

Methodical Approaches to Determining Harm and Losses from Damage to the Road Infrastructure of Ukraine as a Result of the Russian Federation's Armed Aggression

Yevhen Pivnov *

* Post-graduate student at NSC «Hon. Prof. M. S. Bokarius FSI», Kharkiv, Ukraine, ORCID: <https://orcid.org/0009-0005-2430-3510>, e-mail: Pivnov@hniise.gov.ua

DOI: [10.32353/khrife.2.2024.08](https://doi.org/10.32353/khrife.2.2024.08) UDC 343.98:001.891:355.018:625.7:341.322
Received: 25.06.2024 / Reviewed: 26.06.2024 / Accepted for print: 26.06.2024 /
Available online: 30.06.2024



It has been established that, currently, there are no specialized methods that would contain a clear algorithm for performing studies to determine the extent of harm and losses from damage to the road infrastructure of our country as a consequence of the Russian Federation's armed aggression in forensic expert practice of forensic construction-engineering and road technical examination studies in Ukraine. It has been established that if such research is necessary, a forensic expert is forced to adapt the previously developed research methodologies to the present realities. Currently, it is proven that there is an urgent need to develop methodologies and improve existing approaches to establishing the scope and amount of harm and losses inflicted, considering the destruction of Ukraine's road infrastructure due to active hostilities against our country. The Article Purpose is to determine the essence, content, general methodical approaches to establishing the extent of damage and losses from damage to the road infrastructure of Ukraine as a result of the Russian Federation's Armed Aggression. To fulfill this goal, such general methods of scientific knowledge as observation, comparison, abstraction, analysis, synthesis, modeling, etc., as well as separate (instrumental) and special methods of forensic examination (methodologies of forensic research perform the functions of the latter) have been applied.

This article is translation of the original Ukrainian content, which source is available at the link: <https://khrife-journal.org/index.php/journal> (translated by Andriy Bublikov). The authors acknowledge translation as corresponding to the original.

© 2024 The Author(s). Published by National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute» & Yaroslav Mudryi National Law University.

This is an open access article distributed under Creative Commons Attribution License (CC_BY_4.0.0) allowing unlimited use, distribution and reproduction on any medium, subject to reference to the Author and original sources.

Keywords: *automobile road; forensic construction-engineering examination; forensic road technical examination; pecuniary damage; scope of works; damage; armed aggression; damage to road infrastructure.*

Research Problem Formulation

Since February 24, 2022, the Russian Federation's full-scale military aggression on the territory of Ukraine has been underway. As a result, combat clashes with the Russian aggressor are taking place on a large part of the territory of our country. Enemy troops launch missile attacks, conduct artillery shelling and bombardment of cities and critical infrastructure facilities, including roads.

As of the end of June 2024, active hostilities continue in the Luhansk, Donetsk, Kharkiv, Sumy, Zaporizhzhia, Mykolaiv, and Kherson regions. Some of parts of these regions are not controlled by the Ukrainian authorities. Due to active hostilities, enterprises, residential buildings, and infrastructure facilities, including, in particular, automobile roads of settlements, public roads and adjacent territories, departmental roads, have been destroyed ¹.

Based on Report of the Kyiv School of Economics on Damages to Infrastructure from the Destruction Caused by Russia's Military Aggression against Ukraine as of January 2024, the total amount of direct damage to transport infrastructure facilities

in Ukraine amounted to \$36.8 billion. According to preliminary estimates, a total of 25,400 km of roads and 344 bridges and bridge crossings of state, local or municipal importance have been damaged due to the hostilities (for bridges and roads, see the Ministry of Infrastructure). According to the Ministry, a preliminary review of the condition of roads in the de-occupied regions (Chernihiv, Kyiv, Sumy, and Kharkiv regions) confirms preliminary estimates of significant damage to the road structure due to the passage of tanks and other heavy military equipment, which will require reconstruction of a significant part of the damaged roads ².

Ongoing efforts are underway to restore parts of the urban road infrastructure and public roads in government-controlled and de-occupied areas. Based on information from State Agency for Restoration and Infrastructure Development of Ukraine, 57 artificial structures were repaired in 2023, including 21 (destroyed due to Russia's military aggression against Ukraine), 7 (repaired for Polish loan finds), and 5 (in cooperation with IFI). 12 temporary bridges and pontoon crossings were constructed, including: 2 in Chernihiv region, 1 in Kyiv region, 4 in Kharkiv region, 1 in Sumy region, 1 in Chernivtsi region,

-
- 1 Ольхов В. С. Проблемні питання у визначенні вартості пошкоджень автомобільних доріг, які утворилися внаслідок збройної агресії РФ. *Судова експертиза в контексті відновлення України* : мат-ли III Всеукр. наук.-практ. конф. (Львів, 09.06.2023). Київ, 2023. С. 242–245. URL: <https://intelekt.org.ua/wp-content/uploads/2023/08/sudova-ekspertyza-2023-druk.pdf> (date accessed: 28.05.2024).
 - 2 Звіт про прямі збитки інфраструктури від руйнувань внаслідок військової агресії Росії проти України станом на початок 2024 року. 39 с. URL: https://kse.ua/wp-content/uploads/2024/04/01.01.24_Damages_Report.pdf (date accessed: 28.05.2024).

1 in Zakarpattia region, 1 in Dnipropetrovsk region, 1 in Lviv region ³.

According to data released by Prosecutor General's Office of Ukraine, as of January 2024, the Unified Register of Pre-Trial Investigations contained more than 100,000 criminal proceedings involving violations of the laws and customs of war. In 2023 alone, it registered 178,902 proceedings associated with criminal offenses against property, specifically, seizure of the funds provided for restoration of Ukrainian infrastructure destroyed as a result of hostilities ⁴.

Such a number of criminal proceedings involving violations of the laws and customs of war require the appointment and conduct of forensic road technical examination, which can be conducted by both certified forensic experts of state expert institutions and forensic experts who are not employees of specialized state institutions.

In the course of forensic expert practice, the problem of determining the method of estimating the volume and extent of damage and loss resulting from the destruction of the road infrastructure in Ukraine as a result of the military aggres-

sion of the Russian Federation is frequently encountered in this research. That is why, under such conditions, forensic construction-engineering and road technical examinations require new algorithms and methods, new general methodical approaches, which determine the relevance of our research.

Analysis of Essential Researches and Publications

Theoretical and methodical provisions of forensic construction-engineering and road technical examinations are reflected in research papers by domestic researchers. For example, D. Puchko outlined the issues of classifying forensic construction-engineering examinations, evaluating their results, developing other theoretical, legal and general theoretical provisions of forensic construction-engineering examination, particularly he studied challenging issues of construction-engineering research, singled out its types, and suggested possible ways to improve the classification of forensic construction-engineering examinations, etc. ⁵.

3 Звіт Державного агентства відновлення та розвитку інфраструктури України за 2023 рік. 37 с. URL: <https://restoration.gov.ua/4489/zvity/59572/59573.pdf> (date accessed: 28.05.2024).

4 Про зареєстровані кримінальні правопорушення та результати їх досудового розслідування / Офіс Генпрокурора : офіц. сайт. URL: <https://gp.gov.ua/ua/posts/prozareystrovani-kriminalni-pravoporushennya-ta-rezultati-yih-dosudovogo-rozsliduvannya-2> (date accessed: 28.05.2024).

5 Пучко Д. В. Щодо проблемних питань класифікації судової будівельно-технічної експертизи. *Теорія та практика судової експертизи і криміналістики*. 2019. Вип. 20. С. 478—490. DOI: [10.32353/khrife.2.2019.38](https://doi.org/10.32353/khrife.2.2019.38) (date accessed: 25.05.2024) ; Його ж. До питання оцінювання результатів судової будівельно-технічної експертизи у кримінальному провадженні. *Там само*. 2020. Вип. 21. С. 92—105. DOI: [10.32353/khrife.1.2020.06](https://doi.org/10.32353/khrife.1.2020.06) (date accessed: 25.05.2024) ; Його ж. Належність та достовірність висновку експерта як критерії оцінювання судової експертизи. *Там само*. 2020. Вип. 22. С. 174—187. DOI: [10.32353/khrife.2.2020.17](https://doi.org/10.32353/khrife.2.2020.17) (date accessed: 25.05.2024) ; Його ж. До питання про розроблення теоретико-правових та загально-методичних положень судової будівельно-технічної експертизи. *Судова експертиза: сучасність та майбутнє* : мат-ли кругл. столу (Львів, 25.01.2018). Львів, 2019. С. 104—106 ; Його ж. Проблемні питання судової будівельно-технічної експертизи. *Актуальні питання судової експертизи і криміналістики* : мат-ли міжнар. наук.-практ. конф., присяч. 150-річ. з дня народж. Засл. проф. М. С. Бокаріу-

A. Bezuhlyi with his co-authors recommended establishing the amount of damage based on the results of inventory checking, inspection / examination of destroyed or damaged automobile roads, carried out in compliance with current legislation and stemming from the results of comprehensive inventory checking. The amount of damage is calculated in natural units (km, running meter, units, pieces, etc.), for example, the length of destroyed or damaged automobile roads and their components, possibly other facilities of the transport infrastructure ⁶.

H. Bashkirov ⁷ believes that the following methods should be applied to determine the amount of property damage caused by the shelling of residential buildings:

- reproduction (compilation of a cost estimate based on the Estimating Norms of Ukraine in Construction ⁸ : Guidelines for Determining Construction Cost);

- replacement (determination of the amount of losses based on the current cost of creating [acquiring] a new facility similar to the valued facility, which can be an equivalent replacement, for example, using aggregated cost indicators to assess the value of buildings and structures based on functional analogues);
- determining market value of facilities that are either completely destroyed or not subject to restoration (there is no technical possibility and expediency to restore them) as well as destroyed profitable real estate (commercial, warehouse, industrial, office, etc.) as of the beginning of the war (23.02.2022).

However, he emphasizes that the Procedure for Determining Damage and Losses Inflicted on Ukraine as a Result of the Russian Federation's Armed Aggression approved by Resolution of the

са (Харків, 18–19.04.2019). Харків, 2019. С. 310–312 ; Його ж. Проблемні питання диференціації видів судових будівельно-технічних експертиз, що призначаються за злочинами у сфері будівництва. *Пріоритетні напрямки розвитку правової системи України* : мат-ли міжнар. наук.-практ. конф. (Львів, 25–26.01.2019). Львів, 2019. С. 125–128 ; Його ж. До питання удосконалення класифікації судових будівельно-технічних експертиз із урахуванням досвіду країн Балтії. *Проблеми та перспективи розвитку судової експертизи та криміналістики* : мат-ли міжнар. наук.-практ. конф (Одеса, 16.10.2020). Одеса, 2020. С. 487–492. URL: http://ondise.minjust.gov.ua/wp-content/uploads/2020/12/Conference_16102020.pdf (date accessed: 25.05.2024).

- 6 Безуглий А. О., Каськів В. І., Стасюк Б. О., Ілляш С. І., Бібик Ю. М. Теоретичні аспекти та методичні підходи до визначення розміру шкоди та збитків, завданих автомобільним дорогам внаслідок збройної агресії. *Дороги і мости*. 2023. Вип. 28. С. 19–27. DOI: 10.36100/dorogimosti2023.28.019 (date accessed: 25.05.2024).
- 7 Башкіров Г. Б. Про вихідні дані для виконання судових будівельно-технічних експертиз по визначенню шкоди та збитків, завданих Україні у зв'язку з обстрілами житлових будинків внаслідок збройної агресії Російської Федерації. *Проблематика документального оформлення, визначення шкоди та відшкодування збитків, завданих Україні та її громадянам внаслідок збройної агресії Російської Федерації* : тези наук.-практ. конф. (Харків, 22.06.2022). Харків, 2022. С. 48–51. URL: https://nauka.nlu.edu.ua/nauka/download/zbirniki_konf/Tezi_konf_22_06_2022.pdf (date accessed: 25.05.2024).
- 8 Кошторисні норми України у будівництві : затв. наказ. Мінрозвитку громад та територ. України від 01.11.2021 р. № 281. URL: <https://zakon.rada.gov.ua/rada/show/v0281914-21#n12> (date accessed: 25.05.2024).

Cabinet of Ministers of Ukraine No. 326⁹ dated 20.03.2022 (if possible and in case of significant and hidden damage) stipulates determination of damages and losses in monetary terms, as set forth in the methodology approved by the Order of the Ministry of Economy, which did not exist at that time. It is worth pointing out that as of today, the Methodology for Determining Damage and Losses Inflicted on the Energy Infrastructure Facilities of Ukraine as a Result of the Russian Federation's Armed Aggression has been approved by the Order of the Ministry of Energy and the State Property Fund of Ukraine¹⁰.

In the article on the methodical approach to determining the amount of damage and losses resulting from damage and destruction of buildings, structures and other infrastructure as a result of the Russian Federation's armed aggression, A. Vozniuk and M. Hryha concluded that expert assistance in determining the amount of damage and losses resulting from damage and destruction of residential and non-residential buildings and

infrastructure as a result of the Russian Federation's armed aggression is essential for the implementation of mechanisms aimed at reimbursement (compensation) of the damage caused, in particular, at the expense of the aggressor country. The need to establish not only the amount of damage caused but also the cause-and-effect relationship between damage and aggressive military actions of the Russian Federation determines the priority of conducting multidisciplinary expert studies involving specialists from various fields¹¹.

It should be borne in mind that the author of this article has also published a number of publications on peculiarities of forensic road technical examinations, where he considered the current state of road technical research development, aspects of expanding the scope of road technical examination during the war and the restoration of Ukraine in the post-war period, as well as problems of methodical support for forensic road technical examination¹².

- 9 Порядок визначення шкоди та збитків, завданих Україні внаслідок збройної агресії Російської Федерації : затв. постанов. КМУ від 20.03.2022 р. № 326 (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/326-2022-%D0%BF#Text> (date accessed: 28.05.2024).
- 10 Методика визначення шкоди та збитків, завданих об'єктам енергетичної інфраструктури України внаслідок збройної агресії Російської Федерації : затв. наказ. Міненергетики та Фонду держмайна України від 22.02.2023 р. № 57/342. URL: <https://zakon.rada.gov.ua/laws/show/z0708-23#Text> (date accessed: 28.05.2024).
- 11 Вознюк А. А., Грига М. А. Експертне забезпечення визначення розміру шкоди та збитків від пошкодження і руйнування будівель, споруд та інших об'єктів інфраструктури внаслідок збройної агресії рф. *Науковий вісник Ужгородського національного університету. Серія: Право*. 2022. Вип. 73. Ч. 2. С. 123—130. DOI: 10.24144/2307-3322.2022.73.51 (date accessed: 28.05.2024).
- 12 Півнюв Є. Судово-експертне дорожньо-технічне дослідження: стан і зміни відповідно до нових завдань експертного забезпечення правосуддя. *Теорія та практика судової експертизи і криміналістики*. 2023. Вип. 4 (33). С. 178—190. DOI: 10.32353/khrife.4.2023.12 (date accessed: 28.05.2024) ; Його ж. Деякі аспекти розширення меж предмету дорожньо-технічної експертизи в умовах війни та відновлення України у повоєнний період. *Актуальні питання судово-експертної діяльності в умовах воєнного стану та повоєнний період* : мат-ли всеукр. наук.-практ. конф. (Одеса — Львів, 28.09.2022). Львів, 2022. С. 121—124. URL: <http://ndekc.lviv.ua/pdf/174.pdf> (date accessed: 28.05.2024) ; Його ж. До проблем методичного забезпечення судової дорожньо-технічної експертизи під час війни.

Article Purpose

To identify the essence, content, and general methodical approaches to establishing the volumes and extent of damage and losses inflicted due to destruction of the road infrastructure in Ukraine as a result of the Russian Federation's armed aggression.

Research Methods

To fulfil this goal, such general methods of scientific cognition as observation, comparison, abstraction, analysis, synthesis, modeling, etc., as well as separate (instrumental) and special methods of forensic examination (methodologies of forensic research perform the functions of the latter) have been utilized.

Main Content Presentation

Due to the long-term military aggression by the Russian Federation and, accordingly, the resulting destruction of the road infrastructure in Ukraine, there is an urgent need to apply a unified approach to determining the damage and losses inflicted on Ukraine, with the aim of further compensating owners, specifically at the expense of the aggressor country.

Let's consider the terminology related to the analyzed type of research. The National Classifier of Ukraine НК 018:2023

sets forth the following classification of buildings and structures:

“Structures are land related structures that are made of building materials and components and/or on which construction work is undertaken. In this respect, soil preparation, planting or sowing, etc., for agricultural purposes are not considered structures.

Buildings are covered structures that can be used separately, constructed for permanent purposes, forming above or below ground premises designed to accommodate people, equipment, animals, plants and objects. <...>

Engineering structures: all structures that cannot be classified as buildings, including linear facilities of engineering and transport infrastructure and corresponding structures”¹³.

As set out in the Law of Ukraine On Roads, “automobile road is a linear complex of engineering structures designed for continuous, safe and convenient movement of vehicles”¹⁴.

Thus, automobile roads constitute the road infrastructure in Ukraine, and road infrastructure facilities are, accordingly, the objects of forensic road technical examination.

The Procedure for Determining Damage and Losses Inflicted on Ukraine as a Result of the Russian Federation's Armed Aggression, adopted by the Cabinet of Ministers of Ukraine at the beginning of the full-scale invasion, stipulates the following:

Актуальні питання судової експертизи та криміналістики : мат-ли міжнар. наук.-практ. конф. з нагоди ювіл. видат. учен.: 95-річчя від дня народж. Л. Ю. Ароцкера («Ароцкерівські читання») і 105-річчя від дня народж. М. В. Салтевського (Харків, 19.05.2023). Харків, 2023. С. 239–241. URL: <https://drive.google.com/file/d/1WnOCsPaFLjSy4TdY0hSUCiAVWz4ANHL7/view> (date accessed: 28.05.2024).

13 Про затвердження національного класифікатора НК 018:2023 та скасування національного класифікатора ДК 018-2000 : наказ Міністерства економіки України від 16.05.2023 р. № 3573. URL: <https://zakon.rada.gov.ua/rada/show/v3573930-23#Text> (date accessed: 28.05.2024).

14 Про автомобільні дороги : Закон України від 08.09.2005 р. № 2862-IV (зі змін. та допов). URL: <https://zakon.rada.gov.ua/laws/show/2862-15#Text> (date accessed: 28.05.2024).

“15) loss of transport infrastructure, infrastructure (including physical) of electronic communication networks: an area including destroyed or damaged roads, automobile roads, airfields and airfield facilities, port infrastructure, hydraulic structures, vessels of sea and inland water transport, postal facilities, infrastructure (including physical) of electronic communication networks and other transport infrastructure, electronic communications.

Key indicators to be assessed:

- length of ruined, destroyed, or damaged automobile roads (including departmental [technological] roads and their components; <...>
- ruined, destroyed, or damaged transport infrastructure...”¹⁵.

The Ministry for Communities, Territories and Infrastructure Development of Ukraine (hereinafter referred to as the *Ministry of Infrastructure*) is in charge of determining the damage and losses inflicted on Ukraine as a result of the Russian Federation’s armed aggression¹⁶.

In 2023, the Ministry of Infrastructure by Order No. 182 dated March 24, 2024, approved the Methodology of Determining Damages and Losses Inflicted on the Transport Infrastructure, Infrastructure of Electronic Communication Networks and Postal Facilities as a Result of the

Russian Federation’s Armed Aggression (hereinafter — *the Methodology*)¹⁷ developed for analytical assessment by state or local self-government authorities of damage and losses inflicted, particularly on road infrastructure facilities. Such analytical assessment may involve specialists, enterprises, institutions and organizations of any form of ownership. Enterprises, institutions and organizations have the right to assess damage and losses independently on the basis of the General Principles for Assessing Damage to Property and Property Rights as a Result of the Russian Federation’s Armed Aggression¹⁸.

The procedure for calculating damages and losses caused by damage to road infrastructure as a result of the Russian Federation’s armed aggression is stipulated, outlining the period from February 19, 2014, that is, from the beginning of the anti-terrorist operation against the aggressor country. Based on the guiding principles of the World Bank, a mechanism for assessing (determining the size of) direct and indirect damages and the cost of restoration has been determined.

“The methodology does not apply to:

- vehicles that carry out technological transportation only within the territory of enterprises as set out in Article 2 of the Law of Ukraine ‘On Transport’¹⁹;

15 Порядок визначення шкоди та збитків ... URL: <https://zakon.rada.gov.ua/laws/show/326-2022-%D0%BF#Text> (date accessed: 28.05.2024).

16 Ibidem.

17 Методика визначення шкоди та збитків, завданих інфраструктурі транспорту, інфраструктурі електронних комунікаційних мереж та об’єктів поштового зв’язку внаслідок збройної агресії Російської Федерації : затв. наказ. Мінінфраструктури України від 24.03.2023 р. № 182. URL: <https://zakon.rada.gov.ua/laws/show/z0733-23#Text> (date accessed: 28.05.2024).

18 Загальні засади оцінки збитків, завданих майну та майновим правам внаслідок збройної агресії Російської Федерації : дод. до Порядку визначення шкоди та збитків ... URL: <https://zakon.rada.gov.ua/laws/show/326-2022-%D0%BF#Text> (date accessed: 28.05.2024).

19 Про транспорт : Закон України від 10.11.1994 р. № 232/94-ВР (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/232/94-%D0%B2%D1%80#Text> (date accessed: 28.05.2024).— Author.

- *carrying out a standardized, independent damage assessment and forensic examination of destruction and damage to transport infrastructure facilities caused by the Russian Federation's armed aggression.*

Independent assessment or forensic examination (expert study) of actual damages, lost profits and restoration needs assessment are carried out under the Laws of Ukraine 'On Appraisal of Property, Property Rights and Professional Appraisal Activity in Ukraine'²⁰ and 'On Forensic Examination'²¹''²².

Based on information envisaged by the State Agency for Reconstruction and Development of Infrastructure of Ukraine, regional state administrations, military administrations, state authorities, state enterprises, local self-government, enterprise of housing and communal services of any ownership type perform analytical assessment of the damage to road infrastructure facilities that have been damaged or destroyed.

Extent of the damage inflicted on the road infrastructure is calculated for two groups of facilities: 1) public automobile roads, streets and roads of cities and other inhabited localities, departmental (technological) automobile roads; automobile roads in private areas; 2) bridges on public automobile roads, bridges on streets and roads of cities and other inhabited localities, bridges on departmental (technological) automobile roads, bridges on automobile roads in private areas.

The above-mentioned methodology does not address forensic examination.

Accordingly, during forensic examination, the extent of physical damage and losses to transport infrastructure resulting from the Russian Federation's armed aggression shall be determined in accordance with the requirements of the Law of Ukraine *On Forensic Examination* and existing methods that are used in practice during forensic construction-engineering examination, forensic road technical examination, that is, using methods developed in peacetime and which do not take into account the destruction during hostilities.

Forensic experts calculate the amount of property damage during forensic construction engineering examination and in compliance with the tasks (questions) within specialty 10.6 *Examination of real estate objects, building materials, structures and relevant documents* specified in the Scientific and Methodological Guidelines on Preparation and Appointment of Forensic Examinations and Expert Research (hereinafter – SMG):

“What damages to the facility (building, apartment, room, decoration, etc.) occurred as a result of flooding, fire, natural disaster, mechanical impact, soil subsidence in the mining allotment, etc.?”

What is the technical cause of the real estate damage/destruction (elements, structures, utilities, etc.)?”

What is the cost of repair and construction work required to repair damage caused by flooding, fire, natural disaster, mechanical impact, soil subsidence, etc.?”

What is the amount of pecuniary damage to the facility (building, apartment, room,

20 Про оцінку майна, майнових прав та професійну оціночну діяльність в Україні : Закон України від 12.07.2001 р. № 2658-III (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/2658-14#Text> (date accessed: 28.05.2024).— *Author.*

21 Про судову експертизу : Закон України від 25.02.1994 р. № 4038-XII (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/4038-12#Text> (date accessed: 28.05.2024).— *Author.*

22 Методика визначення шкоди та збитків URL: <https://zakon.rada.gov.ua/laws/show/z0733-23#Text> (date accessed: 28.05.2024).

decoration, etc.) caused by flooding, fire, natural disaster, mechanical impact, soil subsidence, etc.?"²³.

Thus, forensic construction-engineering and road technical examinations do not presuppose resolution of issues involving the study of road infrastructure damaged as a result of the aggressor country's actions (artillery shelling, air bombardment and missile strikes). Therefore, there is an urgent need to determine the amount of pecuniary damage inflicted on the owner of the infrastructure facility (automobile roads, road sector, engineering structures, etc.) during hostilities. Since these facilities belong to a special category of road infrastructure, we believe that the issues should be resolved within the framework of: 1) forensic road technical examination, 2) if necessary, multidisciplinary forensic construction-engineering and forensic road technical examination.

To implement the first option, Ch. 4 Sec. II *Forensic engineering technical examination* of the SMG needs to be amended as follows:

"4. Forensic Examination of the condition of roads and road conditions

4.1. Principal tasks of this forensic examination are: determining conformity of technical and operational, geometric and technical indicators of automobile roads with regulatory and technical requirements; ensuring compliance of traffic organization works with traffic safety requirements; establishing technical condition of the road infrastructure, causes of damage and destruction of facilities and their elements; assessing the cost of works on road infrastructure facilities related to restoration, re-equipment, elimination of natural disaster consequences, me-

chanical and other negative impact (air bombardment, artillery shelling, missile attacks, etc.); establishing the extent of pecuniary damage and losses incurred by the owners of road infrastructure facilities.

4.2. Approximate list of issues to be addressed regarding the condition of the road and road conditions at the scene of traffic collision:

Did the actual technical and operational indicators of automobile road (such as flatness, coefficients of adhesion and stiffness, etc.) meet the road safety requirements?

Did the road repair, operation, and maintenance work meet road safety requirements?

Was there a cause-and-effect relationship between traffic collision and road conditions that did not meet the requirements of regulatory documents?

Does organization of traffic on the road section under examination ensure road safety?

Did geometric parameters of the automobile road meet the requirements of regulatory documents?

4.3. Indicative list of issues to be resolved regarding the condition of roads and road conditions resulting from damage to road infrastructure facilities:

What damage occurred to the road infrastructure facilities as a result of aerial bombardment, artillery shelling, missile strikes, natural disasters, mechanical and/or other negative impacts, and soil subsidence in the mining allotment, etc.?

What is the technical cause of damage and destruction of the road infrastructure due to aerial bombardment, artillery shelling, missile strike, natural disaster, mechanical and/or other negative impact, soil subsidence in the mining allotment, etc.?

23 Науково-методичні рекомендації з питань підготовки та призначення судових експертиз та експертних досліджень : затв. наказ. Мін'юсту України від 08.10.1998 р. № 53/5 (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/z0705-98#Text> (date accessed: 28.05.2024).

What is the cost of repair and construction works necessary to eliminate the destruction of the road infrastructure facility as a result of aerial bombardment, artillery shelling, missile strike, natural disasters, mechanical and/or other negative impacts, subsidence of the ground in the mining allotment, etc.?

What is the pecuniary damage suffered by the owner due to the destruction of the road infrastructure facility resulting from aerial bombardment, artillery shelling, missile strikes, natural disasters, mechanical or other negative impacts, or other negative events such as soil subsidence in the mining area, etc.?

What is more, within the framework of this forensic examination, it is possible to resolve the issue of assessing the cost of repair work to restore roads, bridges, etc., or the cost of building a new facility according to specified parameters, i.e., drawing up a cost estimate, or calculating the current cost for creating (acquiring) a new facility.

When drawing up a cost estimate for public automobile roads, it should be borne in mind that *“the estimated cost of road works and services includes the cost of works (services), the cost of installed equipment, and other costs.*

Road works include new construction, reconstruction, and overhaul of public automobile roads.

Road services include current, current average repairs and operational maintenance of public automobile roads”²⁴.

The issue of determining the cost of repair works for restoration of roads, bridges, etc., damaged as a result of the Russian

Federation's armed aggression, or the cost of constructing a new facility according to specified parameters, can be addressed both during repair works (when works such as implementing new construction, reconstruction, repairs, and operational maintenance of public roads have already begun or even been completed), as well as at the stage of preparing the investor's estimate documentation for the performance of works, if available.

When determining the cost of repair work to restore roads, bridges, etc. (when work on new construction, reconstruction, repair and operational maintenance of public roads has already begun or even been completed), a forensic expert conducts expert research according to the following scheme:

- familiarization with the project documentation, working and as-built drawings, and other sources of information;
- visual inspection of the construction site and its structures, taking photos and determining the compliance of the facility with the project. Visual inspection is conducted to obtain the most definitive and reliable information about the type of construction (repair) work performed on the facility and building structures, materials, and products used to perform such work;
- analyzing the inspection results and comparing them with the design and construction documentation. Drawing conclusions on the compliance of the reporting documentation with

24 Методика визначення вартості дорожніх робіт та послуг щодо визначення вартості нового будівництва, реконструкції, ремонтів та експлуатаційного утримання автомобільних доріг загального користування : затв. наказ. Мінінфраструктури України від 07.10.2022 р. № 753 (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/rada/show/v0753733-22#Text> (date accessed: 28.05.2024).

the work actually performed at the construction site ²⁵.

The extent of pecuniary damage and losses (cost of repair and restoration works) is determined by the method of creating a cost estimate according to the Estimating Norms of Ukraine in Construction ²⁶ or the Methodology for Estimating the Cost of Road Works and Services for Determining the Cost of New Construction, Reconstruction, Repairs and Operational Maintenance of Public Automobile Roads ²⁷, as well as according to resource element estimates.

In the presence of the investor's construction estimate documentation, if the work has not yet actually begun, a forensic expert may conduct a study to determine whether the cost of the work specified in the project estimate documentation for constructing and repairing an automobile road (section of an automobile road) complies with the cost specified in the legal regulations on construction ²⁸. In other words, it is possible to determine the compliance of costs for the planned construction of an automobile road (or its section) with legal regulations on construction.

Forensic construction-engineering examination (forensic road technical examination) or multidisciplinary forensic examination can be appointed at the stage when the investor's estimate documentation for repair or construction of a road and transport facilities has not yet been drawn

up, i.e., the scope of work has not been determined and a defective act for the construction facility has not been compiled.

In this case, the amount of construction work is used to determine the estimated cost of construction. These are initial data for determining the estimated cost of construction. The accuracy of determining the estimated cost of construction depends on the accuracy of estimating the scope of work. That is, a forensic expert, independently or with the assistance of relevant specialists, must carry out an inspection of the destroyed automobile road (transportation structure), conduct forensic examination, and determine the scope of construction work.

Inspection of construction sites to determine the scope of required construction or repair and construction works should be carried out in accordance with the requirements of the Methodology for Determining the Actual Scope and Cost of Construction Works Performed According to the Reporting Documentation ²⁹. When inspecting, it is required to take the required measurements, write a description and take photographs.

The scope of work should be calculated in a certain sequence. It is advisable to begin with preparatory work, followed by structural elements and types of work in an order that allows the results of previous calculations to be applied to subsequent stages.

25 Кучеренко Р. И., Пугачова Л. Ф., Пугачова І. Л., Гайдаржі І. О., Кириленко С. А., Міщенко І. П., Радченко С. В., Мацак Н. А. Методика встановлення фактичних обсягів та вартості виконаних будівельних робіт за звітною документацією / за ред. Л. М. Деречі. Рес-е-стр. код 10.6.17. Харків, 2009. 78 с.

26 Кошторисні норми України ... URL: <https://zakon.rada.gov.ua/rada/show/v0281914-21#n12> (date accessed: 25.05.2024).

27 Методика визначення вартості дорожніх робіт та послуг ... URL: <https://zakon.rada.gov.ua/rada/show/v0753733-22#Text> (date accessed: 28.05.2024).

28 Кошторисні норми України ... URL: <https://zakon.rada.gov.ua/rada/show/v0281914-21#n12> (date accessed: 28.05.2024).

29 Кучеренко Р. И., Пугачова Л. Ф., Пугачова І. Л. та ін. Зазнач. твір.

The difficulty of examination lies in the fact that usually the destroyed sections of automobile roads are located either in the zone of active hostilities or in the de-occupied territories with all the negative consequences of the Russian Federation's full-scale invasion. Under such circumstances, there may be explosive objects at the place of expert inspection, which may result in incomplete repair of damage to elements of automobile roads and transport facilities. Overall, during research it is important to determine the exact cause of damage. It is possible only with the involvement of specialists in the field of explosives (specialty 5.2 *Investigation of explosive devices, traces and circumstances of explosion*), who should:

- 1) measure the geometric dimensions of the crater (width, length and depth) using a measuring tape;
- 2) determine coordinates of the crater's center;
- 3) determine the azimuth of the strike by the shape of the crater;
- 4) survey the crater using the UAV;
- 5) remove fragments of destruction means from the crater and place them together with the forensic ruler on the evidence cloth;
- 6) survey the surrounding area, record coordinates of the fragments that help to identify destruction means, remove them and place on the evidence cloth;
and after completion of these works:
- 7) fill in the scheme detailing the location of destruction means fragments in the area;

8) fill in the table of coordinates of craters and fragments;

9) prepare a report on the study of the crater area.

The ultimate goal of the forensic explosives expert is to determine the cause of the damage to the road infrastructure facility. After conducting the blast-explosion investigation, the expert in the field of road technical examination, taking into account the initial data on the condition of the examined object, can determine one of the types of repair or operational maintenance. According to ДСТУ 8747:2017, there are two types of repairs: *overhaul* and *current*.

The list of required works depends on the type of repair. The type of repair, composition and scope of overhaul and current repairs for each road section, separate road structure or element of the road are determined on the basis of the results of diagnostics and assessment of their actual condition, engineering studies, tests and inspections recorded in defective acts or other documents, taking into account the overhaul life of the road surface (pavement) and in accordance with Annex B of ДСТУ 8747:2017³⁰ and other construction rules and regulations.

Operational maintenance works presuppose examination (inspection) of an automobile road and right-of-way for timely detection and elimination of damages, ensuring the operation of road elements in different seasons, keeping them in operational condition in compliance with ДСТУ 8747:2017, engineering and technical support works and emergency works³¹.

30 ДСТУ 8747:2017 Автомобільні дороги. Види та переліки робіт з ремонтів та експлуатаційного утримання : затв. наказ. ДП «УкрНДНЦ» від 20.12.2017 р. № 434 [Чинний від 01.01.2020]. URL: https://zakon.isu.net.ua/sites/default/files/normdocs/dstu_8747_2017.pdf (date accessed: 25.05.2024).

31 ДСТУ 8747:2017. URL: https://zakon.isu.net.ua/sites/default/files/normdocs/dstu_8747_2017.pdf (date accessed: 25.05.2024).

The pricing system for estimating the cost of road works and services stems from the rules for determining the cost of construction, reconstruction, repair and maintenance of public roads under the Methodology for Estimating the Cost of Road Works and Services for Determining the Cost of New Construction, Reconstruction, Repairs and Operational Maintenance of Public Automobile Roads³², as well as according to other methodologies for determining the cost of road works and services, sectoral calculations of resource expenditures, calculations of resource expenditures within enterprises, individual calculations of resource expenditures.

In the pricing system, when determining the cost of road works and services, databases of similar objects, price databases, aggregated cost indicators are used.

Current prices for material resources are accepted on the basis of price analysis at a justified price. This price cannot exceed the average price of material resources, which was at the time of calculating the extent of damage.

The cost of material resources, operation of road machines and mechanisms, the amount of wages can be determined according to the databases developed by the State Enterprise *National Institute of Infrastructure Development*³³. The advantage of using such prices is that they are set individually for each month, year, and region. The minimum, average, and maximum values of prices are also determined. The current prices for material resources are accepted at the level of the average prices in the region. These prices

are established at the time of the project documentation development and are determined on the basis of a price database or market price analysis (with reference to price data sources).

The final stage of determining pecuniary damage is preparation of the investor's estimate documentation, where the consolidated estimate of the cost of construction is a cost indicator for determining the amount of damage, which is prepared on the basis of consolidated estimates of the construction site cost, facility cost estimates, local cost estimates, a statement of resources for local cost estimates, a statement of resources for facility cost estimates, a statement of resources for consolidated cost estimates of the construction site, and cost estimates.

When analyzing the damage to roads and transport facilities caused by the Russian Federation's armed aggression, it can be pointed out that damage from shelling, bombing and missile attacks is due to the destruction of road components and transport facilities caused by explosions during shelling. Technical and operational capabilities of roads and structures are also reduced by the movement of heavy wheeled and tracked military equipment on roads.

Determination of the state of technical and operational indicators for the road is carried out within expert specialty 10.16 *Technical Examination of Roads*. The following issue is resolved: "Do the actual technical and operational indicators (flatness, coefficients of adhesion and stiffness, etc.) of the road meet the road safety requirements?"³⁴.

32 Методика визначення вартості дорожніх робіт та послуг URL: <https://zakon.rada.gov.ua/rada/show/v0753733-22#Text> (date accessed: 28.05.2024).

33 Держзідприємство «Національний інститут розвитку інфраструктури» : офіц. сайт. URL: <https://nidi.org.ua/ua> (date accessed: 28.05.2024).

34 Науково-методичні рекомендації URL: <https://zakon.rada.gov.ua/laws/show/z0705-98#Text> (date accessed: 28.05.2024).

According to sub-clause 5.1.1 of ДСТУ 3587:2022³⁵, automobile roads, railway and tram crossings must meet the level of requirements for the operational condition of their components and protect road users and vehicles when they are moving at the permitted speed.

After determining technical and operational condition of the road, it is possible to conclude that it is safe to maintain and operate within the permitted speed limits.

Depending on the degree of decline in technical and operational characteristics, it is expedient to determine the type of repair, the amount of work required and, having prepared the investor's estimate documentation, to calculate the cost of performing required construction work on assessing and improving technical and operational indicators of the road in order to enhance safe traffic conditions, and, accordingly, to determine the extent of pecuniary damage from the destruction of the road infrastructure facility (cost of repair and restoration work).

Conclusions

According to a study on the current state of methodical approaches to determining the scope and extent of damage and losses resulting from damage and destruction of Ukraine's road infrastructure as a result of the Russian Federation's armed aggression, the following can be stated: currently, there is no uniform approach to determining the scope of repair and restoration works and the amount of damage (losses). In the forensic expert practice of performing forensic construction-engineering and road technical examina-

tions, there are no methodologies that would allow generalizing the algorithm for conducting studies to determine the scope of repair and restoration works and the extent of damage (losses) suffered by the owners of Ukrainian infrastructure as a result of the Russian Federation's armed aggression.

In the course of researching the scope of repair and restoration works and the amount of damage (losses) resulting from damage and destruction of Ukraine's road infrastructure due to the Russian Federation's armed aggression, the forensic expert adjusts the existing research methods of this issue to today's realities, namely to the consequences of the Russian Federation's military aggression.

At present, there is an urgent need to improve the existing approach to determining the scope of repair and restoration works and the amount of damage (losses), taking into account the war and the destruction of Ukraine's road infrastructure as a result of active hostilities.

Methodology developed on the basis of integrating knowledge in the field of explosives (to identify the causes of destruction of road infrastructure facilities), forensic construction-engineering and road technical examination (depending on damaged elements of the road infrastructure facility) will be of a complex nature.

Методичні підходи до визначення шкоди та збитків від пошкодження дорожньої інфраструктури України внаслідок збройної агресії рф

Євген Півнюв

Констатовано, що станом на сьогодні в експертній практиці проведення судових

35 ДСТУ 3587:2022 Безпека дорожнього руху. Автомобільні дороги. Вимоги до експлуатаційного стану : затв. наказ. ДП «УкрНДНЦ» від 21.11.2022 р. № 228 [Чинний від 01.12.2022]. URL: https://online.budstandart.com/ua/catalog/doc-page.html?id_doc=99355 (date accessed: 28.05.2024).

будівельно-технічних і дорожньо-технічних досліджень в Україні немає спеціалізованих методик, які містили б чіткий алгоритм виконання досліджень із визначення обсягів та розмірів завданої шкоди і збитків від пошкодження дорожньої інфраструктури нашої держави внаслідок збройної агресії рф. Зазначено, що в разі необхідності проведення таких досліджень судовий експерт вимушений пристосовувати розроблені раніше методики дослідження до реалій сьогодення. Доведено, що сьогодні існує нагальна потреба в розробленні методики і вдосконаленні наявних підходів до визначення обсягів і розмірів завданої шкоди та збитків із урахуванням руйнацій дорожньої інфраструктури України внаслідок ведення активних бойових дій проти нашої держави. Мета статті: визначити сутність, зміст, загальнометодичні підходи до встановлення обсягів і розмірів шкоди та збитків, завданих у результаті руйнувань дорожньої інфраструктури України внаслідок збройної агресії рф. Для досягнення поставленої мети застосовано такі загальні методи наукового пізнання, як спостереження, порівняння, абстрагування, аналіз, синтез, моделювання тощо, а також окремі (інструментальні) і спеціальні методи судової експертизи (функції останніх виконують методики судово-експертних досліджень).

Ключові слова: автомобільна дорога; судова будівельно-технічна експертиза; судова дорожньо-технічна експертиза; матеріальна шкода; обсяги робіт; збитки; збройна агресія; пошкодження дорожньої інфраструктури.

Financing

This research did not receive any specific grant from funding institutions in the public, commercial or non-commercial sectors.

Disclaimer

Founders had no role in the study design, data collection and analysis, decision to publish, or manuscript preparation.

Participants

Author contributed solely to the intellectual discussion underlying this document, case law research, writing and editing and assumes responsibility for its content and interpretation.

Declaration of Competing Interest

Author declare no conflict of interest.

References

- Bashkirov, H. B. (2022). Pro vykhidni dani dlia vykonannya sudovykh budivelno-tekhnichnykh ekspertyz po vyznachenniu shkody ta zbytkiv, zavdanykh Ukraini u zv'iazku z obstrilamy zhytlovykh budynkiv vnaslidok zbroinoi ahresii Rosiiskoi Federatsii [On the Initial Data for Conducting Forensic Construction and Technical Examinations to Determine the Damage and Losses Inflicted on Ukraine Due to the Shelling of Residential Buildings as a Result of the Russian Federation's Armed Aggression]. *Problematyka dokumentalnoho oformlennia, vyznachennia shkody ta vidshkoduvannia zbytkiv, zavdanykh Ukraini ta yii hromadynam vnaslidok zbroinoi ahresii Rosiiskoi Federatsii* : tezy nauk.-prakt. konf. (Kharkiv, 22.06.2022). Kharkiv. URL: https://nauka.nlu.edu.ua/nauka/download/zbirniki_konf/Tezi_konf_22_06_2022.pdf [in Ukrainian].
- Bezuhlyi, A. O., Kaskiv, V. I., Stasiuk, B. O., Iliash, S. I., Bibyk, Yu. M. (2023). Teoretychni aspekty ta metodychni pidkhody do vyznachennia rozmiru shkody ta zbytkiv, zavdanykh avtomobilnym doroham vnaslidok zbroinoi ahresii [Theoretical Aspects and Methodological Approaches to Determining the Amount of Damage and Losses Caused to Roads as a Result of Armed Aggression]. *Dorohy i mosty*. Vyp. 28. DOI: [10.36100/dorogimosti2023.28.019](https://doi.org/10.36100/dorogimosti2023.28.019) [in Ukrainian].
- Kucherenko, R. Y., Puhachova, L. F., Puhachova, I. L., Haidarzi, I. O., Kyrylenko, S. A., Mishchenko, I. P., Radchenko, S. V., Matsak, N. A. (2009). *Metodyka vstanovlennia faktychnykh obsiahiv ta vartosti vykonanykh budivelnykh robot za zvitnoiu dokumentatsiieiu* [Methodology of Determining Actual Volumes and Cost of Performed Construction Works According to the Reporting Documentation] / za red.

- L. M. Derechi. Reiestr. kod 10.6.17. Kharkiv [in Ukrainian].
- Olkhov, V. S. (2023). Problemni pytannia u vyznachenni vartosti poshkodzen avtomobilnykh dorih, yaki utvorylysia vnaslidok zbroinoi ahresii RF [Problematic Issues in Determining the Cost of Damage to Highways Inflicted by the Russian Federation's Armed Aggression]. *Sudova ekspertyza v konteksti vidnovlennia Ukrainy : mat-ly III Vseukr. nauk.-prakt. konf. (Lviv, 09.06.2023)*. Kyiv. URL: <https://intelekt.org.ua/wp-content/uploads/2023/08/sudova-ekspertyza-2023-druk.pdf> [in Ukrainian].
- Pivnov, Ye. (2022). Deiaki aspekty rozshyrennia mezh predmetu dorozhno-tekhnicnoi ekspertyzy v umovakh viiny ta vidnovlennia Ukrainy u povoiennyi period [Certain Aspects of Expanding the Scope of Road Technical Examination in War Conditions and During Restoration of Ukraine in the Post-war Period]. *Aktualni pytannia sudovo-ekspertnoi diialnosti v umovakh voiennoho stanu ta povoiennyi period : mat-ly vseukr. nauk.-prakt. konf. (Odesa – Lviv, 28.09.2022)*. Lviv. URL: <http://ndekc.lviv.ua/pdf/174.pdf> [in Ukrainian].
- Pivnov, Ye. (2023). Do problem metodychnoho zabezpechennia sudovoi dorozhno-tekhnicnoi ekspertyzy pid chas viiny [Regarding the Issues of Methodical Provision of Forensic Road Technical Examination in Wartime]. *Aktualni pytannia sudovoi ekspertyzy ta kryminalistyky : mat-ly mizhnar. nauk.-prakt. konf. z nahody yuvil. vydat. uchen.: 95-richchia vid dnia narodzh. L. Yu. Arotskera («Arotskerivski chytannia») i 105-richchia vid dnia narodzh. M. V. Saltevskeho (Kharkiv, 19.05.2023)*. Kharkiv. URL: <https://drive.google.com/file/d/1Wn-OCsPaFLjSy4TdY0hSUCiAVWz4ANHl7/view> [in Ukrainian].
- Pivnov, Ye. (2023). Sudovo-ekspertne dorozhno-tekhnicne doslidzhennia: stan i zminy vidpovidno do novykh zavdan ekspertnoho zabezpechennia pravosuddia [Forensic Road Technical Examination: State and Changes in Accordance With New Tasks of Expert Support of Justice]. *Teoriia ta praktyka sudovoi ekspertyzy i kryminalistyky*. Vyp. 4 (33). DOI: 10.32353/khrife.4.2023.12 [in Ukrainian].
- Pro zareiestrovani kryminalni pravoporushennia ta rezultaty yikh dosudovoho rozsliduvannia / Ofis Henprokurora [On Registered Criminal Offenses and Results of Their Pre-Trial Investigation / Prosecutor General's Office] : ofits. sait. URL: <https://gp.gov.ua/ua/posts/pro-zareiestrovani-kryminalni-pravoporushennia-ta-rezultaty-yih-dosudovo-go-rozsliduvannya-2>* [in Ukrainian].
- Puchko, D. V. (2019). Do pytannia pro rozroblennia teoretyko-pravovykh ta zahalno-metodychnykh polozhen sudovoi budivselno-tekhnicnoi ekspertyzy [On the Issue of Developing Theoretical-Legal and General-Methodological Provisions of Forensic Construction and Engineering Examination]. *Sudova ekspertyza: suchasnist ta maibutnie : mat-ly kruhl. stolu (Lviv, 25.01.2018)*. Lviv [in Ukrainian].
- Puchko, D. V. (2019). Problemni pytannia dyferentsiatsii vydiv sudovykh budivselno-tekhnicnykh ekspertyz, shcho pryznachaiutsia za zlochyname u sferi budivnytstva [Problematic Issues of Differentiating Types of Problematic Issues of Forensic Construction and Engineering Examinations Appointed for Crimes in the Field of Construction]. *Priorytetni napriamky rozvytku pravovoi systemy Ukrainy : mat-ly mizhnar. nauk.-prakt. konf. (Lviv, 25–26.01.2019)*. Lviv [in Ukrainian].
- Puchko, D. V. (2019). Problemni pytannia sudovoi budivselno-tekhnicnoi ekspertyzy [Problematic Issues of Forensic Construction and Engineering Examination]. *Aktualni pytannia sudovoi ekspertyzy i kryminalistyky : mat-ly mizhnar. nauk.-prakt. konf., prysiach. 150-rich. z dnia narodzh. Zasl. prof. M. S. Bokariusa (Kharkiv, 18–19.04.2019)*. Kharkiv [in Ukrainian].
- Puchko, D. V. (2019). Shchodo problemnykh pytan klasyfikatsii sudovoi budivselno-tekhnicnoi ekspertyzy [Regarding Problems of Forensic Structural Engineering Classification]. *Teoriia ta praktyka sudovoi ekspertyzy i kryminalistyky*. Vyp. 20. DOI: 10.32353/khrife.2.2019.38 [in Ukrainian].
- Puchko, D. V. (2020). Do pytannia otsiniuvannia rezultativ sudovoi budivselno-tekhnicnoi ekspertyzy u kryminalnomu provadzheni [On the Issue of Evaluating the Forensic Structural Engineering Results in Criminal

- Proceedings]. *Teoriia ta praktyka sudovoi ekspertyzy i kryminalistyky*. Vyp. 21. DOI: [10.32353/khrife.1.2020_06](https://doi.org/10.32353/khrife.1.2020_06) [in Ukrainian].
- Puchko, D. V. (2020). Do pyttannya udoskonalennia klasyfikatsii sudovykh budivelnno-tekhnichnykh ekspertyz iz urakhuvanniam dosvidu krain Baltii [On the Issue of Improving the Classification of Forensic Construction and Technical Examinations Taking Into Account the Experience of the Baltic Countries]. *Problemy ta perspektyvy rozvytku sudovoi ekspertyzy ta kryminalistyky : mat-ly mizhnar. nauk.-prakt. konf.* (Odesa, 16.10.2020). Odesa. URL: http://ondise.minjust.gov.ua/wp-content/uploads/2020/12/Conference_16102020.pdf [in Ukrainian].
- Puchko, D. V. (2020). Nalezhnist ta dostovirnist vysnovku eksperta yak kryterii otsiniuvannia sudovoi ekspertyzy [Relevance and Reliability of an Expert Conclusion as a Criteria for Evaluating Forensic Examination]. *Teoriia ta praktyka sudovoi ekspertyzy i kryminalistyky*. Vyp. 22. DOI: [10.32353/khrife.2.2020.17](https://doi.org/10.32353/khrife.2.2020.17) [in Ukrainian].
- Vozniuk, A. A., Hryha, M. A. (2022). Ekspertne zabezpechennia vyznachennia rozmi-ru shkody ta zbytkiv vid poshkodzhennia i ruinuvannia budivel, sporud ta inshykh ob'ektiv infrastruktury vnaslidok zbroinoi ahresii rf [Expert Provision of Determining the Amount of Damage and Losses From Damage and Destruction of Buildings, Structures and Other Infrastructure Objects as a Result of Armed Aggression of the Russian Federation]. *Naukovyi visnyk Uzhhorodskoho natsionalnoho universytetu. Serii: Pravo*. Vyp. 73. Ch. 2. DOI: [10.24144/2307-3322.2022.73.51](https://doi.org/10.24144/2307-3322.2022.73.51) [in Ukrainian].
- Zvit Derzhavnogo ahentstva vidnovlennia ta rozvytku infrastruktury Ukrainy za 2023 rik* [Report of the State Agency for Restoration and Infrastructure Development of Ukraine as of 2023]. URL: <https://restoration.gov.ua/4489/zvity/59572/59573.pdf> [in Ukrainian].
- Zvit pro priami zbytky infrastruktury vid ruinuvan vnaslidok viiskovoi ahresii Rosii proty Ukrainy stanom na pochatok 2024 roku* [Report on Damages to Infrastructure from the Destruction Caused by Russia's Military Aggression against Ukraine as of January 2024]. URL: https://kse.ua/wp-content/uploads/2024/04/01.01.24_Damages_Report.pdf [in Ukrainian].
- Pivnov, Y. (2024). Methodical Approaches to Determining Harm and Losses from Damage to the Road Infrastructure of Ukraine as a Result of the Russian Federation's Armed Aggression. *Theory and Practice of Forensic Science and Criminalistics*. Issue 2 (35). P. 110–126. DOI: [10.32353/khrife.2.2024.08](https://doi.org/10.32353/khrife.2.2024.08)