Khulna University Studies Volume 19(2): 219-234 : 2022

REVIEW ARTICLE

SCIENCE &ENGINEERING

SPATIAL DISTRIBUTION OF PARKS AS URBAN GREEN SPACE IN KHULNA CITY: AN ANALYSIS IN CONTEXT OF EQUITY PLANNING

Tusar Kanti Roy[1]*, Md Mustafa Saroar[2], Md Ashraful Alam[1]

[1]*Urban and Rural Planning Discipline, Khulna University, Bangladesh*
[2]*Department of Urban and Regional Planning, Khulna University of Engineering & Technology, Bangladesh*

KUS: 21/44: 30112021

Manuscript received: November 30, 2021 Accepted: December 13, 2022

Abstract

Equitable distribution of parks as urban green space over a city can provide recreational, health and environmental services to city people. This research aims to assess the spatial distribution of parks as urban green space of Khulna City in equity planning. Primary data on existing condition of parks with facilities, user satisfaction level, improvement of existing parks, and proposals for new parks etc. are collected from questionnaire survey of 384 park users and key informants of urban planners, civil engineers and architects from Khulna Development Authority (KDA) and Khulna City Corporation (KCC), the city planning and urban service delivery government organizations. Implementation status of park proposals in 1961 and 2001 City Master Plans, and proposals in the 2018 Detailed Area Development Plan (DAP) along with relevant published research articles, reports etc. are reviewed as secondary data sources. Demand for parks is assessed through Buffer and Network analysis using GIS and also from Threshold Population analysis. Khulna, the 3rd largest industrial city of Bangladesh has about 0.7 million people in its 45.65 sq. km area. There are only 8 parks in Khulna City, most of which are small and cover only 0.15% of total KCC area. Among the 31 KCC Wards, only 7 (23%) Wards, where 27% city people live have parks. The remaining 24 (77%) Wards having 73% city people are deprived of parks. Increased urban population due to rapid urbanization is causing tremendous pressure on the existing limited number of parks. KCC and KDA have not followed equity principles while planning and implementation of park proposals. The parks are mostly found in the Wards having planned and old built-up areas. The existing parks are unable to fulfill the demand of city people. Considering the served, over served and underserved area of existing parks in a more conservative manner, a total of 14 new parks are proposed to ensure equity in planning and development of parks in Khulna City.

Keywords: Parks, urban green space, equity planning, Khulna city, GIS, master plan

Introduction

Parks as open green space are one of the vital elements of any city and its environment, which have a great importance in the daily life of urban people. Parks fulfill the recreational and environmental needs of a city; and promote both the physical and mental health (Roy et al., 2019). Parks help to generate local employment, reduce poverty, foster economic growth and human development (Calderon & Chong, 2004; Cockburn et al., 2013; Gibson & Rioja, 2014; Hooper et al., 2018; Leipziger et al., 2003; Mendoza, 2017; Lee et al., 2015). Bangladesh is one of the most densely populated countries in the world. Due to continuous socio-economic development of the country, it is facing a rapid spreadof urbanization in recent time. People from rural areas nowadays are migrating to urban areas for searching of jobs and better living. This migration is making the urban area overcrowded putting tremendous pressure on the existing service facilities like schools, hospitals, parks and open space, and many more. As the life of urban people has been more mechanized, there is a pressing need for relaxation. Though urban areas have some parks, they are not sufficient because of over population. Sometimes the city people have low access to the parks for the prevailed poor environment and facilities due to lack of proper maintenance or for security issues (Karim & Roy, 2012; Roy, 2013). Improper road network or connection services sometimes may cause the accessibility problem. Parks and open green spaces are very necessary for urban people as without proper relaxation, people are losing their working efficiency day by day. So, planning and development of urban parks is very much essential and

* Corresponding author:<tusarkroy@urp.kuet.ac.bd>
DOI: https://doi.org/10.53808/KUS.2022.19.02.2144-se

for that, urban planners of Bangladesh need to be more focused on equity and accessibility-based planning of parks (Ferdous et al., 2016; Istiaque et al., 2018). Khulna city is located in the southwest coastal region of Bangladesh, which is expanding day by day (Haque et al., 2019). The urban population of Khulna city is also growing due to rural-urban migration and natural growth. Its population now in 2022 is 718,735, which was 663,342 in 2011(BBS, 2015a; BBS, 2022).Total area under the existing 8 parks of Khulna city is only 24.54 acres.

Inequal distribution of infrastructure and services delays and retards the socio-economic and environmental development of an area. The implications of unequal distribution of facilities include deprivation of citizens from government services, failing to attract investment for grasping the fruits of development, and continuing the cycle of provision of inadequate services and facilities etc. (Calderón & Chong, 2004; Howlader et al., 2018). Extreme inequality is detrimental not only to poverty alleviation but also to the attainment of sustained socio-economic growth (Bebbington et al., 2008). Political favors and decisions led by local politicians influence development of infrastructure and economic activities in the cities or regions and thereby creates spatial inequality (Shefer & Antonio, 2013; Sridharan, 2011). Targeted investment and public spending decrease infrastructure inequality (Simon & Natarajan, 2017).Parks as public green spaces provide many social benefits. Park social services help to refrain the children, youths, and even adults from anti-social activities. An urban society having adequate number of parks as social public open space becomes socially sound and sustainable resisting social unrest situation and bringing social peace.

As parks are the main source of recreation and greatly contribute to better health of urban people, the demand for parks is increasing with the increase of population and urban functions (Tabassum & Sharmin, 2013). So, it should be ensured that parks and open spaces are equitably distributed over the city and adequately accessible to all categories of people. There are 520 slums in Khulna city, where 188,442 (about 25%) poor and landless people live. Population density per sq. km in the slum areas is 132,988 (CUS, 2006). But there exists acute shortage of urban open green spaces of parks and playgrounds in Khulna city (Rahman & Salauddin, 2009). There are no parks in the nearby areas of most of the slums. There are only four freely accessible small children parks in Khulna City, among them Golokmoni Shishu Park has only 0.06 acres and Nirala Park has only 0.40 acres land. Recreational use of parks largely depends on different attributes like land use patterns, travel time and travel cost to reach the parks (Litman, 2022). Dhaka Metropolitan Development Plan (DMDP) 1995 recommended only 0.16 acres for every 1000 population. They had to fix such a low standard because of high scarcity of vacant land in and around the city. Urban Development Directorate (UDD) in 1985 by its zila and upazila planning project fixed a reasonable standard of 1 acre per 1000 population for the district and upazila level towns. Though several plans were prepared under the project, none was executed. The 1961 Master Plan of Khulna city recommended 4 acres of open space for every 1000 population, where 2 acres for parks and 2 acres for playgrounds. But this target could not be achieved because of non-execution of open space proposals. The 1961 situation of Khulna city has undergone substantial changes. Now it is extremely difficult to find a sizable chunk of vacant land in the city for use as a Central Park. At the same time, the need for open space for future population cannot be ignored. Considering the foregoing discussion of standard provisions, availability of resources and usable space, the 2001 Master Plan of Khulna city recommended 2.71 acres open space per 1000 population.

Khulna Development Authority (KDA) and Khulna City Corporation (KCC) are mainly responsible in planning, development and management of parks in Khulna City. KDA prepares land use-based city master plan where lands are demarcated in different locations for parks and open green spaces. In spite of having significance and potentials of Khulna City, over the last 60 years, all the concerned government organizations mainly KCC and KDA took very little initiative to establish more parks in Khulna city. Existing environment and facilities of the parks need to be improved with utmost care so that maximum number of children and city people can optimally use the parks for their mental refreshment and sound health. There exists no formal sizable park in Khulna city that a metropolitan city should have. There is no metropolitan or regional level park within the Master Plan area too. The existing open spaces in the city are scattered in small pieces and mostly used as play lots, neighborhood parks and playgrounds. The Park-Cum-Zoo at Gilatala is quite large, but it is outside of the KCC area. Its area is about 40 acres. But its distance from the main city and non-availability of easy transport mode makes its accessibility difficult for a large segment of city dwellers living in the far-off areas of the city southern part.

As per the planning standard of KDA 2001 Master Plan of 2.71 acres land for 1000 population, a total of 1327 acres land area is required for Khulna city. Likewise, according to the planning standard of WHO, 2012 (2.2 acres park area for 1000 population), a total of 1459 acres land area is required. According to the planning standard of the Private Housing Project Land Development Rule 2004 (3 acres park area for 25000 population), a total of 80

acres land area is required for the parks of Khulna city. The number, category, size and equitable distribution of the parks are considered and adjusted calculating the land area obtained from different planning standards.

Materials and Methods

Data Collection and Analysis

The data for this study was collected both from field survey of existing parks and from KDA and KCC. Data on existing facilities and conditions of the parks, satisfaction level of the users in terms of locational suitability and service-facilities, problems of the parks and recommendations to solve the problems etc. were collected from the field as well as from relevant studies conducted by Khulna University (KU), Khulna University of Engineering and Technology (KUET), KDA and KCC, where the researchers of this study are also the key contributors. A total of 384 park users were surveyed using a semi-structured questionnaire. Geographic Information System (GIS) was also used for analysis and preparation of maps, where the shape files of Khulna city land use were collected from KDA. Different methods like Multiple Ring Buffer, Network and Threshold population analysis were also followed. Under the study, Key Informant Interview (KII) was conducted with the Civil Engineers, Urban Planners and Architects of KCC and KDA; and Civil Society representatives to get their opinions and views on the planning aspects and existing condition of the parks as open green space. Their suggestions for creation of more parks and open green space for Khulna city were documented. Parks and open green space proposals and related issues highlighted in 1961 and 2001 Khulna City Master Plans and 2018DAP were also reviewed. Field visits of some proposed sites for parks and open space were conducted. Books, journals, reports etc. on parks and open green space collected from internet and other sources were reviewed. Data was processed through Statistical Package for Social Sciences (SPSS) and Microsoft Excel.

Results and Discussion

Khulna City as Study Area and its Parks

Khulna, the third largest city of Bangladesh is basically a linear city. The city is located on the bank of two rivers- the Rupsha and the Bhairab (Istiaque et al., 2018). It lies between $22^0$47´16´´ to $22^0$52´ north latitude and $89^0$31´36´´ to $89^0$34´35´´ east longitude (Karim & Roy, 2012). The city covers an area of 45.65 sq. km with a population of 718735(BBS, 2022; KCC, 2018). It is divided into 31 Wards. In Khulna, there are some facilities like parks, Rupsha Bridge, cinema, New Market and open green spaces for recreation of the city dwellers. But for this research, public parks are chosen as urban green spaces. There are 8 public parks in KCC area, which are highly unequally distributed (Roy 2012; Howlader et al., 2018).

The parks are Hadis Park, Jatisangha Shishu Park, Wonderland Amusement Park, Sonadanga Residential Park, Nirala Park, Golokmoni Shishu Park, Solar Park and Mujgunni S S World Shishu Park. Figure1 and Table 1 show that out of the 31 KCC Wards, only 7 (23%) Wards have parks. Shahid Hadis Park and Golokmoni Shishu Park are located in the old built-up areas. Whereas Sonadanga Residential Park, Nirala Park, Solar Park, Mujgunni S S World Shishu Park and Wonderland Amusement Park are located within and near the planned residential areas developed by KDA and National Housing Authority (NHA).

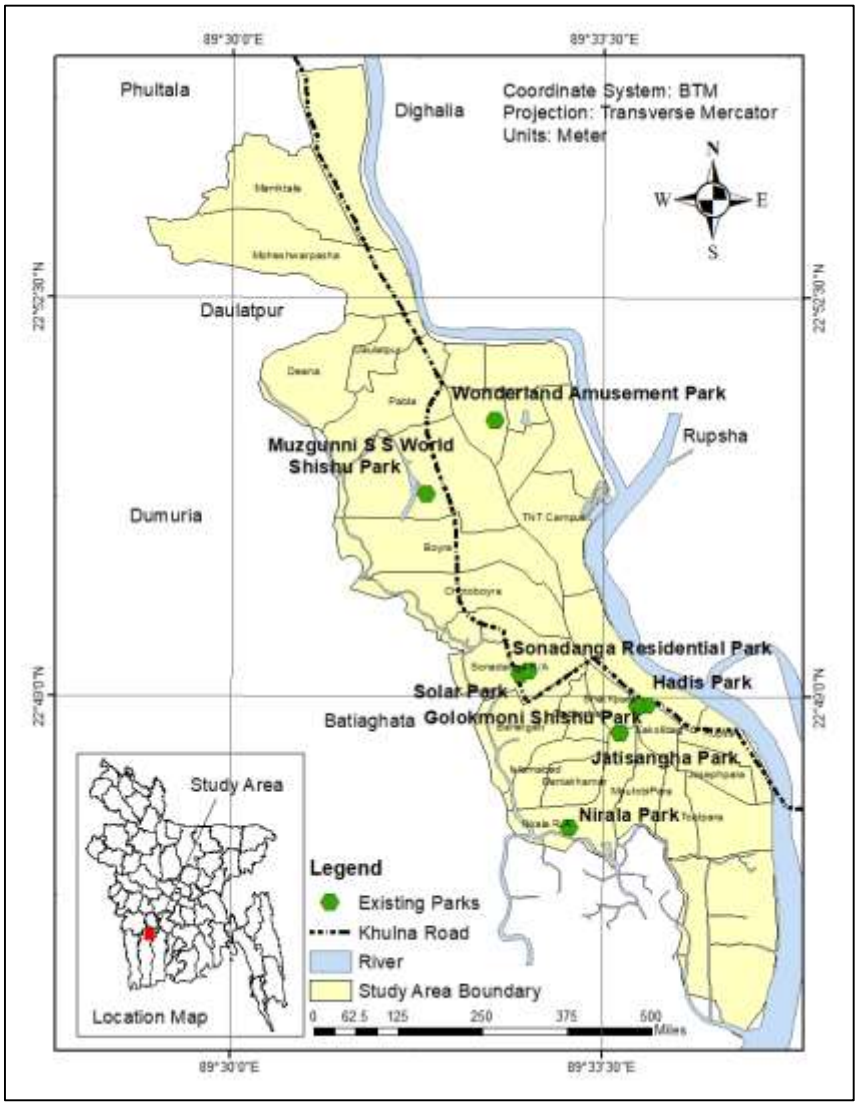

Figure 1. Khulna city and its existing parks

KCC established Solar Park on 4.33 acres land at the eastern side of Sonadanga Second Phase Residential Area and western side of Sonadanga First Phase Residential Area-two planned residential areas developed by KDA in 2007 and 1981 respectively. The park is developed on the land reserved for development of a lake in the design layout. The park has different types of facilities such as slippers, sitting benches, gates and public toilet etc. (Karim & Roy 2012). There is a lake in the middle, one pump house of KWASA (Khulna Water Supply and Sewerage Authority) and one Khulna Renewable Energy Production Workshop cum Training Centre in the park. Internal road and drainage condition of the park is good. Nearby city people use the park for jogging and passing leisure time in morning and evening.

In 2016, KCC has developed a linear park on 14acres land along the western bank of Mayur River just from the north of Gallamary Bridge and eastern side of Khulna University. It is outside of KCC area but adjacent to Ward no. 18 and very close to Ward no. 24 and 25.Leasing out the park to private operator and entry fees amounting BDT 40 per person exclude a large section of marginalized people from using the park (Das et al., 2022). In 1999, KCC has developed another park like amusement spot centering the Bastuhara Lake at the northern side of Bastuhara colony in Muzgunni area. It is located in Ward no. 9. KCC has placed sixround shaped sitting benches

with umbrellas at the eastern bank of the lake. Local people have named the amusement spots Choy Chati Park (Six Umbrella Park) and Sampan Lake as once few Sampan boats were available for visitors.

Table 1. Parks of Khulna city with basic information

Name	*Area (acre)*	*Year of establishment*	*KCC Wards*	*Type*	*Main users*	*Surrounding land use*	*Entry fees*
Hadis Park	5.38	1884	21	Metropolitan park	All people	Commercial	No
Jatisangha ShishuPark	1.13	1994	27	City park	Children	Commercial & Residential	No
Wonderland Amusement Park	3.78	1994	11	Amusement park	Children	Residential	Yes
Sonadanga Residential Park	0.46	1981	17	Neighborhood park	All people	Residential	No
Solar Park	4.33	1999	17	Neighborhood park	All people	Residential	No
Nirala Park	0.40	1980	24	Neighborhood park	All people	Residential	No
Golokmoni Shishu Park	0.06	1960	23	City park	Children	Commercial & Residential	No
Mujgunni S S World Shishu Park	9.0	2006	9	Amusement park	Children	Residential	Yes
Total	24.54						

Source:Karim & Roy, 2012; KDA, 2018;Khaza et al., 2020

Situation regarding availability of parks and green spaces in and around the slum areas of Khulna city is naturally worse. Most of the slum and squatter settlements are found to develop on lands which are normally not suitable for development of shelters or human habitation. Such lands are low lying marshy land, vacant and barren lands next to railway tracks, roadsides and drainage lines etc. (Mowla, 1999). Ward no. 24, 21, 22, and 9 have a higher slum population than other Wards of 7747, 6780, 5927 and 5448 respectively (BBS, 2015b). Only Ward no. 24, 21 & 9 have parks and open spaces. However, these parks are mostly utilized by the higher-income people and have limited applicability to the lower-income people. Lack of education and awareness about the benefits of visiting green spaces of slum people contributes to the low level of use of the parks. Ward no. 24 with a slum population of 7747 has only a small park (Nirala Park on 0.40 acres land), which is primarily used by the residents of Nirala planned residential area. Ward No. 21 having well facilitated, beautifully landscaped, and mostly used Shahid Hadis Park is the most privileged Ward in Khulna city with a slum population of 6780. Considering Hadis Park as one of the significant factors of convenience, Ward no. 21 contributes about 33% contribution to urban convenience, which is about 10 times higher than the expected uniform contribution value of 3.23%.The businessmen and service holders mostly living in Ward no. 21 and its surrounding Wards use Hadis Park for their physical exercise, jogging, and recreation (Howlader et al., 2018). Ward no. 22 having a slum population of 5927 has no open space facility for its residents. Similarly, Ward no. 9 having a slum population of 5884 has Mujgunni S S World Shishu Park. But the entry ticket system costing BDT 70 makes it difficult and inaccessible for the slum dwellers. Concisely, higher transport costs, inadequate transportation infrastructure and entry ticket system at several parks costing between BDT 50-100 make the parks inaccessible to slum and low-income community people (Khaza et al., 2020). Many of the slum clusters are too crowded and densified that there is hardly any open space for further growth and expansion. The lanes or alleys are very narrow and zigzag (Mowla, 1999). Even the slum children cannot use the alleys for their play and recreation. So, parks and open spaces are very much essentials in and around the slum and low-income settlement areas. Consequently, safety and security considerations are a major concern for parks located near slums (Türtseven Doğrusoy & Zeynel, 2017). Authorities should take some security measures (such as 24-hour surveillance) to strengthen the park safety and security for the visitors. Only equity planning based

equitable distribution of parks over Khulna city can ensure socio-environmental justice and accessibility of slum and low-income people to the parks and green spaces.

Equity and Equity in Planning of Parks as Urban Green Space

The concept of equity is a prescriptive approach for the fair, equal and social justice; moral equal treatment; fairness in distributions; equal opportunities or burdens for comparable individuals; and equal respect and equal treatment for individuals (World Bank, 2006; Jones, 2009; Rawls, 1921; and Dworkin, 1983). The government provides essential services and facilities to all its citizens. But in many cases the services and facilities are found unevenly distributed. The more powerful groups capture all the benefits and thus inequity occurs. According to Green & Allen (2008), many of the markets are focused on freely-selected and voluntarily interactions in which individuals achieve or lose in accordance with their attempts and capacities. Inequality occurs when the institutions and their measures are not beneficial; social welfare organizations are inefficient; and political organizations that represent current constructions of political and economic authority within a community are involved in the affairs of unfair, unjust, biased and corruptions (World Bank, 2006).The state of inequality is multidimensional and hard to quantify. Widespread of inequality in developing nations throughout the world is found beyond the normal range (Jones, 2009; Ferreira & Gignoux, 2011).

In equity planning, urban planners use their expertise to impact opinions, mobilize under-represented constituencies and develop strategies and programs that redistribute public and private funds among the impoverished and working groups (Metzger, 1996). According to Davidoff (1965), planning process is a tool for the resolution of the debate on "justice for current social assignment of wealth, knowledge, ability and other social products" where "the right course of action is always an issue of choice, never of fact". The equitability of urban green resources among different social groups is a serious issue of both government and scholar for social and environmental equity (Xiao et al., 2017). The relationship between physical and socio-economic aspects and the significance of equity in access and difficulties is actually the socio-economic consequences. In particular, equity research or 'who should get what' include a number of measures: 1) equality-all residents should have equal opportunity; (2) need-some groups such as low income, minorities, elderly, and children have greater need for services; (3) demand-some groups tend to use parks and trails more than others; and (4) gentrification-instability of local strategies when demographic changes in the neighborhood (Nicholls, 2001; Slater,2004; Talen, 2002). The beneficial impact of parks on property values can, however, lead to competition between financial gain and the equity consequences of affordability of housing and displacement of people.

Social justice of parks is a justice of availing social benefits of parks by all the social groups mainly poor and disadvantaged slum and low-income settlement people. If the parks are not well planned and distributed considering the aspects of social equity, a large share of urban people are excluded and deprived of the social benefits of the parks. Parks as green landscapes provide the city people with various social benefits to improve the quality of life (Chiesura, 2004; Larson et al., 2016). Urban parks promote leisure activities, encourage physical activities, enhance social interactions among different communities, reduce stress and improve both physical and mental health (Barbosa et al., 2007; Akpinar et al., 2016; Richardson et al., 2013; Pazhouhanfar, 2018). The National Recreation and Park Association of USA in a comprehensive review done in 2011 found inequity in park provision (Godbey & Mowen, 2010; Feng et al., 2019; Lee et al., 2015).

According to the Millennium Ecosystem Assessment urban parks can augment social equity as the parks create and maintain public spaces with natural environment for social interactions (Carpenter et al., 2006; Zhao & Zhang, 2006). Social equity and environmental justice can only be ensured if all category city people must have easy and equal access to the public parks. Though in reality it is quite difficult, it can be done in a reasonable spatial distribution manner if the concerned city planning and development organizations namely KDA and KCC consider the social equity and environmental justice issues through their urban planning and policy development instruments. Physical closeness can also not be an indication of a park's usefulness, since the views of prospective customers about the safety or exclusionary atmosphere of a park can actually restrict their access. A study conducted by Carr & Williams (1993) reveals that individuals feel more comfortable and secure to use such parks, in which they see most of the individuals like themselves. Feng et al. (2019) in a study in Beijing, China has shown that accessibility to urban parks varies at district and sub-district levels. Areas with more parks have higher use and accessibility. The study also found that there exists a mismatch between spatial distribution of parks and population, specifically for the elderly residents. The valuable insights of the study are that many developing countries including China currently use only

the public green space ratio to urban construction land and per capita public green space in planning of parks and other public green spaces.

Open Green Space Standards for the Cities of Bangladesh and Other Countries

In determining standards for open green space consideration must be given to two major issues –first, future requirement of open green space and second, availability of vacant land. However, before fixing up standard a review of open green space standards of urban plans of various towns and cities in Bangladesh and abroad is done. The ratio of open space for Khulna city per 1000 population was only 0.40 acres in 1961 and 0.10 acres in 2001, both of which are miserably low compared with urban open green space standard in any country. Khulna City Master Plan of 1961 and 2001 prepared by KDA recommended a standard of 4 acres and 2.71 acres open green space respectively per 1000 population with a good number of open space and green proposals. An emerging megacity, Dhaka should have at least 25 percent of its total land as open green space; but as of now, less than 10 percent of its land, is allocated as open green space.

Table 2. Open space and green standard in cities of Bangladesh and abroad (acre per 1000 population)

Abroad	Bangladesh								
	Dhaka			Zila/ Upazila towns			Khulna		
Hong Kong	DMDP 1995	DAP 2009	DAP 2021	UDD 1985	Master 1961	Plan	Master 2001	Plan	DAP 2018
0.71	0.16	0.13		1.00	4.00		2.71		0.45

Source: KDA, 1961; Khan, 2019; *KDA, 2002; and Preetha, 2011*

The Detailed Area Plan (DAP) of RAJUK (Rajdhani Unnayan Kartripakkho) for Dhaka city approved in 2010 proposed only 0.13 acres of parks and open space for 1000 population, which is significantly lower than the WHO recommendation of 4.23 acres per 1000 population. A reasonable standard (1 acre per 1000 population) was fixed by Zila and Upazila Planning project of Urban Development Directorate (UDD), 1985 for district and upazila level towns of Bangladesh. Whereas Hongkong, the most crowded city in the world provides on average 0.71 acres per 1000 population, which is five times more than the amount proposed by DAP for Dhaka (Preetha, 2011).

Development of public park was one of the policy recommendations of the Master Plan and Structure Plan for the improvement of open green spaces in Khulna City. The Detailed Area Development Plan (DAP) has also set some planning principles and standards for the existing and new urban areas. The 2001 Khulna Master Plan proposed in total 1970.70 acres (797.85 ha) of land for parks and open green spaces for the Master Plan area, where 284.70 acres land was proposed for metropolitan and community level parks within KCC area (Table 3). Considering 2.71 acres of open space for every 1000 population as too ambitious, the DAP has brought down the standard to 0.45 acres land for 1000 population. According to this standard, 798 acres of land would be required to preserve as open space and recreation by the year 2023 for 1662294 population of the Master Plan area. Currently, there has only 179 (72.47 ha) acres of recreational open space. Therefore, additional 619 acres of open space of different categories will be needed to serve the projected population (KDA, 2018).

Proposals of Open Green Space in Khulna City Master Plans and Their Implementation

Open Green Space Proposals of 1961 Master Plan

As indicated by the 1961 Khulna City Master Plan prepared for an area of 181 sq. km. for the period of 1961-1980, the available open space per 1000 population in 1961 in Khulna city was only 0.40 acre. The population in 1961 of Khulna city was140000 and there was only 56 acres of public open space in the city at that time. The plan recommended 1566 acres of open space in the form of park, stadium and playfield based on a standard of 4 acres per 1000 population. On review of 1961 Master Plan implementation, it is revealed that only about 97 acres of open space proposals have so far been implemented which is only 6 percent of the total land earmarked as open space. The only major open space proposal implemented is the divisional stadium at Boyra. Lack of awareness for the need of open space and scarcity of fund are found to be the major reasons for failure to implement open space proposals (KDA, 1961; KDA, 2001; Roy, 2012).

Open Green Space Proposals of 2001 Master Plan

The Khulna City Master Plan 2001 encompasses those areas of Structure Plan coverage that are apprehended to be the most potential for urban growth and agglomeration during the period of ten years (2001-2010). The plan serves as a basis for overall development and land-use based development control of the city. The Master Plan covers an area of 231.67 sq. km. including45.65 sq. km. of KCC area. Structure Plan is the second basic document of the plan package, which sets forth the spatially translated policy, framework for the future Metro-Khulna for a period of 20 years (2001-2020). Open green spaceis a new but a major land use in city Master Plan. Major open space land use provision includes parks, playground, botanical garden and natural greens. A total of 1970.70acres land was proposed for open space use.

Small parks and playgrounds were proposed spread all over the Master Plan area. Metropolitan Park, natural green and botanical garden were put in locations where sufficient vacant land was available for such uses. Open space in the current Master Plan, combining current and proposed, has been categorized as, Metropolitan and Community Level Park; Natural Green and Waterbody/Riverfront Green; Roadside green/Urban Forest/Garden; and Botanical Garden and Zoo/Amusement Park.

Metropolitan and Community Level Parks

The main purpose of Metropolitan Park is to serve as a place of passive recreation at city level, with centrality of its location. It is extremely difficult to find such a large vacant place within the core area of the city that can be used as a Central Park.

After thorough investigation the Master Plan sited the main metropolitan park on 88.42 acres land within the city corporation area at the railway station yard by the side of the Bhairab River. Plenty of land at this place is lying unused. There exist about 15 acres of khas land at the southeast side of Central Storage Depot (CSD) area by the railway line. The land is still found unused. The Plan also suggested converting the land into a metropolitan park with an access road. In absence of large enough land in the central area, there is no option but to go for decentralization of parks at community level. Another advantage of decentralization is to provide easy access of the local people to park facilities. The size of community park varies from 8 acres to over 37 acres.

Open Green Space Proposals of 2018 Detailed Area Development Plan (DAP)

Like the Master Plan and Structure Plan, DAP also has proposed parks at two levels: local level and metropolitan level. One local level park has been proposed for each planning zone. But in a few zones, adequate vacant land is not available to develop parks. Each local level park comprises minimum of 5.12 acres land. In seven planning zones no parks have been proposed due to non-availability of vacant or free space.

DAP has proposed three metropolitan level parks, one water world park and 20 local level new parks for the entire planning zones. Out of the total 20 local level parks on 113.86 acres land, 4 parks on 22.08 acres land have been proposed for KCC area. Among the 4 parks, one park is for Ward no. 1, 2 and 3; one for Ward no. 4; one for Ward no. 5 and 6; and one for Ward no. 9. The 3 metropolitan level larger parks have been proposed on 394.67 acres land and the water world park has been proposed on 24.15 acres land. As the south and southwestern peripheral areas of DAP are the most potential for future urbanization, emphasis has been given to propose parks in those areas (KDA, 2018). Other parts of the Master Plan area are either not suitable for park or adequate space is not available there. If KCC and KDA implement the park proposals of 2018 DAP, Khulna city will have more parks and green space.

Open Green Space Proposals of 2018 Detailed Area Development Plan (DAP)

Like the Master Plan and Structure Plan, DAP also has proposed parks at two levels: local level and metropolitan level. One local level park has been proposed for each planning zone. But in a few zones, adequate vacant land is not available to develop parks. Each local level park comprises minimum of 5.12 acres land. In seven planning zones no parks have been proposed due to non-availability of vacant or free space.

DAP has proposed three metropolitan level parks, one water world park and 20 local level new parks for the entire planning zones. Out of the total 20 local level parks on 113.86 acres land, 4 parks on 22.08 acres land have been proposed for KCC area. Among the 4 parks, one park is for Ward no. 1, 2 and 3; one for Ward no. 4; one for Ward no. 5 and 6; and one for Ward no. 9. The 3 metropolitan level larger parks have been proposed on 394.67 acres land and the water world park has been proposed on 24.15 acres land. As the south and southwestern peripheral areas of DAP are the most potential for future urbanization, emphasis has been given to propose parks in

those areas (KDA, 2018). Other parts of the Master Plan area are either not suitable for park or adequate space is not available there. If KCC and KDA implement the park proposals of 2018 DAP, Khulna city will have more parks and green space.

Table 3. Proposals and implementation of metropolitan and community level parks

Sl. No.	Park Type with Proposed Location	Area (Acre)	Recommended Implementation Phase		Implementation Status
			Phase-I (2001-2005)	Phase-II (2006-2010)	
Metropolitan Level Park					
1.	Railway Yard, Central area of Khulna city (Ward no. 21)	88.42	√	-	Not Implemented
2.	Southeast of Central Storage Depot (CSD),Boyra (Ward no. 14)	15.00	√	-	Not Implemented
Sub-Total		103.42		-	
Community Level Park					
1.	Boyra, Northwest of Medical College Hospital, Boyra ((Ward no. 16))	8.00	√	-	Not Implemented
2.	In front of Lion's School, Gallamariin Dubi and Baniakhamar mouza (Ward no. 24)	37.00	√	-	Not Implemented
3.	Maheshwarpasha in Maheshwarpasha mouza (Ward no. 01)	17.20	-	√	Not Implemented
Sub-Total		181.28			
Grand Total		284.70			

Source: KDA, 2002.

Parks as Green Space of Khulna City in Terms of Equity Planning

Many researchers have investigated into the accessibility and quality of park services in a number of different ways. Scholars in a few studies used ArcGIS's buffer analysis feature to determine park service areas (Nicholls 2001; Smoyer-Tomic et al., 2004; Oh and Jeong 2007; Kun et al., 2012; Saleem and Ijaz 2014). Nonetheless, this approach has severe drawbacks (e.g., assume that all parks are of equal size, linear service distance, no interruption into service area). When conducting a buffer analysis, the service area is determined solely by the locations of the parks. Thus, an approximate service area for the parks is estimated. In contrast, Network analysis has been utilized in several studies to determine park service areas (Nicholls 2001; Oh and Jeong 2007; Unal et al., 2016). When calculating the parks' service area, network analysis is more reliable than buffer analysis since it considers both park accessibility and park location. Alternatively, several studies estimated the total number of parks necessary to serve all residents based on a threshold population (Haggett and Gulzawardena, 1964). Some studies also included appropriateness analysis to determine whether the location of parks is optimal for serving the greatest number of individuals (Nejati et al., 2015).

Multiple Ring Buffer Analysis

According to the Information Report by Moeller (1965) of the American Society of Planning Officials, the service radius of a neighborhood park should be 0.5 mile or about 800meters.Performing Multiple Ring Buffer Analysis with 1000m radius, it is seen that 12.55 sq.km area is served by the existing 8 parks and the rest 33.10sq.km area remains unserved. If it is expressed in percentage, only 27.49% area is served by the existing parks and 72.51%area remains unserved. In the Sonadanga, Sheikhpara and Kakolibag, there exists some over-served area. According to 1000m buffer, total 29 parks are needed for the KCC area and here the service gap is 21. Parks are more needed in Maniktala, Moheshwarpasha, Deana, Daulatpur, Boyra, Moulovipara, Tutpara, Josephpara, Rupsha and Labonchara

as there exists no park in these areas. So, it is clear from the analysis that the amount of served area by the existing parks is quite unsatisfactory.

Network Analysis

From the Network Analysis with 1000m service distance, it is seen that about 8.29 sq.km area is served by the existing 8 parks. Rest 37.36 sq.km area is not served by the parks. If it is expressed in percentage, 18% area is served and 82% area remains unserved. In Sonadanga, Sheikhpara and Kakolibag, there exists some over-served area. According to 1000m service distance, total 44 parks are needed and the service gap is about 36 parks. This analysis indicates that the road networks of the existing parks are not so good. More parks should be developed with good road networks for increasing the accessibility of the people of all classes.

Threshold Population Analysis

According to threshold population analysis, total 27 parks are needed for the 663342 population of KCC. But there are only 8 parks which indicates the service gap of 19 parks. According to the Private Housing Project Land Development Rule 2004, 3 acres park area is needed for 25000 population. As 25000 is the threshold population, the required parks should be of around 3 acres land area for fulfilling the demand of existing population.

The Multiple Ring Buffer Analysis with 1000m radius, Network Analysis with 1000m service distance and Threshold Population Analysis with 3 acres area for parks for 25000 population mentioned above determine the number and area of new parks for Khulna city. Considering the served, over served and underserved area a total of 14 new parks are proposed for Khulna city.

The 24 (77%) Wards where about 73% city people live have no parks and the people of these Wards are deprived of the park facilities. The existing parks cover only 0.15% land area of KCC, which should be at least 10%. This situation clearly shows the inadequacy of parks in Khulna city to cater the park services to the maximum number of city people. Besides, slum and low-income settlement area people are very much deprived of park facilities, as there are no parks in and near of the most of the slums and low-income settlements.

Level of Satisfaction and Dissatisfaction for the Parks

Satisfaction level of the park users was assessed through a questionnaire survey. It is seen by the Figure 2 that only Solar Park, Wonderland Amusement Park, Hadis Park and Sonadanga Park have slightly greater percentage of positive response. Lack of proper sanitation or toilet facilities are the main cause of dissatisfaction to these parks. Also, the parks have no or a very few number of rides. About 94% users of Mujgunni S S World Shishu Park are found dissatisfied due to a lack of authority control over the park environment. Majority of neighborhood residents avoid this park. Therefore, authorities should focus on maintaining the environment and transforming it back into a children's park.

There exists inadequate solely designed play space in the neighborhoods and so, children are to play on roads (Miah and Sultana, 2022).In case of Golokmoni Shishu Park, there is nothing except a vacant land with a boundary. About 90% users are dissatisfied to this park.Figure 2 shows that Jatisangha Parkand Solar Park have very high positive response by the 86% and 77.8% users respectively, because Jatisangha Park and Solar Park have facilities and rides. The parks have only lack of sanitation facilities and the park spaces are relatively small. About 80% respondents of Nirala Park have said that they are facing lack of facilities in the park.So, overall satisfaction level of the parks of KCC area is average except the Mujgunni S S World Shishu Park and Golokmoni Shishu Park. Authorities should take proper steps to satisfy the park users.

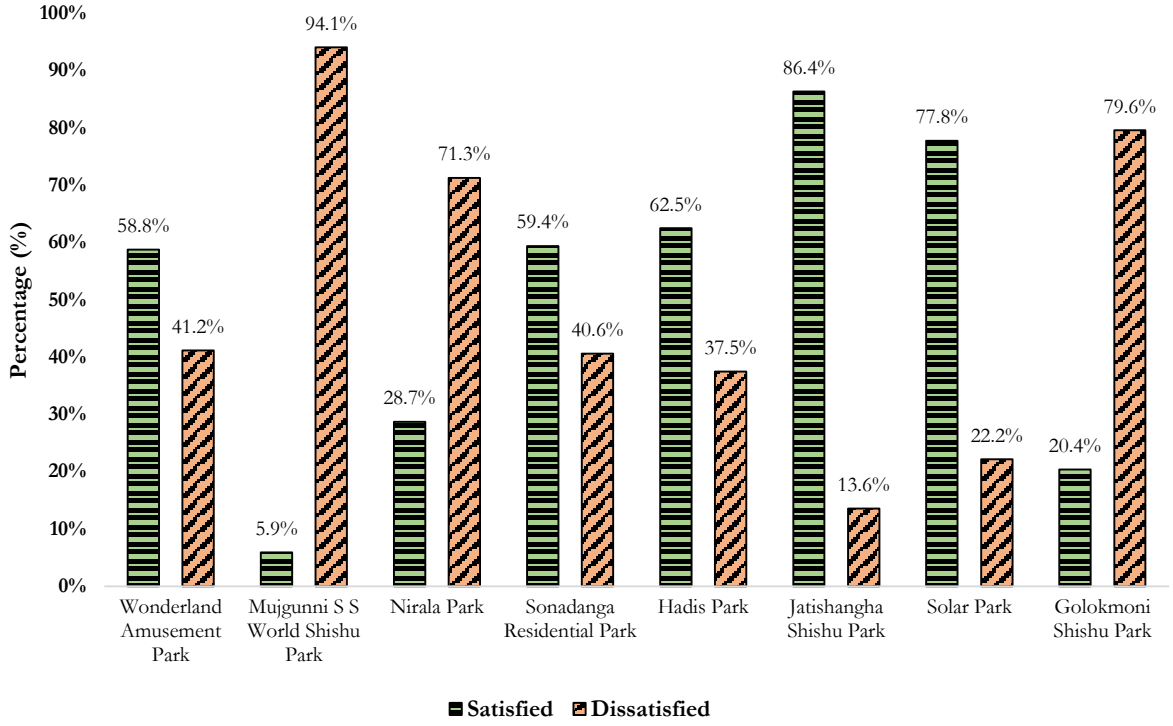

Figure 2. Satisfaction level of the park user

Figure 3 shows that new parks have been proposed in Ward no. 1, 2, 3, 4, 5, 7, 15, 16, 25, 27, 29, 30 and 31. At Ward no. 10, there is Wonderland Amusement Park, which serves the surrounding area (Ward no. 10, 11 & 12 and some parts of Ward no. 7, 8 & 13).At ward no. 9, there is Mujgunni Park, which provide services to Ward no. 9 and some parts of Ward no. 6, & 14. At Ward no. 17, there are two parks named Solar Park and Sonadanga Residential Park, which serve Ward no. 17 & 18. Hadis Park and Golokmoni Shishu Park are located almost at the same place, which serve Ward no. 20, 21 & 23. Jatisangha Park serves some parts of Ward no. 19, 20, 23, 24, 25 & 27.Again, Nirala Park serves some parts of Ward no. 24, 25 & 26. From the analysis, it is seen that there are some overserved areas by the existing parks.For over served areas, the calculations of service gaps have been affected. So, it can be said that the total number of proposed parks and existing parks can serve the whole area of Khulna. That is why the proposed number of parks is 14, which is quite justified.

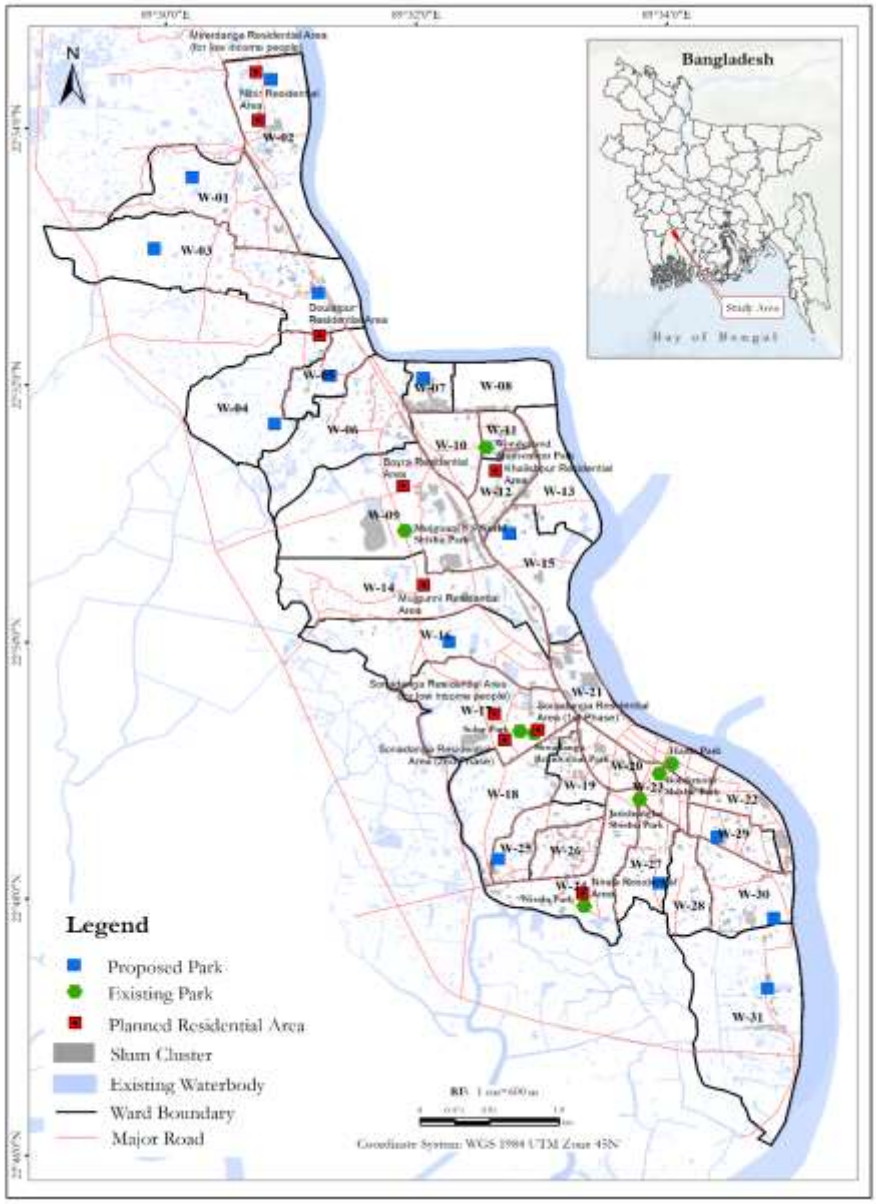

Figure 3.Proposed parks for Khulna city in context of planned residential area and slum clusters

Conclusion

Parks are one of the important components of neighborhood landscape which provide the residents with relief from chaos of the built environment. There were a number of parks and green open space proposals in 1961 and 2001 Khulna City Master Plans. But, their level of implementation is quite unsatisfactory. The main reasons for inadequate and inequal distribution of parks in Khulna city are: lack of coordination and initiatives of KDA, KCC, Forest Department (FD) and other organizations for review of the green space proposals of Khulna City Master Plan and design project proposals for their implementation; lack of awareness of city people and concerned organizations on the needs of parks and open green space in city life and the clear roles of the organizations regarding creation of parks and open green space; lack of commitment of local political leaders and policy makers

for granting allocations for parks; scarcity of funds of concerned organizations i.e. KDA, KCC, FD, DoE and others for developing parks and open green space; and inadequate institutional set up of KDA and KCC mainly with urban planners, architects and civil engineers who are technically and academically motivated towards the needs and provision of parks and open green space for city people. The organizations mainly KCC and KDA should acquire the vacant and non-built-up areas which are generally proposed for parks and open green space to gradually develop parks over the years. It will lessen the acquisition cost and make the land available for parks and open green space. It will also resist the uncontrolled development by the private land owners. Parks can be created in all the KCC Wards to provide park services to all categories of city people. Strict regulatory enforcement should be exercised not to allow any development on the designated sites of river and water bodies till the lands are taken over for the development of open green space projects. Only agriculture or forest related activities may be allowed for the interim period. KDA and KCC can control and monitor such developments using the regulatory instruments namely City Master Plans, EBBC Act 1952, Town Improvement Act 1953, KDA Act 2018, Local Government (City Corporation) Act 2009 and other executive orders. The study through the buffer, network and threshold population analysis finds that the amount of service area of the existing parks is quite unsatisfactory which indicates the need for development of more parks in Khulna city. As KDA and KCC are solely responsible for the planning and development of Khulna city, they should take necessary steps to influence the policy and administrative decisions for investing more on park projects in the deprived Wards for the recreational, health and environmental development of Khulna city in an equitable manner.

Conflict of Interests

The author declares no conflict of interest.

References

Akpinar, A., Barbosa-Leiker, C., & Brooks, K. R. (2016). Does green space matter? Exploring relationships between green space type and health indicators. *Urban Forestry & Urban Greening*, *20*, 407-418. doi:https://doi.org/10.1016/j.ufug.2016.10.013

Barbosa, O., Tratalos, J. A., Armsworth, P. R., Davies, R. G., Fuller, R. A., Johnson, P., & Gaston, K. J. (2007). Who benefits from access to green space? A case study from Sheffield, UK. *Landscape and Urban planning*, *83*(2-3), 187-195.doi:https://doi.org/10.1016/j.landurbplan.2007.04.004

BBS (2015b). *Census of Slum Areas and Floating Population 2014*. Dhaka, Bangladesh: BBS. http://www.bbs.gov.bd/site/page/cc276201-9150-4e9a-a4a8-7cda87287e13/Slum-Census-2014

BBS (2022). *Population & housing census 2022 (Preliminary Report)*. Dhaka, Bangladesh: BBS. http://www.bbs.gov.bd/site/page/47856ad0-7e1c-4aab-bd78-892733bc06eb/Population-and-Housing-Census

BBS (Bangladesh Bureau of Statistics). (2015a). *Population & housing census-2011 (Community Series, Zila: Khulna)*. Dhaka, Bangladesh: BBS. http://www.bbs.gov.bd/site/page/47856ad0-7e1c-4aab-bd78-892733bc06eb/Population-and-Housing-Census

Bebbington, A. J., Dani, A. A., De Haan, A., & Walton, M. (Eds.). (2008). *Institutional pathways to equity: Addressing inequality traps*. World Bank Publications.

Calderón, C., & Chong, A. (2004). Volume and quality of infrastructure and the distribution of income: an empirical investigation. *Review of Income and Wealth*, *50*(1), 87-106. doi:https://doi.org/10.1111/j.0034-6586.2004.00113.x

Carpenter, S. R., DeFries, R., Dietz, T., Mooney, H. A., Polasky, S., Reid, W. V., & Scholes, R. J. (2006). Millennium ecosystem assessment: research needs. *Science*, *314*(5797), 257-258.doi: 10.1126/science.1131946

Carr, D. S., & Williams, D. R. (1993). Understanding the role of ethnicity in outdoor recreation experiences. *Journal of Leisure Research*, *25*(1), 22-38. doi:tps://doi.org/10.1080/00222216.1993.11969907

Chiesura, A. (2004). The role of urban parks for the sustainable city. *Landscape and urban planning*, *68*(1), 129-138.doi:https://doi.org/10.1016/j.landurbplan.2003.08.003

Cockburn, J., Dissou, Y., Duclos, J. Y., & Tiberti, L. (Eds.) (2013). Infrastructure and economic growth in Asia. Cham, Switzerland: Springer. doi:10.1007/978-3-319-03137-8

CUS (2006). Slums of Urban Bangladesh-Mapping and Census, 2005. Dhaka, Bangladesh: Center for Urban Studies (CUS)

Das, A., Sen, A. K., & Khan, N. M. (2022). Challenges of accessibility for marginal people in privately operated public space: linear park, Khulna as a case. *Khulna University Studies*, 19(2), 16 pages. https://doi.org/10.53808/KUS.2022.19.02.2143-se

Davidoff, P. (1965). Advocacy and Pluralism in Planning. *Journal of the American Institute of Planners, 31*(4), 331–338. doi:10.1080/01944366508978187

Dworkin, R. (1983). Comment on Narveson: in Defense of Equality. *Social Philosophy and Policy, 1*(1), 24-40. doi:https://doi.org/10.1017/S0265052500003307

Feng, S., Chen, L., Sun, R., Feng, Z., Li, J., Khan, M. S., & Jing, Y. (2019). The distribution and accessibility of urban parks in Beijing, China: Implications of social equity. *International journal of environmental research and public health*, *16*(24), 4894.

Ferdous, M. S., Suphiyan, M. A., &Rabby, S. F. (2016). A Comparative Analysis on Available Service Facilities and Their Deficiencies Using Threshold and Location Quotient Method: A Case Study on Different Wards of Khulna City. Proceedings of 3rd International Conference on Advances in Civil Engineering (pp. 638-642). Chittagong, Bangladesh: CUET.

Ferreira, F. H., &Gignoux, J. (2011). The measurement of inequality of opportunity: Theory and an application to Latin America. *Review of income and wealth*, *57(4), 622–657*. doi:10.1111/j.1475-4991.2011.00467.x

Gibson, J., & Rioja, F. (2014). A bridge to equality: How investing in infrastructure affects the distribution of wealth. *Georgia state university*.

Godbey, G., & Mowen, A. (2010). The benefits of physical activity provided by park and recreation services: The scientific evidence. Ashburn, VA: National Recreation and Park Association. https://www.deltastate.edu/PDFFiles/hper%20outdoor%20program/benefits%20of%20PA%20provided%20by%20P&R%20services.pdf

Green, D., & Allen, I. (2008). *The Urgency of Now*. Oxfam. https://oxfamilibrary.openrepository.com/bitstream/handle/10546/115508/bk-the-urgency-of-now-230608-en.pdf;jsessionid=D6A7D2E220A9073DD7759EE8369253FB?sequence=1

Haggett, P., and K. A. Gulzawardena. (1964). Determination of population thresholds for settlement functions by the Reed-Muench method. *Prof. Geogr. 16* (4), 6–9. doi:https://doi.org/10.1111/j.00330124.1964.006_q.x.

Haque, M. N., Mamun, M. A., Saroar, M. M., & T. K. (2019). Application of DPSIR Framework to Assess the Status and Role of Blue Ecosystem Services (BES) in Khulna City. *Journal of Engineering Science, 10*(2), 49-60. https://www.kuet.ac.bd/webportal/ppmv2/uploads/160960605806_JES_234_28-10-2019.pdf

Hooper, E., Peters, S., &Pintus, P. (2018). To what extent can long-term investment in infrastructure reduce inequality?*Journal of Infrastructure Policy and Development 2*(2). doi:10.24294/jipd.v2i2.858

Howlader M. H., Ashikuzzaman M., Hossain M. Z. & Khan M.A. (2018). Urban inequality: An assessment on the distribution of infrastructure and services in Khulna City Corporation, Bangladesh. *Khulna University Studies, 15* (1 & 2), 133-148.**doi:** https://doi.org/10.53808/KUS.2018.15.1&2.1801-S

Istiaque, S., Ahsan, M., Roy, T. K., & Rahman, M. M. (2018). Waterfront development for sustainable urban planning: A case study on Bhairab River, Khulna. *Plan Plus, 8*(1), 25-40. https://planplusjournal.com/index.php/planplus/article/view/24/7

Jones, H. (2009). *Equity in development, Why it is important and how to achieve it*. Working Paper 311. London: Overseas Development Institute.https://odi.org/en/publications/equity-in-development-why-it-is-important-and-how-to-achieve-it/

Karim, K. R., & Roy, T. K. (2012). Environment of the Parks in Metropolitan Area: A Case of Khulna City. *The Journal of Social Studies, 135*, 54-71.

KCC (Khulna City Corporation). (2018). Basic statistics.http://www.khulnacity.org/Content/index.php?page=About_KCC&aGo&pid=30.

KDA (Khulna Development Authority). (1961). Report on the Draft Master Plan for Khulna. Khulna, Bangladesh: KDA.

KDA (Khulna Development Authority). (2002). Structure Plan, Vol. 2 of Structure plan, master plan and detailed area plan for Khulna City. Khulna, Bangladesh: KDA

KDA. (2002). Master Plan, Vol. 3 of Structure plan, master plan and detailed area plan for Khulna City. Khulna, Bangladesh: KDA.

KDA. (2018). Detailed Area Development Plan (DAP) for Khulna City. Khulna, Bangladesh: KDA.

Khan, A. M. (2019). Revisiting Planning Standards for Open Spaces in Urban Areas from Global and National Perspectives. *Journal of Bangladesh Institute of Planners, 12*, 1-20. https://www.bip.org.bd/admin/uploads/bip-publication/publication-24/paper/20201002102922.pdf

Khaza, M. K. B., Rahman, M. M., Harun, F., & Roy, T. K. (2020). Accessibility and Service Quality of Public Parks in Khulna City. *Journal of Urban Planning and Development*, *146*(3): 04020024. doi: 10.1061/(ASCE)UP.1943-5444.0000589

Kun, W., Hao, S., Yannan, X., Mingrui, X., & Quan, Z. (2012). Accessibility Analysis of Urban Parks Based on GIS. 2012 Fifth International Conference on Information and Computing Science, 56-59. Liverpool: IEEE. doi:10.1109/icic.2012.6

Larson, L. R., Jennings, V., & Cloutier, S. A. (2016). Public Parks and Wellbeing in Urban Areas of the United States. *PLOS ONE, 11*(4), e0153211. doi:10.1371/journal.pone.0153211

Lee, A. C., H. C. Jordan, and J. Horsley. (2015). Value of urban green spaces in promoting healthy living and wellbeing: prospects for planning. *Risk Management and Healthcare Policy 8*, 131–137. https://doi.org/10.2147/RMHP.S61654

Leipziger, D., Fay, M., Wodon, Q. T., & Yepes, T. (2003). Achieving the millennium development goals: the role of infrastructure. Policy Research Working Paper; No. 3163. Washington, DC: World Bank. https://openknowledge.worldbank.org/handle/10986/17901

Litman, T. (2022). Evaluating Accessibility for Transport Planning-Measuring People's Ability to Reach Desired Services and Activities. Victoria, BC, Canada: Victoria Transport Policy Institute. https://www.vtpi.org/access.pdf

Mendoza, O. M. V. (2017). Infrastructure Development, Income Inequality and Urban Sustainability in the People's Republic of China. ADBI Working Paper 713. Tokyo: Asian Development Bank Institute.https://www.adb.org/publications/infrastructuredevelopment-income-inequality-and-urban-sustainability-prc

Metzger, J. T. (1996). The Theory and Practice of Equity Planning: An Annotated Bibliography. *Journal of Planning Literature, 11*(1), 112–126. doi:https://doi.org/10.1177/088541229601100106

Miah, M. T., & Sultana, M. (2022). Sustainable management of urban facilities in neighbourhood of Khulna city: a case study of Khulna, Bangladesh. *Khulna University Studies,*Special Issue ICSTEM4IR: 189-202, 2022. doi: https://doi.org/10.53808/KUS.2022.ICSTEM4IR.0005-se

Moeller, J. (1965). Standards for outdoor recreational areas. Information Report No. 194. Chicago, Illinois: American Society of Planning Officials. https://planning-org-uploaded-media.s3.amazonaws.com/legacy_resources/pas/at60/pdf/report194.pdf

Mowla, Q. A. (1999). Khulna's Urban Poor and Their Living Environment-A point to ponder at the beginning of third millennium. *Khulna University Studies, 1*(2), 205-212. https://ku.ac.bd/uploads/kustudies/Vol-1/N%202/205-212.pdf

Nejati, H., Teimouri, R., & Ahmadi., T. (2015). Suitability analysis of urban neighborhood parks using GIS techniques. Academics World 5th International Conference, 34–38. Paris, France. https://www.worldresearchlibrary.org/up_proc/pdf/81-144507341134-38.pdf

Nicholls, S. (2001). Measuring the accessibility and equity of public parks: a case study using GIS. *Managing Leisure, 6*(4), 201–219. doi:https://doi.org/10.1080/13606710110084651

Oh, K., & Jeong, S. (2007). Assessing the spatial distribution of urban parks using GIS. *Landscape and Urban Planning, 82*(1), 25–32. doi:https://doi.org/https://doi.org/10.1016/j.landurbplan.2007.01.014

Pazhouhanfar, M. (2018). Role of Space Qualities of Urban Parks on Mood Change. *Psychol Stud 63,* 25–31. doi:https://doi.org/10.1007/s12646-017-0434-6

Preetha, S. S. (2011). Rethinking, Remapping and Reclaiming Space. The Daily Star Weekend Magazine. https://www.thedailystar.net/magazine/2011/12/02/index.htm

Rahman, K. R., & Salauddin, M. (2009). A spatial analysis on the provision of urban public services and their deficiencies: A study of some selected blocks in Khulna city, Bangladesh. *Theoretical and Empirical Researches in Urban Management, 4*(1S), 120–132. http://www.jstor.org/stable/24872413

Rawls, J. (1921). A Theory of Justice. (Rev. ed). Cambridge, MA: Belknap Press of Harvard University Press.https://giuseppecapograssi.files.wordpress.com/2014/08/rawls99.pdf

Richardson, J., Goss, Z., Pratt, A., Sharman, J., & Tighe, M. (2013). Building HIA approaches into strategies for green space use: an example from Plymouth's (UK) Stepping Stones to Nature project. *Health Promotion International, 28*(4), 502–511. doi:https://doi.org/10.1093/heapro/das033

Roy, T. K. (2012). Urban open space and green proposals of Khulna City master plan and their implementation. The 2nd international conference in environmental technology and construction engineering for sustainable development (ICETCESD2012). Sylhet, Bangladesh: SUST.

Roy, T. K. (2013). Management of Park Solid Wastes in Khulna City. WasteSafe 2013-3rd International Conference on Solid Waste Management in Developing Countries. Khulna, Bangladesh, KUET.

Roy, T. K., Saroar, M. M., Haque, S. M. (2019). Use of Co-compost from Faecal Sludge and Municipal Organic Waste in Urban Green Space Plantation of Khulna City: Prospects and Problems. In: Ghosh, S. (eds) Waste Valorisation and Recycling. Springer, Singapore. https://doi.org/10.1007/978-981-13-2784-1_17

Saleem, A., & Ijaz, S. (2014). A GIS Based Measurement of Accessibility of Urban Parks in Faisalabad City, Pakistan. *Academic Research International, 5*(3), 94–99. www.savap.org.pk94www.journals.savap.org.pk

Shefer, D., & Antonio, M. (2013). Spatial Inequality Between and Within Urban Areas: The Case of Israeli Cities. *European Planning Studies, 21*(3), 373–387. doi:10.1080/09654313.2012.718198

Simon, N. S., & Natarajan, P. (2017). Nonlinearity between Infrastructure Inequality and Growth: Evidence from India. *Review of Market Integration, 9*(1–2), 66–82. doi:10.1177/0974929217721764

Slater, T. (2004). Municipally managed gentrification in South Parkdale, Toronto. *The Canadian Geographer, 48*(3), 303-325. doi:https://doi.org/10.1111/j.0008-3658.2004.00062.x

Sridharan, N. (2011). Spatial Inequality and the Politics of Urban Expansion. *Environment and Urbanization ASIA, 2*(2), 187–204. doi:https://doi.org/10.1177/097542531100200204

Tabassum, S., & Sharmin, F. (2013). Accessibility analysis of parks at urban neighborhood: The case of Dhaka. *Asian Journal of Applied Science and Engineering, 2*(2), 48-61.https://www.academia.edu/11159451/Accessibility_Analysis_of_Parks_at_Urban_Neighborhood_The_Case_of_Dhaka

Talen, E. (2002). Pedestrian Access as a Measure of Urban Quality. *Planning Practice and Research, 17*(3), 257-278. doi:10.1080/026974502200005634

Türtseven Doğrusoy, İ., & Zeynel, R. (2017). Analysis of perceived safety in urban parks: A field study in büyükpark and hasanağa park.*Journal of the Faculty of Architecture, 34*(1), 63-84. doi: http://dx.doi.org/10.4305/metu.jfa.2017.1.7

Unal, M., Uslu, C., & Cilek, A. (2016). GIS-based accessibility analysis for neighbourhood parks: The case of Cukurova district. *Journal of Digital Landscape Architecture, 1,* 46-56. doi:10.14627/537612006

World Bank. (2006). Equity and Development. World Development Report 2006. Washington Dc: World Bank. doi:https://elibrary.worldbank.org/doi/abs/10.1596/978-0-8213-6249-5

Xiao, Y., Wang, Z., Li, Z., & Tang, Z. (2017). An assessment of urban park access in Shanghai-Implications for the social equity in urban China. *Landscape and Urban Planning, 157,* 383–393. doi:https://doi.org/https://doi.org/10.1016/j.landurbplan.2016.08.007

Zhao, S.D., & Zhang, Y.M. (2006). Ecosystems and human well-being: The achievements, contributions and prospects of the Millennium Ecosystem Assessment. *Advances in Earth Science, 21,* 895–902, doi: 10.3321/j.issn:1001-8166.2006.09.002