Comparative recreational assessment of Karaganda city public green spaces

I S Akylbekova and T Yu Zengina
Faculty of Geography, Department of Environmental Management, Lomonosov Moscow State University, Leninskie Gory 1, Moscow 119991, Russia
E-mail: indira_msu@mail.ru

Abstract. This article represents evaluation of recreation environment on the territory of the large industrial city of Karaganda, located in the dry steppe zone of Central Kazakhstan. A comparison of quantitative and qualitative indicators, level of recreational attractiveness and providing the citizens with public green spaces, allowed to make a more complete characterization the urban recreation places and to identify the city districts, which require prioritized fundraising for development of existing parks and public gardens, and for creation of new territories of recreational purpose. Based on the results of conducted expert assessment and sociological survey of visitors, the main problems of urban green areas were identified and also the most high-demand trends and practical recommendations for their improvement and further use were proposed.

1. Introduction
Currently, with the increasing of functional and planning structure complexity of the cities, the importance of urban planning, as well as the role of environmental and social open public spaces significantly increased [1, 2]. In this regard, one of the main instruments of urban development is the creation and development of parks and other green areas, which can simultaneously perform several functions: improve outer appearance of the cities, improve environmental conditions and promote development of urban public life.

So, public green spaces (hereafter PGS) in addition to their primary purpose – organization of various forms of mass leisure activities for population – also provide several other functions like planning, sanitary-hygienic and aesthetic roles. PGS are multifunctional and specialized parks, public gardens, boulevards, short-time recreation areas by water, citywide green places and district public centers [3]. Performing the role of major recreation facilities in the city, these areas must respond the current needs of society and have all necessary recreational conditions for different social groups. Therefore, their effective organization and development is one of the main priorities in creating a comfortable urban environment and provision the population with PGS, and the degree of their recreational attraction is considered as important social and environmental indicator that determine the quality of city life [4, 5].

Provision of population with PGS is estimated as square area of parks, public gardens, parkways and other city- and district level recreation facilities per person (m²/person) [6]. Estimation of this index is carried out in accordance with the standards of urban land improvement, which provide hygienic conditions of population life. Generally, the rules of landscaping vary depending on the characteristics of an area, in which the city is located, and on the number of its inhabitants.
Assessment of recreational attractiveness of PGS includes calculation of a number of indicators of transport accessibility, safety, cleanliness and maintenance, level of improvement, as well as a set of objects and services for a variety of recreational activities. This integrated assessment is intended for analysis of the PGS current state and identification of existing deficiencies and the most high-demand directions for their further use and development.

The comparison of these two parameters (provision of PGS and their recreational attractiveness) allows to describe the level of satisfaction the public needs in a short-time daily recreation in the natural complex territories of the city more fully.

2. Study area

In Kazakhstan, the issues of improving the efficiency social and ecological functions of the PGS are most acute in the city of Karaganda - a large industrial center of the country, where the lands disturbed by industrial activities, which not only pose a serious threat to the population health and lives, but also considerably complicate a creation of an integrated green spaces system [7]. Sparseness of forest stands is also caused by adverse soil and climatic conditions of dry steppe zone, where the city is located.

Currently, the area of mining badlands, formed as a result of long-term intensive development of coal deposits, is 28% of the city total area [8]. Moreover, most of them are located in the central part of Karaganda that was the main reason for formation of non-compact urban planning structure and isolated location of residential areas from the city centre.

As a result, Karaganda is distinguished by disjointed and uneven location of recreation areas that defines considerable difference in areal and qualitative provision the people with urban districts, including public green spaces, which have various design. In this regard, this study was aimed to evaluate and compare the certain city districts according to level of provision the population with public green spaces and with recreation space within them (i.e. in terms of their recreational attractiveness).

All parks and the largest public gardens of study area and boulevards located within the five districts of Karaganda were selected as research targets. These are Noviy Gorod, Yugo-Vostok, Maikuduk, Prishakhtinsk and Sortirovka. In total, 19 public green spaces were studied: 5 parks, 10 public gardens and 4 boulevards.

3. Material and Methods

Assessment of recreational attractiveness of PGS was conducted by means of individual expert scoring, which was supplemented with information obtained in the course of the sociological survey.

As such surveys in Kazakhstan are implemented very recently, the expert scoring was based on the criteria, which was used to build the social rating of Moscow and Moscow region parks [9,10]. Evaluation criteria were at first adapted to the climatic and social conditions of Karaganda city. For example, due to dry and hot summers, particular attention was paid to the arrangement of gazebos, canopies and other sun shelters, and presence of water bodies, fountains and shaded leisure areas.

Altogether there were offered 6 key evaluation criteria, amounting 41 positions for parks evaluation and 33 for public gardens and boulevards (Table 1). Unequal number of items is explained by different functional purposes of objects, their sizes and specific character of location in the city planning structure.

For each estimated item, 3-digit rating scale was used, where a point 0 corresponded to the lowest value, and point 2 – the highest value. Thus, maximum amount of value to be gained by park was 82 points and for public garden and boulevard – 66 points.
| Key criterion | Evaluation items |
|---------------|------------------|
| I. Transport accessibility | 1. distance from the main entrance to the nearest public transport  
2. availability of parking for personal transport*  
3. number of parking stalls at the parking space* |
| II. Quality of parking infrastructure | A) marking of entrance zone and availability of indicators for orientation  
4. quality of equipped entrances  
5. presence of pedestrian crossings next to entrances  
6. visual identification of entrances*  
7. availability of park layout, indicators and navigation stands*  
B) arrangement of road and walkway network  
8. presence of cracks, potholes and other deformations of the roadway surfacing  
9. the possibility of tracks using by people with limited mobility  
10. furnishing ladders with ramps  
C) availability and general condition of main land improvement facilities:  
11. public lavatories*  
12. lavatories for wheelchair users*  
13. benches  
14. gazebos, canopies and sun and rain shelters  
15. garden furniture |
| III. Sufficiency of specially equipped spaces and services for various recreation | A) availability of specially equipped spaces for recreation:  
16. playgrounds  
17. sports grounds  
18. fairground attractions*  
19. sites for mass events and stages  
20. bicycle lanes  
21. lawns, picnic grass plots  
22. table game places  
23. water pond rest areas  
24. fountain rest areas  
25. shadow rest areas  
26. quiet rest areas  
B) availability of services and opportunities for comfortable rest and entertainment:  
27. fast-food restaurants  
28. water selling points  
29. game and sports equipment rent  
30. mass cultural events |
| IV. Rest security | 31. police posts  
32. availability of street lamps throughout PGS territory  
33. availability of first aid posts*  
34. presence of homeless and other marginal groups representatives  
35. presence of people drinking alcoholic beverages  
36. presence of stray dogs |
| V. Well-keeping and cleanness of territory | 37. presence of rubbish and level of PGS littering  
38. availability of litter bins throughout PGS territory  
39. availability of dog runs |
| VI. Presence of identification objects distinguishing PGS from the others | 40. memorials, sculptural complexes and other show places structures  
41. landscaped architecture sites (specially designed water ponds, parkways, groves and etc.) |

* items that have not been used for evaluation of public gardens and boulevards.
A social survey of visitors was conducted at the same time with an expert assessment in the 4 most visited parks (Central Park, Park Pobedy (Victory Park), Park Pyatidesyatletiya Nezavisimosti Respubliki Kazakhstan (Kazakhstan 50th Independence Anniversary park), Park Zheleznodorzhnikov (Railroad men cultural center park) and 2 city public gardens (public garden “Vechniy ogon’” (Eternal flame) and public garden on the Respublica Avenue).

The respondents were asked to complete the questionnaire and to evaluate PGS on 5-digit scoring scale on the key criteria applied for the expert scoring assessment. Altogether, 120 visitors were interviewed. Most of them were pupils/students (40%), parents with children (34%) and pensioners (20%).

The responses enabled us to clarify and specify the results of expert assessment and thereafter to evaluate the recreational conditions within each of recreation area surveyed in most exactly manner. For this aim, at the final stage of study, total amount of points were estimated on each PGS, including points of all key criteria. Thus, the results of the expert assessment actually contained elements of collective expertise.

To be able to compare the final results, the amount of points gained by each object of research was converted into relative value - percentage of the maximum value possible for the number of points for objects of this type. Further, based on this variation indicator (%), the explored territories were evaluated (ranked) according to the degree of recreational attractiveness for each of the city districts.

4. Results and discussion

The assessment showed that the integrated evaluation indicators of recreational attractiveness of Karaganda city PGS are much lower than the maximum possible total sum of evaluation points and vary within 20 to 60%.

Out of 19 researched territories, 7 objects (2 parks, 4 public gardens, 1 boulevard) have values above 50%, 9 objects (2 parks, 5 public gardens, 2 boulevards) - 30-50%, 3 objects (1 park, 1 public garden, 1 boulevard) - less than 30%. Most attractive leisure areas are Park Imeni Tridsatiletiya VLKSM (Central Park) in Noviy Gorod district (59.7%) and the public garden of Molodezhniy cultural center in Prishakhtinsk (59%) and the least attractive ones are Park of Zheleznodorzhnikov cultural center in Sortirovka (20.7%) and the boulevard on Satpayev street in Noviy Gorod (19.6%). Consequently, there are no parks, public gardens or boulevards in Karaganda with a high degree of recreational attractiveness that would completely satisfy the needs of population.

In addition, the ratings differ not only between different city districts, but also have significant intraregional differences (Table 2). Thus, the greatest difference in the rating of PGS (up to 40%) was fixed in Noviy Gorod, where 3 of 8 explored objects had values above 50%, 4 objects – 30-50%, and 1 object - 30%. A small rating difference equal to 1-3% was fixed in Yugo-Vostok district leisure areas. Within the other districts, indicators of recreational attractiveness vary from 12.6 to 33.3 percents.

Comparison of the results of a comprehensive assessment of recreational attractiveness with PGS provision levels is highly interesting.

According to the construction norms and regulations of the Republic of Kazakhstan (ROK SNiP standard), public green space area standard in the cities with high population size, including Karaganda, should be 10 m^2/person [11]. With a population of 499,6 million people (2016) and public green space with total area of 3164,3 m^2, on the average, there is 6.33 m^2 per one Karaganda resident, which is below the standard by 1.5 times. However, due to the existing city planning structure, this average figure is not representative.

Level of PGS provision calculated for different city regions (Table 3) varies considerably. So, only for one urban district – Noviy Gorod – it exceeds the standard nearly 1.5 times; for the other districts it varies from 50% of normal value to a value 5 times less than the standard.

Thus, the most favorable conditions for recreation are created in the existing public green spaces of administrative and business district Yugo-Vostok. Parks and gardens recently designed are highly appreciated by the local population (integrated indicator of their recreational attractiveness is more
than 50%), but they are very few in number to provide the leisure areas for all residents of this intensely built-up area. Calculated indicator of PGS provision is more than twice below the standard and in total is 4,16 m²/person.

Table 2. A comprehensive assessment of Karaganda public green spaces recreational attractiveness.

| Urban district          | Public green spaces                                             | Total score, % | Average score by district, % |
|-------------------------|-----------------------------------------------------------------|----------------|-------------------------------|
| Noviy gorod             | Park Imeni Tridsatletiya VLKSM (Central Park)                   | 59,7           |                               |
|                         | Boulevard on Mir street                                         | 54,5           |                               |
|                         | Public garden “Vechniy ogon” (Eternal flame)                    | 51,5           |                               |
|                         | Public garden “Shalkyma”                                        | 50,0           |                               |
|                         | Boulevard on Tolepova street                                    | 43,9           |                               |
|                         | Boulevard on Abdirova street                                   | 39,3           |                               |
|                         | Public garden near Lenin cinema                                 | 36,3           |                               |
|                         | Boulevard on Satpayev street                                   | 19,6           |                               |
| Yugo-Vostok             | Public gardens on the Republica Avenue                          | 53,0           |                               |
|                         | Kazakhstan 10th Independence Anniversary park                   | 51,2           |                               |
|                         | Park Pobedy (Victory Park)                                     | 50,0           |                               |
| Maikuduk                | Public garden of Noviy Maikuduk cultural center                | 54,5           |                               |
|                         | Public gardens on Kuzebaeva street                             | 50,0           |                               |
|                         | Kazakhstan 50th Independence Anniversary park                   | 39,0           |                               |
| Prishakhtinsk           | Public garden of Molodezhnyi cultural center                   | 59,0           |                               |
|                         | Public garden of 21 microregion                                 | 43,9           |                               |
|                         | Public garden in Uzenka                                        | 25,7           |                               |
| Sortirovka              | Public garden on Drujby street                                 | 33,3           |                               |
|                         | Park of Zheleznodorzhnikov                                     | 20,7           |                               |

Table 3. Provision of Karaganda city population with public green spaces (PGS).

| Urban district          | PGS area, m² | Number of population, ths. persons | Specific provision with PGS (m² per man)* | Level of provision with PGS (% of SNiP standard) |
|-------------------------|--------------|------------------------------------|-------------------------------------------|-------------------------------------------------|
| Noviy gorod             | 2 044,8      | 140,6                              | 14,50                                     | 145,0                                           |
| Sortirovka              | 148,1        | 27,7                               | 5,34                                      | 53,4                                            |
| Yugo-Vostok             | 536,8        | 128,8                              | 4,16                                      | 41,6                                            |
| Maikuduk                | 312,7        | 138,7                              | 2,25                                      | 22,5                                            |
| Prishakhtinsk (including neighboring villages) | 121,9 | 63,8 | 1,91 | 19,1 |

* under the ROK SNiP 3.01-01-2008 standard for PGS area – 10 m²/man

Reverse situation is observed in residential-administrative and cultural-historical centre Noviy Gorod, which PGS provision level is 1.5 times above the standard (14.5 m²/person), but average level of their comprehensive recreational attractiveness is lower than in Yugo-Vostok district and amounts to 44,3 % of the possible value. This suggests that, despite the large number of parks, public gardens and boulevards, there are not so many attractive leisure areas.

In other city districts, level of population provision with PGS is considerably below the standard at quite low level of their recreational appeal. This means that most of Karaganda residents are not provided sufficiently with leisure areas that meet the requirements on quantitative indicator (PGS area per resident) or qualitative (level of improvement, their transport accessibility, etc.). The most challenging situation is observed in Prishakhtinsk, connecting several towns with small industrial
enterprises, which PGS provision amounts to 1.91 m²/person and in Maikuduk - a large industrial district - which rate is 2.25 m²/person. Recreation environment within these districts also differs. In the first case, general rate of recreation attractiveness of PGS range from 59.0% to 25.7%, in the second one - from 54.5% to 39.0%. In Sortirovka, the rail transportation maintenance center, level of population PGS provision is slightly higher (5.34 m²/person), but recreational facilities are the worst in the city and level of recreational attractiveness is less than 30% of the possible rate.

The comparison of study results with PGS provision indicators allows to split the Karaganda districts into 3 groups, where:

1 – indicators of PGS provision above the standard at a relatively low level of their recreational attractiveness (below 50%) (Noviy Gorod);
2 – indicators of PGS provision below the standard at a relatively high level of their recreational attractiveness (above 50%) (Yugo-Vostok);
3 – indicators of PGS provision below the standard at a relatively low level of their recreational attractiveness (below 50%) (Maikuduk, Prishakhtinsk, Sortirovka).

The analysis allowed not only to identify the city districts requiring prioritized funds to provide the residents with public green spaces, but also to determine the most popular areas for further development. So, in Noviy Gorod, leisure facilities within the existing parks and gardens should be improved; in Yugo-Vostok district, it is important to create new green areas of recreational purpose; in the other city districts it is necessary to carry out both things.

In addition, assessment of recreation attractiveness has allowed identifying the main problems of Karaganda city public green spaces and to develop appropriate practical recommendations. As it turned out, many of the city leisure areas are heavily littered that requires location of additional litterbins. Considering almost widespread presence of damaged park furniture, it is necessary to enhance control over the public tranquility in the parks. Poor maintenance of public green spaces is also proved by weaker condition of most green plants. To improve their environmental and recreational functions, it is necessary, first of all, to ensure regular watering and timely sanitary pruning and felling [12]. The main problem of transport accessibility is the absence of specially designated transport parking areas in the most of parks’ territories, while they must be placed not farther than 400 m from the park entrance [13].

In estimating of the organization quality of public green areas, a number of problems were identified. These are first of all: 1) insufficient number or absence of gazebos, canopies and other sun and rain shelters; 2) deficiency of facilities and services both for passive and active recreation. In this regard, it is necessary to locate extra park gazebos and sheltered benches at all city recreational areas and install more playgrounds and sports grounds, to expand assortment of sports and game equipment available for rent and hold a variety of cultural and entertainment events.

In general, Karaganda city may become more comfortable and interesting for living if each district leisure areas will differ with unique features, such as spectacular landscape designs, memorials, sculptural complexes, as well as various city events such as music festivals, concerts and etc.

5. Conclusions

The assessment showed that exactly comparison of quantitative and qualitative indicators of public green spaces provision and recreational attractiveness of PGS allows to make a more exactly evaluation of the recreation environment in each city district.

So, it was revealed that none of Karaganda districts was sufficiently provided with landscaped areas of recreational attractiveness high level. The main problems of public green spaces surveyed are associated with their poor maintenance and littering, paucity of facilities and services for various recreations, as well as lack of unique objects defining their distinctness and attractiveness for visitors. In addition, expert assessment showed that there are no necessary conditions for people with limited mobility in the city. This can be considered a significant disadvantage, since nowadays ensuring
recreational needs of all population categories, including disabled persons, is one of the primary tasks of urban planning.

Summarizing the results of expert assessment, including sociological survey, we can conclude that in Karaganda it is necessary, first of all, to pay attention to development of public green spaces with district importance and which are not municipal. It is extremely important to create the multifunctional parks and public gardens in each city district, meeting diverse needs of visitors.

To create new territories of recreational purpose and for efficient development and improvement of existing parks and public gardens, it is necessary to use modern methods of architectural-planning management and landscape design of public green spaces, and also it is very important to consider public opinion solving the issues related to improvement of urban recreation environment [14, 15].

It should be noted that foreign experience of recreational use of disturbed lands is most actual for Karaganda city. Impressive examples of mining badlands recovery and turning into common recreation places are presented in many countries. The most widespread of them are creation of water ponds and common recreation places for various recreational uses replacing the worked out quarries (swimming, fishing, water sports, etc.). In addition, man-made landscapes are being actively transformed to urban gardens and parks. At the same time, green areas are formed in such a way to constitute a single recreation zone, covering all parts of the old industrial center [16]. So, current experience confirms the possibility of involvement the planning structure in Karaganda city not only the local disturbed areas, but also large territories of mining badlands.

Therefore, recommendations and suggestions for improvement and development of Karaganda city public green spaces are consistent with the applicable standards of urban design, meet the modern approaches to the creation of public spaces and sensible to the wishes of the interviewed visitors. In the future, the study results may be included in urban development programs and also used at developmental projects for the city recreational zones development.

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