

STUDY OF DESIGN SOLUTIONS AIMED AT IMPROVING THE ENERGY EFFICIENCY OF INDIVIDUAL RESIDENTIAL BUILDINGS

S.O. Kayumova

Bukhara Engineering-Technological Institute

M22-24 BIA Group Master's Student.

rakhmatova999@gmail.com

<https://doi.org/10.5281/zenodo.14838910>

Abstract. *This article explores various design strategies aimed at improving energy efficiency in individual residential buildings. It examines energy-saving methods based on advanced thermal insulation, the integration of solar energy systems, the use of modern construction materials, and the implementation of cutting-edge engineering technologies. Additionally, the article reviews international best practices and Uzbekistan's policies on energy efficiency. Furthermore, it evaluates ongoing energy conservation projects and their economic feasibility.*

Keywords: *energy efficiency, thermal insulation, solar energy, HVAC systems, construction materials, environmental sustainability, passive design, renewable energy sources.*

ИЗУЧЕНИЕ ПРОЕКТНЫХ РЕШЕНИЙ, НАПРАВЛЕННЫХ НА ПОВЫШЕНИЕ ЭНЕРГОЭФФЕКТИВНОСТИ ИНДИВИДУАЛЬНЫХ ЖИЛЫХ ЗДАНИЙ

Аннотация. *В данной статье рассматриваются различные стратегии проектирования, направленные на повышение энергоэффективности индивидуальных жилых зданий. В ней рассматриваются методы энергосбережения на основе усовершенствованной теплоизоляции, интеграции систем солнечной энергии, использования современных строительных материалов и внедрения передовых инженерных технологий. Кроме того, в статье рассматривается передовой международный опыт и политика Узбекистана в области энергоэффективности. Кроме того, в ней оцениваются текущие проекты по энергосбережению и их экономическая целесообразность.*

Ключевые слова: *энергоэффективность, теплоизоляция, солнечная энергия, системы HVAC, строительные материалы, экологическая устойчивость, пассивный дизайн, возобновляемые источники энергии.*

Energy conservation and environmental sustainability have become global priorities. Improving the energy efficiency of individual residential buildings is a key aspect of modern construction standards. Uzbekistan has implemented several regulations in this field and is actively conducting scientific research to enhance energy savings and improve the quality of construction

materials. This study also explores the technological, economic, and environmental implications of energy efficiency improvements.

Effective thermal insulation of walls, roofs, and floors is critical for energy conservation.

The use of modern materials such as multilayer panels, eco-wool, and high-performance double-glazed windows is recommended. Additionally, optimized facade insulation systems significantly reduce heat loss. Implementing passive design principles, such as strategic building orientation and natural ventilation, can further enhance energy efficiency.

Solar photovoltaic (PV) panels can substantially offset electricity consumption, while solar thermal collectors improve hot water supply efficiency. Modern high-efficiency PV modules enable greater energy independence for individual homes. However, their effectiveness depends on geographic location, solar exposure, and climate conditions, which should be carefully assessed during the design phase.

To minimize energy consumption, advanced heating, ventilation, and air conditioning (HVAC) systems must be integrated. Smart home automation, including programmable thermostats and high-efficiency heat pumps, plays a crucial role in optimizing energy use. The incorporation of heat recovery ventilation (HRV) systems can further reduce energy losses while maintaining indoor air quality.

Beyond energy efficiency, the use of eco-friendly materials is essential for sustainable development. Natural materials such as energy-efficient bricks, engineered wood, and low-carbon concrete retain heat effectively and contribute to long-term energy savings. Additionally, employing locally sourced materials reduces the environmental impact associated with transportation and production.

Although energy-efficient technologies require higher initial investments, long-term savings on utility costs make them economically viable. Studies indicate that implementing energy-saving solutions during construction can reduce operational expenses by up to 30%.

Financial support programs from the World Bank and international institutions further incentivize the adoption of energy-efficient solutions, providing economic benefits for homeowners and developers. Enhancing the energy efficiency of individual residential buildings is not only financially advantageous but also contributes to long-term environmental sustainability. The adoption of advanced thermal insulation, solar energy integration, and modern HVAC technologies significantly reduces overall energy consumption. Additionally, the successful implementation of government policies and the adoption of innovative construction solutions will accelerate this transition toward energy-efficient housing.

REFERENCES

1. Construction Code of the Republic of Uzbekistan.
2. Presidential Decrees of the Republic of Uzbekistan on the "Green Economy."
3. International best practices in energy efficiency.
4. Catalogs of modern construction materials and scientific research articles.
5. Regulatory documents issued by the State Committee for Architecture and Construction of Uzbekistan.
6. Reports from the World Bank and international financial institutions on energy efficiency.
7. Nurmuradova Sh.I. Task-based language teaching. International scientific-online conference: INTELLECTUAL EDUCATION TECHNOLOGICAL SOLUTIONS AND INNOVATIVE DIGITAL TOOLS.
8. IBRAGIMOVNA, S. N. (2021). Creativity of Alisher Navoi-The Pearl of Spirituality. Journal of Contemporary Issues in Business and Government, 2021. 27.
9. IBRAGIMOVNA, S. N. (2021). Creativity of Alisher Navoi-The Pearl of Spirituality. Journal of Contemporary Issues in Business and Government, 2021, 27.
10. Нурмурадова Ш.И. Инновационные педагогические технологии в вузе при подготовке специалистов // Вестник по педагогике и психологии Южной Сибири. 2014. №1. URL:<https://cyberleninka.ru/article/n/innovatsionnye-pedagogicheskie-tehnologiiiv-vuze-pri-podgotovke-spetsialistov>.
11. Нурмурадова Ш.И. Пути формирования социальной активности учителей // Наука. Мысль: электронный периодический журнал. 2014. №10. URL: <https://cyberleninka.ru/article/n/puti-formirovaniya-sotsialnoyaktivnosti-uchiteley>.
12. Нурмурадова Ш.И. Основные понятия и методология этнопсихологии // PEM: Psychology. Educology. Medicine. 2013. №1-1. URL: <https://cyberleninka.ru/article/n/osnovnye-ponyatiya-i-metodologiya-etnopsihologii>.
13. Nurmuradova, S. I. Peculiarities and Some Issues of Learning Vocabulary (February 1, 2021). TJE-Tematics journal of Education ISSN, 2249- 9822.
14. Нурмуродова Шахноз Ибрагимовна. Мастерство и инициативность - основные факторы успешной работы учителей // Достижения науки и образования. 2017. №4 (17). URL: <https://cyberleninka.ru/article/n/masterstvo-i-initsiativnost-osnovnye-factoryuspeshnoy-raboty-uchiteley>.

15. Баракатова, Д. А., Нурмурадова, С. И., & Солиева, М. А. (2016). Социально-психологическое обеспечение педагогического воздействия на учащихся. Молодой ученый,(12), 816-818.
16. Нурмурадова, Ш. И., & Очилова, Н. М. (2016). ИСТОРИЧЕСКИЕ ЭТАПЫ РАЗВИТИЯ АНГЛИЙСКОГО ЯЗЫКА С ТОЧКИ ЗРЕНИЯ ЯЗЫКОВЫХ И ВНЕЯЗЫКОВЫХ ФАКТОРОВ. NovaInfo. Ru, 3(57), 388-395.
17. Нурмурадова, Ш. И. (2015). Сущность коммуникативных технологий обучения. Рецензент, 189.
18. Ibragimovna, N. S. (2022, April). USING THE CASE METHOD IN RUSSIAN CLASSES. In International Conference on Research Identity, Value and Ethics (pp. 33-37).
19. Ibragimovna, N. S. (2018). Influence of Role-Playing Games on Successful Digestion of Lexical Material and Their Psychological Features. Archive, 50.
20. Nurmuradova, S. I. (2021). Peculiarities and Some Issues of Learning Vocabulary. TJE-Tematics journal of Education ISSN, 2249-9822.
21. Ibragimovna, N. S. (2022, April). USING THE CASE METHOD IN RUSSIAN CLASSES. In International Conference on Research Identity, Value and Ethics (pp. 33-37).
22. Komilovna I. N. Ziyo Distributed From Tezguzar. JournalNX, 30-33.
23. Komilovna I. N. (2022). Ibrahim Muminov's Scientific and Philosophical Heritage and Subjective Approaches to His Scientific Activity Under the Rule of the Former Ideology. International Journal on Integrated Education, 5(6), 556-559.
24. Ibodova N. K. (2023). ALI QUSHCHI FAOLIYATINI TADQIQ ETISHDA IBROHIM MO'MINOVNING ROLI. Oriental renaissance: Innovative, educational, natural and social sciences, 3(2), 824-829.
25. Komilovna I. N. (2024). Philosophical Lines to Academician Ibrahim Muminov's Activity. Journal of Sustainability in Integrated Policy and Practice, 2(1), 15-18.
26. Ibodova N. K. (2024). THE ROLE OF IBRAHIM MOMINOV IN STUDYING THE PERSONALITY OF AMIR TEMUR. INTERNATIONAL SCIENCES, EDUCATION AND NEW LEARNING TECHNOLOGIES, 1(4), 154-157.
27. Ibodova N. (2024). ACADEMIC IBRAHIM MOMINOV: MY FIRST TEACHER IS MY MOTHER. Educational Research in Universal Sciences, 3(4 SPECIAL), 436-438.
28. İbodova N., & Raupova, R. (2023). ÖZBEK EDEBİYATI DİLİNİN MODERNİTE DÖNEMİNDE GELİŞİMİNDE ÇOLPON'UN ROLÜ. Philological issues are in the eyes of young researchers, 1(1). 2023

29. Ibodova Nasiba Komilovna. (2024). ANALYSIS OF IBRAHIM MOMINOV'S CREATION OF ABU RAYHAN BERUNI. МЕДИЦИНА, ПЕДАГОГИКА И ТЕХНОЛОГИЯ: ТЕОРИЯ И ПРАКТИКА, 2(4), 359–365. извлечено от <https://universalpublishings.com/index.php/mphttp/article/view/5153>
30. Ibodov G. K. (2023). KLASSIK VA MAXSUS - YORDAMCHI MASHQLARNING YUKLAMA ME'YORI. Educational Research in Universal Sciences, 2(15), 13–16. Retrieved from <http://erus.uz/index.php/er/article/view/4660>
31. Ibodov Ghalibjon Komilovich. Classic And Special -The Loading Standards of Assistant Exercises. Journal of Sustainability Integrated Policy and Practice. 2024. 19-21-p. <https://journals.proindex.uz/index.php/SIPP/article/view/485/419>
32. N. K. Ibodova. Classification of Lexical Units in the Language of Modern Poetry According to Form and Meaning Relationships. European Journal of Innovation in Nonformal Education. 2024. 163-166-p. <https://inovatus.es/index.php/ejine/article/view/4226/4140>
33. N.K.Ibodova. RELATIONSHIPS OF FORM AND MEANING IN JADID POETRY. NEW RENAISSANCE international scientific journal. 2024. 924-978-p. <https://doi.org/10.5281/zenodo.14217148>
34. N.K.Ibodova. THE PERIOD OF GREEDISM: LANGUAGE AND POETRY. International scientific journal. «MODERN SCIENCE AND RESEARCH» 2024. 651-655-p. <https://doi.org/10.5281/zenodo.14543293>
35. N.K.Ibodova. LINGUISTIC AND CULTURAL FEATURES OF NEW POETRY. NEW RENAISSANCE international Scientific Journal. 2025. 905-908-p. <https://doi.org/10.5281/zenodo.14738912>