

FORMATION OF AN ACCESSIBLE SPORTS ENVIRONMENT IN THE CITY OF LVIV: INFRASTRUCTURE DIMENSION

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ABSTRACT

The article examines the role of sports infrastructure in the formation of inaccessible sports environment, as one of the key areas of sustainable development of a modern city, since ensuring equal access to sports infrastructure contributes to social integration, improving the quality of life and strengthening the health of the population.

The work aims to investigate the accessibility of sports infrastructure in the city of Lviv, to consider existing barriers and opportunities for its improvement. It has been established that the sports infrastructure of the city of Lviv consists of 14 stadiums; 15 swimming pools; 10 sports complexes; 4 bases of Olympic, Paralympic and Deaflympic training; 375 sports grounds; 6 shooting ranges, one shooting stand, archery range; 183 sports halls and a bicycle track. An analysis of the location of the city's sports infrastructure indicates an uneven provision of such facilities in its various districts. The formation of an accessible sports environment in Lviv is an important step towards creating equal opportunities for people with disabilities, but in order to fully realize this potential, it is necessary to overcome barriers in accessibility, financing and social support.

The results of the analysis of the pedestrian accessibility of sports facilities showed that the best-equipped districts are Halytskyi (98.1% of residential buildings within a 500 m accessibility zone), Frankivskyi (95.8%) and Sykhivskyi (83.6%). At the same time, the lowest indicators were recorded in Zaliznychny (74.3%), Lychakivskyi (67.6%) and Shevchenkovskyi (64.7%) districts, which indicates limited spatial integration of sports infrastructure in these parts of the city.

Adaptive sports in Lviv are actively developing; evidence of this is the holding of numerous sports competitions, including the national qualifying stage of Invictus Games 2023 and the All-Ukrainian Adaptive Competition Beststrong Games 2024. Sports facilities hosting such competitions are becoming increasingly accessible, however, other sports facilities need to be modernized to increase their accessibility by installing special lifts, ramps, handrails, bathrooms adapted for people with disabilities, etc.

Keywords: *sports environment, sports infrastructure, adaptive sports, accessibility, Geographic Information System, spatial analysis*

Introduction

Creating an accessible sports environment plays an important role in the sustainable development of a modern city, as ensuring equal opportunities for using sports infrastructure contributes to social cohesion, improving the quality of life and maintaining the health of residents (Wibowo et al., 2025). The issues of accessibility of urban sports infrastructure, its assessment and the development of adaptive sports are relevant in the context of the formation of an accessible urban sports environment (Declerck et al., 2021).

Considering the problems of forming the image of the city, we note that in the city various spheres and types of human activity are combined (integrated) and concentrated in close territorial proximity (Fitri et al., 2022). This occurs in conjunction with the development of social processes in the city, which are associated with the general progress of social development. In the city space there are objects that unite the entire urban community – from young people to the elderly. Such objects in the city are elements of sports infrastructure (Yi et al., 2022).

Sports infrastructure is a set of sports facilities, objects and organizations that are intended for the implementation of physical education, sports and recreational and health activities (Samoilenko, 2019). It includes stadiums, swimming pools, fitness centers, gyms, playgrounds and many other objects.

Lviv is one of the key centers of medical, physical and social rehabilitation in Ukraine. Rehabilitation centers are already operating in the city, but their integration with modern sports infrastructure remains limited. Access to quality sports facilities adapted for people with different physical abilities is critically important not only for physical recovery, but also for the psychological rehabilitation of veterans (Nazaruk & Khudoba, 2022).

In this study, the accessibility of the sports environment is considered as the provision of city residents with sports infrastructure and its barrier-freeness. In the conditions of a full-scale war in Ukraine, where adaptive sports activities are used to rehabilitate war veterans and military personnel who have suffered injuries and traumas as a result of hostilities, this problem becomes even more relevant (Plan of sustainable urban mobility of Lviv, 2020).

This work aims to investigate the accessibility of sports infrastructure in the city of Lviv, to consider existing barriers and opportunities for its improvement (Sá et al., 2012).

Methodology

In the process of research, the cartographic method was applied, in particular, the construction of maps of the geospatial location of sports facilities within the city of Lviv. To ensure the complexity of the analysis, general scientific methods were also used, in particular, induction and deduction, which allowed combining empirical observations with theoretical generalizations. In order to quantitatively assess the sports infrastructure, statistical and mathematical methods were used, which made it possible to determine and analyze quantitative indicators of the functioning of sports facilities (Imas et al., 2022).

This study applied a comprehensive approach to spatial assessment of the accessibility of sports infrastructure in the city of Lviv using geographic information technologies. The analysis has been conducted in the ArcGIS 10.3 environment using both vector and raster spatial modeling methods. At the first stage of the study, the transport accessibility of the city's stadiums has been analyzed, which was carried out using the Service tool Area of the Network module Analyst. Based on the vector layer of the street and road network, a Network was created Dataset, which allowed modeling the reach ability zones of stadiums within 5, 10, 15 and 20 minutes of car travel. The resulting isochronous zones reflect the real accessibility of sports facilities, taking into account the structure of the transport network.

Kernel Density Estimation (KDE) method has been used to estimate the density of sports facilities in the city of Lviv. This tool allows identifying spatial clusters of sports infrastructure concentration based on the number of facilities within a certain search radius (Ryśnik & Gibas, 2019; Xiao, & Wang, 2022). In this study, the search radius was set at 1000 meters, which allows taking into account the influence of facilities within walking and short transport reach. KDE allows assessing not only the presence, but also the intensity of distribution of sports facilities in different areas of the city, which is important for spatial planning and identification of underserved areas (Gao et al., 2022).

The pedestrian accessibility of micro district sports facilities (sports stadiums and gyms, sports grounds) for residents of the city of Lviv has been assessed by analyzing the location of residential buildings in relation to these facilities. The spatial layer of residential development has been obtained from OpenStreetMap and pre-processed to select only those objects that are classified as residential (types: apartments, detached, house, residential, etc.). A buffer zone with a radius of 500 meters has been created around each sports facility, which corresponds to the conditional pedestrian accessibility zone. Using the Spatial tool Join determined the number of residential buildings falling within these zones for each district of the city. Based on this, the percentage of residential buildings provided with sports infrastructure at the district level was calculated.

Thus, the selected methods – transport modeling, spatial density analysis, and pedestrian accessibility – in combination allow for a multidimensional assessment of the spatial organization of Lviv's sports infrastructure and its accessibility for residents.

Results

Sports facilities contribute to the active development of physical culture and sports in Lviv, acting as an important component of the accessible space of the city. It is of great importance; especially during the social changes that occur in society, as a result of which the needs for rehabilitation and physical culture and health activities of the population increase. Also, the city's sports facilities are of great importance for the development of event tourism, as they provide for the holding of various cultural and sports events that are visited by tourists and fans from different parts of the world. International sports tournaments contribute to the development of not only sports, but also the city's

infrastructure in general and bring significant revenues to local budgets and profits, especially for service enterprises. Evidence of this is the 2012 European Football Championship, during which Ukraine visited a large number of foreign tourists and fans.

Sports complexes of universal or specialized purpose form their centers in the city space, serving a certain territory of it. City-wide sports facilities serve the needs of the urban population, and most often serve large competitions of the city, regional, inter-regional and international levels. Such facilities are usually called structures of episodic use. This includes open playgrounds for games, athletics grounds, and open water sports facilities. Such facilities mostly require large areas and convenient transport connections for quick service of participants – athletes and spectators. This is especially true for complexes where large international competitions are held (Nazaruk, M., & Khudoba, V., 2022).

The analysis of social factors shows that one of the important aspects that influence the geospatial features of the formation of the city's sports environment is the needs of visitors. Visitors put forward certain requirements for the sports environment intended for training and recreation. The frequency of visits to sports and recreation facilities by the urban population is quite high, due to the high health and recreational potential of the city (Grabski et al., 2013).

The sports infrastructure of Lviv is represented by 14 stadiums, 15 swimming pools, 10 sports complexes, 4 bases for Olympic, Paralympic and Deaflympic training, 358 sports grounds, 183 sports halls, 6 shooting ranges, one shooting stand, an archery range and a cycling track (Table 1).

A significant role in the sports environment of Lviv is played by 14 stadiums, including Arena Lviv, Ukraina, Skif, SKA and others. Stadiums are those sports facilities where mass sports events of city, all-Ukrainian and international importance are held. Unfortunately, today the security situation that has developed due to the full-scale invasion of the Russian Federation on February 24, 2025 into the territory of Ukraine does not allow holding sports events of international importance at the city's stadiums.

The largest and newest stadium in the city is Arena Lviv, which is designed for 34,915 spectators. The stadium was built to host matches of the 2012 European Football Championship. Arena Lviv ranks 4th in Ukraine in terms of the number of seats for spectators. In addition to football matches of regional, national and international importance, Arena Lviv hosts various sports and cultural events.

No less important is the "Ukraine" stadium, located near the central part of the city, designed for 28,051 seats. The "Arena Lviv" and "Ukraine" stadiums are used as sports facilities for high-level football matches.

The oldest among the existing stadiums in Lviv is the "Skif" stadium. The stadium has 3,742 seats. Today it is a complex sports facility of the Ivan Bobersky Lviv State University of Physical Culture "Skif". The stadium played an important role in the sports and cultural life of the city in the first third of the 20th century, and entered the history of Polish interwar sports. Despite the construction of more advanced sports facilities in the post-war period, the stadium was popular and became the property of the Institute of Physical Culture.

Table 1 Sports infrastructure of Lviv districts

Sports infrastructure	Galician	Railway	Lychakivskyi	Sykhivskyi	Frankivskyi	Shevchenkovskyi	Lviv
Stadiums	1	1	3	2	4	3	14
Swimming pools	1	1	4	2	3	4	15
Shooting ranges	1	–	1	–	1	4	7
Sports grounds, <i>including</i>	56	92	91	113	94	981	375
<i>football fields</i>	11	29	18	40	40	26	164
<i>basketball courts</i>	8	12	11	11	6	4	52
<i>playgrounds equipped with exercise machines</i>	6	9	8	16	10	8	57
Children's and youth sports schools	8	1	3	2	5	3	22
Sports clubs	9	14	6	9	10	10	58
Bases of Olympic, Paralympic and Deaflympic training	1	–	–	1	1	2	4
Olympic training centers	–	–	–	–	–	1	1

After the establishment of the Institute of Physical Education in Lviv (1946), the stadium became an athletics base for the educational and training process of students. Before the 2012 European Football Championship, the stadium was reconstructed; it was to be one of the training bases of the tournament. From 2018 to 2020, work continued on the arrangement of athletics running tracks. Arrangement of the tracks is an important step towards the reconstruction of the stadium and sports complex of the Ivan Boberskyi Lviv State University of Physical Culture. The reconstruction of the stadium contributes to the holding of international athletics competitions in the Lviv region, since in November 2021 the Skif stadium became a certified second-category athletics stadium. Also, sports competitions of various levels are held at the Skif stadium in order to attract people with disabilities to sports, one of the largest in 2023. There were sports competitions among wounded servicemen – the All-Ukrainian Games of the Invincible.

SKA is a multifunctional stadium, which is part of the summer sports training base of the Ministry of Defense of Ukraine. The complex includes a stadium with a football field, speedway tracks and spectator stands, an indoor swimming pool, a group of premises for shooting and pentathlon, a riding arena, a cycling track and an administrative building. This sports complex is very often used as a base for various kinds of adaptive sports competitions.

The Frankivsk, Lychakiv and Shevchenkovskyi districts are the best equipped with stadiums, while the Halytskyi and Zaliznychnyi districts have the fewest (Table 1). Arena Lviv, Ukraina, Skif and Yunist stadiums host sports competitions, while other stadiums in the city are used both for sports competitions and for training athletes and city residents.

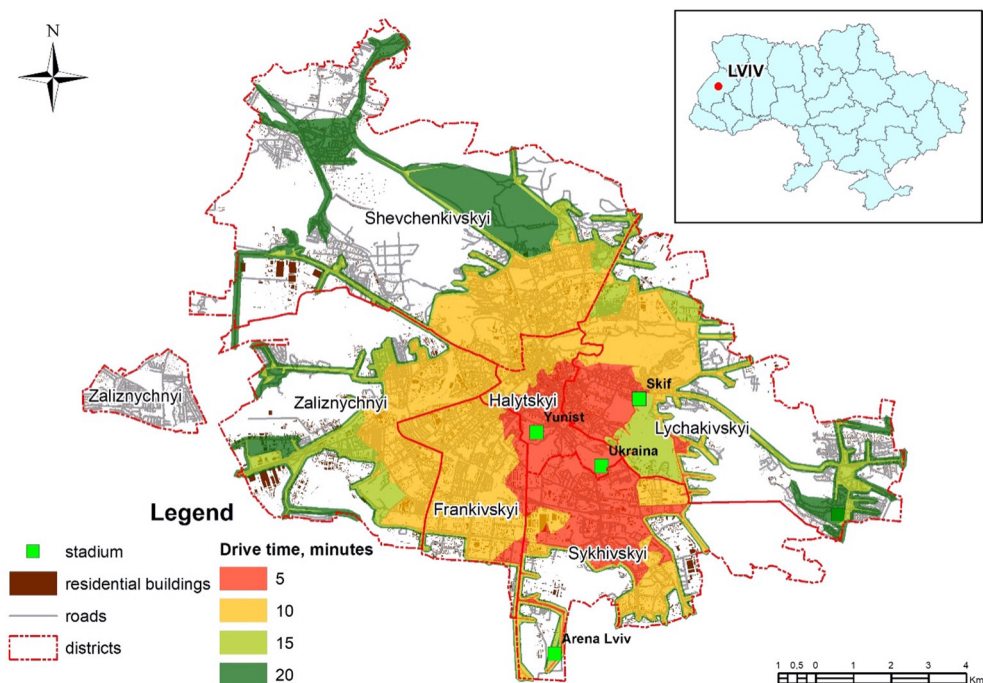


Figure 1 Transport accessibility of stadiums in Lviv

Analyzing the location of these stadiums in the city space, it can be noted that most of them are located closer to the central part of the city than to the periphery (Fig. 1). The model of time areas of accessibility by road transport that we simulated shows that under ideal conditions (movement with an average speed of 50 km/h without traffic jams) residents and guests of the city who are located in the Halytskyi and Sykhivskiyi districts will spend the least time to get to the Ukraina, Skif and Yunist stadiums.

Stadiums in the central part of the city (Yunist, Ukraina) have the best accessibility due to their location in the Halytskyi district – most city residents can reach them in 10–15 minutes. The Skif stadium in the Lychakivskiyi district is convenient for the eastern part of the city, but for the western districts the journey takes up to 20 minutes. Arena Lviv, located in the south in the Frankivskiyi district, is the least accessible: it is convenient only for residents of the Frankivskiyi and Sykhivskiyi districts, while for Shevchenkivskiyi and Zaliznychnyi the journey can take more than 20 minutes. In general, stadiums in the central part provide the best access for most Lviv residents, while more distant stadiums, such as Arena Lviv, are less convenient for a significant part of the city, especially for the outskirts of the Zaliznychnyi and Shevchenkivskiyi districts.

Inter-district and district sports facilities are designed to meet the periodic needs of citizens, and their accessibility radius does not exceed 1000 m, which corresponds to the location of these institutions in the center of residential areas. Such facilities periodically host competitions of various levels, operate specialized and universal sections.

These facilities are called facilities for periodic use. We include other stadiums, swimming pools, sports complexes, etc.

There are 15 swimming pools in Lviv, located throughout the city, however, the largest number of them is located in the Lychakiv, Shevchenkivskyi and Frankivskyi districts. The most functional and popular include the pools of “SKA”, “Dynamo”, “Eurosport” and the pools of the “Sportlife” club.

In recent years, the city has been actively restoring swimming pools in schools and preschool departments. Children have the opportunity to learn to swim during physical education classes.

There are about 50 thousand people per swimming pool in Lviv. The residents of Lychakiv district, where there are four swimming pools, have 26 thousand people per pool, and the residents of Shevchenkivskyi district, where there are also four swimming pools, have 35 thousand people per pool. The residents of Zaliznychny district, where one pool provides for 120 thousand people, and Sykhivskyi district, where one pool provided for 75 thousand people, are the least provided with swimming pools; therefore, in these districts it is necessary to build additional new swimming pools with accompanying infrastructure to meet the needs of the population of these districts (Nazaruk, M., & Khudoba, V., 2022).

In the city space, an important place belongs to micro district sports facilities, including sports grounds, small gyms that serve the local population every day and satisfy people's daily needs. The radius of accessibility of such facilities is 500 m, which corresponds to their location in a residential area, in micro districts and residential groups. In total, there are 358 sports grounds in Lviv (Table 1). Among them, football fields, volleyball and basketball courts, grounds equipped with exercise machines, table tennis tables, and recently there has been an increase in the number of complex sports grounds where you can train in various sports.

The sports grounds are located in all districts of Lviv, but the largest number of them is concentrated in Sykhivskyi – 113, Shevchenkivskyi – 98, Frankivskyi – 94 and Zaliznychnyi district – 92 sites, and the smallest number is in Halytskyi district – 56 (Table 1). However, if we analyze the ratio of the number of sports grounds to the area of the district, the best-equipped districts are Halytskyi district – 7 units per km² and Frankivskyi 6 units per km², the lowest indicators are Shevchenkivskyi district – 1 one sports ground per km². Spatial analysis of the concentration of sports facilities in the city was performed using the kernel density estimation method (Kernel Density Estimation, KDE). This method allowed us to estimate the intensity of the distribution of sports facilities, taking into account their location and density in certain areas of the city (Fig. 2).

The highest concentration of sports facilities is concentrated in the central part of Lviv, while the low concentration is characteristic of the outskirts, which indicates limited accessibility of sports infrastructure in the peripheral areas of the city. Figure 2 shows areas with high and very low concentration of sports facilities in each district of the city. This is due to both the location of sports infrastructure and the territorial organization of the entire urban space. Residents of the central part of the city, in particular residents of the Halytskyi and Frankivsk districts, have the best accessibility to sports infrastructure.

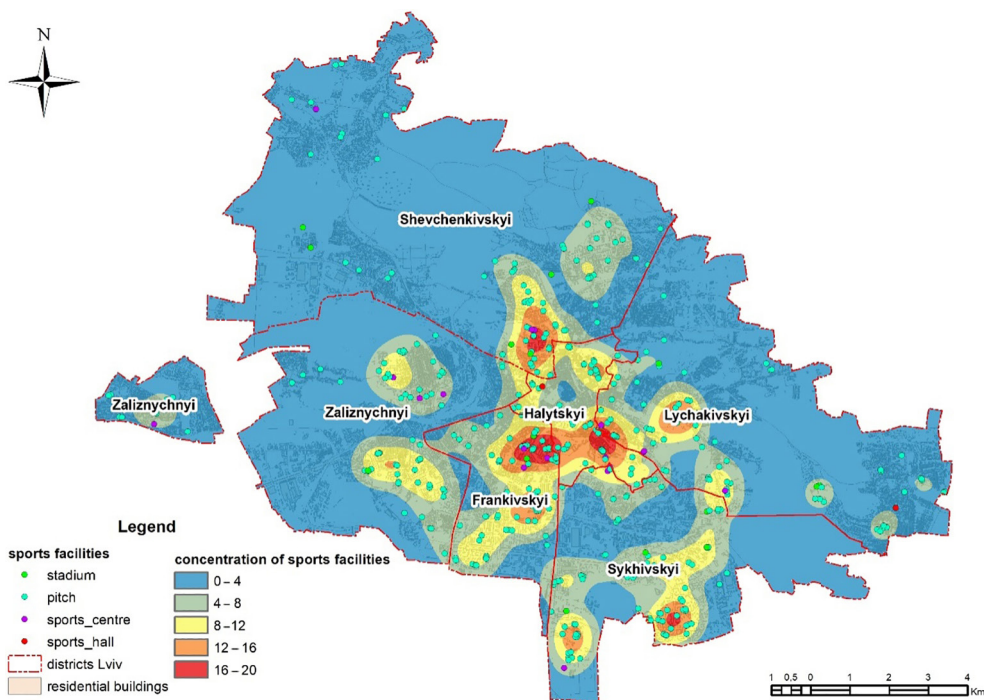


Figure 2 Concentration of sports facilities in areas with a radius of 1 kilometers (KDE – Kernel density estimation)

There are about 2,000 people per sports field in Lviv. The residents of the Halytskyi district are best provided with sports fields, with 1,000 people per sports field. The residents of the Shevchenkivskiy district are least provided with sports fields, with one field for 2,700 people.

The spatial accessibility of microdistrict sports facilities for Lviv residents was assessed by analyzing the location of residential buildings relative to the specified facilities, since the level of accessibility directly depends on their proximity to residential development. Analyzing the intersection of the layer of residential buildings with a 500 m zone around sports facilities made it possible to determine the number of residential buildings located within this zone for each district (Fig. 3).

Based on the obtained values, the percentage of residential buildings in each district of the city with access to sports infrastructure was calculated, which allows us to assess the spatial unevenness of the provision of sports facilities.

As a result of the analysis of pedestrian accessibility of sports facilities within a 500-meter buffer zone from residential buildings, significant variability in provision between administrative districts of Lviv was established. The highest level of accessibility is observed in the Halytskyi district, where 98.1% of residential buildings are located within 500 m from a sports facility. High indicators are also recorded in the Frankivsk (95.8%) and Sykhiv (83.6%) districts. Slightly lower values are recorded in the Zaliznychnyi (74.3%),

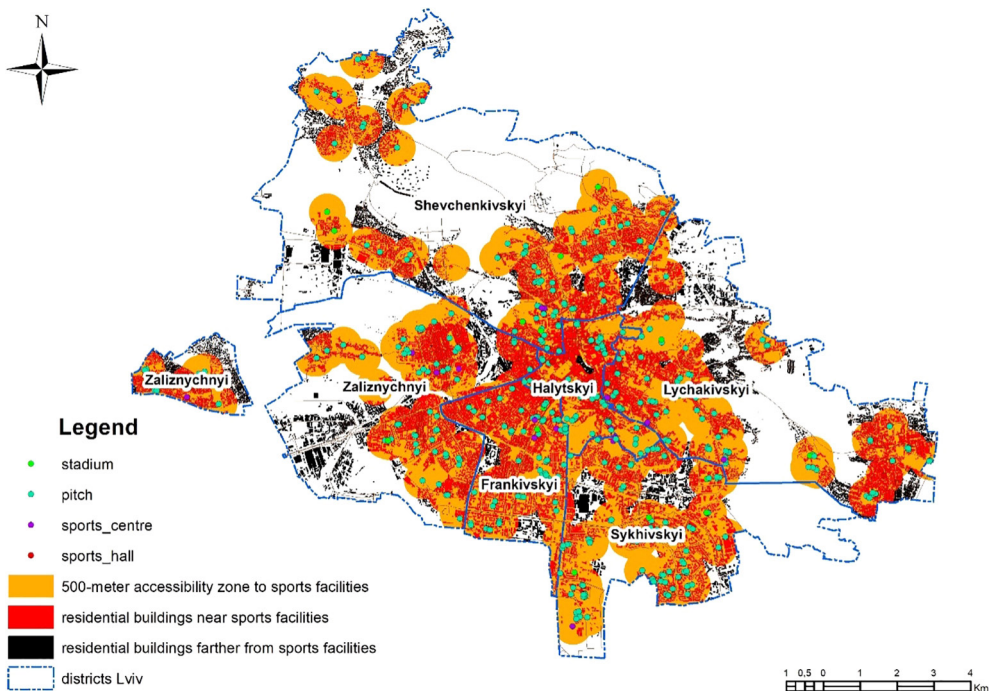


Figure 3 Geospatial analysis of the accessibility of sports infrastructure in the city of Lviv

Table 2 Characteristics of pedestrian accessibility of sports facilities in Lviv districts

Area	Number of sports facilities	Density of sports facilities per km ²	% of residential buildings within 500m of sports facilities
Galickiy	56	8.6	98.1
Sykhivskiy	113	4.5	83.6
Frankivskiy	94	8.4	95.8
Shevchenkivskiy	98	1.7	64.7
Lychakivskiy	91	2.5	67.6
Zaliznychniy	92	2.6	74.3
LVIV	375	2.7	72.0

while the lowest indicators are demonstrated by the Lychakiv (67.6%) and Shevchenkivskiy (64.7%) districts, which indicates the need to improve the accessibility of sports infrastructure in these parts of the city (Table 2).

To determine the current state and provision of sports infrastructure in the city of Lviv, a sociological survey of its residents was conducted. 294 respondents took part in the survey, including 58.3% men and 41.7% women. The survey covered responses from different age groups, where 25% of respondents are aged 35–45, 21.7% – 45–60, 18.3% – 25–35, 16.7% are under 18. Respondents represent all districts of the city, in particular Shevchenkivskiy

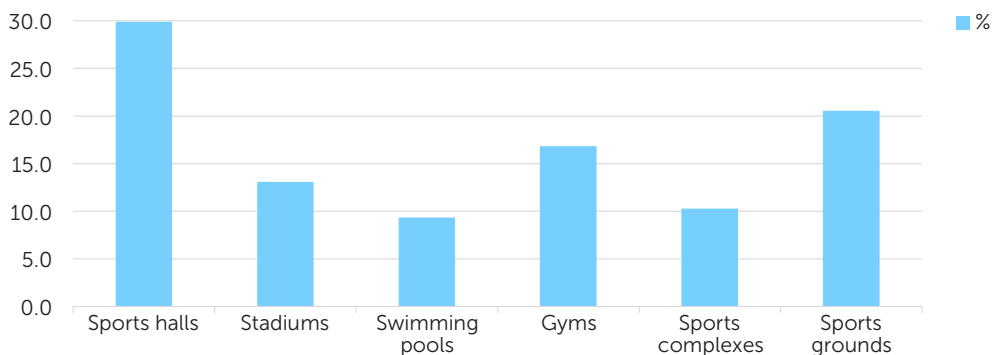


Figure 4 Use of sports infrastructure by residents of the city of Lviv

district – 40%, Lychakivskiy – 17%, Sykhivskiy – 15%, Zaliznychniy and Frankivskiy – 10% each, respectively, Halytskyi – 8%. 90% of respondents use the city's sports infrastructure, but the frequency of its use varies. 56.7% of respondents use sports facilities several times a week, 17% less often than once a week, and only 16% visit such facilities every day. For physical education and sports activities, respondents prefer gyms, sports grounds, and exercise rooms, and swimming pools are the least visited in Lviv (Fig. 4.).

About half of the respondents believe that the level of accessibility of the city's sports infrastructure is satisfactory, for 28% it is good, 12% excellent, but for 10% it is bad. According to the survey results, the condition of sports facilities (in particular, cleanliness, availability of equipment and level of technical support) was assessed by 43% of respondents as satisfactory. Good condition was noted by 39% of the respondents, while 10% consider it unsatisfactory. Only 8% of respondents described the condition of sports facilities as excellent.

An important characteristic of the urban sports environment is the accessibility of sports infrastructure for people with disabilities. This issue is of particular importance in modern conditions, when as a result of the armed aggression against Ukraine, there is an increase in the number of people with musculoskeletal disorders, in particular after amputations. Ensuring barrier-free access to sports facilities is not only a matter of social justice, but also an important step towards the rehabilitation, integration and improvement of the quality of life of those affected. Therefore, assessing the accessibility of sports infrastructure should include not only spatial indicators, but also aspects of physical accessibility for low-mobility population groups.

To create a barrier-free urban environment in Lviv, the city's infrastructure is undergoing significant modernization and adaptation. This process covers various sectors, including sports infrastructure, which is being improved to ensure accessibility and inclusion. However, there are a number of problems that hinder the creation of a barrier-free sports environment in the city of Lviv, including:

- insufficient number of ramps and other means of accessibility for people with disabilities;
- lack of special equipment for people with special needs to do sports;
- insufficient number of sports programs for people with special needs;

- lack of funding for infrastructure modernization;
- poor condition of roads and sidewalks near sports facilities;
- low awareness of staff about the needs of people with disabilities.

Solving these problems will contribute to the development of inclusive sports facilities in Lviv. By implementing the principles of universal design, Lviv strives to create environments that are comfortable for people with different abilities, promoting social inclusion and popularizing a healthy lifestyle, but also contributing to the development of adaptive sports. Adaptive sports are an important method of socialization of people with disabilities. They help overcome post-traumatic stress disorder, restore self-confidence and integrate former military personnel into society. This contributes to the creation of an extensive network of adaptive clubs and the provision of conditions for practicing one or another sport by war veterans and people with disabilities, depending on their interests and preferences. In the past 2024, the number of such clubs in Ukraine increased from 10 to 85, which indicates the need for such services. Such clubs offer swimming, fitness, archery, rugby, golf and other sports.

One of such institutions engaged in the development of physical culture and adaptive sports in Lviv is the Lviv Regional Center for Physical Culture and Sports for People with Disabilities “Invasport” – a center that works to popularize an active lifestyle and involve people with disabilities in professional and amateur sports. The center provides the opportunity to engage in athletics, swimming, table tennis, football, alpine skiing, wheelchair basketball, powerlifting, chess and checkers. In 2024, in Lviv, “Invasport” was a co-organizer of more than 30 sporting events in which about a thousand people with disabilities from different regions of Ukraine took part.

Adaptive sports in Lviv are actively developing; evidence of this is the holding of numerous sports competitions, including the national qualifying stage of Invictus. Games 2023 and the All-Ukrainian Adaptive Competition Beststrong Games 2024. Sports facilities hosting such competitions are becoming increasingly accessible, however, other sports facilities need to be modernized to increase their accessibility by installing special lifts, ramps, handrails, bathrooms adapted for people with disabilities, etc. (Fig. 5).



Figure 5 Accessibility of the athletics arena of the summer sports training base of the Ministry of Defense of Ukraine and the holding of the “Warriors’ Cup” in archery

Today, to improve its accessibility, sports infrastructure in Lviv city mainly equipped with sidewalk ramps and accessible toilets, less so with ramps. However, the biggest problems are with the provision of special lifts, elevators, and other assistive technologies.

Conclusions

Modern Lviv is in an active stage of development due to private investments in real estate. Many territories are being developed, housing is being built, commerce is developing, but unfortunately, it is practically not provided with appropriate sports infrastructure, which does not contribute to the quality of the living environment in the city.

The results of the study showed significant spatial unevenness in providing Lviv residents with access to sports infrastructure. An analysis of the pedestrian accessibility of sports facilities within 500 meters revealed that the best-equipped districts are Halytskyi (98.1% of all residential buildings are located in this accessibility zone), Frankivskyi (95.8%) and Sykhivskyi (83.6%). In contrast, the Shevchenkivskyi (64.7%), Lychakivskyi (67.6%) and Zaliznychnyi (74.3%) districts have the smallest number of residential buildings within accessibility, which indicates insufficient spatial integration of sports facilities in these parts of the city.

The study identified areas with a high concentration of sports facilities, in particular the central part of the city, which is associated with historical development and a dense infrastructure network. At the same time, some peripheral areas are insufficiently provided with sports infrastructure, which emphasizes the need to develop targeted programs for the development of sports infrastructure in these areas.

Barrier-free sports infrastructure is of particular relevance in today's conditions. The increase in the number of people with disabilities as a result of the war requires new standards of inclusion from the urban environment. The creation of accessible sports facilities for all categories of the population, including low-mobility groups, should become a priority in the process of further spatial planning and rehabilitation policy of the city of Lviv. In general, the results of the study emphasize the need for an integrated approach to the development of sports infrastructure, focused on uniform coverage of the city's territory, social inclusion and spatial accessibility of sports infrastructure for all residents of the city.

Creating conditions for city residents to actively spend their leisure time, including using the resources of mass sports and physical culture, is a key area of activity for authorities at all levels in solving the problems of forming a healthy lifestyle for the population and the quality of the living environment in the city. The use of sports infrastructure will contribute to the implementation of recreational, health, educational, and communicative functions and is an important means of developing city residents and human potential.

REFERENCES

- Declerck, L., Stoquart, G., Lejeune, T., Vanderthommen, M., & Kaux, J.-F. (2021). Barriers to development and expansion of adaptive physical activity and sports for individuals with a physical disability in sports clubs and centers. *Science & Sports*, 36(1), e1–e9. <https://doi.org/10.1016/j.scispo.2020.12.002>.

- Fitri, M., Abidin, N. E. Z., Novan, N. A., Kumalasari, I., Haris, F., Mulyana, B., Khoo, S., & Yaacob, N. (2022). Accessibility of inclusive sports facilities for training and competition in Indonesia and Malaysia. *Sustainability*, 14(21), 14083. <https://doi.org/10.3390/su142114083>.
- Gao, W., Wang, H., Liu, Y., & Zhang, J. (2022). Barriers associated with the public use of sports facilities: Facility management perspectives. *Frontiers in Public Health*, 10, 887654. <https://doi.org/10.3389/fpubh.2022.887654>.
- Grabski, M., Podgórski, Z., & Brykała, D. (2013). Sports and recreation facilities as components of the Wrocław's cultural landscape at the beginning of the 21st century. *Journal of Health Sciences*, 3(15), 182–197.
- Imas, Y., Ratnikov, D., & Andreieva, O. (2022). Development of sports infrastructure as a factor in engaging various population groups in recreational physical activity. *Theory and Methods of Physical Education and Sports*, (4), 27–30.
- Nazaruk, M., & Khudoba, V. (2022). Sports infrastructure as a recreational and tourism resource of the city of Lviv. *Visnyk of the Lviv University. Series Geography*, 56, 19–30. <https://doi.org/10.30970/vgg.2022.56.12516>
- Plan of sustainable urban mobility of Lviv. (2020). [PowerPoint slides]. Lviv City Council. https://city-adm.lviv.ua/lmrdownloads/Plan_Transport2020.ppt
- Price, A. E., Coffey, C. R., Kaczynski, A. T., & Stanis, S. A. W. (2023). Quantifying disparities in access to recreational and sports facilities across travel modes. *Journal of Transport & Health*, 30, 101582. <https://doi.org/10.1016/j.jth.2023.101582>
- Qiu, F., & Yang, Y. (2023). Accessible facilities construction and assistive technology application of public sports venues in Shenzhen, Guangdong, China. *Chinese Journal of Rehabilitation Theory and Practice*, 29(12), 1465–1472.
- Ryśnik, J., & Gibas, P. (2019). Identification of urban sports zones as a potential product of sports tourism using spatial dispersion indicators. *Studia Periegetica*, (3)27, 73–97. <https://doi.org/10.26349/st.per.0027.05>
- Sá, M. M., Azevedo, R., Martins, M. C., Machado, O., & Tavares, J. (2012). Accessibility of sports facilities for persons with reduced mobility and assessment of their motivation for practice. *Work*, 41(Suppl 1), 2017–2023. <https://doi.org/10.3233/WOR-2012-0425-2017>
- Samoilenko, T. (2019). Development of sports infrastructure as an effective tool for implementing social policy in the region. *Market Infrastructure*, (37), 523–529.
- Xiao, W., & Wang, W. (2022). Study on the accessibility of community sports facilities in Fuzhou, China. *Sustainability*, 14(21), 14331. <https://doi.org/10.3390/su142114331>
- Yi, E., Jeon, S. W., & Oh, A. (2022). Development of evaluation indicators for sports facilities for people with disabilities considering the universal design: Focusing on the Republic of Korea. *Healthcare*, 10(11), 2151. <https://doi.org/10.3390/healthcare10112151>
- Liu, Y., Wang, H., Sun, C., & Wu, H. (2022). Equity measurement of public sports space in central urban areas based on residential-scale data. *International Journal of Environmental Research and Public Health*, 19, 3104.
- Wibowo, J., Nugroho, A., Santosa, A., & Prasetyo, F. (2025). What kind of information about the accessibility of sports facilities do users need? *Frontiers in Rehabilitation Sciences*, 4, 1456789. <https://doi.org/10.3389/fresc.2025.1456789>