



ОГЛЯДОВА СТАТТЯ

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THE SYSTEM OF URBAN GREEN AREAS IN ZHYTOMYR, UKRAINE

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The area of Zhytomyr is 6083 hectares and the area in the urban system is 4229.8, which is about 69.5 % of the total area of the city. The system of urban green areas of Zhytomyr includes three groups of plantations: green areas for public use, restricted use, and special purpose. These plantations have not been inventoried for more than 35 years. Currently, almost all elements of the green zone of the city have indicators below the norm, especially in terms of beautification. Only 135.0 ha, 40.3 % of public use green areas, have a proper level of beautification. The authors recommend to include in the city master plan the inclusion of coastal stripes, partially water protection zones of all rivers in the structure of separate objects of landscape architecture, mainly landscape parks, improve the location of such facilities throughout the city because most of the residential areas in the center of the city do not have enough recreational areas (parks, squares). Zhytomyr is located in the Polissya climatic zone, the area under forest is 29 %. For the existing population of 270.9 thousand people, 44.7 thousand hectares of green area forests are needed, of which the municipal forests will be 5.4 thousand hectares. The territory of most industrial enterprises has 20 % of green areas, institutions and organizations of defense have 40 %. Of the requirements for urban green areas, the highest priority should be given to the regulatory level of landscaping both within urban areas and beyond. The level of the green area of the territory of most schools, kindergartens, public institutions, hospitals meets the normative indicators. There are 62.0 hectares of forest plantation within the railroad drainage area, about 2.0 hectares of open land with herbaceous vegetation. The authors noted that plantations along the railway are of great importance for the formation and contemplation of landscapes, so plantations and dendrological composition should take into account these circumstances. The composition of herbaceous vegetation should be regulated by the necessary care, the harmful weed species, especially the quarantine species, should not be allowed to reproduce. At present, there are no sanitary protection zones of enterprises, about 15 % of the area of 1–2-storey buildings are located in the contamination zones of harmful emissions of enterprises, which must be taken into account when creating green spaces, constructions of these plantations and selection of the necessary range of trees, shrubs, lawns.

Key words: plantations, use, landscaping, beautification

Introduction

With the rapid development of urbanization and economic growth, urban agglomerations have

become an effective way to realize resource sharing and reduce environmental dependence (Yuan *et al.*, 2019).

Urban spaces are increasingly exposed to air

pollution, which critically influences the health and well-being of cities' inhabitants. Urban green areas provide recognized important environmental and social functions (Silva, 2019). Urban green areas are important locations for people who live in cities to experience nature. This experience can include intangible elements such as fresh air, sunshine, and being outside, as well as more tangible elements like flora and fauna (Irvine et al., 2013).

Nature observation offers possibilities to both experience nature and learn about it, and is further associated with multiple benefits. According to Kaplan (1984), observing is a level of involvement with nature that can enhance the restorative experience in the urban environment and which includes a substantial mental activity. Kaplan points out that even if the observation is considered a passive form of involvement, opportunities for noticing and observing can also emerge in more active interactions with nature like during a walk (Kuldna, 2020).

Although cities occupy only 2 percent of the planet's surface, their inhabitants use 75 percent of its natural resources. The world is urbanizing quickly, too: by 2050, 70 percent of the global population will live in cities and towns. Sustainable urban development is crucial, therefore, for ensuring the quality of life of the world's people. Forests and trees in urban and peri-urban environments, if properly managed, can make important contributions to the planning, design, and management of sustainable, resilient landscapes (Salbitano, 2016).

Urban greening is most important in order to keep the connection with nature and for people's health. Often we see rapid destruction of green planting, which has a negative impact on natural conditions and human health in the long run. The reduction of green spaces is directly related to the tendency of an increase in natural disasters (Khoshtaria & Chachava, 2017).

Zhytomyr is located on the slopes of the Teteriv, Kamianka rivers, on sandy podzolic and loess soils, on the border of the transition from the Polissya to the forest-steppe zone. The relief forms produced by the river network clearly stand out. With the development of the city increases the man-made load on soils, there is a gradual process of flooding, prerequisites for raising groundwater levels to the mark of occurrence of loess soils.

In the green area of the city, there are three groups of green areas, defined by functional features (Fig. 1):
public use – parks, squares, boulevards - elements of

urban development; hydropark, forest parks, forests - outside of buildings;
restricted use – planting in the territories of residential and public buildings, schools, kindergartens, industrial enterprises, sports facilities, health care facilities, etc.;
special purpose – planting along streets, sanitary and protection zones, areas of cemeteries, botanical gardens, military units.

The formation of the green zone is aimed at improving the ecological situation in the city as well as in the adjacent territories, and the enrichment of recreational resources. Ukraine's international commitments and climate change-related measures have become increasingly important in recent years. In this context, the green zone of the city should also act as a significant adsorbent of greenhouse gases (carbon dioxide, methane, nitrous oxide, etc.).

Material and Methods

The purpose of the work is to analyze the green areas of Zhytomyr and assess their compliance with the regulations. The formation of the green zone is governed by the Law of Ukraine "On the beautification of settlements" (2005), as well as government decrees and orders, state building codes (State ..., 1992; Rules ..., 2006; On approval ..., 2007).

An inventory of green space in the city has not been conducted since 1985. Employees of the Zelenbud Municipal Enterprise of the Zhytomyr City Council conducted only an accounting of the areas of public use green areas and forests within the city. Therefore, the analysis of the current state of affairs was carried out on the basis of data from Zelenbud, materials for the establishment of boundaries of individual objects, mapping materials, and other sources, expert research of objects.

Results and Discussion

The area of Zhytomyr is 6083 hectares. Under various development, the area in the urban system is 4229.8, which is about 69.5 % of the total area of the city. The green area of the city occupies 7.9 % of the total area of the urbanized area (green areas of public use and forests) (Fig. 1). Solid roads cover 324.0 ha (5.3 % of the total area) and external transport 230 ha (3.8 % of the total area) (Table 1).

Currently, almost all elements of the green zone of the city have indicators below the norm, especially for the level of beautification of the riverine territories of Teteriv, Kamianka, Lisova, Guiva, and Gnilopyat.

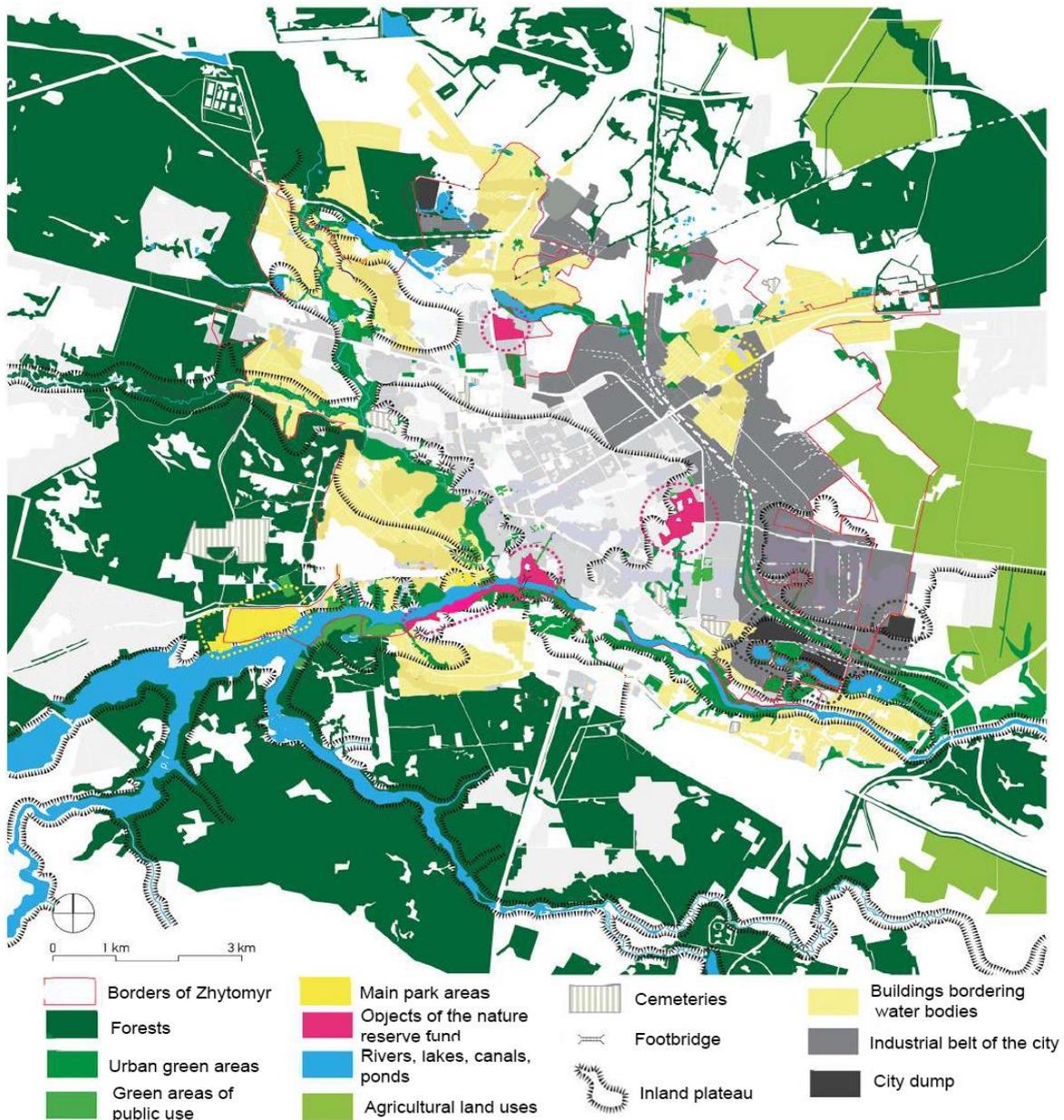


Fig. 1. The green, protected and polluted areas of Zhytomyr

At present, there are no sanitary protection zones of industrial enterprises in the city and their improvement has not been carried out. The arrangement of the adjoining territories is insufficient.

Green areas of public use. This group of plantations by degree of use, level of improvement, normative indicators consists of plantations of public use of the urban area – parks, squares, boulevards and plantations of public use outside of buildings located both within the city and in the surrounding areas – municipal forests, meadow parks, hydroparks, and urban green area forests. Of the total planted area of

public use areas, approximately 135.0 ha (40.3 %) have an adequate level of beautification.

The most important objects within the city are the Y. Gagarin Recreation Park, assigned to the category of the park the monuments of landscape art, a memorial of Eternal Glory, Victory 30-th Anniversary Park; squares, located mainly along the Kyivska, Lech Kaczynski, Berdichevska streets, at the railway station; Old, New, Polish boulevards and other objects. Square, Y. Gagarin Park and the Memorial of Eternal Glory have the proper level of beautification.

Table 1. Distribution of land within Zhytomyr

Indicators	ha	%
The territory within the city	6083.0	100
Residential buildings	2416	39.7
Public buildings	383.4	6.3
Lands of the Ministry of Defense of Ukraine	379.0	6.2
Industrial buildings	642.4	10.6
Communal and warehouse buildings	409.0	6.7
Transport infrastructure	554.0	9.1
Landscape and recreational zone	479.6	7.9
including:		
green areas of public use	335.0	5.5
forests	144.6	2.4
conservational lands	71.6	1.2
agricultural lands	375.0	6.2
water objects	157.8	2.6
other territories	215.2	3.5

We recommend to include in the city master plan the inclusion of coastal stripes, partially water protection zones of all rivers in the structure of separate objects of landscape architecture, mainly landscape parks, improve the location of such facilities throughout the city because most of the residential areas in the center of the city do not have enough recreational areas (parks, squares).

The regulatory area of the objects of this group of plantations with a prospective population

of 270 thousand people will be 432.0 ha. It is advisable to bring the public use green area to 477.0 ha. Thus, the provision of city residents with green spaces for public use will be 110.6 % or 17.7 sq. m/person at a standard of 16.0 sq. m/person.

The estimated cost of building new parks, extending and renovating existing ones, as well as improving the squares and boulevards are shown in Table 2.

Table 2. List of urban green areas for public use

Objects	Total area, ha	Estimated cost, mil. UAH
Y. Gagarin Recreation Park	60.0	13.0
Victory 30th Anniversary Park	17.0	4.0
Central Park	14.0	6.0
Memorial of Eternal Glory	8.0	3.0
Landscape park Livoberezhnyi	20.0	26.0
Landscape park Skhidnyi	25.0	11.0
Landscape park Malovanskyi	40.0	21.0
Landscape park Smolianskyi	10.0	13.0
Landscape park Bohuniia	33.0	43.0
Smokovskyi Park	9.0	6.0
Landscape park Kroshenskyi	80.0	60.0
Landscape park Sokolova hora	50.0	53.0
Landscape park on Lisova river	29.0	25.0
Landscape park on Teteriv river	50.0	53.0
Squares, boulevards	32.0	37.0
Total	477.0	374.0

The regulatory green area for urban parks is at least 65 % (State ..., 1992). Expansion of existing parks, construction of new ones are planned mainly in the river valleys, which will be a significant conservation measure, enrich the landscape of the city, improve conditions for recreation.

The urban green areas with less load on the landscape, lower levels of beautification and recreational activities inherent in the natural landscape include green areas of public use outside the buildings – forests, municipal forests, meadow parks, hydroparks.

Zhytomyr is located in the Polissya climatic zone, the area under forest is 29 %. According to the “Standards for defining areas of forest areas pertaining to forests of green areas”, the normative indicator for forest areas is 1650 sq. m./person, from this area the part of the municipal forest – 200 sq. m./person.

For the existing population of 270.9 thousand people, 44.7 thousand hectares of green area forests are needed, of which the municipal forests will be 5.4 thousand hectares.

Within the city, the area of forests is 144.6 hectares. The insignificant area of forest land within the city limits the necessity of organizing a green zone from the forest areas adjacent to the city of the state enterprise “Zhytomyr Forestry”.

According to forest management materials, the area of forest parks requires 6.0 thousand hectares, about 30.0 thousand hectares is a valuable category of green zone forest.

In addition, the territory surrounding the Zhytomyr region contains 6.6 thousand hectares of the Ministry of Agrarian Policy and Food of Ukraine forests and about 1.5 thousand hectares of forests of the Ministry of Defense of Ukraine.

The level of the green area of municipal forests should be at least 96 %; paths, patches should occupy – 2,5–3 %; structures – 1–1,5 % of the total area of the municipal forest.

Forests are a fire-dangerous, that’s why fire-prevention measures should be a priority. The location of treatment and recreation facilities, other-purpose buildings in pine-dominated woodlands, or adjacent to such woodlands, are associated with a significant risk of damage to the highland fire in the event of its occurrence. Green areas of restricted use include areas of green space for apartment and farm buildings, service establishments, wellness, recreational, historical and cultural significance, public organizations, educational institutions, health care, industrial and utility enterprises.

There is a pattern of distribution of plantations by breed composition, aesthetic value. Thus, in the territories of earlier development, plantations are characterized by a wider range of trees and shrubs, but they lose the aesthetic value due to the denseness and haphazardness of plantings due to the activity of residents (many fruit trees, bushes were planted). Central residential areas, especially the historical part of the city, have more well-groomed areas of plantations, flower beds, lawns.

The territory of most industrial enterprises has 20 % of green areas, institutions and organizations of defense have 40 %. The level of the green area of the territory of most schools, kindergartens, public institutions, hospitals meets the normative indicators. When reconstructing hospital plantations, it is necessary to give preference to light coniferous tree species (*Pinus sylvestris* L., *Pinus strobus* L., *Pinus nigra* Arnold).

Green areas of special purpose include:

- sanitary protection zones of industrial enterprises;
- zones of sanitary protection of water sources;
- security zones of engineering structures, including engineering communications, highways, railways;
- greening of streets, squares, road junctions;
- the territory of cemeteries and their sanitary protection zones.

The area of the streets is 381 hectares, which includes 94 ha (24.7 %) of the green area. This type of planting is a significant impediment to the spread of pollutants from the combustion of motor fuel. The air-cleaning function of street plantations in the city is not sufficiently taken into account both in the designs of these plantations and in the assortment of trees and shrubs.

There are 62.0 hectares of forest plantation within the railroad drainage area, about 2.0 hectares of open land with herbaceous vegetation. It should be noted that plantations along the railway are of great importance for the formation and contemplation of landscapes, so plantations and dendrological composition should take into account these circumstances. The composition of herbaceous vegetation should be regulated by the necessary care, the harmful weed species, especially the quarantine species, should not be allowed to reproduce.

At present, there are no sanitary protection zones of enterprises, about 15 % of the area of 1–2-storey buildings are located in the contamination zones of harmful emissions of enterprises, which must be taken into account when creating green spaces,

constructions of these plantations and selection of the necessary range of trees, shrubs, lawns.

Part of the territory of the apartment building is also located in the contamination zones of the industrial enterprises' harmful emissions. The organization of the territories of sanitary protection zones, their improvement should be carried out on special projects.

It is necessary to create sanitary protection zones approximately 50 hectares: limited liability company "Ukrainian Industrial Company Krok" – 3 hectares, public joint-stock company "Ukraine" – 2.5 hectares, LLC "Zhytomyr Cardboard Mill" – 5 hectares, SE "Liqueur-vodka factory" – 1 ha, additional liability partnership "Zhytomyr beer" – 1 ha, structural unit "Dairy factory" LLC "Leader" – 1.5 ha, PJSC "Zhytomyrgaz" – 1.0 ha, gas station – 9 hectares, warehouses, bases – 5 hectares, etc.

The green plantations of the cemeteries are created mainly by the population of the city, they have a lot of green areas.

Conclusions

1. Of the requirements for urban green areas, the highest priority should be given to the regulatory level of landscaping both within urban areas and beyond.

2. The monuments of history, architecture, objects, which belong to the territories of the nature reserve fund, require the necessary attitude to works on beautification, landscaping not only in the territory of these objects but also in the adjacent territories, as well as within the protection zones.

3. It is advisable to conduct an inventory of urban green areas, reconstruction, and improvement of existing parks, expansion of their territories as green public areas; expanding the network of green spaces for public use by creating new landscaped parks and recreational areas.

4. It is necessary to implement the measures for the protection of green areas from pests and diseases, as well as the organization and improvement of recreational areas of the city with the legal registration of their boundaries and land.

References

Derzhavnyi komitet Ukrainy u spravakh mistobuduvannia i arkhitektury (1992). Derzhavni budivelni normy [State building norms] : nakaz. Retrieved from <http://bit.ly/2sQXDbi> [in Ukrainian].

Derzhavnyi komitet Ukrainy u spravakh mistobuduvannia i arkhitektury (2006). Pravyla utrymanna zelenykh nasadzhen [Rules for

maintaining green space in settlements of Ukraine] : nakaz. Retrieved from <https://zakon.rada.gov.ua/laws/show/z0880-06> [in Ukrainian].

Irvine, K., Warber, S., Devine-Wright, P. & Gaston, K. (2013). Understanding Urban Green Space as a Health Resource: A Qualitative Comparison of Visit Motivation and Derived Effects among Park Users in Sheffield, UK. *Int. J. Environ. Res. Public Health*, 10 (1), 417–442. doi: <https://doi.org/10.3390/ijerph10010417>.

Kabinet Ministriv Ukrainy (2006). Poriadok vydalennia derev, kushchiv hazoniv ta kvitnykiv u naselenykh punktakh Ukrainy [The order of removal of trees, shrubs, lawns and flower beds in settlements of Ukraine] : postanova. Retrieved from <http://bit.ly/37GxB9r> [in Ukrainian].

Kabinet Ministriv Ukrainy (2007). Poriadok podilu lisiv na katehorii ta vydilennia osoblyvo zakhysnykh lisovykh dilianok [On approval of the order of division of forests into categories and selection of especially protective forest areas] : postanova. Retrieved from <http://bit.ly/39M1WVM> [in Ukrainian].

Kaplan, R. (1984). Impact of urban nature: A theoretical analysis. *Urban Ecology*, 8, 189–197. doi: [https://doi.org/10.1016/0304-4009\(84\)90034-2](https://doi.org/10.1016/0304-4009(84)90034-2).

Khoshtaria, T. & Chachava, N. (2017). The planning of urban green areas and its protective importance in resort cities (case of Georgian resorts). *Annals of Agrarian Science*, 4 (15), 217–223. doi: <https://doi.org/10.1016/j.aasci.2017.05.009>.

Kuldna, P., Poltimäe, H. & Tuhkanen, H. (2020). Perceived importance of and satisfaction with nature observation activities in urban green areas. *Journal of Outdoor Recreation and Tourism*, 29, 100227. doi: <https://doi.org/10.1016/j.jort.2019.100227>.

Pro blahoustrii naselenykh punktiv [On the beautification of settlements]. № 49. (2005). Retrieved from <https://zakon.rada.gov.ua/laws/show/2807-15> [in Ukrainian].

Salbitano, F., Borelli, S., Conigliaro, M. & Chen, Yu. (2016). Guidelines on urban and peri-urban forestry. Rome.

Silva, L., Fonseca, F., Pires, M. & Mendes, B. (2019). SAUS: A tool for preserving urban green areas from air pollution. *Urban Forestry & Urban Greening*, 46, 126440. doi: <https://doi.org/10.1016/j.ufug.2019.126440>.

Yuan, W., Li, J., Meng, L., Qin, X. & Qi, X. (2019). Measuring the area green efficiency and the influencing factors in urban agglomeration. *Journal of Cleaner Production*, 241, 118092. doi: <https://doi.org/10.1016/j.jclepro.2019.118092>.