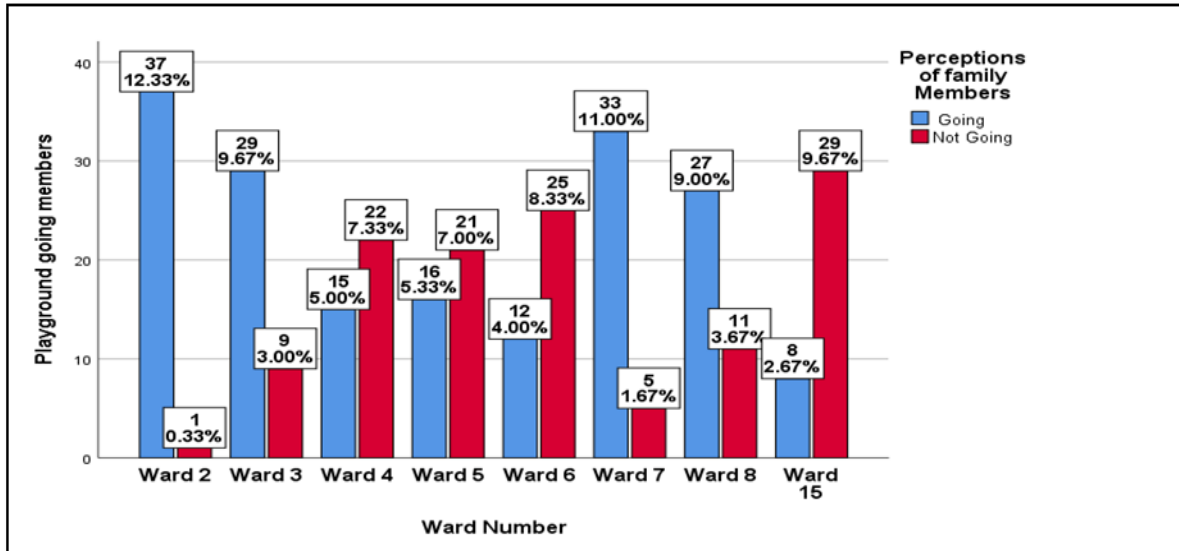

Fig.1:-Ward wise playground going members

Maximum respondents from ward 15 are not going to playground. There is 9.67% respondents are not going to playground from ward 15.

Perceptions of Respondents on Used Playground

From Table 2, there were nine play ground in zone 2, DNCC it is found that maximum percentage of users (23.16%) go to play in the Harun Molla Eidgah Field because it is the large playground located in ward 2 with total area of 7325.36 sq. meters.
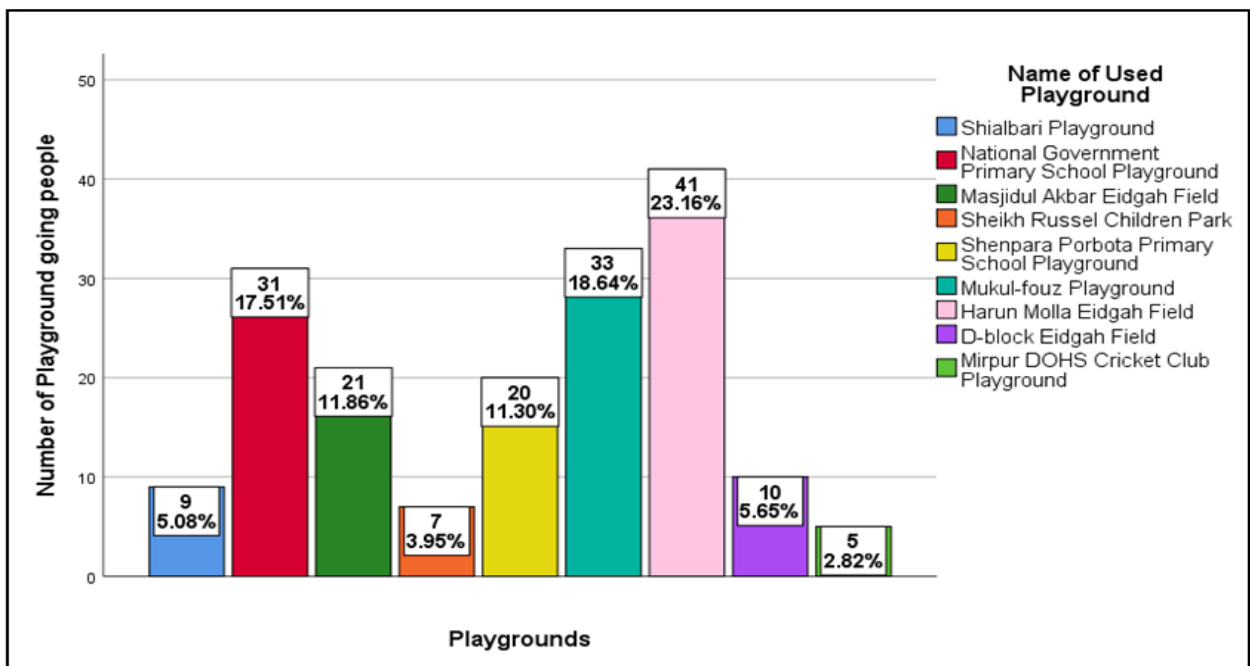
Fig.2:-Number of users per playgrounds

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On the other hand, the small playground is Sheikh Russel Children Park located in ward 8 and the user is only 3.95%. DOHS cricket club playground has low usage as it is 2.82%. So the larger the playground and the facilities is more the user is greater than other playground.

Perceptions on user's Behavior & Activities on going to Playground
Results of the questionnaire survey based on the reasons why the people do not go to the playgrounds are found that 75.60% seems that there is no enough space on the playground (here not assigned means the percentage of the respondents do not give their opinion on that question). From the following figure it is shown that among 41% non- playground users, far from home and not enough space is the major reason for not going to playgrounds. Among them 76.4% and 75.6% are respectively the above mentioned reason in percentages.
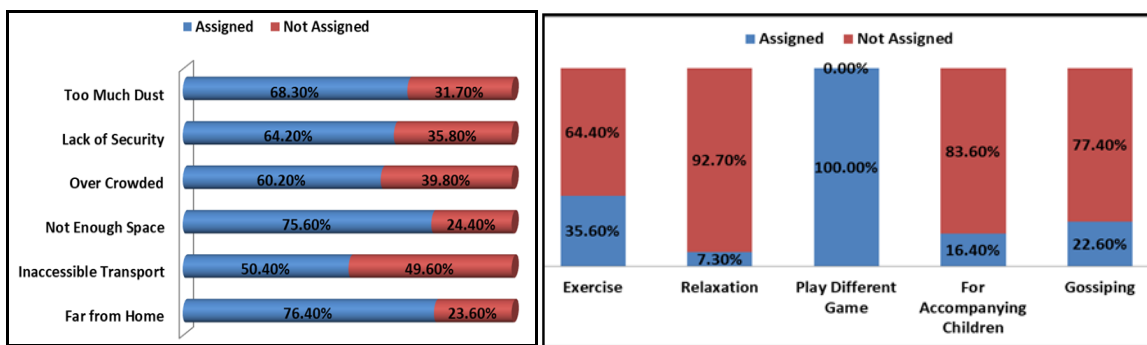

Fig.3:-Reason for not going to playground and user's percentage

In the multiple options question among the respondent's maximum number of users goes for playing there that is 100% and also for exercise purpose that are 35.6%. Most of the playground users go to the playgrounds for exercise (35%) and the second user group for gossiping (22.60%). Time spends in playground and mode of transportation to go to the playground. Among the playground users, maximum users spend 91-120 minutes in the playground and 51.98% is in that group.
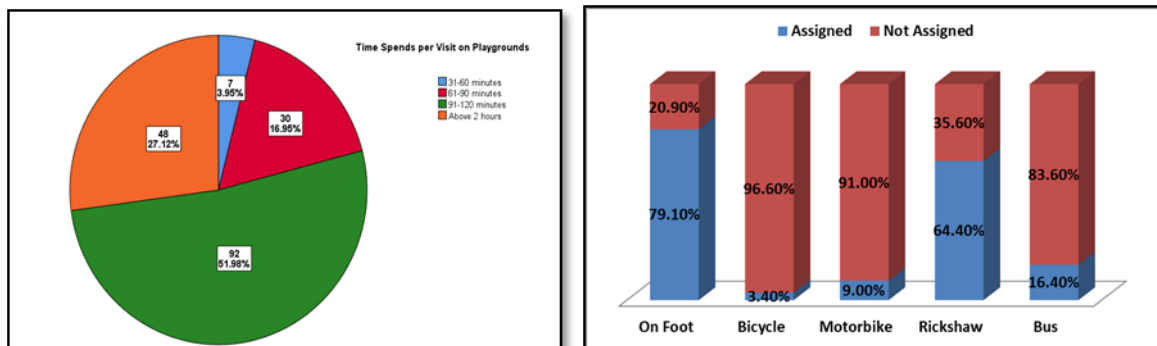

Fig.4:-Time spend on playgrounds by users and mode used by users

Most of the users go to playgrounds on foot & by rickshaw. Among the users on multiple options 79.10% users go playgrounds on foot and about 64% users on multiple options go playgrounds by rickshaw.

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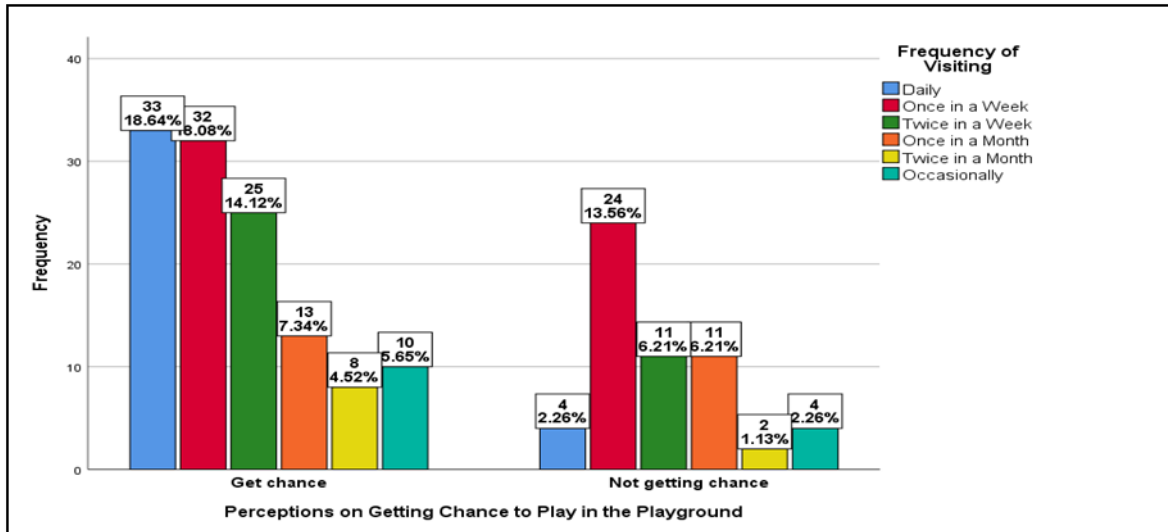
Perceptions on getting Chance and Visiting

Fig.5:-*Getting chance to play in relation with frequency of visiting*

Among the 59 % respondent who go to the playground and with the broader subdivision of the users 18.64% go daily among 121 (Out of 177 or 59%) users who get chance to play. On the other hand, 13.56% among 56 (Out of 177 or 59%) users who don't get chance to play go once in a week.

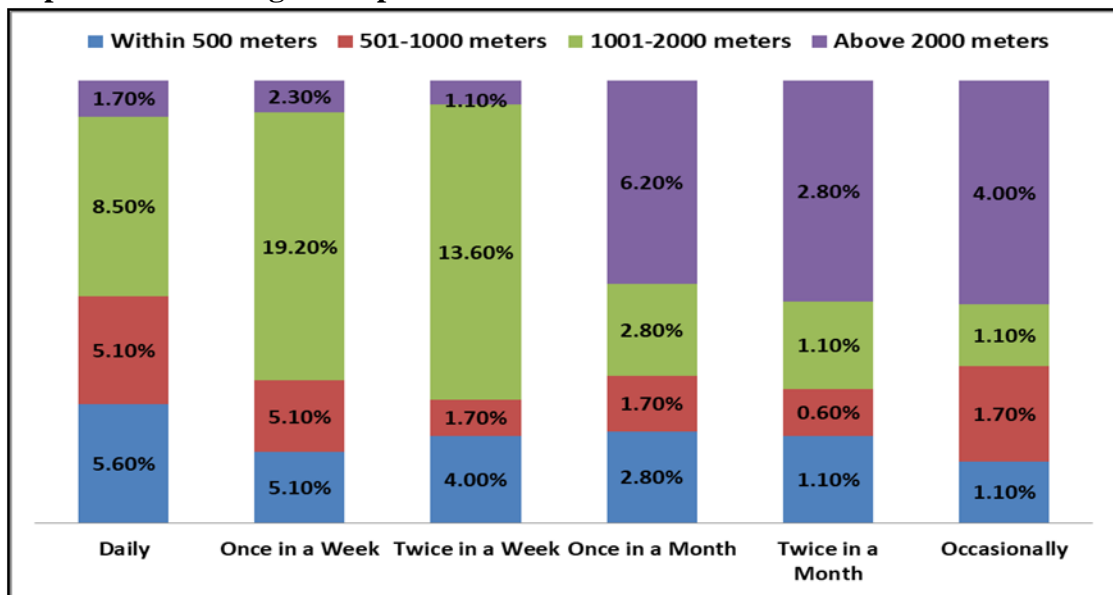## Perceptions on Visiting in Response of Distance

Fig.6:-*Visiting frequency in response to distance*

Among the 59 % (177 out of 300) respondent who go to the playground, most of the users who visited daily, once in a week & twice in a week are come from 1km to 2km distance from playgrounds and respectively the percentages are 8.50%, 19.20% & 13.60%. On the other hand, users who visit once in a month, twice in a month & occasionally are come from above 2km of the playgrounds and respectively the percentages are 6.20%, 2.80% & 4%.

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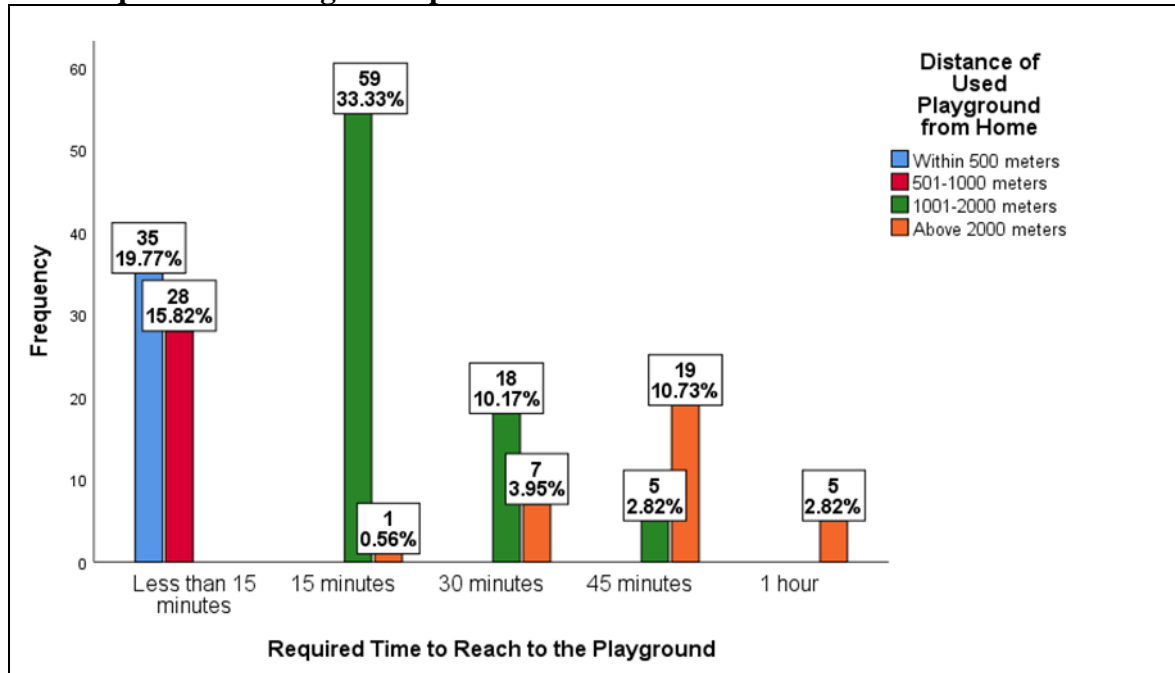**Time Required Reaching in Response to Distance**

Fig.7:-Time-Distance need to go to the playground

From this graph, the relation between times required in reaching to playground and distance from home is shown. The 59 % (177 out of 300) respondent who go to the playground, 33.33% needs 15 minutes to reach the playground that lived 1km to 2km from the playground. Perceptions on sufficiency & locational suitability of playgrounds85.33% of respondents indicate that the service is not sufficient for their outdoor recreation purpose.
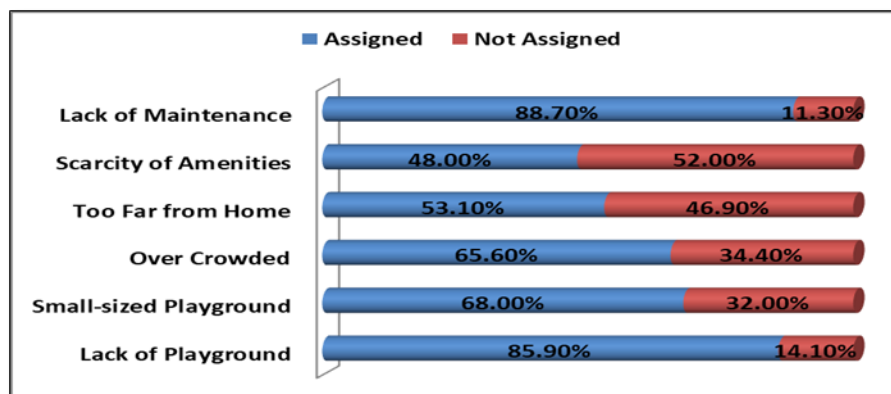

Fig.8:-Reason for insufficiency

Most of the respondents those are assigned insufficiency of playground are indicated lack of maintenance, lack of playgrounds & small-sized playground as the reasons of insufficiency. 88.70% respondents indicated on lack of maintenance.

Locational Suitability Assessment
41.33% inhabitants of zone 2 in DNCC seems that the nine playgrounds that they have are not in suitable location. This reasons is explained in the following figure.
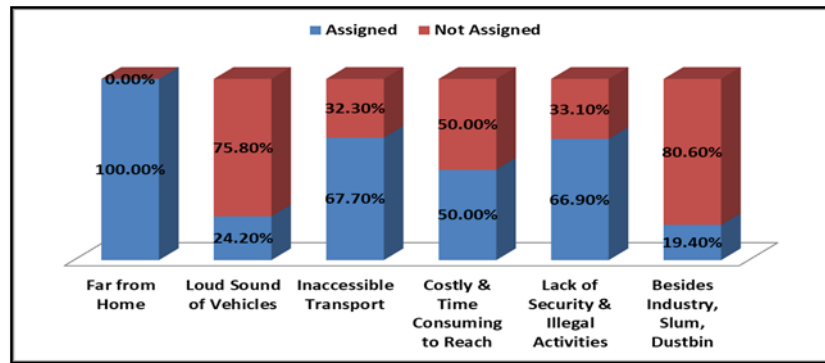
Fig.9:-Reason for unsuitable location

Far from home is the main reason to for locational complexity. Among 124 respondents who assigned to unsuitable location of playgrounds, 100% of them indicated the problem of "far from home". Perceptions on preferring the playground and quality of the playgrounds
The close to home is greater the preference of the service is seen in the zone 2 in

DNCC for preferring the playground. 59% inhabitants of zone 2 in DNCC seems that the nine playgrounds that they have, most of the users prefer the playground because of easy accessibility and that is 69.50% in detailing of their (59%) preference. Some of the inhabitants indicated close to home as their preference that is 48%.
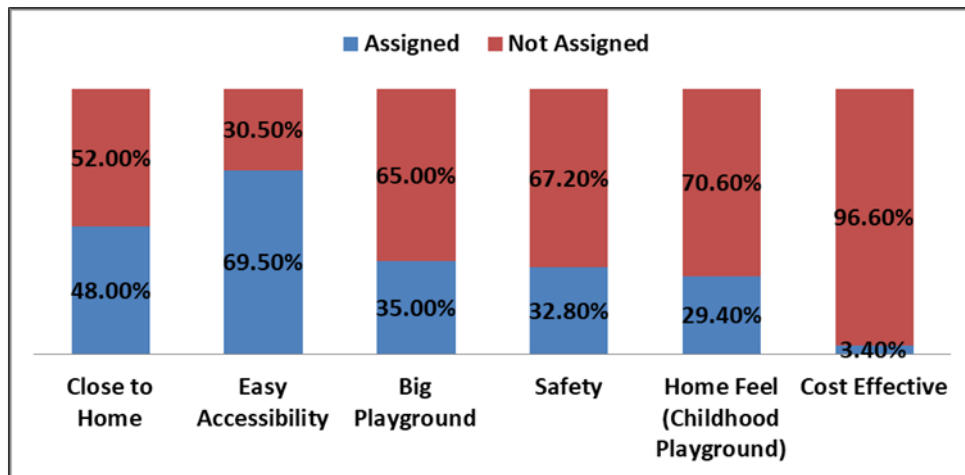

Fig.10:-Reason for preferring the playgrounds

Among all the inhabitants in zone 2 of DNCC, about 42.33% respondents are assigned on disagreement of the satisfaction level results of the questionnaire survey based on a 5 pointlikert scale. The overall satisfaction on the quality of the playground is 3.38 out of 5 pointlikert scale.

Network Analysis and Assessment
Network analysis for playground consists of two methods. One is service area assessment and another is nearest facility analysis.0.5 km service area covered 20.33% of total area. On the other hand, 2 km service area covered 76.57% of total area.5 minutes walking distance covered 14.59% of total area. But, 20 minutes walking distance covered 73.54% of total area.
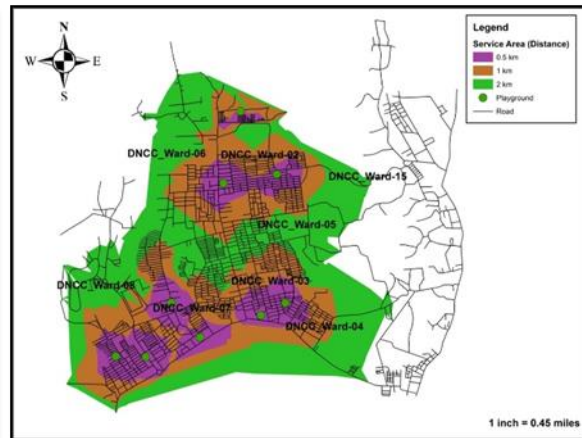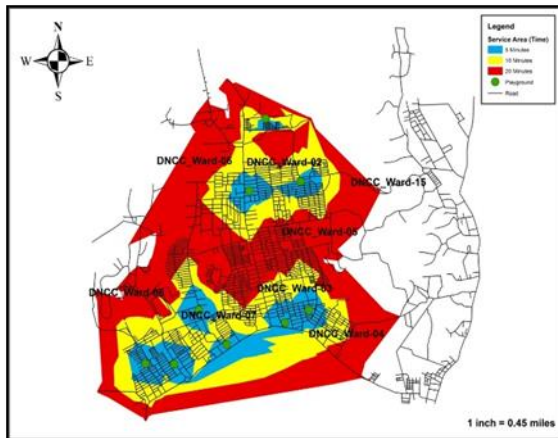
Table 4:-*Service area of playgrounds*

Criteria		Residential area covered by service area	Residential area outside service area	Total Residential area	% of Residential area covered by service area	% of Residential area outside service area
Distance	0.5 km	2.69 sq. km	10.54 sq. km		20.33%	79.67%
	1 km	6.71 sq. km	6.52 sq. km		50.72%	49.28%
	2 km	10.13 sq. km	3.1 sq. km		76.57%	23.43%
Time	5 minutes	1.93 sq. km	11.3 sq. km	13.23 sq. km	14.59%	85.41%
	10 minutes	5.61 sq. km	7.62 sq. km		42.40%	57.60%
	20 minutes	9.73 sq. km	3.5 sq. km		73.54%	26.46%

Source: Prepared by authors, 2019

From this table, its shows that from 0 to 1 there is a small area. That means 0.5 km service area served only 2.69 sq. km. But, 2 km service area served 10.13 sq. km area. Besides these 5 minutes distance covered 1.93 sq. km only. But, 20 minutes walking distance covered 9.73 sq. km area.

Map 3:-*Service area of playground according to Distance and Time*

Table 5:-*Households served by service area*

Criteria		Households served by service area	Households outside service area	Total Households	Percentages of Households served by service area	Percentages of Households outside service area
Distance	0.5 km	50369	189495		21%	79.00%
	1 km	134695	105169		56.15%	43.85%
	2 km	215479	24385	239864	89.83%	10.17%
Time	5 Min	36508	203356		15.22%	84.78%
	10 Min	114599	125265		47.78%	52.22%
	20 Min	206320	33544		86.02%	13.98%

Source: Prepared by authors, 2019

There are 50369 households within the 0.5 km radius service area that is 21% of total households. On the other hand, service area of 2 km radius has served 215479 households and it is 89.83%. In time-based analysis, it is shown that 36508 households are served within 5 minutes walking distance and that is 15.22% of total households. On the other hand, 20 minutes of walking distance have served 206320 households that is 86.02% of total households.

From the service area analysis, 0.5, 1 & 2

km radius of playgrounds have covered respectively 20.33%, 50.72% & 76.57% of total residential area. On the other hand, 5, 10 & 20 minutes time range have covered respectively 14.59%, 42.40% & 73.54%. So, the walking distance & time covered very low percentages of total area.

Closest Facility of Playground Service Area

The closest facility solver measures the

cost of traveling between incidents and facilities and determines which are nearest to one another. When finding closest facilities, you can specify how many to find and whether the direction of travel is toward or away from them. The closest facility solver displays the best routes between incidents and facilities, reports their travel costs, and returns driving directions.
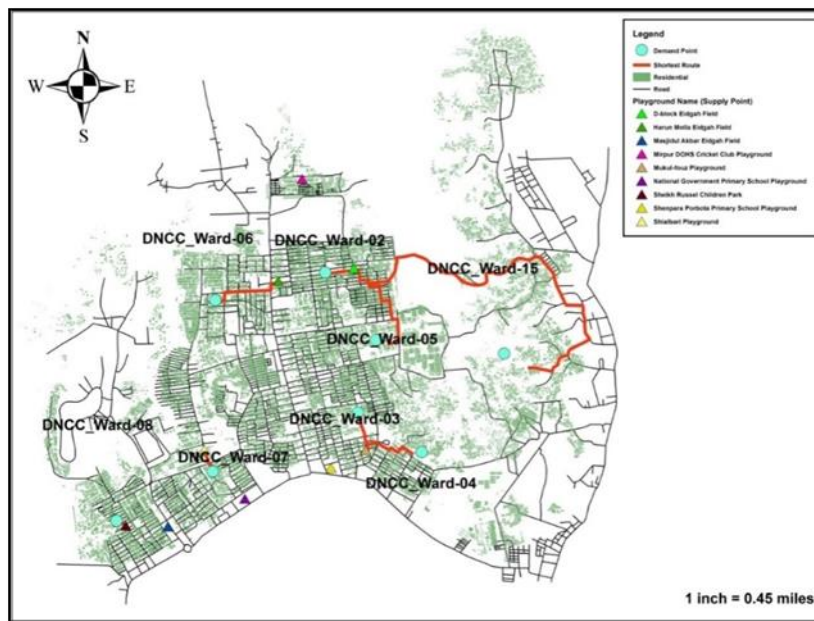
Map 4:-*Closest facility (Demand-supply point analysis)*

From the following table 6, ward- 2, 3, 7 & 8 have minimum a playground close to the locality within 500 meter & within 5 minutes accept ward 3. Ward 15 has to

cover most distance to find a playground and the distance is 4610.04 meter with 54.86 minutes on foot.

Table 6:-*Closest facilities from every ward*

Demand Point to Supply Point	Total Length (Meter)	Total Time (Minute)
Ward 2 - D-block Eidgah Field	306.88	3.65
Ward 3 - Mukul-fouz Playground	450.06	5.36
Ward 4 - Mukul-fouz Playground	674.25	8.02
Ward 5 - D-block Eidgah Field	1334.80	15.88
Ward 6- Harun Molla Eidgah Field	828.11	9.85
Ward 7 - Shialbari Playground	252.60	3.01
Ward 8 - Sheikh Russel Children Park	127.11	1.51
Ward 15 - D-block Eidgah Field	4610.04	54.86

Ward 15 has the most distance to cover to get the closest playground, D-block Eidgah Field and that is 4610.04 meter. Ward 8

has the shortest closest distance facilities, Sheikh Russel Children Park & that is 127.11 meter.

Ward 15 has the most time to cover to get the closest playground, D-block Eidgah Field and that is 54.86 minutes. Ward 8 has the shortest walking distance closest facilities, Sheikh Russel Children Park & that is 1.51 minute.

RECOMMENDATIONS

Some of the relevant recommendations on the basis of research findings are given in below-

- Playgrounds should be regularly maintained to ensure their availability for the users.
- All the playgrounds under Government educational institutions should be open for all after school time.
- Development of small play-lot within the community in vacant space is needed.
- Improvement of path networks & pedestrian access of playground for safe access.
- Pursue opportunities to create new playgrounds in existing open space to service areas deficient in playgrounds.
- Recognize the need for appropriate zoning of recreational activities around playgrounds.

CONCLUSION

To sum up it can be said that the situation of playgrounds is depicted in this study very carefully. The study shows that people are interested to go to the playground but the facilities of the playground and the capacity are very poor which discourage any one to go to playground.

The playground locational analysis indicates that location of playgrounds is not fairly evenly distributed throughout the city. Playgrounds should be located within ½ km from the place of living. More playgrounds should be developed to meet the deficiency. Amenities pure drinking water, toilet facilities, sitting arrangements are also needed in some playground.

The problems of the playground cannot be solved within the pulse of the eye. Government has to play a significant role for development of new playgrounds. It is hoped that authority would realize the vital role of the playground in the society at the same time take necessary steps to bring life into these playgrounds.

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