Influence of Spatial Factors on the Comfort of Sports Activities in the City of Astana

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In large cities, the share of people who follow a healthy lifestyle and preventive health behavior is growing. However, urban sports infrastructure does not always provide sufficient opportunities for regular training. This study aims to identify areas that are comfortable for doing sports in the city of Astana and to develop recommendations for improving the city's sports infrastructure.

The research included the following stages:

1) Areas with a high density of sports activity were identified using the activity map of the athletes' social network Strava [1]. More than 14 areas of increased sports activity were identified.

2) Comfort factors of the urban environment for sports were analyzed based on an online survey of athletes in Astana. The questionnaire was divided into three blocks: assessment of sample representativeness; assessment of advantages and disadvantages of recreational areas; and assessment of weighting coefficients.

3) Spatial data on comfort factors for sports were collected. The following information sources were used: the crowdsourcing platform OpenStreetMap (proximity to food service facilities, cycling paths, rental points, and specialized stores) [2]; the GIS Center geoportal of Astana (vegetation and residential building density) [3]; the geoportal of the Ministry of Internal Affairs of the Republic of Kazakhstan (density of crimes and road traffic accidents) [4]; the Instagram social network (visual attractiveness of the territory); and Google Maps (accessibility zones).

4) An integrated suitability assessment of Astana's territory for sports was performed using a weighted overlay of the spatial factors listed above within the cells of a regular grid covering the city with a fixed step of 30 meters. This stage was implemented using the ModelBuilder visual programming module.

5) Recommendations for improving sports infrastructure were developed. At this stage, the most optimal routes connecting areas of increased sports activity will be identified to plan cycling-lane networks along them; in addition, territories that are potentially highly suitable for organizing sports activity zones, but currently suffer from a deficit of such zones, will be identified.

The survey results show that more than half of respondents do sports outdoors in the city every day, while about 40% train around three times a week. Training frequency also differs by location. In the Botanical Garden, Zheruyyk Park, restricted facilities, on the embankment (except for the Arbat section), and on the ring road, respondents train less than once a week. On the bike path from Ilyinka, the ski-roller track, in the Triathlon Park, and on the embankment (Arbat), respondents train about 2–3 times a week. About half of respondents report exposure to the risk of a road traffic accident during training.

For most respondents, the average training trip time is 2 hours, and the average distance is 50 km. As a result, there is a need for sports zones with long continuous cycling lanes. In most cases, respondents start their training trip from their place of residence, which indicates the need to create sports-friendly areas in close proximity to large residential districts.

Based on the survey, the following weighting coefficients were determined for the influence of spatial factors on the suitability of the territory for organizing sports zones: presence of cycling

paths - 11; rental points - 7; service points - 10; proximity to home - 10; proximity to food service facilities - 8; area safety - 12; vegetation - 10; area attractiveness - 11.

The integrated suitability assessment (Figure 1) revealed a deficit of organized sports sites within the historical city center of Astana (the area bounded by Saryarka Street, Bogenbai Avenue, Valikhanov Street, Baraev Street, and the Ishim River embankment), as well as on the urban periphery in areas of individual low-rise housing. The smallest deficit of sports zones is associated with residential areas near the Ishim River and its tributaries.

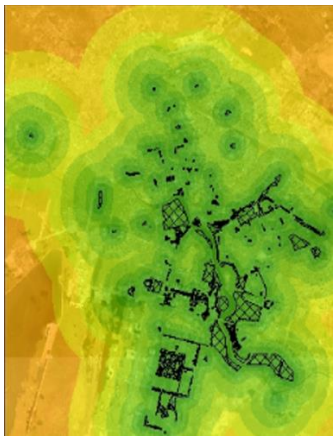

Figure 1. Integrated suitability assessment of Astana's territory for organizing sports zones (fragment)

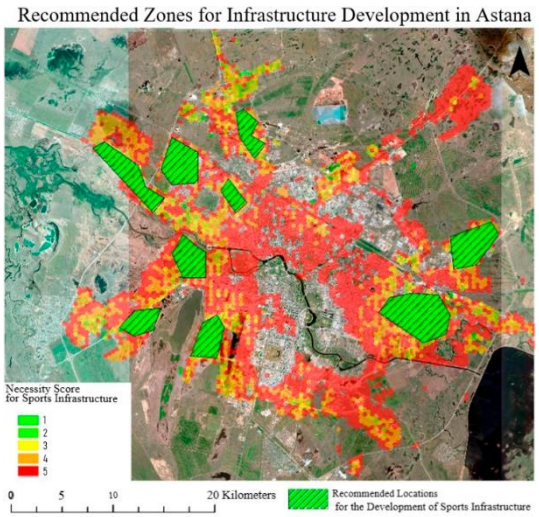

Figure 2. Recommended areas for developing sports infrastructure in Astana

The study leads to the following conclusions:

There is a demand for outdoor sports sites in Astana: more than half of respondents do sports more than three times a week.

A significant issue is that Astana's transport system is not adapted for cycling. More than 50% of respondents regularly face the risk of road traffic accidents during training.

The city has popular places for sports, but most of them are not suitable for long training sessions: the average training trip distance is 50 km.

It is critically important to ensure spatial separation of functional zones in parks and other recreational areas to prevent conflicts between athletes and other visitors. More than 90% of athletes consider this issue significant.

A notable problem is the presence of isolated areas with high suitability for sports (the green belt and the ring road) that are far from residential zones and are not connected by transport corridors that are safe for cycling.

References

[1] Strava - activity map for athletes. Available at: https://www.strava.com/maps (accessed: 25 March 2024).

[2] OpenStreetMap crowdsourcing platform. Available at: https://www.openstreetmap.org (accessed: 25 March 2024).

[3] Geoportal of the Geoinformation Center of the city of Astana. Available at: https://gis.esaulet.kz/ (accessed: 25 March 2024).

[4] Geoportal of the Ministry of Internal Affairs of the Republic of Kazakhstan. Available at: https://gis.kgp.kz/ (accessed: 25 March 2024).