https://doi.org/10.26565/2410-7360-2025-63-41
UDC 502.1(4):[911.53:502.51(282.247.318)](477.44-25)

Received 20 June 2025
Accepted 11 August 2025

Seliteb hydraulic network in the context of the implementation of EU environmental protection strategies

Anatoliy Hudzevych [1]
DSc (Geography), Professor, Department of Geography,
[1] Vinnytsia State Pedagogical University named after Mikhail Kotsyubynsky, Vinnitsa, Ukraine,
e-mail: amarek@ua.fm, https://orcid.org/0000-0001-8884-9436;
Hanna Korobkova [2]
PhD (Geography), Associate Professor,
Department of Ecology and Biotechnology in Plant Production,
[2] State Biotechnological University, Kharkiv, Ukraine,
e-mail: korobkova.ann@gmail.com, https://orcid.org/0000-0002-0246-8585;
Maryna Shmahelska [3]
PhD (Geography), Associate Professor,
Department of Humanitarian, Economic and Financial and Accounting Disciplines,
[3] Vinnytsia Cooperative Institute, Vinnytsia, Ukraine,
e-mail: marinashmahelska@gmail.com, https://orcid.org/0000-0002-4680-5272;
Nataliia Baiurko [1]
PhD (Pedagogy), Associate Professor, Department of Biology,
e-mail: nataliia.baiurko@vspu.edu.ua, https://orcid.org/0000-0002-6172-9669

ABSTRACT

Problem statement. The article examines the structural organization of the Southern Bug basin, operating under urban conditions. This involves obtaining detailed objective information about its condition, which is determined by the need to harmonize this process with European standards in the field of hydrography and with UN Sustainable Development Goals (SDGs).

The purpose of this study is to inventory the watercourses of the Southern Bug basin within the Vinnytsia city catchment area, assess their ecological state and functional problems, and provide a basis for management decisions.

Methods. Classical and modern methods of hydrological, structural-geographical, structural-functional, analytical, remote sensing, instrumental, cartographic, mathematical, and comparative-geographical analyses were applied. The central part of the materials was collected by the authors of the publication during field etymological studies of water bodies of Vinnytsia city, when performing scientific research work in 2023-2024.

Results of the study. The study clarified the location and nature of the discharge capabilities of previously identified watercourses. At the same time, an assessment of the elements of the hydrological regime and morphometric features within the basins was conducted. An inventory of the current state of watercourses in Vinnytsia city enabled us to identify technogenic violations in some of them that developed during the urban development of the territory. It has been established that intensive anthropogenic loading of small-river basins leads to significant transformation of the original natural valley-river landscape, up to its complete disappearance. Focusing research on local needs helps structure efforts in responsible consumption (SDG 12), combating climate change (SDG 13), and preserving ecosystems (SDG 15), which is important for restoring the environment transformed by unsustainable consumer practices.

Conclusions. The results of the study on the structural organization of the Southern Bug basin in the conditions of Vinnytsia city can significantly expand and activate areas of rational water resource management, ensuring their balanced functioning. They have a decisive influence on the planning of optimal water-use scenarios in urban environments, not only at the local but also at the regional and state levels. The results of the study are the basis for developing a strategy for the urban community and achieving the Goals of balanced development and effective management of territorial resources, as well as for scientific and educational purposes.

Keywords*: Sustainable Development, watercourse, stream, small river, hydrographic network, catchment basin, valley-river landscape, settlement, Vinnytsia city.*

In cites: Hudzevych Anatoliy, Korobkova Hanna, Shmahelska Maryna, Baiurko Nataliia (2025). Seliteb hydraulic network in the context of the implementation of EU environmental protection strategies. *Visnyk of V. N. Karazin Kharkiv National University. Series Geology. Geography. Ecology*, (63), 556-565. https://doi.org/10.26565/2410-7360-2025-63-41

Problem statement. In the context of global climate change and rapidly growing anthropogenic impacts on the environment [24, 31], the issue of the rational use of available water resources [22, 28, 29] is of particular relevance. The bulk of freshwater reserves in the world and Ukraine fall on small rivers - the most numerous types of water bodies on Earth [32]. Over the past hundred years, under the slogan of "restructuring nature", significant losses have occurred not only of valuable water bodies of nature, but also of their aesthetic features.

Valley-river landscapes of small rivers have turned out to be the most transformed objects of nature, especially in the conditions of settlement, and above all, the urban environment [1, 26]. At the same time, in the efforts of residents to provide

themselves with amenities and comfort, almost the best opportunities for preserving natural (or close to it) landscape and biotic diversity, which are possessed by valley-river landscape complexes, are completely ignored [13, 25, 27].

One of the reasons for the transformation of watercourses, up to their disappearance, was the practice of inventorying water bodies, which was used by the Hydrometeorological Service of Ukraine until almost our time. According to it, the catchment areas of all rivers, the length of which is more than 10 km, were considered. While their tributaries, up to 10 km long, were either ignored altogether or perceived as nameless streams.

The adoption of the Water Code (1995) [4] by independent Ukraine and its conformation with the UN Sustainable Development Goals [33] and the EU Water Framework Directive (WFD) (2000) [3] requires updating the hydrographic network data it encourages a revision of the registers of water bodies that were concluded before this. According to the Water Code of Ukraine (1995, Chapter 16. Article 79), the classification of rivers by basin area is adopted: small – up to 2000 km^2; medium – 2 000-50 000 km^2; large – over 50 000 km^2. The classification of rivers of the EU countries (small – 10-100 km^2; medium – 100–1 000 km^2; large – 1 000-10 000 km^2; very large – over 10 000 km^2 [3]) is used in our country when assessing the EcoState of surface water masses.

The uncertainty and lack of standardization of the concepts of “stream” and “small river” in Ukraine and the EU [22] influenced our use of the general term “watercourse” (type of water body) when considering the valley-river landscape. According to the classification of water bodies, a watercourse encompasses both significantly modified water bodies (rivers, streams) and artificial ones (canals).

Analysis of recent research and publications. For the first time, the experience of implementing the provisions of the EU WFD in domestic science and practice, particularly, the typification of rivers by catchment area, was applied by hydrologists in studies of the hydrographic network of the Ros River basin [10] and the Vistula tributaries (Western Bug and San) [22].

The reference manual compiled at the beginning of the 21st century by M.M. Palamarchuk and N.B. Zakorchevna “Water Fund of Ukraine” [5], unfortunately does not consider the catchment areas of rivers less than 10 km long. The reference books compiled at this time in the context of individual administrative-territorial regions of Ukraine, particularly, Vinnytsia and Kirovohrad regions [7; 16], do not solve the problem either.

A typical example is the Southern Bug River (Southern Bug), which divides of Vinnytsia city into two parts. The length of this river within the city limits is 14 km. Despite the large number of tributaries of the Southern Bug within the city limits, information about them was absent. Only four tributaries of the Southern Bug had their established names with corresponding reflection on maps, at least at the beginning of the 21st century. These are rivers such as Vyshnia, Vinnytsia (Vinnychka), Tyazhyliv, and Pyatnychanka. Of all the small rivers of Vinnytsia city, the three most famous for the townspeople are Vyshnia, Tyazhyliv, and Vinnytsia. And of all the rivers of the city, only the Vyshnia River is represented in the “Dictionary of Hydronyms of Ukraine” [11].

At the regional and local level (Vinnytsia region, Vinnytsia city), hydronymic studies of rivers and reservoirs were actively carried out in the 20th century by M.T. Dolenko, V.T. Horbachuk, L.T. Masenko, N.M. Pavlykivska. In the early 20s of the 21st century, the research of A.V. Gudzevych clarified the reasons and factors of the historical transformation of the name of the Orikhovatka River (the Ros River basin, Pogrebyshchensk territorial community, Vinnytsia district) and made proposals for the reconstruction and reproduction of 22 lost geographical names of hydronyms [12]. Information about the watercourses and reservoirs of the region is contained in catalogues prepared in the first half of the 20th century. The first basin hydrographic sketch with the calculation of the lengths and areas of the rivers of the Boga system (now the Southern Bug) was compiled in 1918. It had the form of a notebook, but unfortunately it was not printed for wide use. Instead, in the period from December 1922 to November 1923, the employees of the hydrometric service compiled the "Catalogue of Rivers of the Southern Boga Catchment". Published in the "Yearbook of the Hydrometric Service of the People's Commissariat of Land of Ukraine" (1927, pp. 49-54). The catalogue included only rivers 10 km long with data on their length, drainage area, and average direction from "the source to the mouth of each river drainage area" [2, p. 24]. The reconciliation of these two catalogues, considering the difference in measurements of the length of watercourses and the area of the drainage basin of each of them, was reflected in the work of O. Byrulya, published in 1928 [2].

An important source of information about the hydronyms of the region is the “Register of Rivers of Vinnytsia Region”, compiled based on systematization of hydrological and hydronymic research over a period of more than 25 years by the leading hydrologist of the Southern Bug River Water Resources and Environment Department Yu.S. Gavrykov. In the previous 2 editions (2011, 2018), the “Catalog of Rivers of Vinnytsia Region” (over 10

km long) and cartographic maps M: 1:100,000 of the Kyiv Military Cartographic Factory were taken as the basis. The updated "Register…" of 2024 is supplemented with information about rivers over 5 km long [6]. Despite significant additions to the content of the "Register…" (2024) during its compilation, watercourses of Vinnytsia city less than 5 km long and transformation processes regarding them are ignored, which requires an urgent solution.

Identification of previously unresolved parts of the general problem. Effective water resources management involves obtaining detailed objective information about the state of the hydrographic network and is determined by the need to comply with European standards in this area. A clear accounting of water bodies, with the correct use of names, and their monitoring will help to clarify the real EcoState, determine possible economic changes in the river basin with rational water use, restoration and protection of watercourses depending on the need.

The purpose of this study is to inventory the watercourses of the Southern Bug basin within the Vinnytsia area by catchment area, to determine their EcoState and problems of functioning in order to form the basis for making management decisions.

Research material and methods.

The object of the study is the watercourses of Vinnytsia city. The subject is the implementation of the provisions of the EU WFD through inventory with determination of the structure of river basins of Vinnytsia watercourses.

Research methods. To establish the organizational structure of the hydrographic network of the Southern Bug (number, length and area of basins of different order watercourses) and its hydronymy within the Vinnytsia city, classical and modern methods of hydrological, structural-geographic, structural-functional, linguistic and general scientific historical analysis were applied. They included field route and semi-stationary methods of field and geoinformation mapping, as well as landscape-ecological, geobotanical, bioindication study of territorial subdivisions of the urban environment. Based on the system approach, the comparative-historical and questionnaire-survey method and office methods of processing and analysing the hydrographic network were used, particularly, decoding of high-precision satellite images of the urban and suburban area, methods of historical-urban reconstructions, mathematical-statistical methods.

The materials for the study were field forms and diaries, results of analytical processing, topographic and thematic maps of various scales, high-resolution satellite images, technical and design documentation of various city services and design organizations, stock and archival materials. The main part of the materials was collected during field research by the authors of the publication while performing research work on etymological studies of water bodies in Vinnytsia city.

Field work was carried out within the framework of the city's environmental project for the preservation of water bodies of the city "Concept for the Development of Small Rivers of Vinnytsia city - 2035" (2024). This work was also guided by key documents, in particular: the Leipzig Charter and the EU WFD, the Declaration on the Green Course of Vinnytsia (following the example of the European Green Course) with the Roadmap of Activities of the Vinnytsia Urban Territorial Community for the Implementation of the Green Course of Vinnytsia city by 2030, the Water Code of Ukraine, the Concept of Integrated Development of Vinnytsia city 2030, the Strategy for the Development of the Vinnytsia Urban Territorial Community by 2030 (Strategy 3.0), as well as the Environmental Protection Program of the Vinnytsia Urban Territorial Community.

Presentation of the main material of the study. The river basin is a holistic systemic formation in which the main types of substance circulation are closed. Hence, the widespread use of the basin approach by scientists in assessing the quality of environmental components and solving problems of rational use of natural resources and geoecological state of the territory [21].

According to the landscape and hydrological zoning of Ukraine, the Vinnytsia city is located within the forest-steppe, insufficiently humidified landscape and hydrological zone of the Southern Bug basin [9], the Southern Bug basin district according to hydrographic zoning [23] and the Upper Bug subdistrict of the Dniester-Bug district of the catchment areas of Ukraine according to the conditions of formation of annual water runoff [8, p. 30]. The hydrographic network of the city is formed by the Southern Bug River. According to the current Water Code and the EU WFD [3; 4], it is a surface water object and is classified as a large river.

With the introduction of the European water resources monitoring system and the need to implement the EU WFD from January 1, 2019, Ukraine has become necessary for a detailed assessment of the entire basin of the city's main river. In 2023, specialists from the Vinnytsia Urban Development Institute identified 64 water linear objects belonging to the Southern Bug basin and being its 1–3 order tributaries [15]. The identified objects required assessment based on their identification (small river, stream, canal). When studying the state of surface waters of Vinnytsia city (Fig. 1) by the authors of the publication at the turn of 2023-2024, in order to systematize the idea of the features of the hydrographic and toponymic space of Vinnytsia city, as an object of structural and geographical research, there

was a need for a detailed study of their structural and functional organization.

The Southern Bug watershed within the city is formed by numerous watercourses – small rivers with tributaries of the 1st–4th orders, streams and canals. The total length of watercourses exceeds 100 km, and the density of the hydrographic network is 1.05 km/km^2. The following rivers are distinguished with a length of over 10 km: the Vyshnia River (total length 22.7 km, within the city – 5.85 km), the Vinnytsia (Vinnychka) River (total length 13 km, within the city – 5.988 km), the Tyazhyliv River (Tyazhylivka – total length 14 km, within the city – 4.3 km). The Verbyzhivka River (total length 9 km, within the city – 5.3 km), the Pyatnychanka River (total length 7.4 km, within the city – 3.580 km) has a length of over 5 km. Only three rivers have their own 2nd-3rd order tributaries – Vyshnia River, Pyatnychanka River, and Vinnytsia (Vinnychka) River (Fig. 1).

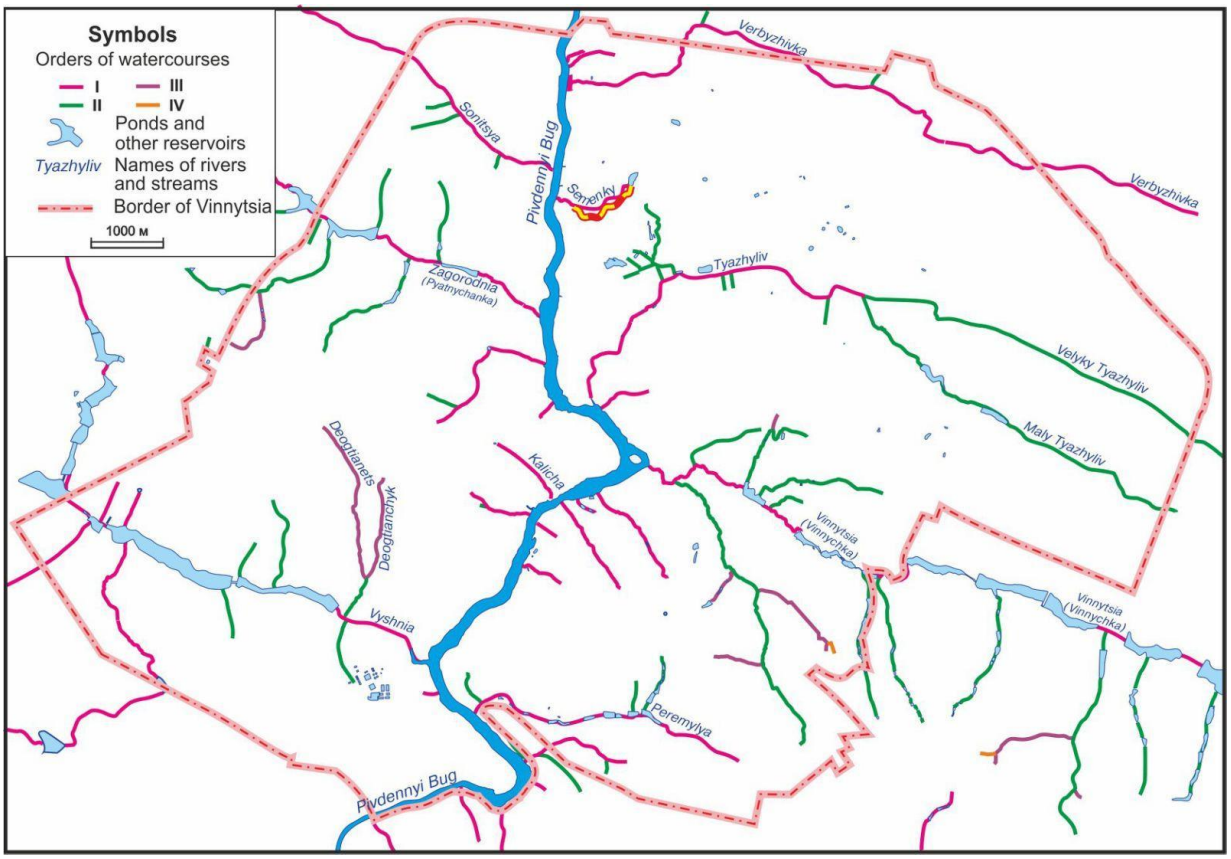

Fig. 1. Structure of the hydraulic network of the Southern Bug catchment in Vinnytsia city

Tributaries of the Southern Bug River are characterized by small channel depths (up to 1–2 m), widths (0.5–4 m) and current speeds (0.2–0.6 m/s). The exception is the mouth of the Vyshnia River, where the channel width reaches 15–25 m. In their original natural state, their channels had a winding character within the floodplain box-shaped and trapezoidal river valleys.

In total, out of 76 identified watercourses, 68 belong to small rivers and streams. The exception is 8 “ditches” of the technogenic type. They are defined as artificial water bodies – canals. All these canals are equipped as drainage linear objects. Seven of them are along communication routes: the bypass highway of the northwestern outskirts of Vinnytsia city (Pyatnychanka inlet No. 11), St. Gonty (10a, 10b, 10c) and railways (left tributaries of the Tyazhyliv River – 16a, 16b, 16c).

At the present stage, most watercourses operate within the intensively built-up territory of the city. Typical problems are closing of channels into underground collectors, creation of artificial channels (chutes), land reclamation through drainage, artificial changes in the relief, creation of artificial reservoirs. Collectors and "chutes" separate water from other elements of the ecosystem – plants, soil, underwater nutrition – thus, in these areas the river is not able to fully function [15, p.13].

The small rivers Vinnytsia (Vinnychka), Peremylya, Tyazhyliv, Verbyzhivka and Pyatnychanka have long been regulated by ponds due to the active development of bird farming. This is also confirmed in the acts of land demarcation of the 16th – 1st half of the 16th century. [17, p. 99, 207-208]. According to the Southern Bug River Water Management Department, there are 35 ponds and numerous channel-type ponds within the city limits (rivers basins of Vinnytsia (Vinnychka), Vyshnia, Peremylya, Tya-

zhyliv rivers). The largest of them, in terms of water surface area, are located on the Vyshnia and Pyatnychanka rivers. There are more than 60 artificial reservoirs in the Peremylya river basin.

Field field surveys made it possible to prove several cases of erroneous ideas of researchers about the flow of watercourses of the Left Bank of the Southern Bug, including those recorded on map schemes [15]. First of all, these are watercourses No. 9, 10, 21, 36 and 38 (Figure 2).

It has been established that the upper reaches of watercourse No. 21 (Nadparomna) from the mid-19th century or somewhat later (during the development of Stetsenko Street, the car park area), but not earlier (it is clearly visible on the map of 1802 [14]), were “torn off” from the main river and directed towards the Southern Bug by a ravine or a gully. There, by introducing the channel into the sewer pipe, the left tributary No. 21 was diverted. As a result, the mouth part was shifted towards the Tyazhyliv River, and the length of the watercourse was reduced, as was its catchment basin. The channel part of the valley of the middle and lower reaches of the watercourse, due to the lack of water, from the mid-20th century was developed by private estates and city buildings for various purposes (bus station, printing house, etc.). During World War II, the watercourse valley was undeveloped [30].

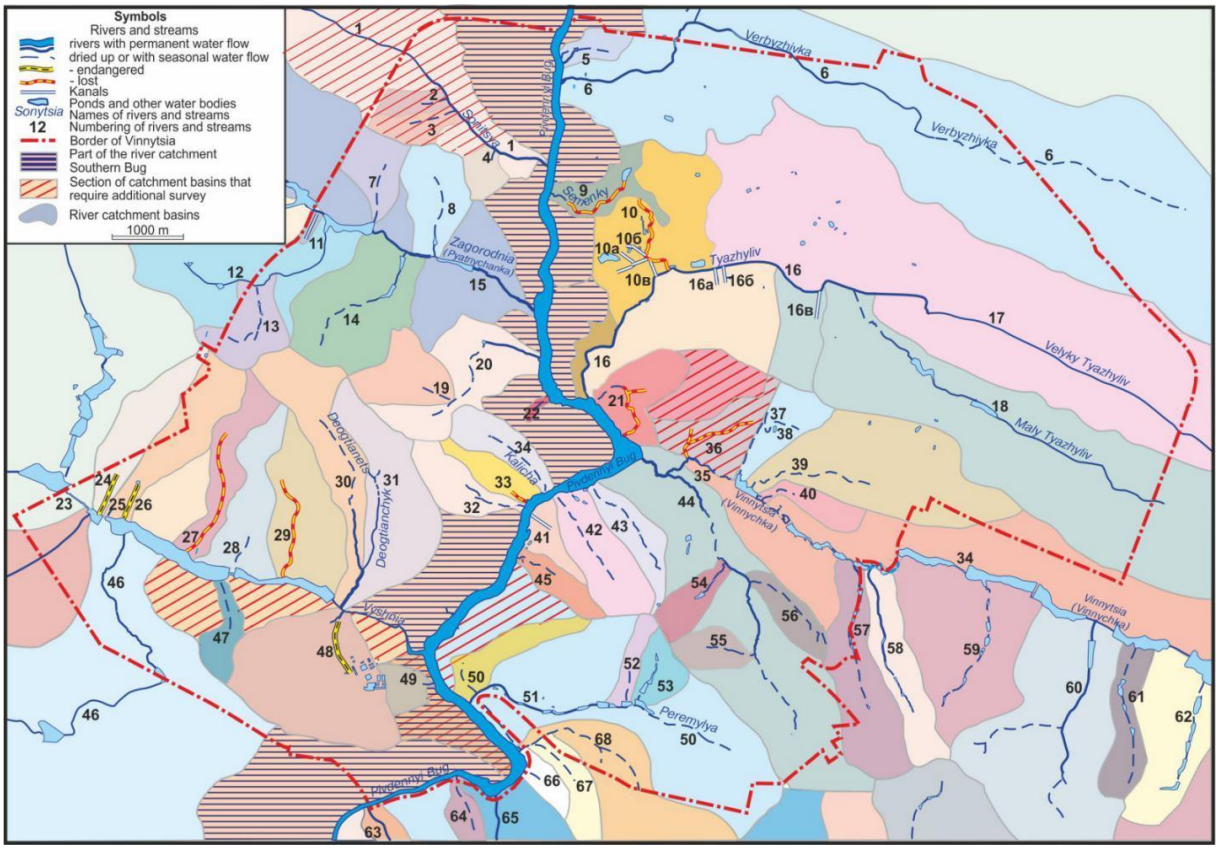

Fig. 2. Basin system of the Southern Bug watershed within the Vinnytsia city

A similar misfortune happened with watercourse No. 36-38. The reason for the deliberate artificial rupture of its channel (Fig. 2) in the middle reaches (current No. 36 and No. 38) was the construction of the Kyiv-Baltic (Kyiv-Odessa) railway (put into operation in 1871) and the opening of railway communication in 1873 on the Kozyatyn - Zdolbuniv, Vinnytsia city, Zhmerynka railway. However, these actions led to the formation of two watercourses: a "relict" and an artificially created one (No. 36 and No. 38, Fig. 2). Another example is related to the development of the watercourse basin through intensive development with industrial facilities in the middle of the 20th century. The stream (No. 9) is known from descriptions as the Semenka River, which once served as the border of urban lands in the north-eastern reaches of Vinnytsia city [18, p. 22]. The upper and middle reaches of the river were pressed into pipes and filled with soil mixtures. Due to the proximity of the sources No. 9 and No. 10, which can be seen on the map of F. Schubert (mid-19th century), researchers mistakenly perceived the middle course of stream No. 9 as the source of stream No. 10. The modern canalized appearance of the latter is due to water reclamation measures carried out in the middle of the twentieth century.

In general, within the city limits, a third of the area of the stream valleys was filled in. Their channels were also found underground. By the beginning

of the 21st century, watercourses were mainly transformed at intersections with transport highways (the Vyshnia River – Barske Highway, Yunosti and Pyrohova streets; the Vinnytsia (Vinnychka) River – D. Nechaya, Pryvokzalna, Chumatska, Hetmana Mazepy streets, etc.; the Dyogtianets River – Khmelnytsky Highway, Keletska and K. Vasylenko streets). The railway fragmented the Vinnytsia (Vinnychka) River and its tributaries, the Tyazhyliv and Verbyzhivka rivers.

Only the tributaries of the Sonytsia River in the northwest of Vinnytsia city and the tributaries of the Southern Bug in the Sabarivsky forest avoided the rupture of the valley-river complex with a road and street network.

Since the beginning of the 21st century, the construction of new residential complexes directly on watercourses has become a negative trend: the Dyogtianets River – 28A Keletska Street, WOG gas station, Oscar residential complex; Kalicha River – Residential Complex "Artynov Hall"; Tyazhiliv River – Residential Complex "Naberezhnyi Kvartal" and "Naberezhnyi Kvartal 2", Residential Complex "Komfort" and municipal housing on St. Striletska; River No. 32 (Skelna) – Residential Complex "Riviera", Residential Complex on Amosova Lane.

Unfortunately, the practice of "filling" the valley-river landscape with poorly controlled residential development within Vinnytsia city continues to this day. For example, watercourses No. 24 and No. 26 are left tributaries of the Vinnytsia (Vinnychka) River (Dream Lake residential complex). Similar changes also affected the mouth of watercourse No. 8 (left tributary of the Pyatnychanka River) during the development of the Town House.

Since the beginning of the 21st century, cases of “appropriation” of watercourses have become more frequent (the Kalicha River basin (No. 32), Peremyl (No. 50, etc.). Negative trends are also maintained by introducing changes in the morphological structure of watercourses. In particular, in the summer of 2023, the relief of the mouth of the Pyatnychanka River basin was changed. This happened because of the embankment of soil along the coastal protective strip and the introduction of the channel into a concrete pipe with subsequent discharge into the Southern Bug River. In the spring of 2025, as a result of the pouring of soil mixture and clay-sand-gravel material, a swampy stream outlet on the southwestern outskirts of Vinnytsia city was destroyed. These works were carried out in violation of the requirements of Articles 80, 88, 89 of the Water Code of Ukraine and Articles 59, 60 of the Land Code of Ukraine.

A significant number of Vinnytsia's watercourses are placed in underground collectors. For example, in the historical centre (New City, Zavallia), the Kalicha River (No. 32) has survived only in small fragments near Khlibna Street, before and after Koriatovychiv Street. Watercourses No. 27 and No. 29, which are tributaries of the Vyshnia River, as well as No. 9, No. 21, No. 33 and No. 36, were completely underground.

These and other cases of unauthorized interference in the "cultivation" of river valleys became possible due to the lack of boundary marking for the water protection zones of almost all watercourses in Vinnytsia city, regardless of their hierarchy. It is planned to begin the process of marking the coastal protection strips in nature with the imminent approval of the Comprehensive Plan for Spatial Development of the Community and the General Plan of Vinnytsia city. The preservation and restoration of the city's valley and river landscapes should be facilitated by Vinnytsia's inclusion in the European initiative RESTORIVER and the European projects U_CAN (Tyazhyliv River) and DALIA (Vinnytsia River) in the spring of 2005. These projects help determine modern methods of water resource management and adaptation to climate change.

In our opinion, in order to preserve watercourses in urban conditions, it is necessary to overcome the harmful practice of filling up valleys during economic development of the territory. In case of need to cross valleys with a transport highway, it is worth using gabions (metal meshes filled with gravel) to ensure natural drainage and resistance to destruction of river valley elements and artificial formations such as dams. Along the banks of watercourses (in particular, low orders), it is worth creating plantations of tree and shrub vegetation (in their absence), which will prevent small rivers and streams from drying up during the summer low water period.

Given the importance of the cultural heritage of individual tributaries of the Southern Bug, it is necessary to consider the issue of their protection as soon as possible. After all, small rivers for centuries performed boundary functions of Vinnytsia’s lands (Verbyzhivka, Sonytsia, Peremylya rivers) and were centres of industries: bird farming – Sonytsia and Pyatnychanka rivers, milling – Peremylya river. In addition, these rivers have relatively better-preserved pre-valley areas, in contrast to the reduced tributaries of the industrial and residentially developed part of the city. The mouth area of river No. 45 (Krutyy Yar) is also distinguished by a little-changed channel-floodplain part with preserved rapids and pseudo-waterfalls ("waterfalls"). The need to preserve the entire valley-river system of these watercourses will prompt the creation of a protected area at the level of a landscape reserve. The area of the southwestern outskirts of Vinnytsia city (the Vyshnia river basin) also requires environmental

attention. Intensive development of cottage and estate-type buildings poses a threat to the only spring in this part of the city, Vyshenske, with water suitable for drinking. It is the source of the stream of the same name. This stream, together with the spring, is worthy of human care and protection as a hydrological monument of nature.

Conclusion. An inventory of watercourses in the urban residential area of Vinnytsia was conducted to determine the structure of river basins to implement the provisions of the EU WFD in local water resources management practices.

During a study of the structural organization of the Southern Bug River basin in an urban environment, rivers were classified by catchment area for the first time. This work, conducted in accordance with the parameters of the EU WFD, made it possible to identify a few significantly changing watercourses, a previously insignificant list of small rivers and streams in Vinnytsia. All prominent watercourses in the urban environment were considered. Their length and catchment area were measured and displayed on a unified cartographic basis. A barrier to clearly defining the status of "small river" or "stream" for a watercourse is the lack of regulation of these concepts in the Water Code of Ukraine or the EU WFD, and therefore a clear boundary between them. The identification materials included data on the number and length of all rivers, temporary streams and creeks, as well as branches and permanent canals with a length of at least 0.5 km.

An inventory of the current state of the city's rivers allowed us to: determine the structural, functional, and ecological state of the valley-river complexes; identify man-made disturbances to individual rivers and significant transformations of the original natural valley-river landscape that developed during the urban development of the area.

It has been observed that the intensity of anthropogenic transformation of valley complexes directly depends on the nature of urban development processes. Specifically, estate development in Vinnytsia's urban landscape has largely preserved the natural structural and functional properties of valley complexes over many centuries and has had little noticeable impact on riverbed processes. In turn, high-rise construction or any economic development of urban areas leads to their transformation, even to the point of complete destruction. Due to their vulnerability, Vinnytsia's waterways require extensive environmental protection. The best opportunities for preserving watercourses are in territories with a special land use regime (recreation parks – Vyshensky and Pyatnychansky, forest areas – Sabarivsky and Prybuzky and the forest park).

Acknowledgments. The authors express their gratitude for assistance in conducting the study to V. Lyubchenko.

Bibliography

1. *Байрак, Г.Р.(2016). Руслова мережа Львова: зміни за історичний період та сучасний стан. Вісник Львівського університету. Сер. геогр.,(50), 3–21.*
2. *Бируля, О. (1928). Ріка Бог та її сточище: матеріали до гідрології ріки та використання її енергії. У Вінниці: Віндерждрук.*
3. *Водна Рамкова Директива ЄС 2000/60/ЄС (2006). Основні терміни та їх визначення. Київ.*
4. *Водний кодекс України від 06.06.1995 № 213/95/ (1995). Відомості Верховної Ради України(24), 189 (зі змінами та доповненнями протягом 2000-2024 рр.).*
5. *Гавриков, Ю.С. (2014). Реєстр річок Вінницької області (довжиною понад 5 км). Вінниця: Басейнове управління водних ресурсів річки Південний Буг.*
6. *Гавриков, Ю.С. (2011). Реєстр річок Вінницької області. Вінниця-Київ: Чорноморська програма Ветландс Інтернешнл.*
7. *Горбачова, Л.О., Христюк, Б.Ф. (2016). Гідрологічне районування території України за умовами формування річного стоку води на основі кривих Ендрюса. Український географічний журнал (3),27–33. URL: http://nbuv.gov.ua/UJRN/UGJ_2016_3_6*
8. *Гребінь, В.В. (2010). Сучасний водний режим річок України (ландшафтно-гідрологічний аналіз) : монографія. Київ: Ніка-Центр.*
9. *Гребінь, В.В., Хільчевський, В.К., Сташук, В.А., Чунарьов, О.В., Ярошевич, О.Є. (Уклад.). (2014). Водний фонд України: Штучні водойми-водосховища і ставки: Довідник. Київ : «Інтерпрес».*
10. *Гребінь, В.В., Хільчевський, В.К., Бабій, П.О., Забокрицька, М.Р. (2015). Оцінка річкової мережі басейну Росі за типологією річок згідно Водної рамкової директиви Європейського Союзу. Гідрологія, гідрохімія і гідроекологія, 2(37), 23–33. URL: http://nbuv.gov.ua/UJRN/glghge_2015_2_4*
11. *Гудзевич, А.В.(2015). Гідроніми Вінниці: історія й сьогодення формування. Краєзнавство: наук. журн., (1), 80-92. URL: http://kraieznavstvo.history.org.ua/doc/ kraeznavstvo _2025_1_10*
12. *Гудзевич, А.В. (2024). Гідронімія водозбору р. Оріховатки (басейн р. Рось) як джерело ідентифікації місцевості. Історико-географічні дослідження в Україні, (18), 33-55. URL: http://resource.history.org.ua/publ/Igdu_2024_18_4*
13. *Гудзевич, А.В. (2012). Просторово-часова організація сучасних ландшафтів : теорія і практика [монографія]. Вінниця: Віндрук.*
14. *Карта Вінниці 1802 р.(1802). URL: Карта Вінниці 1802 р_.jpg - Google Диск*

15. Концепція розвитку малих річок Вінниці 2035 (2023). Вінниця: КП «Інститут розвитку міст».
16. Кривульченко, А.І.(2011). Водні об'єкти Кіровоградської області. Частина І. Словник водних об'єктів. Частина ІІ. Атлас гідрографічної мережі. Класифікатор водотоків. Водосховища: Монографія. Кіровоград: Імекс.
17. Отамановський, В.Д. (1993). Вінниця в XIV-XVII століттях. Історичне дослідження. Вінниця: «Континент-прим».
18. Петренко, О.С. (1993). З історії відмежування вінницьких міських земель у XVI-XVII ст. Вінниці – 630. 1363–1993: матеріали І Вінниц. наук.-теорет. конф. Вінниця, 19–25.
19. Словник гідронімів України (1979). Київ: Наукова думка.
20. Туристична схема. Вінниця (1976). URL: https://unc.ua/uk/auction/vinnica-plan-turisticheskaya-shema-1976-god-ukraina-sssr-107119#lot-gallery-1
21. Ухань, О., Осадча, Н. (2023). Навантаження біогенними елементами та органічними речовинами річок басейну Дону (суббасейн р. Сіверський Донець). Вісник Харківського національного університету імені В.Н. Каразіна. Серія «Геологія. Географія. Екологія», (59), 320–328. DOI: https://doi.org/10.26565/2410-7360-2023-59-24
22. Хільчевський, В.К., Гребінь, В.В., Забокрицька, М.Р. (2016). Оцінка гідрографічної мережі району річкового басейну Вісли (Західного Бугу та Сану) на території України згідно типології Водної рамкової директиви ЄС. Гідрологія, гідрохімія і гідроекологія, 1 (40), 32–44.
23. Хільчевський, В.К., Гребінь, В.В. (2017). Гідрографічне та водогосподарське районування території України, затверджене у 2016 р. – реалізація положень ВРД ЄС. Гідрологія, гідрохімія і гідроекологія, 1(44), 8–20.
24. Huang, B., Yin, X., Menne, M. J., Vose , R., Zhang, H. (2025). NOAA Global Surface Temperature Dataset (NOAAGlobalTemp), Version 6.0.0. NOAA National Centers for Environmental Information. DOI: https://doi.org/10.25921/rzxg-p717
25. Hudzevich, A., Matviichuk, O., Korobkova, H., Hudzevich, L., Bronnikova, L. (2023). Degradation risks and prospects for valley and river landscapes conservation in east Podilsk Transnistria (on the example of the Nemiya river). Visnyk of V.N. Karazin Kharkiv National University, series «Geology. Geography. Ecology», (58), 321–335. DOI: https://doi.org/10.26565/2410-7360-2023-58-24
26. Hudzevych, A.V., Nikitchenko, L O., Hudzevych, L.S., Bronnikova, L.F., Demets, R.O. (2021). Approaches to organize the econetwork of the Transnistria region in the conditions of urban landscape. Journal of Geology, Geography and Geoecology,30 (3), 449–459. DOI: https://doi.org/10.15421/112141
27. Matviichuk, O., Hudzevich, A., Shevchuk, O., Korobkova, H. et al. (2024). Biodiversity centers of fauna in the urbanized landscape of Eastern Podillia: taxonomic richness and conservation prospects. Visnyk of V.N. Karazin Kharkiv National University, series «Geology. Geography. Ecology», (58), 379-388. DOI: https://doi.org/10.26565/2410-7360-2024-60-28
28. Rybalova, O., Malovanyy, M., Bondarenko, O., Proskurnin, O., Belokon, K. & Korobkova, H. (2022). Method of Assessing the Potential Risk to the Health of the Population During Recreational Water Withdrawal. Journal of Ecological Engineering, 23(5), 81–91. DOI: https://doi.org/10.12911/22998993/146998
29. Seelen, L.M.S., Flaim, G., Jennings, E., De Senerpont Domis, L.N. (2019). Saving water for the future: Public awareness of water usage and water quality. Journal of Environmental Management, 242, 246–257. DOI: https://doi.org/10.1016/j.jenvman.2019.04.047
30. Stadtplan Winniza (1943). URL: https://depo.vn.ua/sites/default/files/u1/vinitca_german_.jpg
31. State of the Global Climate 2024 (2025). WMO, 1368. URL: https://library.wmo.int/idurl/4/69455
32. Tsaryk, L.P., Kovalchuk, I.P., Tsaryk, P.L., Zhdaniuk, B.S., Kuzyk, I.R. (2020). Basin systems of small rivers of Western Podillya: state, change tendencies, perspectives of nature management and nature protection optimization. Journ. Geol. Geograph. Geoecology, 29(3), 606–620. DOI: https://doi.org/10.15421/112055
33. Transforming our world: the 2030 Agenda for Sustainable Development: draft resolution referred to the United Nations summit for the adoption of the post-2015 development agenda by the General Assembly at its 69th session (2015). URL: https://digitallibrary.un.org/record/803352?v=pdf&ln=es

Authors Contribution: All authors have contributed equally to this work
Conflict of Interest: The authors declare no conflict of interest

References

1. Bayrak, G. R. (2016). The channels of river of Lviv: transformation during the historical epoch and modern stage. In Visnyk of the Lviv University. Series Geography, (50), 3–21. [in Ukrainian].
2. Byrulya, O. (1928). The Bog River and its outlet: materials on the hydrology of the river and the use of its energy. Vinnytsia: Vinderzhdruk. [in Ukrainian].
3. EU Water Framework Directive 2000/60/EC. Key terms and their definitions (2006). Kyiv. [in Ukrainian].
4. Water Code of Ukraine dated 06.06.1995 No. 213/95/ (1995). Bulletin of the Verkhovna Rada of Ukraine, 24, 189 (with amendments and additions during 2000-2024). (in Ukrainian).

5. *Havrikov, Yu.S.(2024). Register of rivers of Vinnytsia region (over 5 km long). Vinnytsia: Basin Administration of Water Resources of the Southern Bug River. [in Ukrainian].*
6. *Havrykov, Y.S. (2010). Register of rivers of Vinnytsia region. Vinnytsia-Kyiv: Black Sea Program Wetlands International. [in Ukrainian].*
7. *Horbacheva, L.O., Khrystyuk, B.F. (2016). Hydrological zoning of the territory of Ukraine according to the conditions of formation of annual water runoff based on Andrews curves. Ukrainian Geographical Journal, 3, 27–33. URL: http://nbuv.gov.ua/UJRN/UGJ_2016_3_6. [in Ukrainian].*
8. *Hrebin, V.V. (2010). Modern water regime of rivers of Ukraine (landscape-hydrological analysis): monograph Kyiv: Nika-Center. URL: http://nbuv.gov.ua/UJRN/glghge_2015_2_4 [in Ukrainian].*
9. *Hrebin, V.V., Khilchevsky, V.K., Stashuk, V.A., Chunaryov, O.V., Yaroshevich, O.E. (Compilers). (2014). Water Fund of Ukraine: Artificial Reservoirs and Ponds: Handbook. Kyiv: "Interpress". [in Ukrainian].*
10. *Hrebin, V.V., Khilchevsky, V.K., Babiy, P.O., Zabokrytska, M.R. (2015). Assessment of the river network of the Rosi basin by river typology according to the Water Framework Directive of the European Union. Hydrology, Hydrochemistry and Hydroecology, 2 (37), 23–33. [in Ukrainian].*
11. *Hudzevych, A.V. (2025). Hydronyms of Vinnytsia: history and present formation. Local history: scientific journal. Kyiv, (1), 80–92. http://kraieznavstvo.history.org.ua/doc/kraeznavstvo_2025_1_10 [in Ukrainian].*
12. *Hudzevych, A.V.(2024). Hydronymy of the Orikhovatka River catchment (Ros River basin) as a source of identification of the area. Historical and geographical research in Ukraine, (18), 33-55. URL: http://resource.history.org.ua/publ/Igdu_2024_18_4 [in Ukrainian].*
13. *Hudzevych, A.V. (2012). Spatial-temporal organization of modern landscapes: theory and practice. Vinnytsia: Vindruk. [in Ukrainian].*
14. *Map of Vinnytsia 1802. (1802) URL: Карта Вінниці 1802 р_.jpg - Google Диск*
15. *Concept of development of small rivers of Vinnytsia 2035 (2023). Vinnytsia: KP "Institute of Urban Development". [in Ukrainian].*
16. *Kryvulchenko, A.I. (2011). Water bodies of Kirovograd region. Part I. Dictionary of water bodies. Part II. Atlas of the hydrographic network. Classifier of watercourses. Reservoirs: Monograph. Kirovograd: Imeks. [in Ukrainian].*
17. *Otamanovsky, V.D. (1993). Vinnytsia in the XIV–XVII centuries. Historical study. Vinnytsia: "Continent-prim". [in Ukrainian].*
18. *Petrenko, O.S. (1993). On the history of the delimitation of Vinnytsia city lands in the 16th-17th centuries. Vinnytsia, 630. 1363–1993: materials of the I Vinnytsia Scientific-Theoretical Conference. Vinnytsia:19–25. [in Ukrainian].*
19. *Dictionary of Hydronyms of Ukraine (1979). Kyiv: Naukova Dumka. [in Ukrainian].*
20. *Tourist scheme. Vinnytsia (1976). URL: https://unc.ua/uk/auction/vinnica-plan-turisticheskaya-shema-1976-god-ukraina-sssr-107119#lot-gallery-1*
21. *Wuhan, O., Osadcha, N. (2023). Load of biogenic elements and organic substances of the rivers of the Don basin (subbasin of the Siverskyi Donets river). Bulletin of the V.N. Karazin Kharkiv National University. Series "Geology. Geography. Ecology", (59), 320–328. DOI: https://doi.org/10.26565/2410-7360-2023-59-24 [in Ukrainian].*
22. *Khylchevsky, V.K., Hrebin, V.V., Zabokrytska, M.R. (2016). Assessment of the hydrographic network of the Vistula (Western Bug and San) river basin district in Ukraine according to the typology of the EU Water Framework Directive. Hydrology, Hydrochemistry and Hydroecology, 1 (40), 32–44. [in Ukrainian].*
23. *Khilchevsky, V.K., Hrebin, V.V. (2017). Hydrographic and water management zoning of the territory of Ukraine, approved in 2016 – implementation of the provisions of the EU WFD. Hydrology, hydrochemistry and hydroecology, (44), 8-20. [in Ukrainian].*
24. *Huang, B., Yin. X., Menne. M. J., Vose. R., Zhang. H. (2025). NOAA Global Surface Temperature Dataset (NOAAGlobalTemp), Version 6.0.0. NOAA National Centers for Environmental Information. DOI: https://doi.org/10.25921/rzxg-p717.*
25. *Hudzevich. A., Matviichuk. O., Korobkova. H., Hudzevich. L., Bronnikova. L. (2023). Degradation risks and prospects for valley and river landscapes conservation in east Podilsk Transnistria (on the example of the Nemiya river). Visnyk of V.N. Karazin Kharkiv National University, series «Geology. Geography. Ecology», (58), 321–335. DOI: https://doi.org/10.26565/2410-7360-2023-58-24*
26. *Hudzevych, A.V., Nikitchenko, L.O., Hudzevych, L.S., Bronnikova, L.F., Demets, R.O. (2021). Approaches to organize the econetwork of the Transnistria region in the conditions of urban landscape. Journal of Geology Geography And Geoecology, 30 (3), 449–459. DOI: https://doi.org/10.15421/112141*
27. *Matviichuk O., Hudzevich A., Shevchuk O., Korobkova H. et al. (2024) Biodiversity centers of fauna in the urbanized landscape of Eastern Podillia: taxonomic richness and conservation prospects. Visnyk of V.N. Karazin Kharkiv National University, series «Geology. Geography. Ecology», (58), 379–388. DOI: https://doi.org/10.26565/2410-7360-2024-60-28*
28. *Rybalova, O., Malovanyy, M., Bondarenko, O., Proskurnin, O., Belokon, K. & Korobkova, H. (2022). Method of Assessing the Potential Risk to the Health of the Population During Recreational Water Withdrawal. Journal of Ecological Engineering, 23(5), 81–91. DOI: https://doi.org/10.12911/22998993/146998*
29. *Seelen, L.M.S., Flaim, G., Jennings, E., De Senerpont Domis, L.N. (2019). Saving water for the future: Public awareness of water usage and water quality. Journal of Environmental Management, (242), 246–257. DOI: https://doi.org/10.1016/j.jenvman.2019.04.047*
30. *Stadtplan Winniza (1943). URL: https://depo.vn.ua/sites/default/files/u1/vinitca_german_.jpg*

31. *State of the Global Climate 2024 (2025). WMO, (1368). Geneva. URL: https://library.wmo.int/idurl/4/69455*
32. *Tsaryk, L.P., Kovalchuk, I.P., Tsaryk, P.L., Zhdaniuk, B.S., Kuzyk, I. R. (2020). Basin systems of small rivers of Western Podillya: state, change tendencies, perspectives of nature management and nature protection optimization. Journ. Geol. Geograph. Geoecology, 29(3), 606–620. DOI: https://doi.org/10.15421/112055*
33. *Transforming our world: the 2030 Agenda for Sustainable Development: draft resolution referred to the United Nations summit for the adoption of the post-2015 development agenda by the General Assembly at its 69th session (2015). URL: https://digitallibrary.un.org/record/803352?v=pdf&ln=es*

Гідромережа селитеба у контексті реалізації Євросоюзних природоохоронних стратегій

Анатолій Гудзевич [1]
д. геогр. н., професор, кафедра географії,
[1] Вінницький державний педагогічний університет
імені Михайла Коцюбинського, Вінниця, Україна;
Ганна Коробкова [2]
к. геогр. н., доцент,
кафедра екології та біотехнологій в рослинництві
[2] Державний біотехнологічний університет, Харків, Україна;
Наталія Баюрко [1]
к. пед. н., доцент, кафедра біології;
Марина Шмагельська [3]
к. геогр. н., доцент,
кафедра гуманітарних, економічних та фінансово-облікових дисциплін,
[3] Вінницький кооперативний інститут, Вінниця, Україна

У статті розглядається нагальна проблема з'ясування реального екостану та структурної організації басейну Південного Бугу, функціонуючого в умовах міського середовища. Її постановка викликана потребою узгодження Водного Кодексу України з Водної рамковою директивою (ВРД) ЄС та цілями сталого розвитку ООН. Дослідження зосереджено на інвентаризації водотоків басейну Південного Бугу у межах м. Вінниці за водозбірною площею. На підставі картометричного аналізу і маршрутних обстежень було встановлено: основні види, морфометричні параметри та територіальне поширення водотоків, характер їх стокових можливостей, а також здійснено оцінку елементів гідрологічного режиму та морфометричних особливостей в розрізі басейнів кожного з них. Окрім того, оцінювання сучасної ситуації річок міста дозволило: визначити структурно-функціональний та екологічний стан долинно-річкових комплексів; виявити техногенні порушення окремих з них та значну трансформацію вихідного природного долинно-річкового ландшафту, що склалися в процесі містобудівного освоєння території. У силу вразливості водотоки Вінниці потребують дбайливого відношення, що передбачає відмову від засипання долин при господарському облаштуванні території і, натомість: використання габіонів, створенням насаджень деревно-чагарникової рослинності та якнайширшого включення до природоохоронного середовища у якості ландшафтних заказників і гідрологічних пам'яток природи. Визначення структури водотоків міського селитебу Вінниця, в розрізі водозбірних басейнів, сприяє імплементації положень ВРД ЄС та ЦСР ООН у практику управління водними ресурсами на локальному рівні шляхом інтегрування глобальних і національних цілей у свою місцеву стратегію, забезпечуючи комплексне управління розвитком. Результати вивчення долинно-річкових ландшафтів вказують на значний природоохоронний і туристсько-рекреаційний потенціал водних ресурсів міського середовища та є основою для збалансованого розвитку й ефективного управління територіальними ресурсами Вінниці. Проведені дослідження є базою для подальшого аналізу гідрографічної мережі та сприяють розробці рекомендацій для ефективного використання водних ресурсів на шляху підвищення стійкості громад та інтеграції до європейського простору.

Ключові слова*: сталий розвиток, водотік, струмок, мала річка, гідрографічна мережа, водозбірний басейн, долинно-річковий ландшафт, селитеб, місто Вінниця.*

Внесок авторів: всі автори зробили рівний внесок у цю роботу
Конфлікт інтересів: автори повідомляють про відсутність конфлікту інтересів

Надійшла 20 червня 2025 р.
Прийнята 11 серпня 2025 р.