ISIS Journal No. 1 (59), 2025

LIFE CYCLE MANAGEMENT OF CONSTRUCTION FACILITIES

CURRENT PROBLEMS OF RESIDENTIAL REAL ESTATE VALUATION

V.V. BREDIKHIN, Y.V. DAVIDENKO

Vladimir Viktorovich Bredikhin, Doctor of Economics, Professor, Southwestern State University, Kursk, Russia.
Yulia Vladimirovna Davidenko, Lecturer, Southwestern State University, Kursk, Russia.

This article examines the current problems of residential real estate valuation. Key issues such as insufficient valuation quality, lack of a unified methodology and transparency of real estate valuation, as well as deliberate distortion of the value of real estate have been studied. All the problems have been considered in detail, and solutions have been proposed.

Keywords: life cycle, valuation, appraiser, real estate object, SRO, market value.

References

1. Nanazashvili I.Kh. Real estate valuation / I.Kh. Nanazashvili, V.A. Litovchenko. - M .: Architecture-S, 2005 .-- 198 p.
2. Uchinina T.V. Modern problems of real estate valuation / I.M. Bobrova, T.V. Uchinina // Actual issues of modern economics. - 2019. - No. 3-1. - P.174-177.
3. Bredikhin, V.V. Problems of approaches to real estate valuation / V.V. Bredikhin, Yu.V. Davidenko // Scientific journal. Engineering systems and structures. - 2024. - No. 1 (55). - P. 6-11. 4. Saltykov, A. P. “Poor-quality” assessment as a complex problem of organizing the assessment of the market value of real estate objects / A. P. Saltykov // The World of Economics and Law. - 2010. - No. 3. - P. 4-9.
5. Vlasov, A. D. Problems of assessing real estate objects in Russia / A. D. Vlasov // Inter Expo Geo-Siberia. - 2019. - Vol. 3, No. 1. - P. 64-70. - DOI 10.33764/2618-981X-2019-3-1 64-70.
6. Teshev, I.K. Problems of mass valuation of real estate / I.K. Teshev, A.S. Kolpakov, Ya.V. Zaitseva // Modern problems and prospects for the development of land and property relations: Collection of articles based on the materials of the II All-Russian scientific practical conference, Krasnodar, April 24, 2020 / Responsible for the issue E.V. Yarotskaya. - Krasnodar: Kuban State Agrarian University named after I.T. Trubilin, 2020. - P. 156-161.
7. Bugrova A.V. Selection of methods and approaches to real estate valuation // Scientific notes of the Tambov branch of RosSMU. 2018. No. 12. - Access mode - Electronic resource - [https://cyberleninka.ru/article/n/vybor-metodov-ipodhodov-otsenki-nedvizhimosti].
8. Koroleva N. I, Germanovich A. G. The role and problems of mass valuation of land and residential real estate at cadastral value // International Journal of Applied Sciences and Technologies "Integral". - 2019. - No. 2. - Access mode - Electronic resource [https://cyberleninka.ru/article/n/rol-i-problemy-massovoy-863 nedvizhimosti-po-kadastrovoy-stoimosti] - accessed on 25.11.2019.
9. otsenki-zemli-i-zhiloy Mikheev G. V., Shikhovtsov A. A., Varich E. S., Bazarov I. B. Improving the management processes of a construction enterprise // Fundamental research. - 2019. - No. 1. - P. 40-45.
10. Federal Law of the Russian Federation of July 29, 1998 No. 135-FZ "On Appraisal Activities in the Russian Federation".
11. / Galimova, A. R. Problems of assessing the market value of real estate objects A. R. Galimova // Student science - for agricultural production: Proceedings of the 80th student (regional) scientific conference, Kazan, February 08-09, 2022. Volume 1. - Kazan: Kazan State Agrarian University, 2022. - P. 75-80.

DOI:10.36622/2074-188X.2025.31.81.001

ADAPTATION OF A RATING SYSTEM FOR ASSESSING THE SUSTAINABILITY OF THE HABITAT FOR UNIVERSITY CAMPUSES

E.E. PROKSHITS, O.A. SOTNIKOVA, D.K. PROSKURIN

Ekaterina Evgenievna Prokshits, Senior Lecturer, Voronezh State Technical University, Voronezh, Russia
Olga Anatolyevna Sotnikova, Doctor of Technical Sciences, Professor, Voronezh State Technical University, Voronezh, Russia
Dmitry Konstantinovich Proskurin, Candidate of Physical and Mathematical Sciences, Associate Professor, Voronezh State Technical University, Voronezh, Russia

The article formulates a set of criteria for assessing the sustainable development of the university environment, including new categories "Technological innovation and digitalization of BIM" and "Interaction with the city". The introduction of these categories is justified by ranking and adjusting them, taking into account the specifics of the university campus. With the help of an expert assessment, the consistency of opinions and the significance of criteria have been established. The maximum points are proposed for calculating the integral indicator (S-factor) of the sustainability of campus development.

Keywords: university campus, habitat sustainability, sustainable development, rating system, expert assessment

References

1. Savvinov, V.M. The concept of sustainable development as a basis for modern education management practices. Professional education in Russia and abroad. - 2021. - No. 1 (41). - P. 136-146.
2. Brodach, M.M. Global goals of sustainable development and environmental requirements for real estate / M.M. Brodach, N.V. Shilkin // Energy saving. - 2022. - No. 6. - P. 1-13.
3. Brodach, M.M. Sustainable development strategy: environmental requirements for real estate / M.M. Brodach, N.V. Shilkin // Science, education and experimental design: Abstracts of reports of the international scientific and practical conference of faculty, young scientists and students, Moscow, April 3-7, 2023. – Moscow: Moscow Architectural Institute, 2023. – P. 362-363.
4. STO NOSTROY 2.35.4–2011 Green construction. Residential and public buildings. Rating system for assessing the sustainability of the living environment. – Moscow: NOSTROY, 2011. – [Electronic resource].
5. Innovative educational environment (campuses): approved by the Minister of Science and Higher Education of the Russian Federation on December 12, 2024. – [Electronic resource].
6. Prokshits, E.E. Implementation of sustainable development principles in the formation of a dynamic model of a university campus / E.E. Prokshits // Scientific journal. Engineering systems and structures. – 2024. – No. 1 (55). – P. 19-26.
7. Zagorskaya, A.V. Application of expert assessment methods in scientific research. The required number of experts / A.V. Zagorskaya, A.A. Lapidus / Scientific and technical journal "Construction production". - 2020. - No. 3. - P. 21-34.
8. Lyubushin, N.P. Using the generalized Harrington desirability function in multiparameter economic problems / N.P. Lyubushin, G.E. Brikach / Economic analysis: theory and practice. - 2014. - No. 18 (370). - P. 2-10.
9. Postnikov, V. M. Analysis of approaches to the formation of the composition of the expert group focused on the preparation and adoption of decisions / V. M. Postnikov // Science and education: scientific publication of Bauman Moscow State Technical University. - 2012. - No. 5. - P. 23.
10. Shchekin, A.V. A priori ranking of factors. Guidelines for laboratory work for students majoring in 110400 "Foundry production of ferrous and non-ferrous metals". - Khabarovsk: Khabarovsk State Technical University, 2004. - 12 p.

DOI: 10.36622/2074-188X.2025.64.24.002

A METHOD FOR IDENTIFYING THE STAGE OF THE CITY'S LIFE CYCLE BASED ON A SYSTEM OF INDICATORS BASED ON THE EXAMPLE OF VORONEZH

Y.A. ZOLOTUKHINA, D.K. PROSKURIN, O.A. SOTNIKOVA

Zolotukhina Yana Alekseevna, Senior Lecturer, Voronezh State Technical University, Voronezh, Russia
Proskurin Dmitrij Konstantinovich, PhD in Physics and Mathematics, Associate Professor, Voronezh State Technical University, Voronezh, Russia
Sotnikova Olga Anatolievna, doctor of technical sciences., Professor, Voronezh State Technical University, Voronezh, Russia

The article is devoted to the methodology of identifying the stages of the city's life cycle based on a system of indicators covering economic, social, environmental, infrastructural and innovative aspects of development. The article considers an integrated approach that includes data collection and processing, normalization and weighting of indicators, calculation of an integral indicator and interpretation of the results to determine the current stage of the city's life cycle. The example of the city of Voronezh shows how this methodology can be applied to analyze and develop sustainable development strategies.

Keywords: life cycle, life cycle stage identification, indicators, risk zone, stability zone, thresholds, transformation.

References

1. Savvinov, V.M. The concept of sustainable development as a basis for modern education management practices. Professional education in Russia and abroad. - 2021. - No. 1 (41). - P. 136-146.
2. Brodach, M.M. Global goals of sustainable development and environmental requirements for real estate / M.M. Brodach, N.V. Shilkin // Energy saving. - 2022. - No. 6. - P. 1-13.
3. Brodach, M.M. Sustainable development strategy: environmental requirements for real estate / M.M. Brodach, N.V. Shilkin // Science, education and experimental design: Abstracts of reports of the international scientific and practical conference of faculty, young scientists and students, Moscow, April 3-7, 2023. – Moscow: Moscow Architectural Institute, 2023. – P. 362-363.
4. STO NOSTROY 2.35.4–2011 Green construction. Residential and public buildings. Rating system for assessing the sustainability of the living environment. – Moscow: NOSTROY, 2011. – [Electronic resource].
5. Innovative educational environment (campuses): approved by the Minister of Science and Higher Education of the Russian Federation on December 12, 2024. – [Electronic resource].
6. Prokshits, E.E. Implementation of sustainable development principles in the formation of a dynamic model of a university campus / E.E. Prokshits // Scientific journal. Engineering systems and structures. – 2024. – No. 1 (55). – P. 19-26.
7. Zagorskaya, A.V. Application of expert assessment methods in scientific research. The required number of experts / A.V. Zagorskaya, A.A. Lapidus / Scientific and technical journal "Construction production". - 2020. - No. 3. - P. 21-34.
8. Lyubushin, N.P. Using the generalized Harrington desirability function in multiparameter economic problems / N.P. Lyubushin, G.E. Brikach / Economic analysis: theory and practice. - 2014. - No. 18 (370). - P. 2-10.
9. Postnikov, V. M. Analysis of approaches to the formation of the composition of the expert group focused on the preparation and adoption of decisions / V. M. Postnikov // Science and education: scientific publication of Bauman Moscow State Technical University. - 2012. - No. 5. - P. 23.
10. Shchekin, A.V. A priori ranking of factors. Guidelines for laboratory work for students majoring in 110400 "Foundry production of ferrous and non-ferrous metals". - Khabarovsk: Khabarovsk State Technical University, 2004. - 12 p.

DOI: 10.36622/2074-188X.2025.74.65.003

SCENARIO MODELING OF THE IMPACT OF THE UNIVERSITY CAMPUS DEVELOPMENT TRAJECTORY ON THE CITY

E.E. PROKSHITS, O.A. SOTNIKOVA, P.V. MOSKALEV

Ekaterina Evgenievna Prokshits, PhD student, Voronezh State Technical University, Voronezh, Russia
Olga Anatolyevna Sotnikova, Doctor of Technical Sciences, Professor, Voronezh State Technical University, Voronezh, Russia
Pavel Valentinovich Moskalev, Doctor of Physical and Mathematical Sciences, Professor, Moscow State Technological University "STANKIN", Moscow, Russia; Professor, Voronezh State Technical University, Voronezh, Russia

The article presents a scenario-based modeling of the impact of university campus development on the formation of a sustainable urban environment. Three scenarios for the development of a university campus are considered. The theoretical aspects of the cognitive approach in management are analyzed, the concepts of the cognitive map are formulated, cause-and-effect relationships between the concepts are established, the weights of the connections are determined, and the consonances and dissonances of the influence of the system and the concepts are calculated.

Keywords: university campus, comfortable urban environment, scenario modeling, Fuzzy Cognitive Map, concept

References

1. Zakharova, E.N. Study of weakly structured problems of socio-economic systems. Cognitive approach / E. N. Zakharova, G. V. Gorelova, S. A. Radchenko. - Rostov-on-Don: Southern Federal University, 2006. - 332 p. - ISBN 5-7507-0220-0. - EDN RSGKOT.
2. Gorelova, G.V. Cognitive approach to simulation modeling of complex systems / G. V. Gorelova // Bulletin of SFedU. Technical sciences. - 2013. - No. 3 (140). - P. 239-250. - EDN PYMNEB.
3. Zakharova, E.N. Cognitive Russian Modeling in the System of Corporate Governmance / E.N. Zakharova, A.A. Kerashev, G.V. Gorelova, V.V. Prokhorova / Mediterranean Journal of Social Sciences. – 2015. – Vol. 6. No. 2. – Pp. 295-303. –DOI:10.5901/mjss.2015.v6n2p442.
4. Schofer, E. The Worldwide Expansion of Higher Education in the Twentieth Century / E. Schofer, J. W. Meyer / American Sociological Review. – 2006. – Vol. 70, № 6. – Pp 898–920. DOI: 10.1177/000312240507000602.
5. Abramova, N.A. Cognitive analysis and management of situation development: problems of methodology, theory and practice / N. A. Abramova, Z. K. Avdeeva // Problems of Management. – 2008. – No. 3. – P. 85-87. – EDN IJWFMX.
6. Kamaev, V. A. Cognitive modeling of socio-economic systems: A textbook is intended for students of the following areas: economics, management, informatics and computer engineering, information systems in economics / V. A. Kamaev. – Volgograd: Volgograd State Technical University, 2012. – 114 p. – EDN TEXWQP.
7. Rakitina, M. S. Cognitive analysis and scenario modeling of interbudgetary relations / M. S. Rakitina // Bulletin of the Rostov State University of Economics (RINH). – 2009. – No. 3(29). – P. 134-142. – EDN ORMJYD.
8. Melnik, M. S. Modeling trends and patterns of labor activity in Russia: a cognitive approach / M. S. Melnik, V. D. Orekhov, O. S. Prichin // Problems of Economics and Legal Practice. - 2018. - No. 3. - P. 94-101. - EDN XSNGCD.
9. Anisimov, O. S. Method of working with texts "and intellectual development. - M .: Encyclopedia of management knowledge. - 2001. - 461 p. - ISBN 5-8875-028-0.
10. Karanashev, A.Kh. Dynamic modeling of scenarios for the development of the organizational culture management system of a modern university / A.Kh. Karanashev, D. Yu. Prichin // Bulletin of Adyghe State University. Series 5: Economy. - 2016. - No. 2 (180). - P. 138-155. – EDN XBSBZB.
11. Saak, A. A. Cognitive mapping of rural youth employment problems / A. A. Saak // Systems analysis in design and management: collection of scientific papers of the XXVII International scientific and

practical conference: in 2 parts, St. Petersburg, October 13–14, 2023. – St. Petersburg: POLYTECH-PRESS, 2024. – P. 117–123. – DOI 10.18720/SPBPU/2/id24-155. – EDN DNGVWE.
12. Gorelova, G. V. Problems of development of the south of Russia: modeling results / G. V. Gorelova, A. V. Maslennikova // Proceedings of the conference "Management in technical, ergatic, organizational and network systems", St. Petersburg, October 9–11, 2012 / Edited by S. N. Vasilyeva, I.A. Kalyaeva, D.A. Novikova, G.G. Sebryakova. - St. Petersburg: Central Research Institute "Elektropribor", 2012. - P. 1152-1155. - EDN SHJMLH.
13. Azhmukhamedov I.M. Solving information security problems based on system analysis and fuzzy cognitive modeling: monograph / I.M. Azhmukhamedov - Astrakhan. - 2012. -308 p. - DOI: https://arxiv.org/abs/1204.3245.
14. Orekhov, V.D. Development of models and methods for forecasting the development of socio-economic systems taking into account the human capital factor / V.D. Orekhov. - Moscow: Izdatelstvo "Znanie-M", 2022. - 207 p. – ISBN 978-5-00187-137-8. – DOI 10.38006/00187-137 8.2022.1.207. – EDN RVTNYF.
15. Certificate of state registration of computer program No. 2019617827 Russian Federation. Decision support system based on fuzzy cognitive models "IGLA" (Intelligent Generator of the Best Alternatives), version 4.0: No. 2019616516: declared. 05/29/2019: published. 06/20/2019 / A. G. Podvesovsky, D. G. Lagerev, D. A. Korostelev, R. A. Isaev. – EDN SHEZLV.
16. Gresko, A. A. Development of a cognitive map for analyzing the effectiveness of the organization's HR department / A. A. Gresko // Problems of modern economics. - 2020. - No. 4 (76). - P. 93-97. - EDN NXJKQZ.

DOI: 10.36622/2074-188X.2025.37.75.004

FORMATION OF ORGANIZATIONAL, TECHNOLOGICAL AND ECONOMIC MECHANISMS OF ACTIVITY OF ENTERPRISES OF THE PENZA REGION CONSTRUCTION COMPLEX

B.B. KHRUSTALEV, A.A. KARGIN, V.O. GUTROV

Boris Borisovich Khrustalev Professor, Doctor of Economics, Head of the Department of Economics, Organization and Production Management, FSBOU VO Penza State University of Architecture and Construction (PGUAS), Penza, Russia.
Alexey Alexandrovich Kargin Senior lecturer of the Department "Economics, Organization and Management of Production", FSBOU VO Penza State University of Architecture and Construction (PGUAS), Penza, Russia.
Vladimir Olegovich Gutrov, graduate student of the Department of Economics, Organization and Production Management; Penza State University of Architecture and Construction, Penza, Russia.

In the context of the activities of enterprises of the construction complex, various organizational and technological situations arise most sharply, when the nature of work and development directions in the housing market change, taking into account the accumulated experience and potential. This determines the need to improve the necessary organizational and technological mechanisms and directions of their development aimed at stabilizing the entire construction industry and processes, reducing the influence of the external environment. Within the framework of this study, comprehensive analysis methods were used, including theoretical understanding of the problem, empirical approaches to studying the object of research, as well as subsequent processing, generalization and systematization of the data obtained. The research is based on fundamental scientific approaches such as dialectical, systemic, dynamic, variant, balance, and modeling methods, which allowed for a comprehensive assessment of the processes under consideration. The subject of the research is the organizational and technological mechanisms of the functioning of enterprises, as well as the patterns of their formation and application. The analysis included a study of the structure, principles, and factors influencing the effectiveness of these mechanisms. Special attention is paid to the integration of digital technologies and advanced methods of organizing material production aimed at improving the efficiency of construction process management. The use of these mechanisms at various stages of the life cycle of real estate objects helps to increase the stability and reliability of enterprises in conditions of environmental instability and uncertainty of construction production.

Keywords: enterprises of the construction complex, organizational, technological and economic mechanisms, development directions, life cycle.

References

1. Belyaev M.K. Features of managing the investment and construction complex of the region in modern conditions [Text]: monograph / M.K. Belyaev, G.Yu. Novikova; Moscow State University of Education and Science of the Russian Federation, Volgograd State Technical University. - Volgograd: Volgograd State Technical University, 2018. - 160 p.
2. Bogatyreva V.V. Managing the competitiveness of construction organizations: essence, areas of improvement, foreign experience [Electronic resource]. - URL: http://www.e-rej.ru/upload/iblock/34f/34ff56917af8265c03984704af0f2d12.pdf (accessed: 02/22/2021). 3. Ivanov A. V. Management of the investment and construction complex: essence and characteristic features [Text] / A. V. Ivanov // Economic analysis: theory and practice. - 2018. - No. 3 (474). - Pp. 562 - 574.
4. Ivanova E. I. Ways to improve the competitiveness of a construction enterprise // Youth Scientific Forum: Social and Economic Sciences: electronic. collection of articles on mat. VII international. student scientific and practical. conf. No. 7. [Electronic resource]. - URL: https://nauchforum.ru/archive/MNF_social/7(7).pdf (date of access 02/17/2021).
5. Potapova I. I. The concept of enterprise competitiveness and the main factors of its ensuring in the construction industry [Text] / I. I. Potapova, B. V. Volkov // Bulletin of MGSU. - 2017. - No. 12 (111). - P. 1369 - 137.
6. Ways to improve the quality of work at construction enterprises [Electronic resource] - URL: http://tsp.msk.ru/puti-povysheniya-kachestva-vypolneniya-rabot-na stroitelnyx-predpriyatiyax/ (date accessed 06/05/2021)
7. Socio-economic situation of the Penza region in 2019 [Text]: Statistical yearbook / Territorial body of the Federal State Statistics Service for the Penza region. – Penza, OOP Penzastata, 2020. – 393 p.
8. Khrustalev, B. B., Antipov, V. A., Lunyakov, M. A. The main features of the development of the investment and construction complex of the Russian Federation / B. B. Khrustalev, V. A. Antipov, M. A. Lunyakov // Real estate: economics, management. 2022. No. 2 (67). P. 6-10.
9. Khrustalev B. B. Klyueva E. S. Antipov V. A. Zakharov S. V. The case of Thermodom: features of operation and development of construction holding companies in the residential real estate market of Penza / B. B. Khrustalev, E. S. Klyueva, V. A. Antipov, S. V. Zakharov // Real estate: economics, management. 2021. No. 2 (63). pp. 6-12.
10. B. Khrustalev, P. Grabovy, K. Grabovy, A. Kargin, Taking into Account the Impact of Various Types of Losses When Using Information Modeling Technology in Construction. Journal of Law and Sustainable Development, 2023, 11(2), e289. https://doi.org/10.55908/sdgs.v11i2.289.
11. Khrustalev B., Features of the use of information modeling technology in the activities of the construction complex enterprises in risk conditions/ B. Khrustalev, P. Grabovy, K. Grabovy, A. Kargin, Nexo Revista Científica, Vol. 35, No. 03, pp. 777-786/September 2022. DOI: https://doi.org/10.5377/nexo.v35i03.15007.
12. Khrustalev B.B., Antipov V.A. Factors influencing the sustainable development of enterprises of the investment and construction complex of the Penza region / B.B. Khrustalev, V.A. Antipov // Real Estate: Economics, Management. 2020. No. 2. Pp. 68-72.
13. Khrustalev B.B., Antipov V.A. Formation of an intra-firm strategy for the construction complex using the example of the Penza region in the context of the economic crisis / B.B. Khrustalev, V.A. Antipov // Construction Economics. 2020. No. 3 (63). Pp. 68-77.

DOI: 10.36622/2074-188X.2025.34.72.005

TECHNOLOGY AND ORGANIZATION OF CONSTRUCTION

PUNCHING SHEAR RESISTANCE OF MONOLITHIC REINFORCED CONCRETE FLOOR SLABS WITH DEFECTS CONSTRUCTION WHICH IS BASED ON METAL COLUMNS WITH VARIOUS SHAPES OF COLUMN HEADS

G.A. SMOLYAGO, N.V. FROLOV, S.V. DROKIN

Gennadij Alekseevich Smolyago, Grand PhD in Engineering, Professor of the Belgorod State Technological University named after V.G. Shukhov, Belgorod, Russia
Nikolaj Viktorovich Frolov, PhD in Engineering, Associate Professor of the Belgorod State Technological University named after V.G. Shukhov, Belgorod, Russia
Sergej Vladimirovich Drokin, PhD in Engineering, Associate Professor of the Belgorod State Technological University named after V.G. Shukhov, Belgorod, Russia

Using the example of a real building, the combined effect of construction defects and the different shapes of metal column heads on the punching shear resistance of a girder less monolithic reinforced concrete floor slab has been studied. The study was conducted based on the results of an inspection of the technical condition of the floor slab, which revealed a significant deviation of the actual concrete strength class (on average for the slab B12.5) from the specified in the project (B35). Verification calculations of the slab for punching shear resistance were performed for the effect of concentrated force and bending moments according to the standard methodology. It was found that the punching shear resistance of the floor slab is not ensured in the places where it rests on T-shaped and L-shaped column heads beyond the boundary of the transverse reinforcement, as well as in areas near corner columns with L-shaped column heads with a through hole in the support area in the presence of transverse reinforcement.

Keywords: monolithic reinforced concrete slab, construction defect, strength, punching, column head, calculation, section, basic control perimeter.

References

1. Trekin N.N., Sarkisov D.Yu., Trofimov S.V., Krylov V.V., Evstafieva E.B. Experimental and theoretical study of the punching shear strength of slabs // Bulletin of MGSU. - 2021. Vol. 16. - No. 8. - Pp. 1006-1014.
2. Tamrazyan A.G. On the analysis of the junction of monolithic slabs and columns under punching shear // Safety of the construction stock of Russia. Problems and solutions. Proceedings of the International Academic Readings. Edited by S.I. Merkulov. - 2020. - Pp. 101-109.
3. Kabantsev O.V., Pesin K.O., Karlin A.V. Analysis of the stress-strain state of slab structures in support zones // International journal for the calculation of civil and building structures. - 2017. Vol. 13. - No. 1. - P. 55-62.
4. Kabantsev O.V., Krylov S.B., Trofimov S.V. Numerical analysis of longitudinal reinforcement effect on RC slab punching shear resistance by strength and crack propagation criteria // International Journal for Computational Civil and Structural Engineering. - 2021. Vol. 17. - No. 1. - P. 21-33.
5. Filatov V.B., Galyautdinov Z.Sh. Experimental study and methodology for calculating the strength of reinforced concrete slabs under punching shear // Urban development and architecture. - 2021. Vol. 11. - No. 4 (45). - P. 53-65.
6. Merkulov S.I., Chuykova O.E. Calculation of the monolithic beam-free floor slab for punching shear // Auditorium. - 2017. - No. 3 (15). - P. 68-72.
7. Shogenov O.M., Beppaev A.M. Evaluation of the punching strength of reinforced concrete slabs // Engineering Bulletin of the Don. - 2016. - No. 2 (41). - P. 101.
8. Kremnev V.A., Kuznetsov V.S., Talyzova Yu.A. Calculation of the punching strength of a beam-free capless floor slab // Bulletin of MGSU. - 2014. - No. 10. - P. 34-40.
9. Manaenkov I.K. Comparative analysis of the results of calculating flat reinforced concrete slabs for punching shear // Engineering Bulletin of the Don. - 2022. - No. 2 (86). - P. 362-370.
10. Pekin D.A. Influence of bending on the punching mechanism of the support zone of a reinforced concrete slab // Industrial and civil engineering. - 2019. - No. 10. – P. 20-28.
11. Ankudinov D.A., Rudny I.A., Vorontsova N.S. Comparison of punching strength of flat reinforced concrete roof slabs at different positions of punching contours // Trends in the development of science and education. - 2023. - No. 96-9. - P. 11-15.
12. Dementeva M.E., Minin K.E. Analysis of the operational suitability of the roof slab of the metro station block // Bulletin of the Belgorod State Technological University named after V.G. Shukhov. - 2018. - No. 7. - P. 42-52.
13. Serykh I.R., Chernysheva E.V., Goltsov A.B. Survey of load-bearing structures of the main building of the canning plant // Bulletin of the Belgorod State Technological University named after V.G. Shukhov. - 2022. - No. 2.- P. 30-37.

14. Volkov A.S., Dmitrenko E.A., Korsun A.V. Influence of construction defects on the bearing capacity of reinforced concrete structures of a monolithic frame building // Construction of unique buildings and structures. - 2015. - No. 2 (29). - P. 45-56.
15. Mirsayapov I.T. Assessment of the residual bearing capacity of reinforced concrete structures in operation // Bulletin of the Kazan State University of Architecture and Civil Engineering. - 2022. - No. 2 (60). - P. 6-14.
16. Leonova A.N., Ishchuk Yu.P., Pogodina P.V. Methods for strengthening floor slabs in the punching shear zone // Science. Technology. Technologies (Polytechnic Bulletin). - 2020. - No. 1. - P. 339-344.
17. Ershov M.N., Mushkin A.V. Technology of strengthening floor slabs from punching shear using gluing in transverse reinforcement bars Hilti HZA-P // Technology and organization of construction production. - 2013. - No. 2. - P. 29-35.
18. Lyudkovsky A.M., Sokolov B.S. Experience in designing and testing reinforced support units of monolithic reinforced concrete floors on columns // Bulletin of MGSU. - 2018. Vol. 13. - No. 1 (112). - P. 33-43.
19. Zobkova N.V., Pshenov A.A. Increasing the bearing capacity of the interfloor floor // Technical regulation in transport construction. - 2018. - No. 5 (31). P. 33-35.

DOI: 10.36622/2074-188X.2025.66.74.006

PLANNING OF EXPERIMENTAL STUDIES OF STRUCTURES WITH DISPERSED REINFORCEMENT

S.D. NIKOLENKO, A.N. TKACHENKO, V.N. STARTSEV

Sergey Dmitrievich Nikolenko, Candidate of Technical Sciences, Associate Professor, Associate Professor of Voronezh State Technical University, Voronezh, Russia
Alexander Nikolaevich Tkachenko, Candidate of Technical Sciences, Associate Professor, Associate Professor, Voronezh State Technical University, Voronezh, Russia
Vladimir Nikolaevich Startsev, Candidate of Technical Sciences, Associate Professor, Voronezh State Technical University, Voronezh, Russia

At the initial stage of experimental research, after selecting an object, setting goals and objectives of the experiment, the most important factors affecting the strength of experimental structures are selected. The method of a priori ranking of factors is used as an expert method to select the most significant factors. The characteristics of the experimental samples are given. The method of testing beams for alternating effects is presented. The results of statistical processing of the obtained experimental data are presented.

Keywords: a priori ranking of factors, experimental planning, experimental samples, experimental methodology, statistical processing

References

1. Rabinovich F.N. Composites based on dispersed-reinforced concrete. Theory and design issues, technology, structures. Moscow: ASV Publishing House, 2004.- 560 p.
2. Lesovik V.S. New generation composites for special structures / V.S. Lesovik, R.S. Fedyuk // Construction materials.- 2021.- No. 3.- P. 9-17.
3. Klyuev S.V., Klyuev A.V., Abakarov A.D., Shorstova E.S., Gafarova N.E. Influence of dispersed reinforcement on the strength and deformation characteristics of fine-grained concrete // Civil Engineering Journal.- 2017.- No. 7 (75).- P. 66–75. 4. Saad M. M. G., Almsajdi S.A.A.S., Nankya H., Abdulwahed B.M.H. Steel and basalt fiber comparison in the flexural strength of conventional concrete // International Journal of Humanities and Natural Sciences.- 2021.- No. 2-1 (53).- pp. 69-73.
5. Shafei B., Kazemian M., Dopko M., Najimi M. State-of-the-art review of capabilities and limitations of polymer and glass fibers used for fiber-reinforced concrete // Materials.- 2021. Vol. 14.- No. 2.- pp. 1-45.
6. Pukharenko, Yu.V. Development of a method for testing crack resistance of steel fiber reinforced concrete / Yu.V. Pukharenko, D.A. Panteleev, M.I. Zhavoronkov // Construction Economics. – 2023. –№ 9. – P. 132-137.

7. Zertsalov M.G., Khoteev E.A. Experimental determination of crack resistance characteristics of fiber-reinforced concrete // Vestnik MGSU.- 2014.- № 5.- P. 91–99.
8. Tiberti G, Minelli F, Plizzari G (2015) Cracking behavior in reinforced concrete members with steel fibers: a comprehensive experimental study. Cem Concr Res 68:24–34. doi: 10.1016/j.cemconres.-2014.10.011.
9. F. Altun, T. Haktanir, and K. Ari, "Effects of Steel Fiber Addition on Mechanical Properties of Concrete and RC Beams," Construction and Building Materials, vol. 21 (3), pp. 654-661, 2007. 10. Travush V.I., Konin D.V., Krylov A.S. Strength of reinforced concrete beams made of high-strength concrete and fiber-reinforced concrete // Engineering and construction journal. - 2018. - No. 1 (77). P. 90-100.
11. Pukharenko Yu.V., Panteleev D.A., Morozov V.I., Zhavoronkov M.I. Influence of coarse aggregate on the energy and power characteristics of steel fiber concrete. Construction and reconstruction. 2022; (3): 110-118. https:// doi.org/10.33979/2073-7416-2022 101-3-110-118
12. Dupont D, Vandewalle L. Bending capacity of steel fiber reinforced concrete (SFRC) beams. In: Proceedings of the International congress on challenges of concrete construction, Dundee; 2002. p. 81–90.
13. Perfilov, V.A. Strength and crack-resistance of concrete with fiber fillers and modifying nano-additives. Magazine of Civil Engineering. 2023. 119(3). Article no. 11909. DOI: 10.34910/MCE.119.9
14. Lam, T.Q.K. Input parameters of three-layer steel fiber concrete beams. Magazine of Civil Engineering. 2024. 17(2). Article No. 12604. DOI: 10.34910/MCE.126.4
15. Tarasov R.V., Makarova L.V., Bakhtulova K.M. Assessment of the importance of factors by the method of a priori ranking // Modern scientific research and innovation. 2014. No. 4. Part 1 [Electronic resource]. URL: https://web.snauka.ru/issues/2014/04/33181 (date of access: 02/22/2025).

DOI: 10.36622/2074-188X.2025.50.97.007

THE MAIN DIRECTIONS OF USING AND LEARNING ALGORITHM OF NEURAL NETWORKS IN THE CONSTRUCTION INDUSTRY IN ORDER TO INCREASE EFFICIENCY AND REDUCE THE NEGATIVE IMPACT ON THE ENVIRONMENT

D. I. YEMELYANOV, I. A. KLOKOV, D.V. LEONTIEV

Dmitry Igorevich Yemelyanov, Candidate of Technical Sciences, Associate Professor, Voronezh State Technical University, Voronezh, Russia
Igor Alexandrovich Klokov, Postgraduate Student, Voronezh State Technical University, Voronezh, Russia
Dmitry Vladimirovich Leontiev, Postgraduate Student, Voronezh State Technical University, Voronezh, Russia

An algorithm for learning a neural network is considered, which allows for analytical calculations, whether it is analyzing possible events, monitoring resources and equipment, which will allow both at the planning stage and in the future to reduce production costs and avoid downtime during construction and installation work due to the rational allocation of work and resources over time, when entering provide the necessary data and suggest options for improving and optimizing the construction process in order to reduce the negative impact on the environment.

Keywords: construction organization, construction technology, neural network, learning algorithm.

References

1. Mishchenko A. S. Using neural network technology in construction activities // Bulletin of Polotsk State University. Series D. Economic and legal sciences. - 2024. - No. 2. URL: https://cyberleninka.ru/article/n/ispolzovanie tehnologii-neyronnyh-setey-v-stroitelnoy-deyatelnosti.
2. Golubova O. S., Nguyen Thi Thu Ngan. Foreign experience of using an artificial neural network to forecast the cost of construction // Proceedings of BSTU. Series Economics and Management. - 2023. - No. 1 (268). URL: https://cyberleninka.ru/article/n/zarubezhnyy-opyt-ispolzovaniya-iskusstvennoy-neyronnoy-seti dlya-prognozirovaniya-stoimosti-stroitelstva.

3. Sofiat O. A., Lukumon O. O., Lukman A., Anuoluwapo A., Juan M. D. D., Muhammad B., Olugbenga O. A., Ashraf A. Artificial intelligence in the construction industry: A review of present status, opportunities and future challenges, Journal of Building Engineering, Volume 44, – 2021. 103299, ISSN 2352-7102.
4. Holzmann V., Lechiara M. Artificial Intelligence in Construction Projects: An Explorative Study of Professionals' Expectations. European Journal of Business and Management Research. – 2022. 7. 151-162. 10.24018/ejbmr.2022.7.3.1432.
5. Angah O., Chen A. Y. Tracking multiple construction workers through deep learning and the gradient based method with rematching based on multi-object tracking accuracy. Automation in Construction, – 2020. 119: 103308.
6. Mishchenko V. Ya. Methods for solving calendar planning problems based on compositional matrix-network models / V. Ya. Mishchenko, D. I. Emelianov // News of higher educational institutions. Series: Construction. – 2002. – No. 5 (521). – P. 58-63. EDN: SIIJOR
7. Ponyavina N. A. Implementation of BIM technologies as the main way to improve the construction industry / N. A. Ponyavina, M. E. Popova, K. A. Andreeva, A. V. Mishchenko // Construction and real estate. – 2020. – No. 3 (7). – P. 115-119.
8. Azar E. R. Construction equipment identification using marker-based recognition and an active zoom camera. Journal of Computing in Civil Engineering, – 2016. 30(3): 04015033.
9. Emelianov D. I. Solving the problem of planning complex production processes at an enterprise based on network planning methods / D. I. Emelianov, N. A. Ponyavina, E. A. Chesnokova // News of higher educational institutions. Series: Textile industry technology. – 2017. – No. 5 (371). - P. 28-32. EDN: YUPVNK
10. Emelianov D. I., Ponyavina N. A., Klokov I. A., Andreeva K. A. Application of matrix models and complex optimization criterion in scheduling of construction production / D. I. Emelianov, N. A. Ponyavina, I. A. Klokov, K. A. Andreeva // Construction production. - 2020. - No. 4. - P. 51-57. - DOI 10.54950/26585340_2020_4_51. - EDN YMLXFH.
11. Emelianov D. I., Ponyavina N. A., Klokov I. A., Andreeva K. A. Solving problems of planning construction and installation works in organizational and technological design taking into account energy efficiency / D. I. Emelianov, N. A. Ponyavina, I. A. Klokov, K. A. Andreeva // Construction production. - 2021. - No. 3. - P. 35-40. - DOI 10.54950/26585340_2021_3_5. - EDN WBTTES.
12. Oleinik P. P. Organization of construction production / P. P. Oleinik. MGSU - Moscow: ASV, 2010. - 572 p.
13. Azar E. R. Construction equipment identification using marker-based recognition and an active zoom camera. Journal of Computing in Civil Engineering, – 2016. 30(3): 04015033.
14. Klokov I. A. Dependence of money and time in construction / I. A. Klokov, A. A. Stukalin, I. A. Polushkina, K. A. Andreeva // Innovative methods for designing building structures of buildings and structures: collection of scientific papers of the 2nd All-Russian scientific and practical conference, Kursk, November 20, 2020. - Kursk: South-West State University, 2020. - P. 8-10. EDN: LTKAJT
15. Chupakova A. O., Gudin S. V., Khabibulin R. Sh. Development and training of an artificial neural network model for creating decision support systems // Bulletin of ASTU. Series: Management, computing technology and informatics. - 2020. - No. 3. URL: https://cyberleninka.ru/article/n/razrabotka-i-obuchenie-modeli-iskusstvennoy-neyronnoy-seti-dlya sozdaniya-sistem-podderzhki-prinyatiya-resheniy.

DOI: 10.36622/2074-188X.2025.84.24.008

RESEARCH OF CONSTRUCTIVE SOLUTIONS OF EXTERIOR ENCLOSING STRUCTURES OF LOW-RISE RESIDENTIAL BUILDINGS AT THE DESIGN STAGE

E.E. SEMYONOVA, T.V. BOGATOVA

Elvira Evgenievna Semenova, Candidate of Technical Sciences, Associate Professor, Voronezh State Technical University, Voronezh, Russia
Tatiana Vasilyevna Bogatova, Associate Professor, Voronezh State Technical University, Voronezh, Russia

The article highlights the issues of justifying the choice of building materials for external enclosing structures in order to reduce their thickness. At the same time, the thermal insulation characteristics of the building are preserved and the construction time is shortened. Based on the thermal engineering calculation, the general principles of comparing structures are considered. Analysis of the cost of building materials and installation of construction allows you to choose the best option for exterior enclosing structures for low-rise residential buildings.

Keywords: energy efficiency, building materials, heat loss, thermal conductivity coefficient.

References

1. SP 50.133302.2024. Thermal protection of buildings. Updated version of SNiP 23-02-2003 / Ministry of Construction of Russia. 2024. - 114 p.
2. Semenova E.E. Feasibility study for the selection of enclosing structures in low-rise construction / E.E. Semenova, Yu.V. Umnikova // High technologies in the construction complex. - 2023. - No. 1. - P. 129-133.
3. Ministry of Regional Development of the Russian Federation. Strategy for the development of the building materials industry for the period up to 2020 and the further prospect up to 2030 / Order of the Government of the Russian Federation dated 10.05.2016 No. 868-r // AO Code. - P. 5-10.
4. Guide to assessing the economic efficiency of investments in energy-saving measures / Dmitriev A. N., Kovalev I. N., Tabunshchikov Yu. A., Shilkin N. V. - Moscow: AVOK-Press. - 2010 - 36 p.
5. Sibikin M. Yu. Energy saving technology: textbook / M. Yu, Sibikin, Yu. D. Sibikin // M: Direct-Media. - 2014. - 352 p.
6. Turbina K. S. Analysis of the use of energy-efficient building structures / K. S. Turbina, E. E. Semenova // Scientific journal. Engineering systems and structures. - 2021. - No. 1 (43). -P. 30-35.

DOI: 10.36622/2074-188X.2025.63.50.009

FEATURES OF CONSTRUCTION CONTROL DURING THE CONSTRUCTION OF ENERGY-EFFICIENT LIFE CYCLE BUILDINGS

V. M. CHELNOKOVA, E. V. ROMANENKO

Vera Mikhailovna Chelnokova, PhD in Engineering, Saint Petersburg State University of Architecture and Civil Engineering, Russia, St. Petersburg
Evgeny Vyacheslavovich Romanenko, Postgraduate student, Voronezh State Technical University, Russia, Voronezh

In the context of the development of sustainable and integrated territorial development in Russia, the task of increasing energy efficiency is one of the fundamental tasks for all branches of construction production. The problem of building energy-efficient multi-family apartment buildings depends on how well the construction control was carried out. The article discusses the main stages of the implementation of possible defects in the enclosing structures of an apartment building. Their systematization is given. The reasons for the occurrence and suggestions are presented to reduce the negative impact of poorly performed construction control of enclosing structures for further study. Approaches to the formation of construction control are outlined, taking into account the prospects for the development of sustainable architecture. Solutions have been identified to reduce the negative impact of various deviations that occur during construction in the field of energy efficiency, and various control measures have been proposed to identify and prevent such influences, including the use of digitalization of control measures.

Keywords: energy efficiency, construction control, apartment building, enclosing structure, sustainable architecture, violations of construction technology, the life cycle of objects.

References

1. Kabanova, T.V. Thermal imaging survey as a method of operational control of thermal protection properties of enclosing structures / T. V. Kabanova, V. N. Enyushin, S. E. Anufriev // Bulletin of the Kazan State University of Architecture and Civil Engineering. - 2019. - No. 3 (49). - P. 104-111.
2. Lysev, V.I. Directions for improving the energy efficiency of buildings and structures / V.I. Lysev, A.S. Shilin // Scientific journal of NRU ITMO. Series "Refrigeration and air conditioning". - 2017. - No. 2/3. - P. 18-25.
3. Baulin, A.V. Construction control in the project of work production / A.V. Baulin, A.S. Perunov // Engineering Bulletin of the Don. – 2021. – No. 4. – URL: ivdon.ru/ru/magazine/archive/n4y2021/6909 (date of access: 02.02.2025).
4. Lapidus, A. A. Comprehensive assessment of organizational and technological processes that optimize the duration of monolithic works in the construction of residential buildings / A. A. Lapidus, D. V. Topchiy, A. E. Stepanov. - Moscow: ASV Publishing House, 2022. - 142 p. - ISBN 978-5-4323-0452-0.
5. Lapidus, A. A. Organization of works on inspection of buildings and structures / A. A. Lapidus, D. V. Topchiy // Industrial and civil engineering. - 2023. - No. 3. - P. 12-15. – DOI 10.33622/0869-7019.2023.03.12-15.
6. Features of construction supervision at civil high-rise construction sites / D. V. Topchiy, E. O. Kochurina, A. Yu. Kochetkov, V. S. Chernigov // Construction production. – 2022. – No. 4. – P. 91-94. – DOI 10.54950/26585340_2022_4_91.
7. Abramyan, S. G. Energy-efficient and resource-saving construction technologies / S. G. Abramyan. – Moscow: Limited Liability Company "Rusains", 2022. – 286 p.
8. Rusanov, A. E. Organization of construction supervision by energy efficiency parameters // Bulletin of the South Ural State University. Series: Construction and architecture. – 2014. – No. 2 (12). – P. 15-17.
9. Tolstokorova, A. A. Study of modern methods of design and construction of prefabricated buildings / A. A. Tolstokorova, D. M. Elshaeva // Construction and architecture – 2024: Proceedings of the international scientific and practical conference of the faculty of industrial and civil engineering, Rostov-on-Don, April 17-19, 2024. – Rostov-on-Don: Don State Technical University, 2024. – P. 293-294.
10. A Review of Sustainable Bio-Based Insulation Materials for Energy-Efficient Buildings / P. Raja, V. Murugan, S. Ravichandran [et al.] // Macromolecular Materials and Engineering. – 2023. – Vol. 308, No. 10. – DOI 10.1002/mame.202300086.
11. Organization of supervision over construction works using UAVs and special software / A. Tugay, R. Zeltser, M. Kolot, I. Panasiuk // Science and Innovation. – 2019. – Vol. 15, No. 4. – P. 21-28. – DOI 10.15407/scine15.04.021.
12. Strategies for Sustainable Architecture [Electronic resource] – Access mode: http://library.uniteddiversity.coop/Ecological_Building/Strategies_for_Sustainable_Architecture.pdf (time access: 01/31/2025).
13. Sassi, P. Strategies for Sustainable Architecture // New York USA, Taylor & Francis Inc. 2006, P. 306.
14. Esaulov, G. V. Sustainable architecture - from principles to development strategy // Bulletin of TGASU. - 2014. - No. 6 (47). - URL: https://cyberleninka.ru/article/n/ustoychivaya arhitektura-ot-printsipov-k-strategii-razvitiya (date of access: 31.01.2025).
15. Cao, H. Application of BIM technology in construction project cost refinement control and construction energy consumption control / H. Cao // Applied Mathematics and Nonlinear Sciences. - 2024. - Vol. 9, No. 1. - DOI 10.2478/amns.2023.2.01584.
16. Topchiy, D. V. Practice of conducting an examination as a type of control (supervisory) action with the involvement of experts and expert organizations / D. V. Topchiy, A. Ya. Tokarsky, M. S. Rivanenko // Construction production. - 2023. - No. 1. - P. 56-59. - DOI 10.54950/26585340_2023_1_56.
17. Dennehy, G. Building control (amendment) regulations 2014: integration and compliance in large Irish construction organizations / G. Dennehy, B. Kennedy, J. Spillane // International Journal of Building Pathology and Adaptation. – 2023. – Vol. 41, No. 1. – P. 225-237. – DOI 10.1108/ijbpa-04-2021-0063.
18. Etubi, U. A. Study of Quality Related Project Control Measures on Building Construction Projects in Delta State / U. Etubi, I. O. Victor, E. Daniel // IRESPUB Journal of Environmental & Material Sciences. – 2024. – Vol. 3, No. 2. – DOI 10.62179/irespub-jems.v3i2.3.
19. Serebryanaya, I. A. Quality Control of Welded Joints During Construction and Technical Expertise / I. A. Serebryanaya, A. V. Nalimova // Networked Control Systems for Connected and Automated Vehicles: Conference proceedings, St. Petersburg, 08–10 February 2022. Vol. 510-2. – Switzerland: Springer Nature Switzerland AG, 2023. – P. 1615-1622. – DOI 10.1007/978-3-031-11051-1_166.

20. Khuzhaev, P. S. Energy-efficient wall enclosures of buildings with high thermal insulation characteristics / P. S. Khuzhaev, D. I. Ismatullozoda, F. N. Khasanov // Water resources, energy and ecology. – 2023. – Vol. 3, No. 3. – P. 109-118.
21. Friev, A. M. Study of methods for improving the energy efficiency of residential buildings / A. M. Friev, D. A. Pogodin // Bulletin of Eurasian Science. – 2019. – Vol. 11. – No. 5. – P. 1-11.
22. Fişne, A. Energy-efficient buildings with energy-efficient optimized models: a case study on thermal bridge detection / A. Fişne, M. M. E. Yurtsever, S. Eken // Cluster Computing. – 2024. – DOI 10.1007/s10586-024-04624-y.
23. Kartavskaya, V. M. Improving the energy efficiency of a residential building / V. M. Kartavskaya, S. A. Khoroshikh // IOP Conference Series: Materials Science and Engineering: 3, New Technologies and Targeted Development Priorities, Irkutsk, April 23–24, 2020. – Irkutsk, 2020. – P. 012032. – DOI 10.1088/1757-899X/880/1/012032.
24. Zhigulina, A. Y. Problems of Energy Efficiency of Residential Buildings / A. Y. Zhigulina, A. M. Ponomarenko, E. N. Borodacheva // IOP Conference Series: Materials Science and Engineering: International Science and Technology Conference "FarEastCon 2019", Vladivostok, Russian Island, October 01–04, 2019. Vol. 753, 3, Chapter 2. – Vladivostok, Russian Island: Institute of Physics Publishing, 2020. – P. 032020. – DOI 10.1088/1757-899X/753/3/032020.
25. Kosukhin, M. M. The Energy-Efficient Facade Systems for Civic Buildings / M. M. Kosukhin, A. M. Kosukhin // IOP Conference Series: Materials Science and Engineering: electronic edition, Vladivostok, October 02–04, 2018. Vol. 463, Part 4. – Vladivostok: Institute of Physics Publishing, 2018. – P. 042037. – DOI 10.1088/1757-899X/463/4/042037.
26. Thermal Performance Assessment of Aerogel Application in Additive Construction of Energy-Efficient Buildings / E. V. Kotov, D. Nemova, V. Sergeev [et al.] // Sustainability. – 2024. – Vol. 16, No. 6. – P. 2398. – DOI 10.3390/su16062398.
27. Machine learning-enhanced all-photovoltaic blended systems for energy-efficient sustainable buildings / M. Nur-E-alam, K. Zehad Mostofa, B. Kar Yap [et al.] // Sustainable Energy Technologies and Assessments. – 2024. – Vol. 62. – P. 103636. – DOI 10.1016/j.seta.2024.103636.

DOI: 10.36622/2074-188X.2025.52.72.010

URBAN PLANNING, PLANNING OF RURAL SETTLEMENTS

PRE-PROJECT ANALYSIS AND ORGANIZATION OF TOURIST ROUTES USING THE EXAMPLE OF PLES, IVANOVO REGION

K.S. KOTOVA, Y.A. ZOLOTUKHINA, A.E. KOSTINA

Kristina Sergeevna Kotova, PhD in Technical Sciences, Associate Professor, Voronezh State Technical University, Voronezh, Russia
Yana Alekseevna Zolotukhina, PhD student, Voronezh State Technical University, Voronezh, Russia
Anastasia Eduardovna Kostina, Master's Degree student, Voronezh State Technical University, Voronezh, Russia

This article discusses the methodology for creating tourist routes based on a preliminary analysis of cultural heritage sites. An analysis and classification of the cultural heritage sites in the city of Ples, in the Ivanovo region, has been carried out. A city planning analysis has also been conducted, on the basis of which the structure for the directions of pedestrian tourist routes has been formed.

Keywords: pre-project analysis of the territory, tourism, small towns, tourist route, cultural heritage sites.

References

1. "Strategy for the Development of Tourism in the Russian Federation until 2035" dated September 20, 2019 No. 2129-r
2. State Program of the Russian Federation "Development of Tourism" dated December 24, 2021 No. 2439

3. Kostina, A. E. Problems of Small Towns in Russia and the Possibility of Solving Them from the Perspective of Sustainable Development / A. E. Kostina, E. E. Prokshits, Ya. A. Zolotukhina // Innovative Potential for the Development of Society: a View of Young Scientists: Collection of Scientific Articles from the 5th All-Russian Scientific Conference on Advanced Developments. In 4 volumes, Kursk, November 29, 2024. - Kursk: ZAO "Universitetskaya kniga", 2024. - P. 312-316. - EDN EZNNUB.
4. Zakharchenko, M.K. Issues of small towns as promising centers of socio-economic development of the country / M.K. Zakharchenko // Bulletin of the Plekhanov Russian University of Economics. Introduction. Path to Science. - 2020. - Vol. 10, No. 2 (30). - P. 89 98. - EDN ECEJSV.
5. Vavulin, K.E. The concept of sustainable development of small historical towns / K.E. Vavulin, E.V. Malaya // Bulletin of the South Ural State University. Series: Construction and Architecture. - 2020. - Vol. 20, No. 4. - P. 5-12. - DOI 10.14529/build200401. - EDN SUFRBK.
6. Bolshakov A.G., Gladysheva Yu.B. Methodology for the formation of tourist routes and urban planning principles for the exposition of cultural heritage sites in Chita// Bulletin of IrSTU - 2014. - No. 11 (94). - P. 144-150.
7. N 73-FZ "On cultural heritage sites (historical and cultural monuments) of the peoples of the Russian Federation" dated 06/25/2002
8. Plyos (city) [Electronic resource] // Wikipedia. Free encyclopedia. - URL: https://ru.wikipedia.org/wiki/Плёс_(город) (date of access: 10/25/2024)
9. Minkult-Maps [Electronic resource] // URL: https://okn-mk.mkrf.ru/maps# (date of access: 11/25/2024).
10. Evtushkova E.P., Simakova T.V. Historical, cultural and economic framework as a basis for territorial organization, tourist activities in the territory of Yalutorovsk // Moscow Economic Journal - 2020. - No. 12. - P. 509-521.
11. Krasheninnikov A.V. Social and spatial structure of pedestrian space // Bulletin of IrSTU - 2015. - No. 3 (98). - P. 152-156.
12. Kulakov A.I., Shishkanov V.S., Shishkanova M.A. Organization of pedestrian tourist routes in historical cities // AMIT. - 2012. - No. 4 (21). - P. 1-7.
13. Ponomareva I.Yu., Tankieva T.A., Ponomareva M.V., Korolev A.V. Tourism as a direction of sustainable development of small towns// Online scientific journal. – 2012. No. 3(85). – P. 137-150.

DOI: 10.36622/2074-188X.2025.18.75.011

ENVIRONMENTAL SAFETY OF CONSTRUCTION AND URBAN ECONOMY

THE ROLE AND PLACE OF LANDFILLS IN THE ECOLOGICAL AND ECONOMIC SYSTEM OF URBAN INFRASTRUCTURE

E.A. ZHIDKO, A.S. CHESNOKOV

Elena Aleksandrovna Zhidko, Doctor of Technical Sciences, Professor, Voronezh State Technical University, Voronezh, Russia
Alexander Sergeevich Chesnokov, Candidate of Technical Sciences, Associate Professor, Voronezh State Technical University, Voronezh, Russia

The primary task of the urban environment is to manage the environmental situation. Waste management is an important component of the environmental sustainability of urban infrastructure. The article analyzes waste management processes in the Russian Federation, the impact of landfills of solid household waste on the environment and the population. The SPZ of the polygon's influence has been determined. For the reclamation and further use of the territories of the landfill, field studies were conducted, including several stages. In order to minimize the risk of possible emergencies and the consequences of their impact on the operating system, a set of engineering and technical measures has been proposed.

Keywords: production and consumption waste, solid household waste, landfill, environment, damage, reclamation

References

1. Zhidko E.A., Popova V.A., Kiryanov K.A., Zakharchenkova I.A. Waste management as an important component of environmental sustainability of urban infrastructure. Scientific journal. Engineering systems and structures. 2023. No. 1 (51). P. 45-50.
2. Azizov M.K., Zhidko E.A. Waste management system as the main element of environmental and economic sustainability of urban infrastructure [Text] / Azizov M.K., Zhidko E.A. // Engineering systems and structures. - 2021. - No. 1 (43). - P. 74 -79.
3. Sotnikova O.A., Zhidko E.A. Problems of waste disposal from environmentally hazardous and economically important facilities of the Central Black Earth Region and ways to solve them // Biosphere compatibility: man, region, technologists. 2017. No. 3 (19). P. 11-20
4. Russian statistical yearbook. 2023: Stat.sb./Rosstat. - P76 M., 2023 - 701 p.
5. Zhidko E.A., Nedonoskov A.B. The impact of harmful emissions on human health and quality of life: current state. In the collection: Technosphere safety: scientific trends, means of support, special education. Proceedings of the All-Russian scientific and practical conference. Responsible. editor I.M. Kazbanova. Voronezh, 2023. P. 12-18
6. Gilmundinov V.M., Tagaeva T.O., Boksler A.I. Analysis and forecasting of waste management processes in the Russian Federation // Forecasting problems. - 2020. - No. 1. - P. 126-134.
7. Hygienic requirements for ensuring the quality of atmospheric air in populated areas. SanPiN 2.1.6.1032-01.-M.: Ministry of Health of Russia, 2001.
8. GN 2.1.6.2309-07 "OBUV of pollutants in the atmospheric air of populated areas".
9. Methodological manual for the calculation, standardization and control of emissions of pollutants into the atmospheric air, 2012.
10. Methodological manual for the calculation, standardization and control of emissions of pollutants into the atmospheric air", St. Petersburg, Research Institute Atmosphere, 2005.

DOI: 10.36622/2074-188X.2025.71.54.012

RENOVATION OF AN APARTMENT BUILDING AFTER A GAS EXPLOSION AND SUBSEQUENT FIRE

D. V. PANFILOV, A. M. ZAITSEV, O. E. PEREKALSKY

Dmitry Vyacheslavovich Panfilov, Candidate of Technical Sciences, Assoc. Voronezh State Technical University, Voronezh, Russia
Alexander Mikhailovich Zaitsev, Candidate of Technical Sciences, Assoc. Voronezh State Technical University, Voronezh, Russia
Oleg Evgenievich Perekalsky, Candidate of Technical Sciences, Assoc. Voronezh State Technical University, Voronezh, Russia

Research materials on the condition of structural elements after the elimination of gorenje are presented. The degree of structural damage was determined, the strength characteristics of concrete and reinforcement were experimentally determined, a calculation equation was derived, and the heating of the supporting reinforcement of the floor slabs in the fire was calculated. The structural elements that need to be replaced have been identified. An opinion was issued on the possibility of restoring the house; as a result, the house was restored and put into operation within three months.

Keywords: explosion, fire, building structures, residential building, household gas, experimental study of materials, analytical study of heating tasks, restoration of buildings.

References

1. Sushko E.A., Zaitsev A.M., Kashnikova A.A., Chernykh D.S. On natural gas explosions and their consequences in a multi-story residential sector. // Bulletin of the Voronezh Institute of the GPS of the EMERCOM of Russia. - 2013. - No. 3 (8). - P. 20-23.
2. Panfilov D.V., Zaitsev A.M., Arifullin E.Z. Restoration of a residential building after a domestic gas explosion and subsequent fire. // Civil defense and natural and technical systems. Collection of articles

based on the materials of the XVIII International scientific practical conference. Responsible. editor P.S. Kuprienko. Voronezh, - 2022. - P. 450-459.
3. Komarov A.A. Forecasting dynamic loads during emergency explosions in premises // Mechanization of construction. - 2000. - No. 6. – P.21-26.
4. Komarov A.A. Analysis of the consequences of an emergency explosion of natural gas in a residential building // Fire and Explosion Safety. – 1999. – Vol.8, – No.4. – P.49-53.
5. Panfilov D., Zaitsev A., Yudin E. Analysis of the results of a survey on a residential building after a gas explosion and fire In the collection: E3S Web of Conferences. Topical Problems of Green Architecture, Civil and Environmental Engineering, TPACEE 2019. – 2020. – P. 08014.
6. Piotr Knyziak, Robert Kowalski, Janusz R. Krentowski. Fire damage of RC slab structure of a shopping center. // Engineering Failure Analysis, – Volume 97, – March 2019, – Pages 53-60.
7. Yong Wang, Guanglin Yuan, Zhaohui Huang, Junli Lyu, Bangyun Long. Modeling of reinforced concrete slabs in fire. // Fire Safety JournalVolume 100, – September 2018, – Pages 171-185.
8. Eunmi Ryu, Heesun Kim, Yeonju Chun, Inhwan Yeo, Yeongsoo Shin. Effect of heated areas on thermal response and structural behavior of reinforced concrete walls exposed to fire. // Engineering StructuresVolume 20715, – March 2020, – Article 110165.
9. R. T. Kuehnen, M. A. Youssef, Equivalent standard fire duration to evaluate internal temperatures in natural fire exposed RC beams. // Fire Safety JournalVolume 108, – September 2019, – Article 102831.
10. Komarov A.A. Forecasting dynamic loads during emergency explosions in premises // Mechanization of construction. - 2000. - No. 6. - P. 21-26.
11. Malakhova A. N., Balakshin A. S. Emergency destruction of a panel residential building of typical series 1-115 // Bulletin of MGSU. - 2014. - No. 11. - P. 109-117.
12. Orlov G. G., Korolchenko A. D. Loads destroying building structures as a result of emergency explosions // Fire and explosion safety. - 2016. - V. 25, No. 3. - P. 45-54.
13. Polandov Yu. Kh., Babankov V. A., Dobrikov S. A. Features of the development of a gas explosion in a room in the presence of an adjacent room // Fire and explosion safety. – 2016. – Vol.25, No.1. – P. 38-44.
14. Zaitsev AM Heating of reinforced concrete structures during real fires // Fire and explosion safety. – 2004. – No.6, – P. 26-32.
15. Zaitsev AM Graphical method for calculating the fire resistance limit of enclosing structures based on the heating of the unheated surface to the standard temperature // Fire and explosion safety. – 2005. – No. 1. – P. 29-32.
16. Zaitsev AM Methodology for calculating the heating of fire-protected steel structures under conditions of extreme temperature effects of fire // Fire and Explosion Safety. - 2005. - No. 6. - P. 15-21.
17. Zaitsev AM, Nikulin AV Analysis of the possibility of operating reinforced concrete trusses after a fire // Fire and Explosion Safety. - 2004. - No. 4. - P. 66-71.
18. Zaitsev AM, Bolgov VA, Chernykh DS Determination of the heat transfer coefficient in building structures during a standard fire. // Heliogeophysical Research - 2014. - No. 9. - P. 49-53.
19. Zaitsev AM, Bolgov VA, Chernykh DS On the issue of heating of building structures under boundary conditions of the second kind. // Heliogeophysical studies - 2014. - No. 9. - P. 54-58.
20. Groshev M.D., Zaitsev A.M. Fire resistance and fire protection of building structures. // Study guide. Voronezh. VSUACE. - 2008. - 134 p.
21. Roytman V.M. Engineering solutions for assessing the fire resistance of designed and reconstructed buildings. // Fire science. - Moscow. - 2001. - 382 p.
22. Mkrtychev O.V., Doromensky V.B., Sidrov D.S. Reliability of building structures during explosions and fires. // Monograph. Moscow. ASV Publishing House. - 2016. - 174 p.
23. Zaitsev A.M., Panfilov D.V., Larionov S.G. Bearing capacity of a typical hollow-core slab during a volumetric explosion inside the premises. // Scientific journal of construction and architecture. - 2023. - No. 2 (70). - P. 11-22.

DOI: 10.36622/2074-188X.2025.46.88.013

SYSTEM ANALYSIS, MANAGEMENT AND INFORMATION PROCESSING (IN CONSTRUCTION AND ARCHITECTURE)

JUSTIFICATION OF THE INFORMATION PROCESSING METHOD TO IMPROVE THE ACCURACY OF THE SHORT-TERM FORECAST OF ELECTRICITY CONSUMPTION

(USING THE EXAMPLE OF A COMPLEX OF UNIVERSITY ENGINEERING CAMPUS FACILITIES)

N.V. SAVVIN, D.N. VASENIN, D.S. SVIRIDOV

Nikita Vladimirovich Savvin, PhD Student, Voronezh State Technical University, Associate of the Higher School of Economics, Russia
Dmitry Vasenin, Researcher, Faculty of Information Engineering, University of Brescia, Italy
Sviridov Dmitry Sergeevich, PhD Student, Voronezh State Technical University, Voronezh, Russia

This article presents a new method for short-term forecasting of electrical load, which focuses on the integration of calendar data and a unique time coding method. The analysis showed that weather variables have little effect on the accuracy of forecasts. In this regard, a new approach is proposed that allows models to better understand temporal patterns using sinusoidal and cosine transformations of minutes, hours, days of the week, and year. Machine learning models were used to predict the load: LSTM (long-term short-term memory), Bi LSTM (bidirectional LSTM), CNN-LSTM (convolutional neural network with LSTM) and CNN-Bi-LSTM. According to the experimental results, Bi-LSTM showed the best accuracy.

Keywords: energy consumption forecasting, time series, machine learning, hybrid approaches.

References

1. Belov S. I., Leshtaev O. V. Intelligent analysis of optimization of micropower systems operation in rural power grids // BBK Z81: Z21Ya73 I74. - P. 254.
2. Nekrasov S. A., Klimenko V. V. On ways of reducing energy supply costs in Russia // MIR (Modernization. Innovations. Development). - 2024. - Vol. 15. - No. 3. - P. 356-370.
3. Vasenin D. N., Podvalny S. L., Savvin N. V. Improving the accuracy of short-term load forecasting using ensemble models and weather data // Engineering systems and structures. - 2024.- No. 4 (58). - P. 72-87. 4. Gryaznov I. E., Belousov A. A. Study of the solution of the problem of forecasting the daily load of the power system based on the analysis of time series // Innovative Science. - 2023. - No. 3-1. - P. 7-14.
5. Klyuev R. V. et al. Forecasting the planned electricity consumption for the unified power system using machine learning // Notes of the Mining Institute. - 2023. - No. 261. - P. 392-402.
6. Golovinsky P. A., Vasenin D. N., Savvin N. V., Prokshits E. E., Simulation modeling of energy consumption by a cluster of buildings of a university campus // Control Systems and Information Technologies. - 2022. - No. 4 (90). - P. 92-99.

DOI: 10.36622/2074-188X.2025.36.19.014