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New assessment tool to evaluate Khartoum parks

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ABSTRACT

The result of this study is the outcome of the exploration of a tool to assess parks in Khartoum town in Sudan. Different tools were used to formulate the new tool. The purpose of this assessment tool is to evaluate parks that can help both the manager and the user. Knowing the location, considering literature and through the survey of parks in Khartoum, the tool is prepared. It is based on two main items, accessibility, and physical components. The accessibility includes welcoming, physical access, location with respect to street and parking, whereas the physical components are comprised of shelter and shade, landscape, green space and lawn, services and facilities, paths, water feature, and playground. As well as those, two minor variables were also measured: aesthetic and quality and personal security. After the tool was prepared, the evaluation of the open space characteristics was done by seven architects in selected six parks, either knew or had designed the spaces. The evaluation concluded that open spaces in Khartoum town lack proper facilities and appropriate features, and that makes their evaluation low.

1. Introduction

Open spaces and parks provide opportunities for urban residents to perform physical activities and social interactions (Giles-Corti et al., 2005). Well-planned/designed public spaces such as parks and open spaces are important components for people to practice social activities. The success indicator of a park as a recreational space is its ability to be used by different groups of people (Turel et al., 2007). Throughout history, open spaces and parks have played a vital role in providing people with opportunities to connect with each other and nature and creating a healthier, more sociable community. Nowadays, in most cities and countries, open spaces continue to decline in both quality and quantity due to lack of proper attention and misuse (Glavič and Lukman, 2007).

The less money spent on up keeping and preserving new land as well as the city's continuous growth in both population and size make the situation worse. The result is that there is a lack of usable and accessible open spaces in cities (Awad, 2018). This deficit has caused many negative impacts on urban dwellers. A deep understanding of the environment where park visitation takes place is vitally the first step in encouraging people to visit parks. One way of assessing the deficit is the use of the audit assessment tool. This tool provides up-to-date information on parks within residential areas and evaluates the characteristics of the physical environment within the park.

2. Background

The city of Khartoum, which is called greater Khartoum, is the capital of Sudan. Greater Khartoum is also called a triple city because it is composed of three towns: Khartoum, Khartoum North, and Omdurman. This study is going to focus only on Khartoum town (sometimes referred to as Khartoum). Khartoum town is located at the confluence of White Nile and Blue Nile (latitude: 15 30° N, 32 32° E). The location of the city is over a flat plain area (400m above sea level). The area of the city witnessed a rapid expansion from 5km^2 in 1905 to 125km^2 in 2003 (Awad, 2019).

That means that the area multiplied approximately more than 250 times in less than 100° years. The location between the latitude, as mentioned above, made its' climate characterized by a high temperature, which may reach up to 48°C in

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May and June. Meanwhile, the lowest temperature of 15°C normally occurs from December to February (Awad, 2019).

The average sunrise hours are over 70% of daily hours and, in most cases, tend to reach 95% during the summer months. In this climate, the city often witnesses dust storms from time to time (Awad, 2019). Therefore, the climate of the city is generally uncomfortable for people to be in parks during the daytime if it is not well prepared to meet the habitable demand of society.

2.1. Suitable related tools

While searching, the author found that many tools were available in the field of study, but none of these tools were suitable for the case study of Khartoum town. The author found that some related items could be selected from different tools, which can serve the evaluation items.

2.1.1. BRAT-DO

BRAT-DO is a comprehensive tool based on a conceptual model that conceptualizes environmental characteristics in six areas (Bedimo-Rung et al., 2005). The main use of the tool is to evaluate physical features related to physical activities. Since physical activities are one of the main reasons for park visitation hence the tool can be used to evaluate park visitations. It can also be used to assess characteristics related to park visitation since physical activity is one of the purposes of park visitation. The tool has six main factors (namely: Physical components, general condition, accessibility, aesthetic impression, safety, and policies) that can be used to evaluate parks. The factors are:

- Physical component is the features and facilities that are available in the park that can encourage park visitation.
- The general condition of those features and facilities in terms of whether it is new or old and whether it works well or has some defects.
- Accessibility, in the aspect of Bedimo (Bedimo-Rung et al., 2005), mentioned five categories of accessibility. These include availability, which refers to the provision of space allocated for the park within the city or town, measured either by park space per capita or per acre. Equitable access, which refers to an even distribution of the park within different types of residential areas. Individual access is the distance between the residence of the visitors and the closest park. Heavy traffic around a park may also hinder the visitors from visiting the park. Access within the park refers to the possibility of people moving from one place to another within the park boundaries (Bedimo-Rung et al., 2005). Finally, parking lot location and the far location of facilities from the activity area may discourage patronage (Shuaibu and Kara, 2019).
- Aesthetic, aesthetic impression is the attractiveness and consent of the various design elements.
- Safety, safety is related to two aspects: perceived, which means how people feel within and around the park, and the objective measure, which refers to actual cases of incidents related to the park usage.
- Policies. These include operating hours, rules of behavior, park design, and management in terms of maintenance, budget, development, and maintenance.

2.1.2. EAPRS

EAPRS is an inclusive instrument for assessing the physical environment of all available parks and playground elements (Saelens et al., 2006). It focuses on the function or uses of the physical and environmental elements of the park through monitoring. EAPRS tool has two scopes; the first being park elements, which are rated on a dichotomous scale such as present/absent and counted if possible. Lighting in open spaces is considered as a park sub-element, assessed to be present/absent, and were usually countable. The second dimension is the qualities related to the park elements, such as cleanliness and aesthetics. These are observable and often uncountable. Qualities of elements were rated on a Likert-type scale. The inter-rater reliability testing was generally considered high for the EAPRS instrument, and it is more reliable for small parks.

2.1.3. QREAT

Cavnar et al. (2004) developed the QREAT tool for evaluating the safety, situation, and maintenance of recreational facilities. The main items of this tool are playground equipment, sports facilities (such as sports field, basketball, tennis court, swimming pool, etc.), recreation center, and walking/biking trail. The tool has a total of 61 items: 29 condition items, 12 maintenance items, and 20 safety items. The inter-rater reliability test kappa was used for agreement between the evaluators.

A kappa value of at least 0.61 was required for a substantial agreement between the rators-three normally employed. In terms of reliability, the tool is considered reliable in assessing the quality of recreational facilities.

2.1.4. OSAA

The OSAA audit tool contains six main items (Zhang et al., 2018):

1. Welcoming park,
2. Health and security,
3. Cleanliness and maintenance,
4. Conservation and heritage,
5. Community involvement, and

6. Marketing. This tool focuses on recreational open spaces that have public access.

2.1.5. SAGE

Sage was developed by Byrne and Sipe (2010) for assessing parks and open spaces at a regional level. It contains a comprehensive checklist of facilities and features such as golf courses and beaches. This tool was developed to assess parks and open spaces within the southern California study area. Although the tool has some related items, it is generally more related to Golf coursesthanopen spaces and parks.

3. Open spaces and parks in Khartoum

In this study, the author considered the parks in Khartoum in the vicinity of the residents. In other words, reaching the parks exclude overnight stays. This means that they can be reached either by transport or are within walking distance, and open for all visitors. The author did a quick survey for the six selected parks to give an idea about the general condition of the park before the final evaluation. These parks are El Mugran (9 acres), Burri (2 acres), El Gurashi (9 acres), El Tifl (31 acres), El Riad (27 acres), and El Dawha (8 acres) with a total area of 86 acres. Here are some surveyed data from the parks as well as park location (Table 1 and Fig. 1).

3.1. Al Mugran Park

Al Mugran Park is located at the confluence of the White Nile and the Blue Nile; it covers an area of approximately 9 acres. The park was founded in 1980. Although the park has a magnificent location that is bordered by the Nile Avenue in the south, the Blue Nile from the north, and the White Nile from the west and besides public transportation. But, it has weak accessibility (it is not easy for a family with a kid to enter the park as the main access is beside the main road with no traffic light or zebra cross to help accessibility). The merits of this location only allow easy access for those with private transportation, which does not constitute the majority of the visitors. This park is considered the first park in Khartoum in-terms of a variety of playing equipment, and it is considered the first bark furnished with play equipment. But, still lacking recreation and supporting facilities such as restaurant, restroom, and sitting areas. The park belongs to the al-Shaheed organization, owned by military force.

Table 1: Parks in Khartoum town and their characteristics

Park Name	Foundation date	Area/acres	Highest-ranked	% of Highest-ranked	Lowest-ranked features	% Lowest-ranked Features
AL Gurashi	Before 1960	9 acres	Green space and lawn	65%	Waterbody Shaded areas Play-equipment	15% Zero % 7%
AL Mugran	1980	9 acres	Green space and lawn	80%	Physical accessibility Waterbody Shaded areas	15% Zero% 18%
AL Tifl	1997	31 acres	Play-equipment	65%	Physical accessibility Waterbody Shaded areas	20% 10% 17%
EL Riadh	1997	27 acres	Green space and lawn	70%	Green space and lawn shade area Waterbody	23% 13% Zero %
AL Dawha	2007	9 acres	Physical accessibility	80%	Facility Waterbody Shaded areas	17% Zero
Burri Park	2007	2 acres	Play equipment's	70%	Green space and lawn Waterbody Shaded areas	4% Zero% 6%

Fig. 2 shows the Al Mugran Park zoning plan, and Fig. 3 and Fig. 4 show the Al Mugran Park plan and different views of Al Mugran Park, respectively.

3.2. Burri Park

Burri Park is the smallest park in Khartoum town, only 2 acres, and is located at the edge of the west side of the Burri residential area, close to the Khartoum International Airport on the East side of the Airport (Fig. 5 and Fig. 6). This park belongs to the Blue Nile Company and is considered new as it was founded in 2007. The park is equipped with a variety of playing equipment, but it lacks many recreational features such as green and shaded areas, sitting areas for socialization. The playground is in good condition as it is new, and the clean environment of the park is one of the merits that encourages frequent visitations, but the problems are the air and noise pollution as a result of its location beside the main road and Khartoum International Airport. The location of the park, far from public transportation and beside the main road, makes it not easily accessible by the majority of visitors. This location makes it dangerous to access and unaffordable access, as the visitors need to use private transport. The park lacks a shaded area that limits the visitation only at late evening before sunset time, and this also is not affordable access since the visitors need to use private transport because in late time no public transport. Fig. 7 shows

difficult access to cars and pedestrians' access (Burri Park).

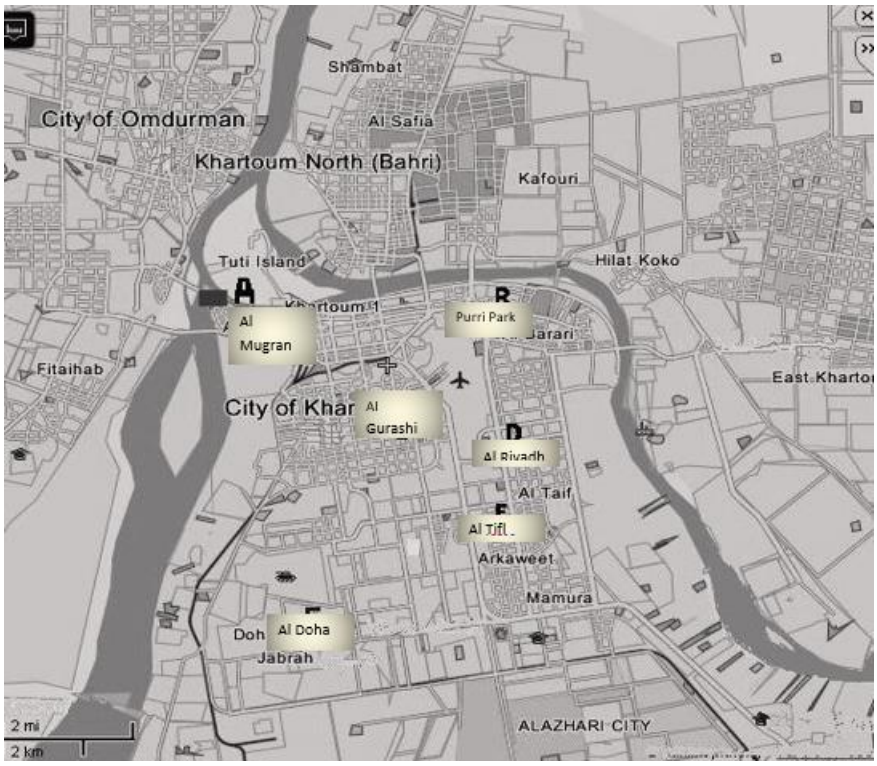
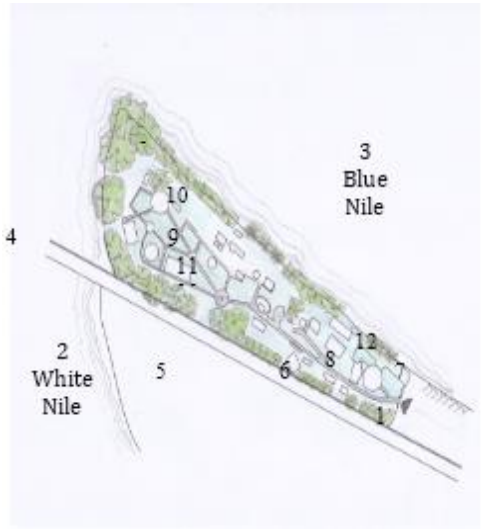


Fig. 1: Locations of parks in Khartoum town

Fig. 2: Al Mugran Park zoning plan



1 Entrance	6 Nile Avenue	11 Kid auto racing game
2 White Nile	7 Restaurant	
3 Blue Nile	8 Mosque	12 Administration office
4 White Nile Bridge	9 Outdoor play area	13 Car parking
5 farms	10 Auto racing game	

Fig. 3: Al Mugran Park plan

3.3. Al Gurashi

Unlike other parks, this is the only open space allocated originally as a park within a residential area. It is the oldest park in Khartoum and was founded before 1960, and has a relatively small area of about 9 acres (Figs. 8, 9, and 10). The green surface is almost two-third of the whole area and doesn't contain weed (Table 1).

Fig. 4: Different views of Al Mugran park

Fig. 5: Burri Park zoning plan

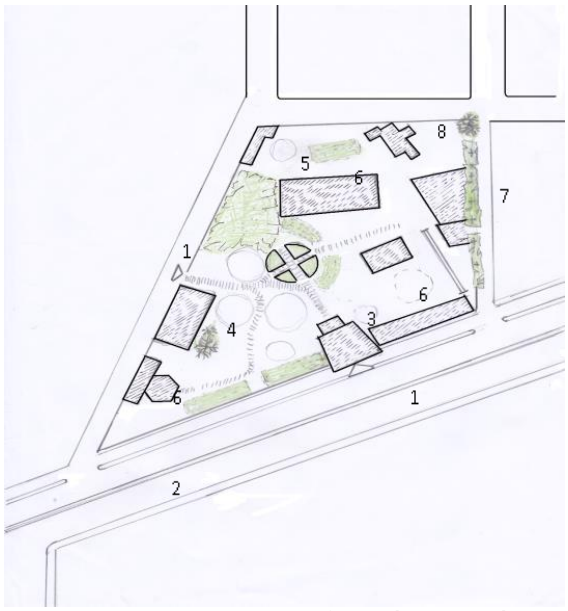


Fig. 6: Burri Park plan

Fig. 7: Difficult access car and pedestrians' access (Burri Park)

There are shaded sitting areas available, but they are limited and do not have seats. Because the park is located beside the school area, the majority of the visitors to this park are students. Although the park is located in a residential area where the route of public transport passes by, this makes the park is easily accessible with enough parking for cars located outside the park and adjacent to the highway. But the discouraging of visitation is that the park still has limited or no recreational facilities except its greenery area. Moreover, it does not provide any trees or shaded areas to sit under, nor any play equipment facilities. There are no adult playing field as well as seats except the benches that are located alongside the walking track. In terms of lighting conditions, it is not sufficiently well as it is not distributed properly. They are also limited alongside the track.

3.4. Al Tifl Park

Al Tifl Park is the largest fenced park in the Khartoum area in terms of its size (31 acres). It was founded in 1997. The park is located at the southern part of Khartoum within the premises of the International Airport neighboring Arkaweet residential area from the east, and the Rotana hotel at the north side (Figs. 11, 12, and 13). One of the things that distinguish the park is the play equipment. In terms of playing equipment, the park has a wide variety. However, of this merit but the bark has many problems, one of the problems that this park face is, like other parks, lacking a number of supporting facilities such as seating and shaded areas. Another problem is the park location. The park is surrounded by the airport's reserve area from the south that puts the park in a danger zone as well as the unhealthy environment resulting from the noise due to landing and take-off of Airplanes. The playground is old and without soft finishes and exposes children to danger. The number of toilets is few compared to the number of visitors as well as lacking maintained and it is dirty. Moreover, the park has limited usage. Although it is open for all families, it is mainly prepared for enhancing children's abilities. The park does not include an adult playing field, no benches, in addition to the low condition of the sitting areas.

3.5. Al Dawha Park

Al Dawha Park is also considered a new park. Founded in 2007, not more than five years old, it is located within a new residential area called Taha Al Mahi. It is situated in the middle of the residential area, it has a distinguished location far from the public transport route quiet and within the residential area, with an area of 9 acres (Figs. 14, 15, and 16), which seems relatively small. Another distinguishing feature is that the walking path that links most of the services and facilities is well finished with shading (Fig. 16). The park is designed in the way that a square shape with diagonal partially shaded roads leads the visitors to the whole parts of the park. Like most of the parks, it lacks shaded areas and a variety of facilities. In–terms of services and facilities this park has a quite number of toilets which is to some extend clean, restaurants and kiosks for selling different items. In terms of lighting conditions, it is sufficient as well as it is distributed properly.

Fig. 8: Al Gurashi Park zoning plan

Fig. 9: Al Gurashi plan

Fig. 10: Poor sitting area

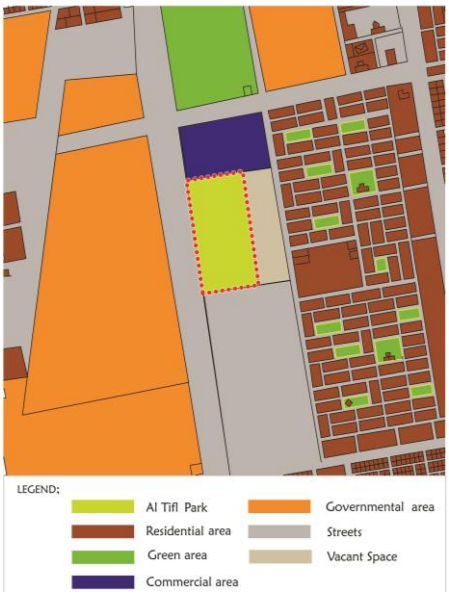


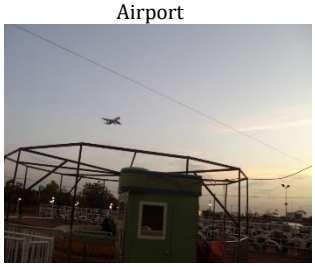
Fig. 11: Al Tifl Park Park zoning plan

Legend					
1	Main Entrance	8	chairs wheel	15	Water Skiing
2	Car parking	9	Ghost room	16	Water games
3	Administration office	10	Computer games	17	Sitting area
4	Soft climb toys	11	mosque	18	gymnastic
5	restaurant	12	Garbage collection	19	Auto racing bike
6	Auto racing cars	13	simulator	20	Ferris Wheel
7	Cinema	14	toilets	21	Soft playground

Fig. 12: Al Tifl Park plan

They are also distributed all-over the park area. One of the problems of this park is that it is not accessible by public transportation. Either the visitors to be from the area itself or should use private transport. With respect to the water feature, the park has no water body or fountain or any kind of water features.

Location Adjacent to the Airport



Poor furnishing of socializing area

Fig. 13: Different views of Al Tifl Park

3.6. Al Riad Park

Al Riad Park is located between Khartoum International Airport and El Riad residential area, on the east side of the airport (Fig. 17). The park is rectangular in shape, and it covers an area of 27 acres. It extends from East to West. It was constructed together with Al Tifl Park in 1997. The park has limited facilities, but it is the only park that has a festival hall. The park is divided by an unpaved road crossing from West to East, with unpaved areas located on both sides of the road as car parking (Fig. 18). The park has two main gates; at the west as an entrance and the other at the east. The park is also used for many official and local celebrations and festivals because of the accessible location, and the large size of the park as well as the park has Hall for festivals and enough area to host events. The problem with this park is that the percentage of the shaded area is less than 8%, as well as its low quality due to the overuse and less care. Moreover, there is no water feature within the park. The shaded areas are very limited, and they don't block enough sunlight for staying out in the park. The toilets are not very clean and, in most cases, lack water. There are no benches to sit either for gathering nor to facilitate monitoring the children, which makes it uncomfortable to accompany visitors to visit the park with their kids (Fig. 19).

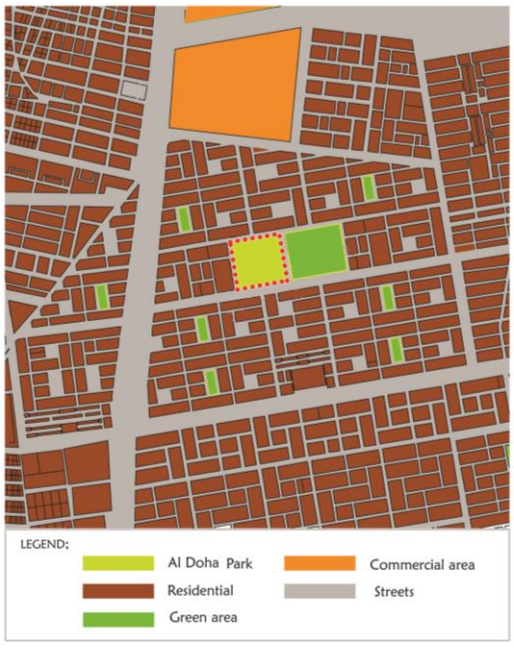
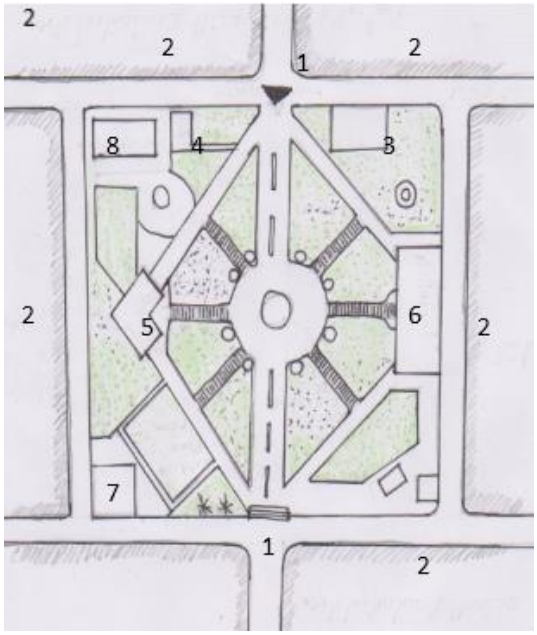


Fig. 14: Al Dawha Park zoning plan



1 Main Entrance
2 Residential area
3 Admin
4 mosque
5 restaurant
6 restaurant
7 storet
8 workshop

Fig. 15: Al Dawha Park plan

Covered pathway linking different activities

Outdoor sitting area

Fig. 16: Different views from Al Dawha Park

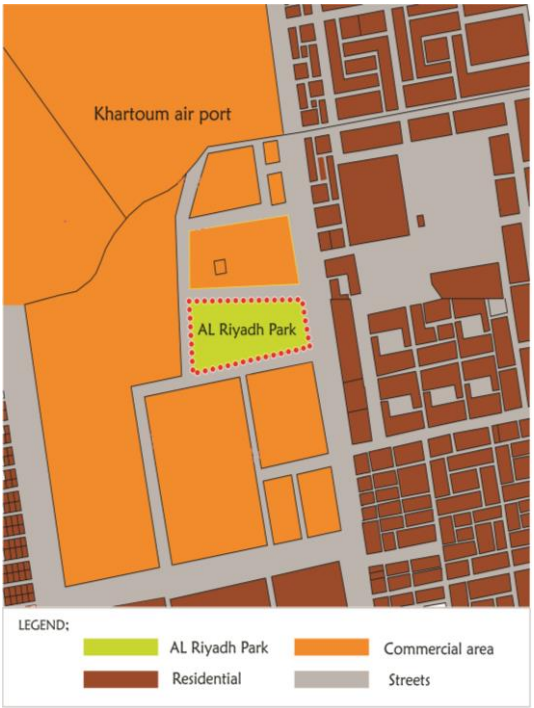
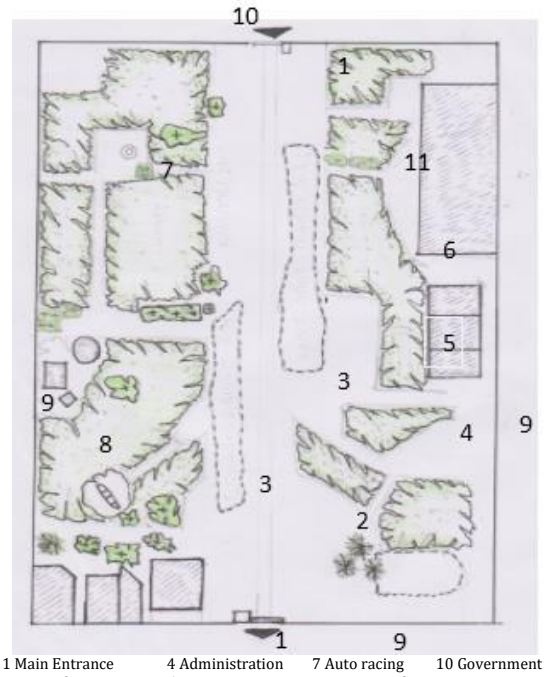


Fig. 17: Al Riad Park zoning plan



1 Main Entrance
2 Car parking
3 Outdoor play area
4 Administration
5 Mosque
6 Ferris Wheel l
7 Auto racing
8 Commercial
9 Main road
10 Government
11 green Area

Fig. 18: Al Riad Park plan

Outdoor play areas

Fig. 19: Al Riad Park

4. Condition of parks in Khartoum town

Bedimo–Rung posits five variables related to accessibility (Bedimo-Rung et al., 2005). Availability, equitability, individual access, equitable access, and access within the park. Applying these variables to a park, in turn, revealed the actual prevailing conditions of the public space. Parks serve a population of 1.4 million residents, which means there is a clear deficiency in terms of the level of services and availability.

In addition to the problems of accessibility, parks in Khartoum also suffer from problems related to park characteristics, as well as heavy traffic around the parks that may hinder people from reaching the park. In short, the poor conditions of the parks discouraged users from using them. Furthermore, hardly any improvement programs have been carried out on them. All these issues raise the importance and need for this type of evaluation in order to obtain the real conditions of these parks. Considering availability, which refers to the provision of space allocation for parks and open spaces, the amount of urban open spaces in the city (Berridge, 2015), which is 0.2492m^2/inhabitant, is far below the WHO standard, which recommends 10m^2/inhabitant. In addition, it is found that the area allocated for parks and open spaces is very small and constitutes less than 5% of the total development (Hamid and Bahreldin, 2013). With regard to equitability, which refers to an even distribution of parks and open spaces within a residential area, it is clear that the service area of each park does not cover most of the residential area. With respect to individual access (the distance between the residence of the visitors and closet park), most residences are more than 1.3km from parks. Finally, in regards to access within the park (possibilities of people to move easily from one place to another within the park), most of the parks either provide wrong applications, such as an incorrect sidewalk, insufficient material choices, or deficient design. From the general view, nearly almost all parks lack recreational facilities, supporting facilities, and a variety of modern playing equipment. In addition, all parks suffered from usage degradation as most of the parks do not have maintenance funding. Nearly all parks were not designed originally as parks but were erected in vacant land, normally belonging to the government, without any kind of planning. Furthermore, despite how most of these parks land originally belong to the government, they are still operated, managed, and maintained by private organizations. Developers seem to incline more on profit rather than recreational satisfaction. In some of the clusters, pleasant scenes are viewed as a result of peoples' effort due to the closeness of its location, its area, and the feeling of belongingness of the residents, but negligence in terms of development and maintenance is reflected in the majority of them. With regards to city parks, no park reaches the level to be considered as a city park, neither from size nor from its characteristics (Awad, 2018).

5. Methodology

5.1. Selection of the assessment tool

Because the characteristics of societies are different, the park's characteristics and the tool should be different accordingly. Hence, the necessity of having a new tool stem to the surface from the neediness. This research used suitable items selected from different five assessment tools that are, BRAT-DO (Bedimo-Rung et al., 2005), EAPRS (Saelens et al., 2006), QREAT (Cavnar et al., 2004), SAGE (Byrne and Sipe, 2010), and OSAA (Zhang et al., 2018) to assess open spaces in Greater Khartoum. Although BRAT-DO has a lot of merits among all tools, it has some considerations which make it difficult to be used alone. The instrument is mainly suitable for large regional parks and not for medium to small parks. On the other hand, EAPRS is huge. The inventory tool contains 45 pages and detailed items that make it difficult to use and hence raises the possibilities of less inter-rater reliability. With respect to the QREAT tool, it is used to evaluate a larger recreational site. The tool seems to be more

on general inventory than a detailed one. As well as, no scale is used in rating. SAGE is mainly used for regional rather than urban parks and also contains items not related to the study area. Finally, OSAA contains a suitable number of items, although not all items are considered to be related to the parks in Khartoum town. However, in accordance with the limitations of each tool and the purpose with which it is intended, the decision to combine selected items relevant to the present study was made.

5.2. Scoring

Each park was rated with respect to four main items: (1) accessibility, access from outside and access within site, (2) availability of physical components, (3) safety and security, (4) aesthetic condition and quality. In availability of the physical components, the assessment tool evaluated it in seven sub-items: Shelter and shade, facilities and services, landscape, green space, playground, path, and water feature. Moreover, four sub-items under accessibility, which were welcoming, physical access, street, and parking area. To score for the aforementioned items, each question related to the above item was marked a point value. All the 'yes' answers were given 2 points, and all 'no' answers were given 1 point, the same for the present/absent question. Ratings for poor, below average, average, above average, excellent, and a lot, moderate, some, very little, none choices are shown in Table 2.

Table 2: Parks rating criteria

Rating	Condition
1	"Poor" and "a lot"
2	"below average" and "moderate"
3	"average" and "some"
4	"Above average" and "some"
5	"excellent" and "none"

The rule was inversed in the case of sentences hold negative sense (e.g., is their litter present?). In this case, "yes" worth 1, and "no" worth 2. After all the questions were given with points, the points were collected for each main item, and each main item was divided by the number of sub-items relating to a particular main item, such as accessibility. All points relating to the main item were averaged, resulting in a rating of "excellent" (80% and above), "good" (60%-80%), "fair" (40%-60%), or "poor" less than (40%). An overall evaluation was then obtained by averaging the 4 main items together (Steinijans et al., 1997). The range for the overall points was interpreted as the same as those listed above for the main items, that was excellent, good, fair, or poor. Fliess kappa computed in Excel 2016 to determine the inter-rater reliability of the items in the assessment tool (Gisev et al., 2013). Inter-rater reliability is the degree of agreement among evaluators (Kottner and Dassen, 2008). If various evaluators do not agree, either the scale is defective, or the evaluator needs to be re-trained (Kottner and Dassen, 2008). A kappa value of at least 0.61 was required (k range 0.61-0.80 mean substantial agreement, k range 0.81-1.00 almost perfect agreement).

$$Kf = (pa - pr)/(1 - pr) \quad (1)$$

where pa is the observed level of agreement, estimated agreement due to chance

$$pa = \sum_{i=1}^{n}\sum_{j=1}^{m}(k^2ij - nk)/nk(k-1) \quad (2)$$

where, k is the number of evaluators, n the number of tasks, and m the number of categories.

$$pr = \sum_{j=1}^{m} p^2 j, \;\; pj = (\tfrac{1}{nk})\sum_{i=1}^{n} kij \quad (3)$$

Pr is the sum of the square probability of each category on the whole dataset. The interpretation of k as < 0 means no agreement; k range 0.00-0.20 means slight agreement, k range 0.21-0.40 means fair agreement, k range 0.41-0.60 means moderate agreement, k.

6. Discussion

The results of this study demonstrate that the features and components that got the highest points in the evaluation are that in the Al Mugran, the green space and green space and lawn area had been ranked number one related to other features and components (85%) with Kappa value 0.87. The same was the case in Al Gurashi, which was worth the highest value (71%) with Kappa value 0.68. The difference between the two parks was that the highest value in Al Mugran came from trees and bushes, while in Al Gurashi, it came from the lawn. This result indicates that the condition of green space and lawn was good, and the agreement among evaluators is substantial.

In Burri, the case was different than the playing equipment was worth the highest value (70%) with Kappa value 0.65. This result suggests that the need for more care to the existence of other facilities and features such as green space and landscape, water features, and shade trees and shelter. With regards to Al Tifl, the play equipment gained the highest value, 68%, with Kappa value 0.60. Although the play equipment green space gained the highest value among others, it is still low in both the tool's evaluation and the agreement among the evaluators, which means that the standard of the characteristics is low. The and lawn area in Al Riad also gained the highest value between the other components and features but was worthless, that is 55% with Kappa value 0.58. This suggests that the standard of the park, in terms of features and facilities, is very low. Therefore, the conditions of all features in this park are not up to the level of emotion for a user and can't enhance the lives of people (Azish, 2015). Finally, the path in Al Dawha got the highest value (62%) compared to the other features and facilities with a Kappa value of 0.55. This means that the conditions of the park's features and facilities do not encourage

park visitation. On the other hand, the features or components with the lowest value are as follow.

Only 4% of the Burri Park area was composed of green space and lawn and shade with Kappa value 0.60. This indicates that the conditions of shade and green spaces were not appropriate for visitation. Kappa value 0.60 means that the agreement among the evaluators was nearly the same.

The accessibility in Al Mugran, Al Tifl, and Al Dawha got the lowest values among other components, 10%, 12%, and 14%, with Kappa values 0.55, 0.58, and 0.58, respectively. This result implies that visitors were hindered from visiting this park, and the agreement between the evaluators was moderate. It means that most of the evaluators gave the same answer.

Al Riad park had got the lowest points in facilities and shaded areas: 14% with Kappa value 0.60. This condition did not encourage people to visit the park, and the agreement among the evaluators was substantial.

Finally, in terms of all features and facilities, Al Tifl gained the highest value (62%) among the parks with a Kappa value of 0.80. In contrast, Burri got the lowest value (40%) among all parks, Kappa value 0.65. This result indicates that the condition of the parks in Khartoum was very poor for recreation purposes. In summary, the parks lack restrooms, water features, shade, and shelters, and they were not easily accessible.

Several conclusions can be drawn from the results: There is a number of features and facilities that influence the evaluation of the parks Table 3:

Table 3: Parks evaluation criteria

No	Main components	Sub-Activity	Max points	%	% of sections
1	1/ Accessibility	Welcoming Park and Signage to the park	20	7.22	32.85
2		Physical access to the park	4	1.44	
3		Parking area	19	6.86	
4		Street Questions	22	7.94	
5		Path Questions	26	9.39	
6	2/Availability of physical components	What facilities or services are available at the site? Tick as many as you have observed in the park.	48	17.33	53.43
7		What are the landscape and trees features that you have observed in the park?	16	5.78	
8		Green Space and lawn	22	7.94	
9		Shelters and shade	20	7.22	
10		Playground area	38	13.72	
11		Water features	4	1.1.44	
12	3 Safety and security	Safety and security	8	2.89	2.88
13	4/ Aesthetic condition and quality	Aesthetic, Condition, and quality	30	10.83	10.83
14		Total	277	100.00	100.00

In terms of physical components, lawns, water features, shade, and shelter appeared to be neglected in all parks. In terms of natural components, most parks lack this feature, such as trees and soft landscapes, which are very important features in a city like Khartoum with an arid hot season. However, this new tool gives an evaluation that may be focused on environmental attributes and can be directly translated into policy recommendations and design guidelines, which later may help planners and designers to plan and implement an effective environmental intervention. This tool provides an early information baseline on the characteristics of park features related to park visitation. The need for these new tools that may consider climates like that in Khartoum town and different visitor's needs is very important since every community is unique with unique needs.

In summary, the new tool, which is derived from BRAT-DO, EAPRS, QREAT, and OSAA, appears to be suitable for assessing parks in dry and hot climates like Khartoum. The tool concentrates on items related to physical characteristics of parks, including green space and lawn, water features, shade and shelter, and accessibility. Compared to BRAT-DO and EAPRS, both tools are too detailed and are used for large parks. Unlike QREAT and OSAA, which are too simple and do not concentrate on physical characteristics related to hot climates since they are used to evaluate parks only in European countries. Hence, this new tool is appropriate to evaluate the physical conditions for small to medium parks.

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Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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