

Assessment of Open Spaces Ensuring Socio-Environmental Quality in Bogura Town, Bangladesh

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Abstract

The present article is the outcome of a study carried out to assess the existing condition, spatio-temporal changes and socio-environmental quality of four parks and six playgrounds in Bogura town of Bangladesh from January to June 2018. A questionnaire survey involving 150 respondents was carried out addressing environment, management, pattern, amenity, welfare and people's reliability of the parks and playgrounds. The total area of parks and playgrounds has decreased by 8.09% and 14.19%, respectively, in last a decade. Qualitative assessment indicates that Kalitola Park is in very bad condition, while Shibbati Children's Park and Shaheed Khokon Park are in good condition, and Pouro Edward Park is in moderate condition. The Ulka and Brindabonpara Playgrounds are in good condition, whereas MS Club and Altafunnessa Playgrounds are in moderate condition, and Dhorompur and Medical Playgrounds are in bad condition. The study has also shown that environment, pattern, beauty, welfare and people's reliability indicators set the parks and playgrounds between moderate and good condition; however, managerial and institutional indicators and amenity indicator need improvement. It is recommended that a proper planning, management and accessibility of open spaces of Bogura town should be ensured.

Keywords

Open space; Temporal change; Socio-environmental quality; Bogura town



Introduction

The world's urban areas are ending up progressively into overcrowded and polluted places (Blanco *et al.*, 2009). Open spaces usually consider roads, school yards, outside game buildings, burial grounds, and open squares (Hall and Ward, 1998). Urban parks and playgrounds are open spaces utilized usually by urban dwellers and have an important role in increasing social quality by expanding social correspondence and cooperation (Low, Taplin and Scheld, 2009; Aydin and Ter, 2008 and Wong, 2009). The arrangement and the nature of open spaces have moved to the highest point of political and policy agendas in both developed and developing countries (Carmona, 2010). Social analysts and planners, such as Francis (2003) and Giles-Corti *et al.* (2005), focused on the impressive significance of flourishing space utilization. Saving and keeping up open spaces in urban areas is now considered as a critical perspective to comply with the requirements of natural quality and livable city (Lindgren, 2014). Open or green space may purify the air, evacuate a contamination, limit the commotion, cool the temperatures, abstain the storm water, recharge the groundwater, and provide the food (Groenewegen *et al.*, 2006; Escobedo, Kroeger and Wagner, 2011). They also contribute to sustain biodiversity and improve the urban natural surroundings (Kwak, Yoo and Han, 2003; Morancho, 2003). The green spaces or other natural spaces give satisfaction and enthusiastic prosperity, reduce a pressure, and in particular conditions, upgrade prosperity of the citizens (Hetherington, Daniel and Brown, 1993). The parks and playgrounds have great influence in reducing stress levels and mental depression of urban dwellers (Nielsen and Hansen, 2007; Morita *et al.*, 2007) and in creating walking opportunities (Li *et al.*, 2005). In addition, increased walking enhances physical and psychological health (Fritz *et al.*, 2006). The low quality of open spaces in urban areas can be a confinement for the prosperity of the occupants, as it does not support healthy lifestyles, including spending time outdoors, walking, playing, etc. (Holt *et al.*, 2008; Mitchell and Popham, 2008). In other words, open spaces act as refreshment zone for the urban dwellers.

Bogura is a fastest growing northern district of the Rajshahi Division of Bangladesh and acts as a dominant commercial hub in the north Bengal. Bogura town, which is more than a hundred years old, has long been praised by its inhabitants for its greenery and wonderful waterfront. But over last few decades, it has become a noisy and bustling town with more than 400,983 inhabitants (Bogura Paurashava, 2010). As incorporated in Dhaka Structure Plan Standard 2016-2035 (Jafrin and Beza, 2018), there ought to be a 9 m² (WHO, 2012) or 3.5 m² green space per city tenant for guaranteeing better life. But the provisions of open spaces are not adequate in proportion with the population demand in Bogura town. The existing open spaces are congesting day by day due to the unplanned urbanization. There is no uniformity in open space standard throughout the whole town. The open spaces in Bogura town are also facing management related problems. Very little and scanty research is done on open space management, especially of parks and playgrounds, in large cities like Dhaka and Chattogram of Bangladesh. No systematic investigation on safeguarding and keeping up the open spaces is carried out in Bogura town so far. Therefore, the present study focuses on the actual scenario of the parks and playgrounds, their spatio-temporal changes and socio-environmental quality, and to find out the possible way to strengthen the existing management practices.

Methodology

Study area

Bogura is a northern district of the Rajshahi Division of Bangladesh (Figure 1). It is called the gateway to the north Bengal. Bogura became a zila (district) in 1821 (BBS, 2011) and Bogura Paurashava, earlier Bogura municipality, in 1876 (Bogura Paurashava, 2010). It consists of 21 wards and 127 mohallas (communes) after the extension of the Paurashava (municipality) area in 2006. Bogura town lies between 24° 47' and 24° 52' N latitude and between 89° 21' and 89° 24' E longitude and covers a total area of 69.56 km² with 498,000 people (Bogura Paurashava, 2010). There are 21 parks and playgrounds (BBS, 2011) from which 4 are public parks and 6 are public playgrounds providing refreshment facilities to the town dwellers.

These parks or playgrounds are not satisfactory in number to support healthy lifestyles, including spending quality time in outdoors, walking, playing, etc.

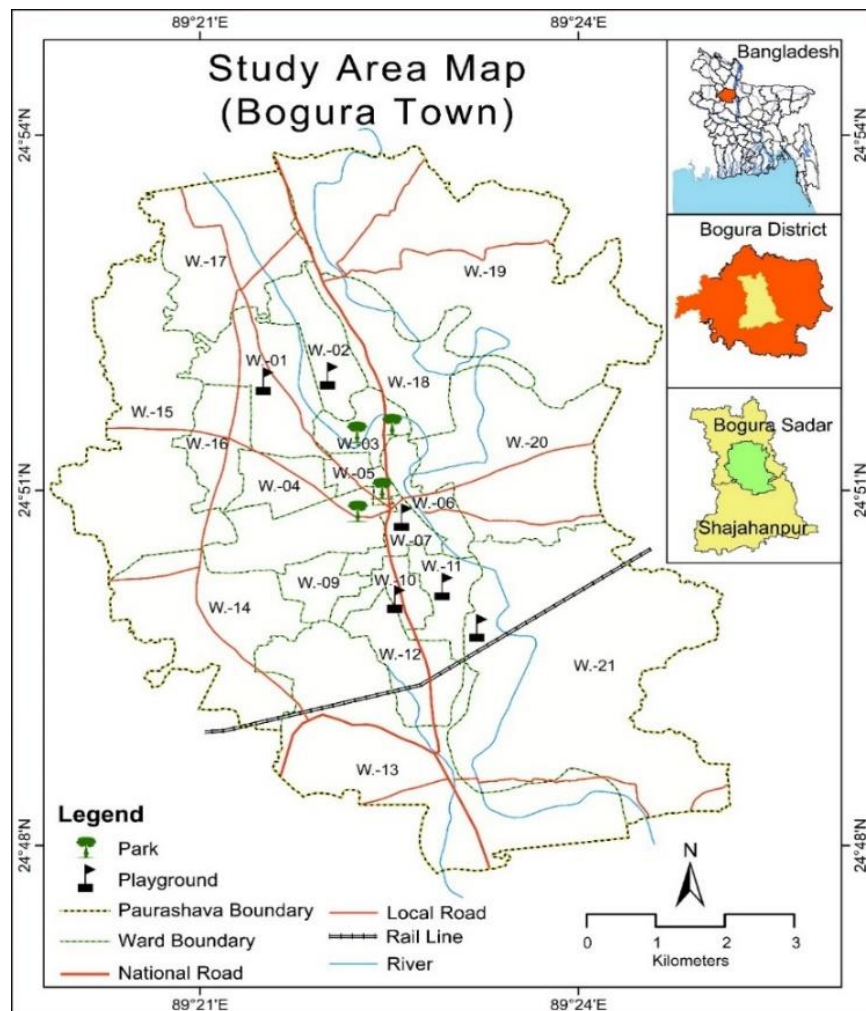


Figure 1: Map showing the study area in Bogura town

Data collection

The study was undertaken covering 4 public parks and 6 public playgrounds in the year 2018. The selected 4 parks were Pouro Edward Park, Shaheed Khokon Park, Shibbati Children's Park and Kalitola Park. Among 6 playgrounds were Medical Playground, MS Club Playground, Ulka Playground, Altafunnessa Playground, Dhorompur Playground and Brindabonpara Playground. The data related to spatio-temporal changes were collected from records of Bogura Paurashava. Besides, a total 150 respondents were interviewed to capture the people's perception about the socio-environmental quality of open spaces i.e., parks and playgrounds. 20 respondents were chosen randomly from 3 public parks, whereas 15 respondents were selected randomly from each of 6 public playgrounds. The 89.33% respondents were male and 10.67% were female. Most of the respondents were students (41.33%) along with 18% businessmen, 14% government servants, 11.33% private servants, 8% housewives and 7.33% unemployed people. Among the respondents, 41.33% were graduate, and 38.67% were HSC passed. The sampling was carried using simple random sampling.

Data analysis

The area map of Bogura Paurashava was digitized and processed in ARC Map 10.3.1. The ward boundary of the Bogura Paurashava was also digitized and processed in ARC Map 10.3.1. The location of the parks and playgrounds were recorded and marked by GPS survey. Current area and temporal changes that took place in the parks and playgrounds were retrieved from 2009, 2012, 2015, 2018 Google Earth images and then were processed in ARC Map software (using calculate geometry tool). The spatio-temporal changes of parks and playgrounds were calculated in accordance with the formula given by Mostofa (2007).

Spatio-temporal change = Beginning year (area) – Desired year (area) (i)

The spatio-temporal rate of change of the parks and playgrounds were calculated by using following formula:

Spatio-temporal rate of change = Spatio-temporal change (area) ÷ Total Number of years (ii)

The socio-environmental quality of Bogura town was assessed using five indicators namely: environmental quality, managerial and institution, amenity, pattern and beauty, and welfare and reliability. Environmental quality indicator was analyzed by using following parameters: air quality, odour, noise, crowdies, and temperature, whereas managerial and institution indicator was assessed on the parameters like standard, maintenance, cleanness standard, authority's commitment, broken elements management, remaining vegetation, nature sustainment, landscape appearance, management charge, internal management and grievance redressal. Range of visitor opportunities, convenience provided especially to children and parents, sitting plan, playing devices, physical exercise stuff, children amusement instruments, conveying, car parking zone, footpath, streetlight, beverages and restroom facility etc. were taken into account as part of amenity indicator. To reveal the pattern and beauty of the open spaces of Bogura town, attractiveness, availability and linkage, distinct enterprise, intrigue appearance, refreshment options, signboard, topography and vegetation, and pavement design were assessed. Besides, welfare and reliability indicator had the parameters, such as begging, robbery, abuse, drug handling and inhalation, unsocial activity and presence of floating vendors.

Table 1: The rating of the acceptance level of socio-environmental quality indicators

Indicators	Acceptance level with rating point				
	Very Bad (1)	Bad (2)	Moderate (3)	Good (4)	Very Good (5)
Environmental quality	No management system	Negligible management system	Average management system	Satisfying management system	Highly satisfying management system
Managerial and institution					
Amenity					
Pattern and beauty					
Welfare and reliability					

The mean value of each indicator had been calculated to find out the socio-environmental quality of Bogura town by using the following formula given by Mostofa (2007) and Islam, Mahmud and Islam (2015):

Total point = Σ (Frequency × Weightage of acceptance level)..... (1)

Each parameter mean = Total point/Total frequency..... (2)

Indicator mean = all parameter mean/ Total no. of parameters..... (3)

Results and Discussion

Spatio-temporal changes of parks and playgrounds

The total area of parks in Bogura town in 2009 was 38,272 m², but it has decreased about 8.09% over a decade and became 35,177 m² in 2018 due to illegal possession and mismanagement by the authority. The total area of all the playgrounds was 55,085 m² in 2009, which tremendously decreased by 14.19% in 2018 (47,268 m²) due to the illegal possession of the people for their personal gains (Figure 2).

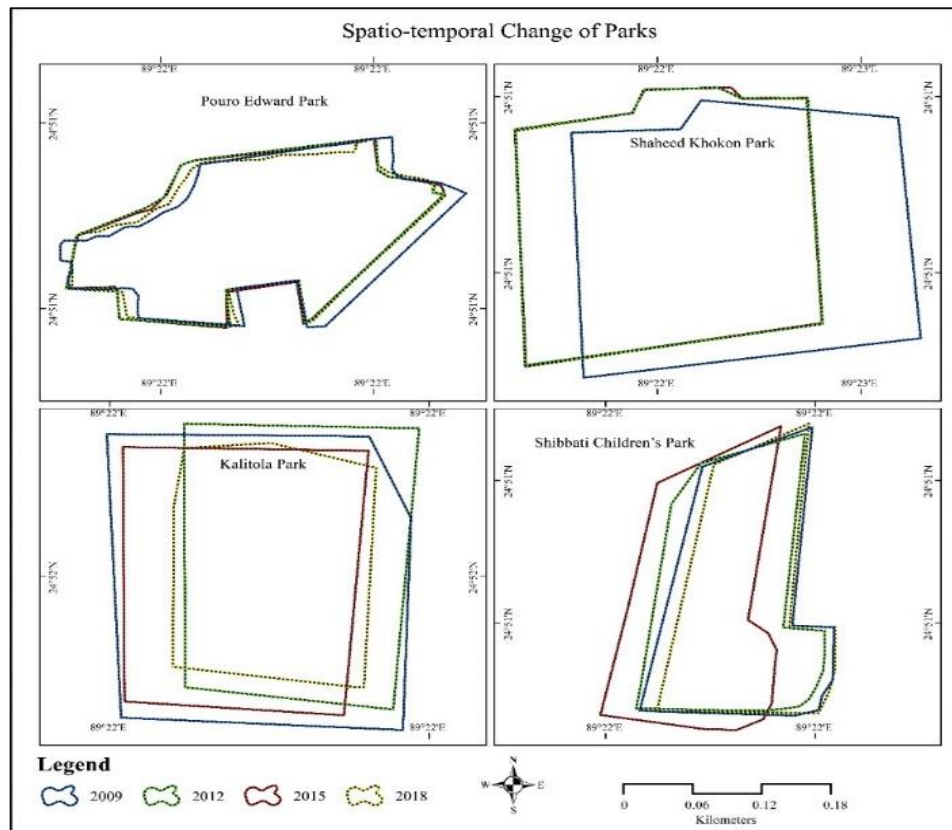


Figure 2: Map showing the spatio-temporal change of all parks in Bogura town

Within a period of 10 years from 2009 to 2018, the spatio-temporal change (Figure 2) of Pouro Edward Park was -2,334 m², of Shaheed Khokon Park was -336 m², of Kalitola Park was -380 m² and of Shibbati Children's Park was -45 m² when calculated using the formula (i). The total area loss over 10 years in Pouro Edward Park was 6.82%, whereas in Shaheed Khokon Park was 11.99%, in Kalitola Park was 46.51% and in Shibbati Children's Park was 11.06%.

The spatio-temporal changes of the playgrounds (Figure 3) of Bogura town within 10 years from 2009 to 2018 showed negative results, as the area has shrunk. The spatio-temporal change of MS Club Playground was -1,504 m², of Altafunnessa Playground was -356 m², of Medical Playground was -2,438 m², of Ulka Playground was -282 m², of Brindabonpara Playground was -246 m² and of Dhorompur Playground was -2,991 m² when calculated using the formula (i). The total area loss over 10 years in MS Club Playground was 14.78%, whereas in Altafunnessa Playground was 2.61%, in Medical Playground was 17.51%, in Ulka Playground was 6.85%, in Brindabonpara Playground was 6.05%, and in Dhorompur Playground was 32.81%.

The rate of spatio-temporal change was -233.4 m^2 for Pouro Edward Park, -33.6 m^2 for Shaheed Khokon Park, -38 m^2 for Kalitola Park and -4.5 m^2 for Shibbati Children's Park over a period of 10 years when calculated using the formula (ii). The rate of spatio-temporal change was -150.4 m^2 for MS Club, -35.6 m^2 for Altafunnessa, -243.8 m^2 for Medical, -28.2 m^2 for Ulka, -24.6 m^2 for Brindabonpara and -299.1 m^2 for Dhorompur Playground over the period of 10 years. Pouro Edward Park is situated in the centre of the Bogura town. A drastic change has happened in the park because it lost its area due to illegal possession during the period of 2009-2012, whereas during 2012-2015 the change was comparatively low (-66 m^2). However, during the period of 2015-2018, the rate of change was higher because surrounding roads, total fencing and a market were constructed on the front side of the park (Table 2).

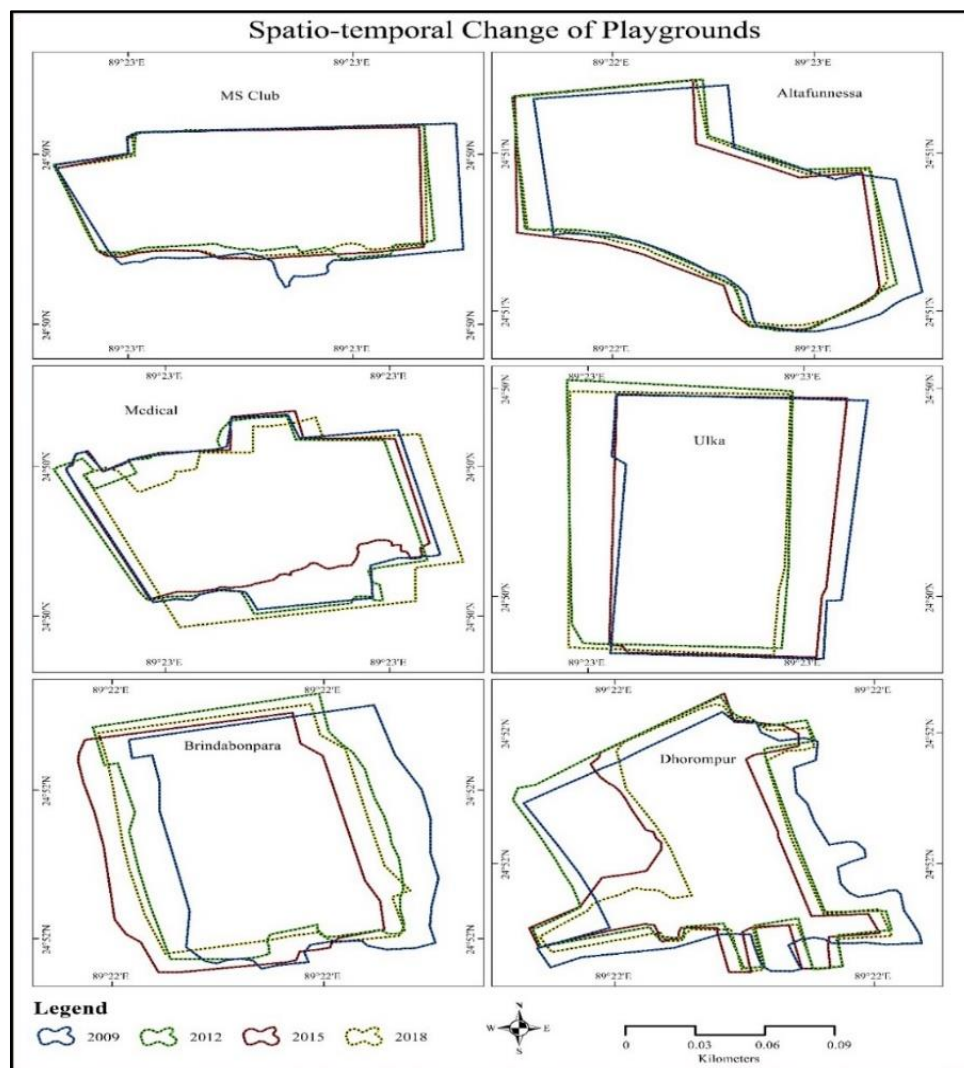


Figure 3: Map showing the spatio-temporal change of all playgrounds in Bogura town

Shaheed Khokon Park has also lost some of its land for constructing road surrounding it and for a building construction for Power Development Board, Bogura, during the period of 2009-12. Following that, the development authority built a fencing wall that stabilized the rate of further change. Kalitola Park is adjacent to a school and it lost some of its land to the school during the period of 2009-2012. On the other hand, during 2012-2015 some of its land was used for widening the road, and finally, during 2015-2018 the local people occupied some area of the park. Shibbati Children's Park has no fencing, so the landowners surrounding the park encroach upon its land for their own purposes. MS Club Playground lost its land for widening the road during 2015-18, whereas Altafunnessa Playground lost a huge portion of its land to the

adjacent district court during 2012-15. Lastly, during the period of 2015-2018, it lost some of its land for the construction of the fencing wall. The housing of Dalit¹ community, who are the sweepers of Mohammad Ali Hospital, occupied some areas of Medical Playground. Ulka Playground, Brindabonpara Playground and Dhorompur Playground have no fencing and the respective urban authority has no records; that is why the spatio-temporal rate of changes occurred drastically in these playgrounds (Table 2).

Table 2: Spatio-temporal rate of changes of all parks and playgrounds in Bogura town

Name	Period with Area (m ² /3 years and m ² /10 years)			
	2009-2012 (3 years)	2012-2015 (3 years)	2015-2018 (3 years)	2009-2018 (10 years)
Pouro Edward Park	-257.67	-66	-454.33	-233.4
Shaheed Khokon Park	-112	0	0	-33.6
Kalitola Park	-73.67	-0.67	-52.33	-38
Shibbati Children's Park	-1	-1.33	-12.67	-4.5
MS Club Playground	-501	0	-0.33	-150.4
Altafunnessa Playground	-27.33	-90.33	-1	-35.6
Medical Playground	-248.67	-124.67	-439.33	-243.8
Ulka Playground	-65	-10	-19	-28.2
Brindabonpara Playground	-17.67	-17.33	-47	-24.6
Dhorompur Playground	-211	-746.33	-39.67	-299.1

Table 3: Comparison of open spaces of Bogura town with national and international standards for playgrounds and parks

Type	Recommended space standard (acres/1,000 people)				
	Bangladesh	India	Pakistan	USA	Open Space in Bogura
Playground	0.50	1.5	1.3	1.5	0.03
Park	0.75	2	1.3	1.25	0.02

Source: Khan, 2006; Khan, 2014

Dhaka Structural Plan (2016-2035) recommends 0.86 acre/1,000 people for both parks and playground, while Rajshahi Urban Area Functional Master Plan (2004-2024) considers 1.5 acre/1,000 people and Barishal Master Plan (2010-2030) approves 1 acre/1,000 people (Khan, 2014). Chattogram Development Authority recommends a standard of 0.12 acre/1,000 people for park and 0.08 acre/1,000 people for playground (Jafrin and Beza, 2018). Bogura town has 0.03 acres of playground for 1,000 people (Table 3). The recommended playground area for Bangladesh is 0.50 acres/1,000 people (Khan, 2006), compared to 1.5 acres/1,000 people for USA (Khan, 2014). So, it clearly indicates that the area of playgrounds is not enough for the urban dwellers of Bogura. On the other hand, Bogura town has 0.02 acres of park for 1,000 people whereas the recommended park space for Bangladesh is 0.75 acres per 1,000 people and 1.25 acres per 1,000 people for USA (Table 3). It is also an indication of insufficient parks for the urban dwellers. There should be a management of some open spaces in Bogura town through evicting illegal occupation on khas² lands.

¹ Dalit Community is a caste or a group of castes, population marginalized to the extreme by partly religious sanctions and partly by social and economic deprivations. Dalits in Bangladesh are often forced to undertake specific types of labour as a consequence of their assigned caste status and are most commonly associated with the profession of "Jat Sweepers" or "Horijon". As a result of their limited access to employment Dalit's are almost exclusively working in 'the service sector' performing unclean jobs in urban areas such as street sweeping, manual scavenging and burying dead bodies (Banglapedia, 2015; IDSN, BDERM and Nagorik Uddyog, 2018).

² Khas land means government owned fallow land, where nobody has property rights. It is land which is deemed to be owned by government and available for allocation according to government priorities (Chancery Law Chronicles, 2011).

Socio-environmental quality of parks and playgrounds

The environmental indicators of Shibbati Children's Park and Shaheed Khokon Park were found in between very good and good conditions, which is attributed to the strict environmental maintenance by authority, while Pouro Edward Park was found in a good condition. The respondents were satisfied on the existing air quality, temperature and crowd of visitors in the parks, but were moderately satisfied on noise and odour condition, as the parks are situated besides the road. The environmental quality of Altafunnessa Playground was found between good and very good because the authority takes good care of it. MS Club was in good condition as the local people look it after. Brindabonpara, Dhorompur and Ulka Playgrounds were in almost good condition because they are maintained by authority and local people. The Medical Playground lied between moderate and good environmental condition (Figure 4).

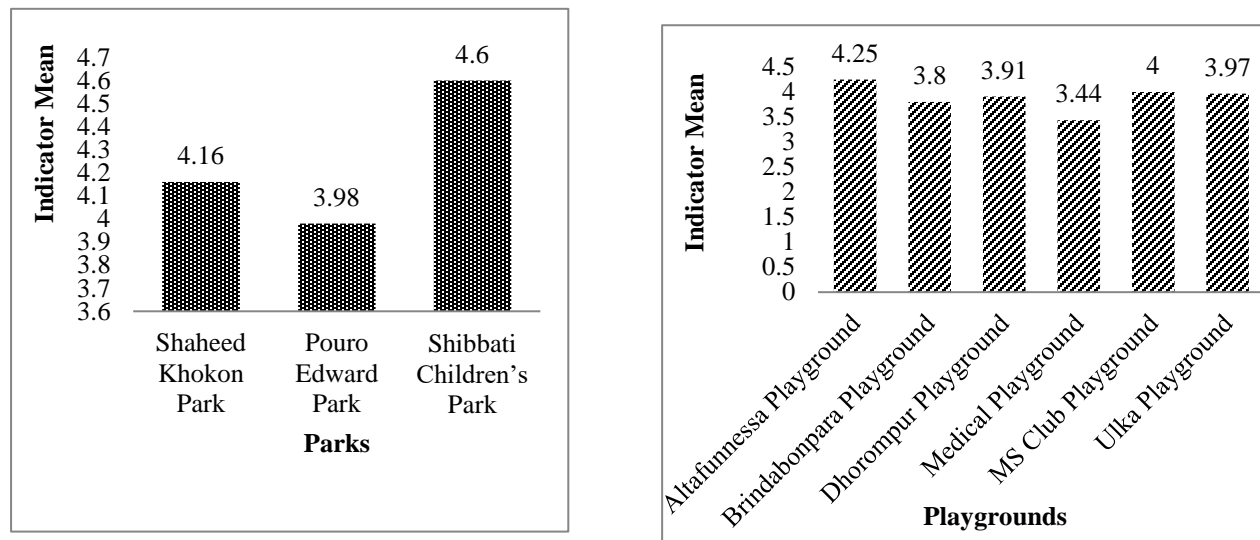


Figure 4: Comparison of environmental indicator of all parks and playgrounds

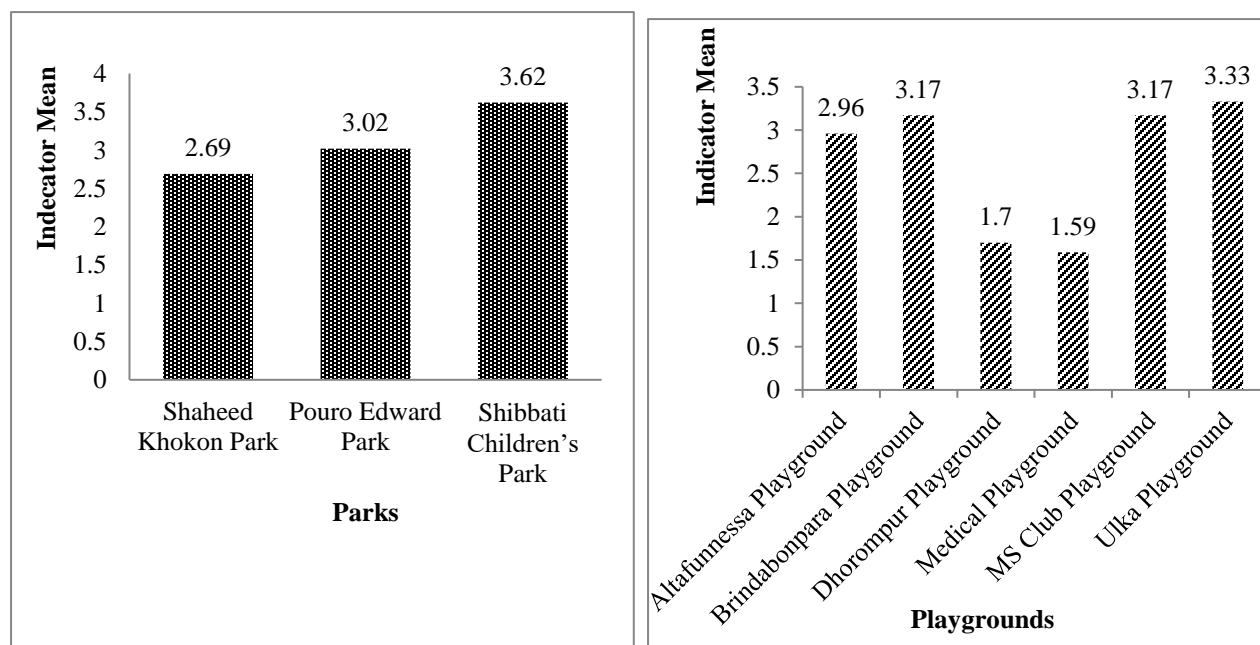


Figure 5: Comparison of managerial and institutional indicator of all parks and playgrounds

The managerial and institutional indicator of Shibbati Children's Park was in between moderate and good condition, as there was involvement of local people in the management system. On the other hand, Pouro Edward Park was in moderate and Shaheed Khokon Park was in between bad and moderate condition because management systems were weak there. The managerial and institutional indicators of Brindabonpara, MS Club and Ulka Playgrounds were found in between moderate and good condition, as the authority takes good care of the playgrounds. Altafunnessa Playground was in almost moderate condition, while Dhorompur and Medical Playgrounds were in between very bad and bad condition because of the coordination problems between the concerned authorities (Figure 5).

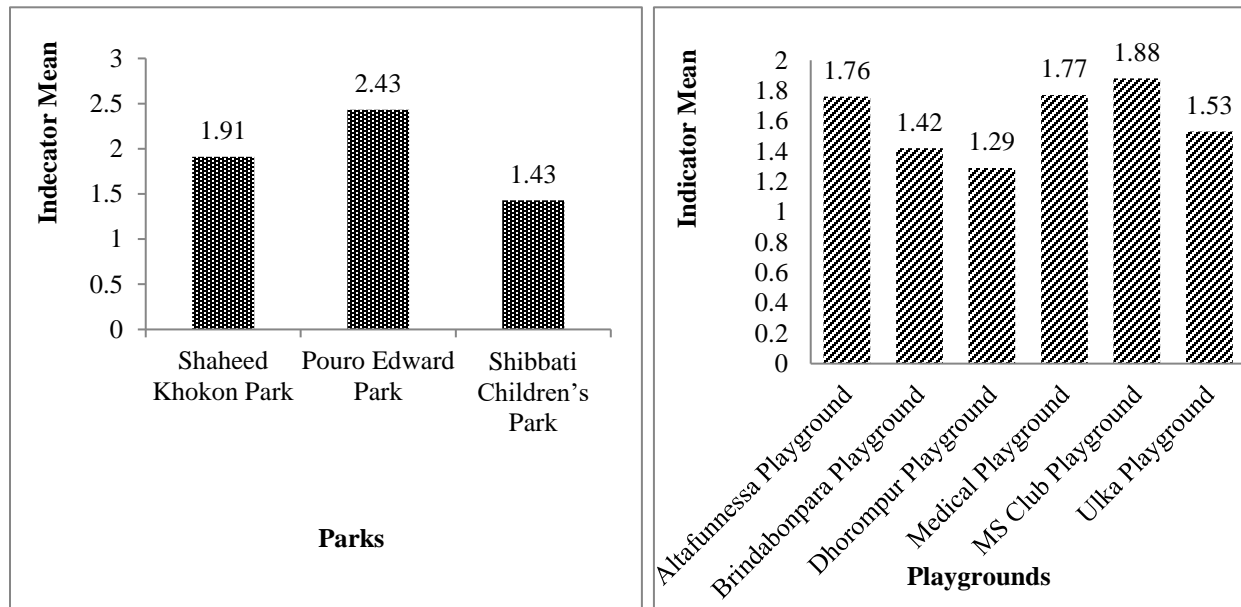


Figure 6: Comparison of amenity indicator of all parks and playgrounds

The comparison of amenity indicator showed that Shibbati Children's Park and Shaheed Khokon Park were in between very bad and bad condition, as the parks open for one hour only in a day and there is not enough space for sitting and walking. On the other hand, Pouro Edward Park and Shaheed Khokon Park were found in between bad and moderate condition as the facilities provided are not good enough. The comparison of the facilities of playgrounds indicated the facilities to be unsatisfactory at all i.e., the playgrounds were lying in between very bad and bad condition due to the gross negligence of the authority (Figure 6).

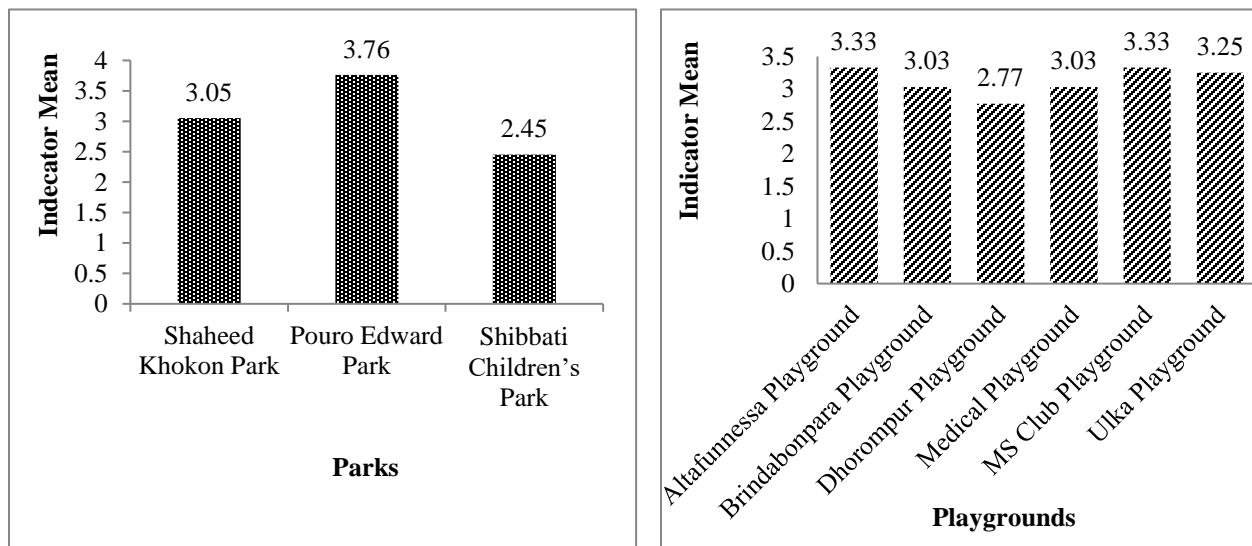


Figure 7: Comparison of pattern and beauty indicator of all parks and playgrounds

The pattern and beauty indicators of Pouro Edward Park was found in between moderate and good, as the park was covered with trees and the layout design was also moderate. The Shaheed Khokon Park was found in a moderate condition, as the park was well organized. Shibbati Children's Park was in between bad and moderate condition, as it was not well planned. The rating for pattern and beauty indicator for Altafunnessa Playground was 3.33, Brindabonpara Playground was 3.03, Medical Playground was 3.03, MS club Playground was 3.33, and Ulka Playground was 3.25. The pattern and beauty indicators of these playgrounds were moderately satisfactory because of the authority and local people's care. On the other hand, the rating of Dhorompur Playground was 2.77, which was in between bad and moderate satisfaction level (Figure 7).

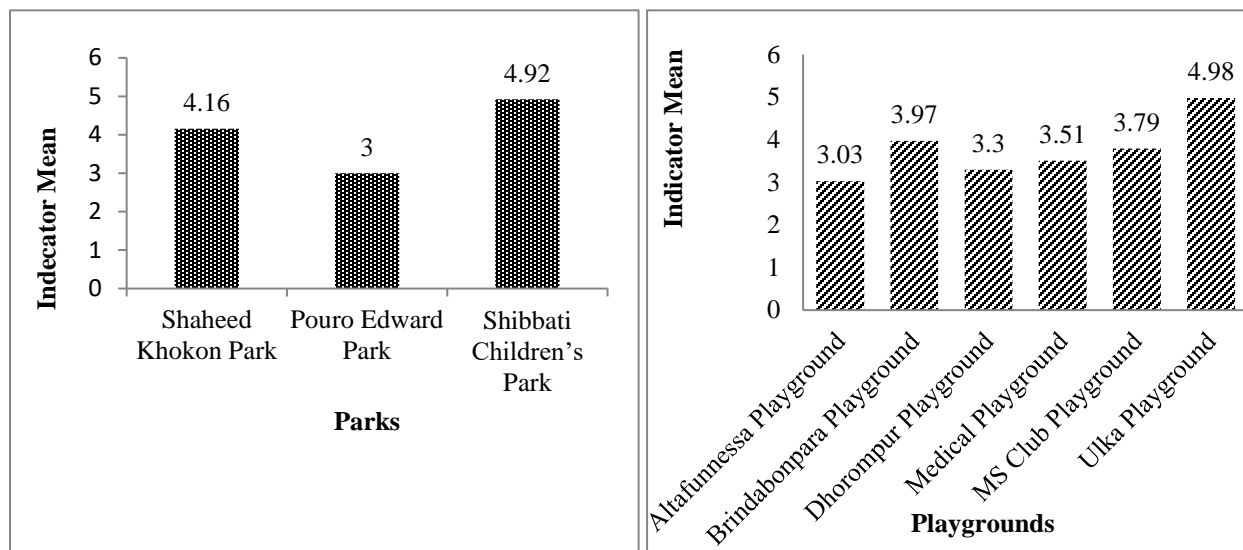


Figure 8: Comparison of welfare and reliability indicator of all parks and playgrounds

The welfare and reliability indicators of Shibbati Children's Park were found in almost very good condition, and that of the Shaheed Khokon Park were in good condition. But the Pouro Edward Park was found in moderate condition. The rating of Brindabonpara Playground was 3.97, of MS Club Playground was 3.79, of Medical Playground was 3.51, and of Dhorompur Playground was 3.3. It means they were in between moderate and good condition because only the local people use the playground. The rating of Ulka Playground was 4.98 (very good) because the playground was managed by the authority in cooperation with the local people. On the other hand, the rating of Altafunnessa Playground was 3.03, which was in moderate condition, as many people come here for various purposes. The welfare and reliability measures were not maintained by the authority (Figure 8).

The total area of parks and playgrounds in Bogura town has decreased over a period of 10 years. This spatial decrease has no positive correlation with socio-environmental quality. It seems that only open space area was reduced, and urban dwellers have neutral attitudes towards the common property resources. They visited open spaces frequently, enjoyed fresh air, gossiped and played games. The 44% respondents visited these parks and playgrounds in the afternoon and 28% visited in the morning for playing, walking and doing exercise. The majority of the respondents (34%) spent 30 minutes to 60 minutes, 28.67% spent more than 60 minutes and 20.67% spent less than 30 minutes in these parks and playgrounds. That is why, all indicators showed good results except amenity indicator. Inadequate bench for sitting, poor condition of pavements, lack of amusement facility for children and adolescents, poor quality or no washroom and water supply, improper lighting, etc. indicated poor quality of all parks and playgrounds in Bogura town. The 48% respondents were satisfied, 40.67% were moderately satisfied and only 11.3% respondents were highly dissatisfied on the existing condition of open spaces because they found lack of amenities in those open spaces. When compared with adjacent Rajshahi town, Bogura has a poor record. A massive development has occurred in Rajshahi town of Bangladesh. The roads are wide with trees amid the road divider,

pavements are adequate, planned open spaces with proper facilities satisfy urban dwellers to enjoy their free time indicating increased socio-environmental quality of Rajshahi town (The Daily Star, 2021). The provision for open spaces in Rajshahi town is 1.5 acre/1,000 people which is much better than the Bogura town. The facilities in the open spaces of Bogura town were inadequate and urban dwellers showed dissatisfaction with it.

Conclusion

The rapid growth of urban population in Bogura town has caused the massive encroachment of open spaces due to increasing demand of land for housing and commercial activities. The main objective of the present study was to investigate the spatio-temporal change and the socio-environmental quality of parks and playgrounds. Through the investigation, it was observed that the area of the parks and playgrounds has decreased over a decade and it is insufficient for the people living in Bogura town. The negligence in maintaining socio-environmental quality, especially amenity of parks and playgrounds, was observed. The socio-environmental quality of Ulka Playground (3.41) was much better than other studied playgrounds. Shibbati Children's Park showed the best results compared to other three parks. The descending order of socio-environmental quality of playgrounds were Ulka followed by MS Club followed by Brindabonpara followed by Altafunnessa followed by Medical followed by Dhorompur Playground. Similarly, quality of parks was best in Shibbati Children's Park followed by Pouro Edward Park followed by Shaheed Khokon Park. By rectifying the past wrongs with proper planning and maintenance in future, the accessibility and fruitful use of the parks and playgrounds can be enhanced.

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Authors' Declarations and Essential Ethical Compliances

Authors' Contributions (in accordance with ICMJE criteria for authorship)

<i>Authors' Contributions (in accordance with ICMJE criteria for authorship) Contribution</i>	Author 1	Author 2	Author 3
Conceived and designed the research or analysis	Yes	Yes	Yes
Collected the data	Yes	Yes	Yes
Contributed to data analysis & interpretation	Yes	Yes	Yes
Wrote the article/paper	Yes	Yes	Yes
Critical revision of the article/paper	Yes	Yes	Yes
Editing of the article/paper	No	No	Yes
Supervision	No	No	Yes
Project Administration	Yes	No	No
Funding Acquisition	No	No	No
Overall Contribution Proportion (%)	30	30	40

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During the research, the authors followed the principles of the Convention on Biological Diversity and the Convention on the Trade in Endangered Species of Wild Fauna and Flora.

Research on Indigenous Peoples and/or Traditional Knowledge

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