

RECONSTRUCTION OF STADIUMS: A CASE STUDY OF UKRAINE

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ABSTRACT

Motives: In Ukraine, stadiums have been built in line with global design and construction standards. Light and color play an important role in the design process, and traditional regional forms and ornaments have been incorporated into conceptual designs. The construction or reconstruction of stadium is fraught with numerous problems due to the need to separate different categories of spectators, ensure spectator comfort, and decrease project costs.

Aim: The aim of this article was to analyze and compare the condition of Ukrainian stadiums in 2020 and 2022–23, to identify the reasons for poor stadium maintenance, and to propose solutions to these problems.

Results: The main characteristics and design concepts of Ukrainian stadiums were described. The existing problems were identified in each stadium, and potential solutions were proposed. Stadium reconstruction projects were reviewed, and their strengths and weaknesses were described.

Keywords: sports facilities, football, development, investments, new projects

INTRODUCTION

Currently, the topic of reconstruction of sports facilities in Ukraine is becoming increasingly relevant. After the start of Russia’s full-scale invasion on February 24, 2022, a significant part of the sports infrastructure was damaged and destroyed by shelling. Therefore, it is important to review works that describe previous experience in reconstructing sports infrastructure, analyze the situation with sports facilities before the war, and describe the current situation (as of 2022), considering the extent of damage.

It is determined that modern tendencies in the design and construction of modern stadiums in world and Ukrainian practices are the innovation of constructive and volumetric-spatial solutions, the use of light and color in the conceptual decision of the stadium, the application of traditional regional forms and ornaments in the solution of the image. The study of foreign recommendations for the construction of modern stadiums, a comparative analysis with domestic legislation, the factors influencing the reconstruction of existing stadiums are identified: unimpeded access to the stadium, segregation of various categories of spectators and participants,

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measures for the safe evacuation (including emergency) of spectators, changing requirements to the comfort of the spectator and types of services, a reduction in government funding and an increase in the share of commercial self-service in the provision of stadiums, etc. As a result of previous studies, the principles of reconstruction of a multifunctional stadium, which are the basis for working with an object with its own unique history, were the result.

It should be noted that the last modernization of the domestic regulatory framework was in the form of Annex No. 1 from 1.10.2010 to the State building codes “Sports and sports facilities” (2003). This allowed for partial harmonization of Ukrainian design requirements with European ones for stadiums, two of which were built and two were reconstructed to participate in the European Football Championship in EURO-2012. Stadiums, of course, had to be certified for these competitions according to the requirements and criterias set before European sports facilities, which were set out in Union of European Football Associations (UEFA) regulations, in particular the Green Guide (The Guide to Safety..., 2018). As a positive phenomenon, we should mention the appearance among the current regulations of the “Regulations of stadium infrastructure and safety measures for football defects” (FIFA Stadium Safety..., 2020), which is developed to further harmonize with the provisions of Fédération Internationale de Football Association (FIFA) and UEFA, which are more demanding than current state building codes of Ukraine. The document was developed by the Ukrainian Football Association and does not have the status of mandatory state requirements, but non-compliance with these requirements will lead to the lack of stadium certification for competitions of the appropriate level.

More than ten years have passed since EURO-2012. The state of many stadiums in Ukraine had significantly changed since then. There is a need to analyze the current situation and actions that are going to be taken for the reconstruction of the stadiums depending on their state. Thus, the purpose of the paper is to analyze the state of the stadiums in Ukraine in 2020 and compare it with the state

in 2022–23, and also to find out the reasons for lack of maintenance and to propose possible ways to solve the problems.

LITERATURE REVIEW

A large number of publications by both Ukrainian and foreign scientists are devoted to the problems of studying and researching the reconstruction of existing stadiums. The most relevant are the studies of scientists from Germany, such as King (2012), Kutsevich (2014), Honcharenko et al. (2013), Chub (2017, 2018), Chub and Kreizer (2019, 2020) and others were engaged in research of reconstruction of the existing Ukrainian stadiums.

Klos (2012) drew attention to the problem of using stadiums outside of major sporting events. He contrasted stadiums with hotels because they bring profit not only during major events involving a large number of tourists, while for stadiums this is a significant problem. The author sees the multifunctionality of stadiums as a solution to this problem.

Güppert (2012) studied the peculiarities of the architect’s choice of the stadium roof shape. The importance of such a choice is due, in particular, to the fact that it has a significant impact on the city’s landscape, as stadiums are often visible from many points of the city. The scientist paid special attention to the transformable roof, because, in his opinion, it increases the level of comfort of the spectator, as well as the multifunctionality of the stadium.

Trzepacz (2020) studied the specifics of the localization of stadiums in cities. He argues that the change in localization has occurred in such a way that stadiums have been pushed away from the central part of cities and their outskirts to the outer fringes of the urbanized area. The researcher emphasizes that many factors need to be taken into account when building a stadium. Among them is the question of how the stadium will function after the event for which it was built. As an example, Trzepacz cites the Arena BRB Mane Garrincha, which, after completing the 2014 FIFA World Cup, began to function as a bus parking lot.

Naumko and Samoilenko (2019) have been working to justify the need for reforms in the system of organization and management of sports in Ukraine. The researchers note that the provision of the Ukrainian population with sports and recreational facilities and other infrastructure elements is currently more than three times below the required level. The sports infrastructure and physical activity of the Ukrainian population are in direct proportion to each other. Therefore, the number and quality of sports facilities should directly affect the physical activity of citizens.

Nikitenko (2016b) studied the specifics of financing physical culture and sports in Ukraine in the context of the crisis caused by economic and political factors, as well as the war. The scientist noted that in the context of the crisis and the war with Russia, unconquerable corruption in Ukraine, physical culture and sports are funded by the state on a residual on a residual basis. This situation has had a negative impact on the development of a number of sports. Under these conditions, the state and sports federations were forced to decide on the priority sports that should be developed and financially supported.

Solopenko (2018) noted, that the development of a system of financing physical culture remains relevant, so it is time to focus on: developing state-targeted programs for financing physical culture and sports; identifying priorities for physical education and sport; improved organization and financing of physical education and sport; improved regulatory and legal framework; streamlined system of physical education institutions; improved mechanisms of financing physical culture and sports.

MATERIALS AND METHODS

The official documentation and state building regulations were analyzed, the Ukrainian regulatory framework was compared with the European one, in order to determine the convergence of its requirements for the design of stadiums with the European ones, as well as the compliance of existing stadiums in Ukraine with the requirements and criteria put forward for European sports facilities (Chub & Kreizer, 2020;

DBN..., 2003; FIFA Stadium Safety..., 2020; IAAF Track..., 2008; The Guide to Safety..., 2018).

For the stadiums considered in the study, the following were studied: their history, the reasons for reconstruction, the main components of the reconstruction project, the purpose of the stadium, the events that were held in it, as well as those that are planned to be held. For this, method of historical study of the stadiums' evolution and system method were applied.

The state of stadiums is compared depending on the presence or absence of a leading sports team training there and depending on the owner of the stadium and their policy.

The "CSK ZSU" stadium is located in Kyiv, the capital of Ukraine, which has repeatedly hosted guests from almost all over the world. Therefore, the state must provide funding for the stadium, so it corresponds to the IAAF category, because it is planned to hold international competitions of European or world level. Also, in this stadium it is planned to train ZSU fighters and conduct their rehabilitation, which creates the need to increase the level of overall funding for the training of high-class army athletes, especially in the realities of a full-scale war.

The last renovation of the "Metallurg" stadium in Kryvyi Rih took place in 1999, and then it conformed to UEFA standards. However, after the collapse of the "Kryvbas" team, after some time due to the lack of any support the stadium was abandoned, resulting in athletes had to train literally in unsafe conditions. In 2020, renovation work began, but it only touched the facade of the stadium, moreover, without any safety requirements. Therefore, it is important to develop a proper strategy for the reconstruction of the stadium.

At the end of 2014 Kharkiv "Metalist" stadium began to have significant financial problems because of debts to the team "Metalist", which, among other things, were considered by FIFA and the Court of Arbitration for Sport in Lausanne in favor of the plaintiffs. Because of the lack of financial support, the stadium may be as abandoned as "Metallurg" stadium in Kriviy Rih. In addition, in the summer

of 2022 the stadium was partially damaged during the shelling by Russian missile fragments. Therefore, it is also important to consider possible solutions to the financial problems to maintain the existence of this stadium.

It is worth noting that Kharkiv and Kryvyi Rih are located in eastern Ukraine, and as a consequence, these regions suffer most from shelling by the Russian Federation, which damages civilian infrastructure, including sports infrastructure. Therefore, looking at these cases, it is possible to find ways to further rebuild the affected stadiums once the full-scale invasion is over.

A comprehensive analysis of the current state (as of 2022) of the stadiums was carried out, in particular, the date of the last reconstruction was taken into account, as well as the legal affiliation of the stadium to the city council, its maintenance, the budget allocated for the care of the stadium and its territory, as well as the state of documentation for the stadium and potential projects for its reconstruction (Karch, 2020). The impact of military actions after the start of Russia's full-scale invasion was analyzed.

RESULTS AND DISCUSSION

The state of stadiums and sports facilities in Ukraine

Today, in Ukraine, there are more than 106,000 sports facilities for various purposes (1108 stadiums with stands for more than 1,500 people, 11,700 grounds with gym equipment, 1,300 grounds with synthetic turf, 11,700 football fields, 16,400 premises for physical education and recreation, more than 17,000 gyms, 601 swimming pools, 89 rowing and sports facilities, 58 equestrian and 69 ski facilities, 62 artificial ice facilities, etc.) (Fig. 1). However, a significant part of these sports facilities was built during the Soviet era in Ukraine, they have exhausted their depreciation capacity, have a not very attractive appearance and low capacity.

According to statistics, in 2016–2019, more than UAH 1 billion was allocated in Ukraine for the restoration of sports infrastructure in the regions.

These funds were used to restore and build 32 facilities in 2016 for UAH 100 million, 100 facilities in 2017 for UAH 374 million, and 137 facilities for UAH 600 million in 2018 (Naumko & Samoilenko, 2019). From 2016 to 2018, 2650 sports facilities were built. For the first time, a subvention was provided to local budgets for the construction of sports palaces (UAH 150 million). Construction of sports palaces has begun in Rivne (UAH 42 million) and Khmelnytskyi (UAH 54 million). The budget of the Ministry of Youth and Sports provided UAH 400 million for subventions to the regions for the repair, reconstruction and construction of sports palaces and swimming pools (Naumko & Samoilenko, 2019).

Strengthening the material and sporting base of sports and building of new sports facilities is a prerequisite for building a healthy nation. Modern sports facilities play a special role in improving the health of Ukrainians. Today, the construction of sports facilities is becoming increasingly important. However, Ukraine has not yet formed the necessary modern sports infrastructure at the place of study, residence, work and recreation.

Overview of sports infrastructure reconstruction projects in Ukraine

Today, work continues in the framework of cooperation between the Athletics Federation of Ukraine and the Ministry of Defense of Ukraine on the construction of a new athletics infrastructure as part of the reconstruction of the **Kyiv stadium “CSK ZSU”**, located on Povitroflotsky Avenue, 6 in Kyiv (Chub & Kreizer, 2020). The history of the stadium, the reasons for its immediate reconstruction, the main components of the project, the authors described in detail at last year's conference, as well as in their article (Chub & Kreizer, 2020). The purpose of the stadium is declared as: sports of the highest achievements (athletics, football, modern pentathlon and so on); physical training of servicemen; physical and physiotherapeutic rehabilitation of combatants; holding competitions in the system of the International Council of Military Sports; development of children's and youth sports. That is, according to the above,

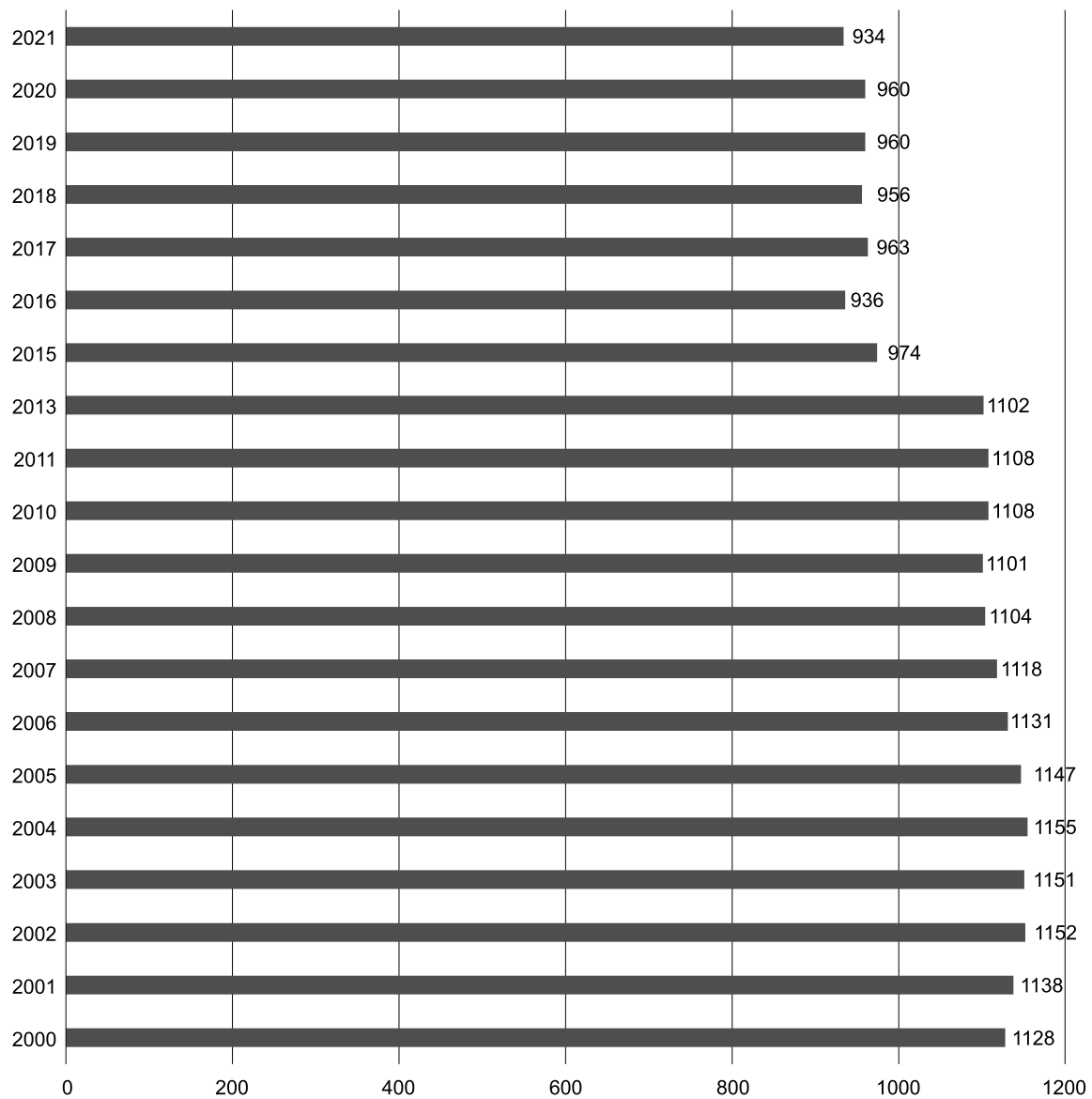


Fig. 1. Amount of stadiums with stands for 1,500 seats and more in 2000–2020 in Ukraine

Source: Statistical Yearbook..., 2020.

in addition to the national level, it is a competition of European or world level. The infrastructure of the stadium is designed mainly for competitions of the appropriate level of athletics. Requirements for such sports facilities are set out in the documents of the International Athletics Federation (IAAF) (IAAF Track and Field..., 2008).

This stadium, located in the center of the Ukrainian capital, together with a training running complex,

a complex for training in javelin throwing, discus, shot put, etc. can become the main base for training the national team of Ukraine, athletes of Kyiv, and a place of high-quality championships of continental and domestic levels. In addition to total preparation and special training of ZSU servicemen in the program of purely military training, rehabilitation of employees and their families, training of high-class army athletes, it is very important to increase the level of total

funding for training high-class army athletes, as well as renewal and reconstruction of unique Olympic bases are subordinated to the Defense Ministry.

The stadium must comply with the IAAF category, which will allow to host level competitions for the European Championship and the European Cup inclusive. Also, let's not forget about the ambitious plans of the army to hold Invictus Games in Ukraine – Igor Neskorenkh (Fig. 2).

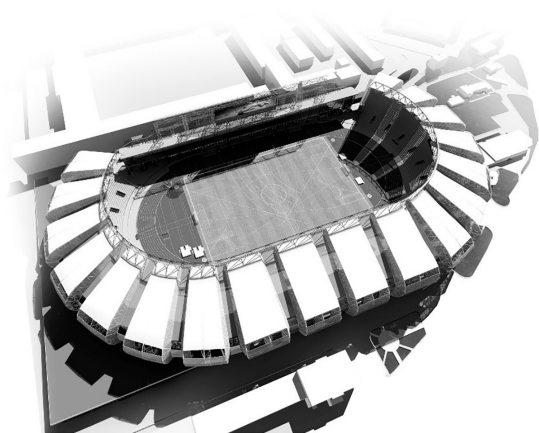


Fig. 2. The concept of construction of the central arena of the stadium of the Central Sports Club of the Armed Forces of Ukraine

Source: Chub and Kreizer (2020).

One of the main problems at the moment is the financing of sports infrastructure. The difficult macroeconomic situation in Ukraine has led to a crisis financial condition of physical culture and sports. The reduction in the amount of funds allocated from the state budget has had a negative impact on the development of physical culture and sports. In such conditions, physical culture and sports facilities are put on a sports facilities are on the verge of survival (Naumko & Samoilenko, 2019).

Kryvyi Rih stadium “Metallurg” once a successful multifunctional sports facility, is now overgrown with grass and weeds. The last reconstruction was at the stadium in 1999, on the 225th anniversary of Kryvyi Rih. Then, according to UEFA requirements, individual plastic seats and a VIP box were installed at the stadium. While the “Kryvbas” football club was alive and matches were held in the arena, the stadium

was more or less well-groomed. Stars performed here and held concerts dedicated to the City Day and the Metallurgist’s Day.

In the spring of 2013, Kryvbas ceased to exist. FC “Girnyk” played at the stadium for some time, but soon the team moved to its own base. Then the players of the “Girnyk” rugby club trained and played here, but the team ceased to exist in November 2019. Today the sports facility belongs to the Kryvyi Rih City Council and is on the balance of one of the city’s sports schools. There are no people in the staff of CYSS No. 1 who would take care of the football

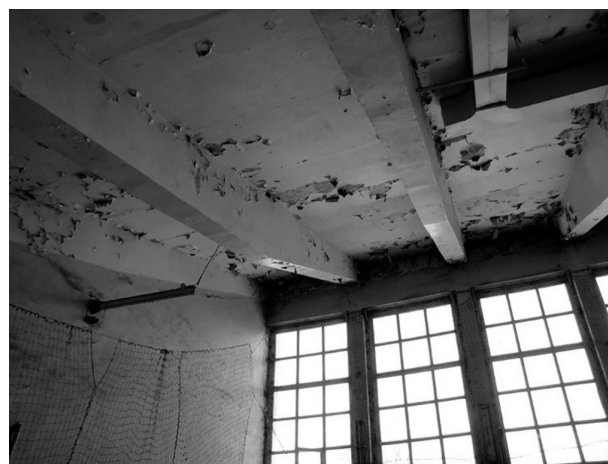


Fig. 3. Emergency condition of the hall of “Metallurg” Stadium
Source: created by authors (2021).



Fig. 4. Unsatisfactory condition of the tribune covers unsatisfactory condition of the tribune cover
Source: created by authors (2021).

field. And there is no money in the communal school for the maintenance of such a huge stadium either. The stadium has not been repaired for several decades; it is in disrepair. Athletes are forced to practice and compete in halls with moldy walls and perforated bridges (Figures 3–4).

The return of big football in the city of miners and metallurgists are looking forward to. Fans are ready to support even the renamed project to restore the former glory of the main team of the city and re-immense themselves in the emotions of football battles (Figures 5–6). Recently, the city of Kryvyi Rih was nominated in the private competition European Capitals and Cities of Sport Federation for the title of “European Capital of Sport”.

The Department of Capital Construction of the Dnipropetrovsk Regional State Administration has announced the purchase of services for the recon-



Fig. 5. Kryvyi Rih stadium “Metallurg” (2020)
Source: Chub and Kreizer (2020).



Fig. 6. Kryvyi Rih stadium “Metallurg” (2020)
Source: created by authors (2022).

struction of the main sports arena of Kryvyi Rih. The project was taken as a basis, the development of which was ordered in 2015–2016 by the Department of Capital Construction of Kryvyi Rih in the project organization of the State Enterprise PPKTI “Kryvyi Rih BUDPROJECT” (Karch, 2020). Project documentation for the overhaul of the stadium was rejected by the State Architectural and Construction Inspection as inconsistent with the new construction standards. Today, the project is undergoing another adjustment in the regional administration.

In April 2020, repair work began at the “Metallurg” Stadium. But the much-needed building repairs began with the facade, the design solution was developed separately (Fig. 7). And it seems that this will be the only work that will be carried out at the stadium. The facade of the stadium, of course, looks bad, but the emergency basement, with falling plaster, covered with mold and fungus, look much scarier. In addition, in Kryvyi Rih it was decided to place architectural lighting on the not yet repaired facade (The Guide to Safety..., 2018).

Nikolaenko and Petruk (2014) noted, that it is typically important to expand the site and give it easy access to all metropolitan areas when building citywide physical education and sports centers. Sometimes it is necessary to demolish low-value structures in order to expand the complex’s site, which, according to the system reconstruction project, should become a citywide physical culture and sports center (in the absence of undeveloped areas on its borders). This transforms the monocentric system into a polycentric system (Nikolaenko & Petruk, 2014).

The theoretical model’s transformation, location, and creative application are necessary for system reconstruction. Yet, it must always be a cohesive system, with each component’s position and role determined by those of the others, as well as by how it interacts with other public institutions, the city’s planning framework, and the settlement system. Urban physical culture and sport complexes must, like any system, have a certain redundancy of functional connections, materials, and places in order to prepare for unforeseen development (Nikolaenko & Petruk, 2014).



Fig. 7. Design solution for the restoration of the facade of the stadium with lighting
Source: created by authors (2021).

Given the current situation (as of 2022) at the Kryvyi Rih stadium “Metalurg”, we can conclude that, unfortunately, among city officials, as well as in the Ministry of Youth and Sports there is no strategy for development and planning of construction and reconstruction of existing multifunctional stadiums at both national and at the regional level.

The fate of **Kharkiv’s “Metalist” Stadium** (Fig. 8), which also lacks its own team today, may be similar in the near future and, as a result, its constant operation. “Shakhtar’s” trainings and games took place at the stadium for some time. “Metalist’s” financial problems began in late 2014, after a change of ownership. There

were big debts to the players and the coaching staff. Eventually, the “Metalist” team ceased to exist and in 2017 did not compete in any of the all-Ukrainian competitions. Debts to players have not yet been repaid, and were considered by FIFA and the Sports Arbitration Referee in Lausanne in favor of the plaintiffs. Now in Kharkiv there are two versions of the team’s rebirths: “Metalist 1925” (created in 2016 by fans, plays in the First League) and “Metal” (created in 2020 by a functionary of “Metalist” under V. Yaroslavsky Eugene Krasnikov, Second League). Both clubs are not “Metalist’s” successors yet.

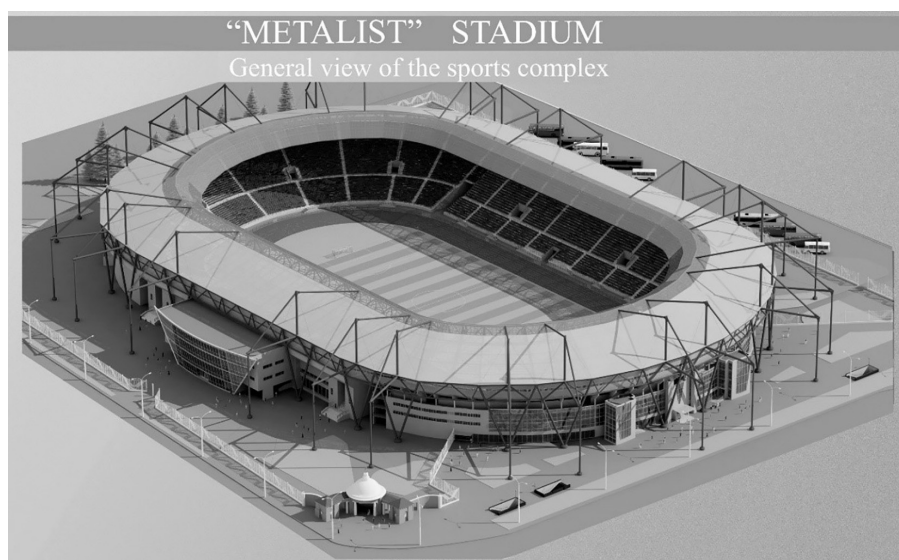


Fig. 8. Reconstruction project for “Metalist” Stadium in Kharkiv
Source: Chub and Kreizer (2020).

Nikitenko (2016a) explains the specifics of the current financing of Ukraine’s “physical culture and sports” sector and initiatives at reform. He points out that the majority of funding for non-profit sports and fitness organizations and institutions comes from state budgetary money, and the particulars of management are brought about by the social orientation of these organizations. Professional clubs are primarily supported by the owner’s cash, sponsorships, and commercial activity.

Now businessman V. Yaroslavsky, former president of the “Metalist” team from 2006 to 2012 (with him the team won the bronze medal of the Ukrainian Championship eight times, reached the 1/4 of the Europa League), puts forward a proposal to revive the team, but on its own terms. It is becoming clear that such large multifunctional buildings require large financial costs that cannot be covered from local budgets, require investment, additional financial infusions, and better yet, strategic plans and measures that could help prevent the negative consequences of cost-effective construction projects.

In October-November 2020, the STEEL FREEDOM competition was held among Ukrainian students of architecture and construction, organized by the Ukrainian Center of Steel Construction Association, whose mission is to promote steel as a predominant material in the construction and reconstruction of real estate. The general partner of the competition is Metinvest Group. The competition was supported by the National Union of Architects of Ukraine. In the technical task STEEL FREEDOM of 2020 two categories of competitive projects were declared:

- creation of a stadium project in Mariupol. The customer of the project is Mariupol City Council;
- creation of a project of a multifunctional sports and educational complex in Ivano-Frankivsk. Developer of the DC Evolution project.

The review of the projects submitted to the competition showed modern views on the formation and functional organization of stadiums and sports complexes, interesting were the solutions of structures, the organization of the environment. The issues of long-term existence and planning of measures

to maintain the proposed architectural solutions were not raised by the organizers and, as a result, were not addressed by the participants.

The state of Ukraine’s sports infrastructure during a full-scale war

During the full-scale war, Russian troops partially or completely destroyed more than a hundred facilities on the territory of Ukraine (113 as of July 2022). Among them, 63 sports complexes, 17 stadiums, nine swimming pools, three ice arenas, and one cycling complex were affected. Most of them (30) were destroyed or damaged in Donbas, where active hostilities are currently underway. It is stated that 19 sports facilities were completely destroyed during this time (Vadym Gutzeit: During the full-scale invasion... , 2022). In particular, a stadium in Volnovakha, a cycling track in Lyman, an ice palace in Sievierodonetsk, the Neptune swimming pool in Mariupol, the Olimp sports center in Kreminna, the Avangard sports complex in Kyiv, the Chernihiv training and sports center, and many others were destroyed. “Metalist” Stadium in Kharkiv the stadium was shelled but has not yet suffered significant destruction.

The Druzhkivka Altair Ice Arena was opened in 2013. It was built as part of the state program Hockey of Ukraine. It was home to a large children’s and youth sports school for hockey and figure skating, where up to 3,000 students were trained. After the occupation of Donetsk and part of the region, the arena became the home ground for the Donbass hockey club. It is the largest hockey and figure skating school in Ukraine. The Altair Ice Arena was shelled by the Russian army on the evening of January 2 (Russia destroyed the ice arena... , 2023). One of the rockets pierced the roof. The blast wave destroyed the wall and damaged the glass sides (Fig. 9).

A sports complex with a stadium was damaged as a result of shelling by Russian troops in Donetsk Oblast. As a result of the occupiers’ actions, the “Metallurg” football and track and field sports complex in Bakhmut were destroyed (Fig. 10). The sports complex was built in 1949. In 2012, it was reconstructed for UAH 119.4 million (Rocket strike

destroys..., 2022). The complex hosted sports events at the city, regional, national, and international levels in athletics, martial arts, and football. The arena was used for training the Olympic and Paralympic athletics teams.

In total, the Ministry of Youth and Sports of Ukraine estimates the total damage caused by Russian attacks on sports facilities at more than \$160 million. However, the authors should note that at this point it is impossible to assess what the damage to the sports infrastructure will be, as the full-scale war in Ukraine continues. On July 4, 2022, the Recovery Plan for Ukraine was presented in Switzerland, where the

main approaches to post-war reconstruction in the field of physical culture and sports were considered (Develop Culture and Sport systems...). The plan prioritizes 5 project areas:

1. Creation of active parks across the country;
2. Launching a “club system” of funding for mass sports;
3. Reconstruction of sports boarding schools and schools;
4. Implementation of the presidential program “25 sports magnets”;
5. Opening 5+ flagship top-class sports facilities.



Fig. 9. The Druzhkivka Altair Ice Arena before and after the shelling
Source: Russia destroyed the ice arena... (2023).



Fig. 10. “Metallurg” sports complex in Bakhmut before and after the shelling
Source: Rocket strike destroys... (2022).

CONCLUSIONS

In the future, Ukrainian cities will continue to invest in the design of new and reconstruction of existing multifunctional sports complexes to maintain their prestige and secure a place on the country's sports map. It was determined that it is necessary to involve the jury of architects and sports managers who are specialists in the design of modern stadiums and sports facilities.

On the example of “CSK ZSU” in Kyiv, “Metallist” in Kharkiv, and “Metallurg” in Kryvyi Rih, it was shown that stadiums need to be reconstructed according to modern requirements, and the legislation and regulations for the design of stadiums should be reviewed and updated. Another problem is unwanted financial waste. It can be prevented only by sustainable planning measures in the creation of sporting and mega sporting events. It is necessary to apply the principles of planning:

1. Forecasting of sports events;
2. Forecasting long-term use;
3. In case of not long-term use of object it is necessary to lay down measures on rigid economy, or as an option – transformation or adaptation to other types of sports activity;
4. Continuous monitoring of existing multifunctional stadiums, as declared by current building codes.

Reconstruction of the stadium is a complex process, for which it is necessary to take into account existing state and international standards, the status of the stadium, the need to ensure safety for spectators and athletes. It is important to reduce public funding and increase the level of commercial independence, to pay attention to the business planning of the complex and marketing strategy.

The problem of not using the stadium for a long time should be solved by the possibility of adapting it for various activities. Despite the fact that the appearance of the stadium is important, the priority during the reconstruction should be the repair of the load-bearing structures, basements and other interior spaces. At the same time, it is important not to draw attention with color and lighting to the elements that have not yet been reconstructed.

Another important problem that necessitates the reconstruction of stadiums is the full-scale invasion by Russian troops and the destruction of sports infrastructure by shelling. Currently, the damages are worth hundreds of millions \$US. Nevertheless, Ukraine is already working to rebuild what was destroyed after the victory. Thus, the Ministry has opened a special account at the National Bank of Ukraine to receive funds from international partners to rebuild all the lost sports and youth infrastructure in the future.

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