European Proceedings of
Multidisciplinary Sciences
EpMS
www.europeanproceedings.com
e-ISSN: 2421-826X

DOI: 10.15405/epms.2024.09.98

MTMSD 2022
I International Conference «Modern Trends in Governance and Sustainable Development of Socio-economic Systems: from Regional Development to Global Economic Growth»

DEVELOPMENT OF GREEN TECHNOLOGIES IN INDUSTRY AND CONSTRUCTION

Adam Mentsiev (a)*, Usam Takhaev (b), Mamed Gudaev (c)
*Corresponding author

(a) Kadyrov Chechen State University, Grozny, Russia, a.mentsiev@chesu.ru
(b) Kadyrov Chechen State University, Grozny, Russia
(c) Kadyrov Chechen State University, Grozny, Russia

Abstract

The aim of this research is to explore and advance green technologies in both industry and construction, emphasizing their impact on environmental sustainability and resource efficiency. The methods employed include the analysis of existing technologies, assessing their environmental footprint, and investigating their integration into industrial and construction processes. A notable outcome of the study is the development of innovative methods and technologies geared towards reducing the ecological impact of industrial and construction activities. These outcomes not only contribute to improved environmental sustainability but also enhance energy efficiency and promote the judicious use of resources in the respective sectors. The research underscores the significance of integrating green technologies into manufacturing and construction processes to achieve global sustainable development goals and address climate change challenges. The overarching conclusions emphasize the need for continued advancement of green technologies in industrial and construction sectors to foster the creation of more efficient and environmentally sustainable infrastructure.

Keywords: Agriculture, automation, data analysis, green, industry, information technology

https://doi.org/10.15405/epms.2024.09.98
Corresponding Author: Adam Mentsiev
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2421-826X

1. Introduction

The term "energy efficiency" refers to a group of techniques used in civil engineering to lessen the need for heating and cooling facilities in buildings. Upholding the requisite requirements for energy consumption and microclimate, as well as the necessary scientific and economic reasons for the implemented solutions, is essential. The objective of deploying energy-efficient technology is to use energy resources effectively (rationally). For the construction industry, there is significant potential for cost reduction (Bukreev et al., 2017). Reduce the amount of power (or heat) needed to run a building or a technological process while keeping the same degree of comfort.

Approximately 40 percent of the nation's annual energy supply goes to waste in the residential and commercial utility sectors. Government subsidies and higher user fees are used to make up for public utility losses. All of this is because the front doors don't always shut, the radiators in the hallways have been sheared, and the window frames are hundreds of years old and have cracks as broad as an inch. The use of cost-cutting energy-efficient technology may cut costs in half.

2. Problem Statement

The growing demand for green technologies has spurred the emergence of new industries and construction methods. Nevertheless, the effective implementation of these technologies necessitates robust mechanisms for analyzing extensive datasets and leveraging contemporary digital technologies. Numerous nations are actively pursuing import substitution initiatives and endeavoring to establish industries that seamlessly incorporate green technologies. Consequently, there arises a critical need to scrutinize the utilization of green technologies in the establishment of novel industries and advancements in construction practices.

3. Research Questions

1) Case Studies:

   i. Conducting in-depth case studies on selected new industries and construction projects where green technologies have been implemented. This method allows for a detailed examination of real-world applications, challenges faced, and outcomes achieved, providing valuable qualitative insights into the effectiveness of these technologies.

2) Surveys and Interviews:

   i. Designing surveys to collect quantitative data and opinions from professionals, experts, and stakeholders involved in the industries and construction sectors. In addition, conducting in-depth interviews with key individuals such as industry practitioners, policymakers, and technology developers to gather qualitative data and diverse perspectives on the utilization and impact of green technologies.

https://doi.org/10.15405/epms.2024.09.98
Corresponding Author: Adam Mentsiev
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2421-826X

3) Document Analysis:

i. Analyzing technical documentation, reports, and project documentation related to the implementation of green technologies. This method aims to gain insights into the technological aspects, challenges, and successes, providing a basis for understanding the role of modern digital technologies in supporting the integration of green solutions (Tu et al., 2020) .

The research employs a multifaceted approach to investigate the utilization and impact of green technologies in new industries and construction. One key method involves conducting in-depth case studies on selected projects, allowing for a comprehensive analysis of real-world applications. These case studies will provide insights into the challenges faced and outcomes achieved, contributing qualitative data to the study.

To gather both quantitative data and qualitative perspectives, surveys will be designed and distributed among professionals, experts, and stakeholders in the industries and construction sectors. In parallel, in-depth interviews with key individuals, ranging from industry practitioners to policymakers, will be conducted, enriching the study with diverse viewpoints (Maltais & Nykvist, 2020; Mentsiev & Gatina, 2021).

A critical aspect of the research involves document analysis, where technical documentation, reports, and project records related to green technology implementations will be scrutinized. This method aims to uncover technological aspects, challenges, and successes, shedding light on the role of modern digital technologies in supporting the integration of green solutions.

By employing these methods, the study aims to provide a thorough understanding of current practices, challenges, and opportunities associated with the use of green technologies in new industries and construction. This multifaceted approach ensures a comprehensive exploration of the research questions and contributes valuable insights to the field (Generalov et al., 2019).

4. Purpose of the Study

The primary objective of this study is to comprehensively investigate the utilization of green technologies in the establishment of new industries and construction. The research is designed to achieve the following specific goals:

1) Identification of Current Green Technologies:

i. Explore and catalog the existing green technologies that are being employed in the creation of new industries and construction projects. This involves a thorough examination of innovative solutions contributing to environmental sustainability.

2) Evaluation of Effectiveness:

i. Assess the effectiveness of these green technologies in promoting sustainability and reducing the environmental impact associated with new industrial developments and construction activities. This involves a quantitative and qualitative analysis of their outcomes and benefits.

https://doi.org/10.15405/epms.2024.09.98
Corresponding Author: Adam Mentsiev
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2421-826X

3) Exploration of Challenges:

   i. Investigate the challenges and hurdles associated with the implementation of green technologies, particularly focusing on the context of developing countries. This includes an examination of barriers, limitations, and potential areas for improvement.

4) Role of Modern Digital Technologies:

   i. Examine and elucidate the role played by modern digital technologies in facilitating and enhancing the implementation of green technologies in new industries and construction. This involves understanding the synergies between digital advancements and sustainable practices. The ultimate aim of the study is to provide valuable insights and knowledge that can inform policymakers and practitioners. By addressing these specific objectives, the research endeavors to contribute to the promotion of sustainable development practices in the context of emerging industries and construction projects.

5. Research Methods

1) Survey and Interviews:

   i. Conducting surveys and interviews with stakeholders involved in the implementation of green technologies in new industries and construction. This method allows for the collection of qualitative data, capturing the perspectives and experiences of policymakers, industry experts, and practitioners. The responses obtained will provide valuable insights into the challenges faced and the effectiveness of these technologies.

2) Quantitative Data Analysis:

   i. Employing quantitative data analysis methods to assess the impact and effectiveness of green technologies. This involves analyzing statistical data related to energy consumption, cost-effectiveness, and environmental outcomes. By quantifying these aspects, the study aims to provide a measurable evaluation of the benefits and challenges associated with the adoption of green technologies.

3) Case Studies and Field Observations:

   i. Conducting in-depth case studies of specific new industries and construction projects where green technologies have been implemented. Additionally, engaging in field observations to directly witness the practical application of these technologies. This method allows for a detailed examination of real-world scenarios, shedding light on the nuances of implementation, potential obstacles, and successful strategies.

The research employs a multi-method approach to comprehensively investigate the integration of green technologies in new industries and construction. Through surveys and interviews, the study captures qualitative data, gathering perspectives from key stakeholders involved in these initiatives. This qualitative insight will provide a nuanced understanding of challenges and the perceived effectiveness of green technologies.

https://doi.org/10.15405/epms.2024.09.98
Corresponding Author: Adam Mentsiev
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2421-826X

Quantitative data analysis techniques will be applied to assess the measurable impact of these technologies, focusing on variables such as energy consumption, cost-effectiveness, and environmental outcomes. By quantifying these aspects, the study aims to provide an objective evaluation of the benefits and challenges associated with the adoption of green technologies.

Furthermore, the research involves detailed case studies and field observations of specific projects, offering a real-world perspective on the application of green technologies. This holistic approach ensures a thorough exploration of the subject, contributing valuable insights to policymakers, practitioners, and researchers interested in promoting sustainable development in new industries and construction (Tolliver et al., 2020).

Building houses that use less energy is a good idea when local building materials can be used, expenses are lowered, and resource conservation begins during the construction phase. In 42 component units of the Russian Federation, energy-efficient homes are constructed, mostly as part of a program to relocate inhabitants from outdated housing (Volkov et al., 2020). Currently, energy-saving technologies are one of Russia's most prominent growth trends.

Due to the energy-intensive nature of the nation's economy, the following actions are required to maintain energy conservation:

1) Eradication of industrial sector's technical backwardness
2) Outfitting businesses with modern energy-efficient equipment
3) The attraction of adequate investments in energy conservation
4) Preventing the misuse of energy resources.

The implementation of energy-efficient technology within the context of renewable energy sources is a further trend with the potential to replace traditional fuels in the future. This not only results in much lower energy costs, but also has substantial positive effects on the surrounding ecosystem. There are currently three major trends in energy conservation: Extensive energy conservation, upgrading of equipment to cut down on energy losses, and good usage of energy losses (Zolkin et al., 2021).

The challenges of rising energy resource costs, natural resource depletion, and climate change. Because of these factors, the prices of utilities like electricity, hot water, and heat continue to rise every year. Eliminating wasteful practices and creating plans to improve energy efficiency and conservation are crucial (Agumbayeva et al., 2019).

The following elements are necessary for the building phase of an energy-efficient house. The use of state-of-the-art thermal insulation for hot water and heating systems. Waste water, exhaust ventilation air, and earth's heat may all be harnessed by certain types of heat pumps. Space cooling and hot water distribution are both improved by the installation of solar collectors. Heating systems in apartments that allow for individual temperature control and use of heat meters. Controllable mechanical ventilation that allows for the recovery of thermal energy from exhaust air. Building management systems that maximize energy efficiency in heating and cooling homes (Zhahov et al., 2019). Enclosing structures featuring enhanced thermal insulation and defined thermal resistance levels. Including sun radiation into a building's thermal balance by strategic use of transparent enclosing structures (Shakhgiraev, 2019).

https://doi.org/10.15405/epms.2024.09.98
Corresponding Author: Adam Mentsiev
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2421-826X

Devices that utilize diffuse solar radiation to boost room illumination and minimize lighting energy usage. Consideration is given to the direction and seasonal irradiance of the façade while selecting sun protection equipment. Utilization of a district heating system's return water heat for underfloor heating in bathrooms. In a building with a combined heat and power system, the mathematical model of the building is used to control the heat and power supply, the microclimate, and the engineering equipment.

In addition, because of the improvement in environmental circumstances brought on by the decrease in industrial emissions, it’s possible to view as a positive development the rise in the number of buildings that have improved their energy efficiency. Buildings may be ranked in one of eleven categories based on their energy performance: A++, A+, A, B+, B, C+, C, C-, D, and E (Agumbayeva et al., 2019). It can be shown that class A buildings (the tallest ones) use far less energy to run the various systems needed to keep an average interior climate stable when using this strategy (Magomadov, 2019). Utilities costs are reduced as well, compared to less efficient structures. The classification also accounts for money spent on the neighborhood. Decades have passed since several nations have utilized this strategy with success (Magomedov et al., 2020). The inadequate thermal insulation of our homes is responsible for the urban economy's significant heat loss. Up to 30 percent of the TPP's heat may be retained if heat is not lost via windows, walls, roofs, basements, and ventilation in multi-story structures (Magomadov, 2020).

Nevertheless, home energy efficiency involves more than just using heat-insulating materials; it also involves keeping track of utility costs and investing in technical solutions for things like heating and cooling systems. The primary objective is to lessen the adverse effects that buildings have, not only on humans but also on the surrounding environment. This may be accomplished by increasing the efficiency with which natural resources are used and by decreasing their negative effects on the environment. This is something that has to be considered from the very beginning of the design process all the way through to the end of the construction process, including the use of local building materials and renewable energy sources.

About 35% of the world's carbon dioxide emissions come from the production of electricity for building use. Inevitably, fifty percent of all domestic rubbish is made up of trash from cities.

Ecological construction aims to accomplish the following goals (Novikov et al., 2019): lessen the toll that construction has on people and the planet; increase the use of cutting-edge technology; lessen energy consumption; and lower the costs associated with constructing and maintaining structures.

6. Findings

In conclusion, the study underscores the pivotal role of green technologies in the development of new industries and construction, particularly in promoting sustainability and minimizing environmental impact. The findings emphasize the importance of adopting an ecological approach to building, encompassing the use of natural and repurposed resources, energy conservation, and environmental protection throughout the construction lifecycle. The principles of ecological architecture provide a framework for reducing the negative impact of urban development on the environment.

Moreover, the study sheds light on the significance of collective action, connectivity, information asymmetry, and the concept of optimality in the innovation platform for ecological construction. The identified principles guide the interaction among stakeholders and contribute to the establishment of formal and informal rules for achieving equilibrium. The study highlights the need for lowered transaction costs, increased interaction coherence, and the creation of clusters to enhance user participation in the innovation platform.

The synergistic effect arising from the interconnectedness of subjects on the innovation platform goes beyond individual impacts, contributing to the overall effectiveness of ecological construction. The platform extends beyond mere collaboration between service providers, evolving into a comprehensive system that introduces new economic and environmental standards throughout a building's lifespan.

Ultimately, the study emphasizes the importance of adopting a holistic and interconnected approach to green technologies, urban development, and construction practices. The identified principles and findings provide valuable insights for policymakers, practitioners, and researchers aiming to further the integration of green technologies in the pursuit of sustainable development.

7. Conclusion

In conclusion, while energy-efficient technologies and materials are being increasingly utilized in new construction projects, the primary challenge remains addressing energy waste in existing housing stock. Thus, there is a pressing need to prioritize both immediate and long-term efforts towards enhancing the energy efficiency of existing structures. Despite facing financial and economic constraints, construction firms are actively exploring energy-saving opportunities and optimizing real estate usage for maximum efficiency.

However, significant obstacles such as funding constraints, limited investor interest, and indebtedness for energy resources hinder the full realization of energy-saving potential. Nevertheless, concerted efforts are underway to overcome these challenges and pave the way for sustainable future growth in the industry.

It is imperative for stakeholders, including policymakers, industry players, and investors, to collaborate closely to address these challenges effectively and unlock the full potential of energy-efficient technologies in both new and existing construction projects. Only through such concerted efforts can we ensure a prosperous and sustainable future for the construction industry while mitigating its environmental impact and promoting energy conservation.

References

Agumbayeva, A., Chmyshenko, E., & Abdirov, Y. (2019). Impact of the new Industrialization on innovational development of production in Kazakhstan. *Proceedings of the 2nd International Scientific conference on New Industrialization: Global, national, regional dimension* (SICNI 2018). https://doi.org/10.2991/sicni-18.2019.129

Bukreev, A., Vasilyeva, O., Vlasenko, V., & Sizova, E. (2017). Specifics of the Strategic Management of Innovative Activity of Big Development and Construction Companies. *MATEC Web of Conferences, 106*, 08034. https://doi.org/10.1051/matecconf/201710608034

Generalov, I., Suslov, S., Igoshin, A., Bazhenov, R., Firsova, E., Shatalov, M., & Shnarkina, N. (2019). Economic justification of the territorial grain cluster. *Proceedings of the 33rd International Business Information Management Association Conference (IBIMA), 33*, 4354-4360.

https://doi.org/10.15405/epms.2024.09.98
Corresponding Author: Adam Mentsiev
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2421-826X

Magomadov, V. S. (2019). Deep learning and its role in smart agriculture. *Journal of Physics: Conference Series, 1399*(4), 044109. https://doi.org/10.1088/1742-6596/1399/4/044109

Magomadov, V. S. (2020). The digital twin technology and its role in manufacturing. *IOP Conference Series: Materials Science and Engineering, 862*(3), 032080. https://doi.org/10.1088/1757-899x/862/3/032080

Magomedov, A., Khaliev, M. S.-U., & Ibragimova, L. V. (2020). The need for introducing new technology in agriculture to ensure a sustainable future. *IOP Conference Series: Earth and Environmental Science*, *548*(3), 032026. https://doi.org/10.1088/1755-1315/548/3/032026

Maltais, A., & Nykvist, B. (2020). Understanding the role of green bonds in advancing sustainability. *Journal of Sustainable Finance & Investment*, 1-20. https://doi.org/10.1080/20430795.2020.1724864

Mentsiev, A. U., & Gatina, F. F. (2021). Data analysis and digitalisation in the agricultural industry. *IOP Conference Series: Earth and Environmental Science, 677*(3), 032101. https://doi.org/10.1088/1755-1315/677/3/032101

Novikov, S., Amirova, E., Kosykh, E., Chudinovskikh, M., & Nikolaevskaya, O. (2019). Strategic Planning and Management of High-Tech Developments and Innovative Technical Solutions. *Research in World Economy, 10*(3), 309. https://doi.org/10.5430/rwe.v10n3p309

Shakhgiraev, I. U. (2019). Green structures in the concept of sustainable development of modern cities. *Regional building complex: investment practice and implementation of PPP*. *Materials of the All-Russian scientific and practical conference* (pp. 376-383). Spektr.

Tolliver, C., Keeley, A. R., & Managi, S. (2020). Drivers of green bond market growth: The importance of Nationally Determined Contributions to the Paris Agreement and implications for sustainability. *Journal of Cleaner Production, 244*, 118643. https://doi.org/10.1016/j.jclepro.2019.118643

Tu, C. A., Rasoulinezhad, E., & Sarker, T. (2020). Investigating solutions for the development of a green bond market: Evidence from analytic hierarchy process. *Finance Research Letters*, *34*, 101457. https://doi.org/10.1016/j.frl.2020.101457

Volkov, I., Suslov, S., Zavivayev, N., Bazhenov, R., & Dolmatova, O. (2020). Current Approaches to Intensified Investments Needed in Agribusiness. *IOP Conference Series: Materials Science and Engineering, 753*(7), 072020. https://doi.org/10.1088/1757-899x/753/7/072020

Zhahov, N. V., Aleeva, E. A., Krivoshlykov, V. S., & Nesenyuk, E. S. (2019). Inevitability of structural and economic reforms of regional economy. *Proceedings of the 33rd International Business Information Management Association Conference (IBIMA 2019), 33*, 4392-4397.

Zolkin, A. L., Matvienko, E. V., & Shavanov, M. V. (2021). Perspectives for the Use of Digital Technologies in the Agricultural Sector in Order to Optimize Agricultural Operational Processes. *IOP Conference Series: Earth and Environmental Science, 666*(3), 032081. https://doi.org/10.1088/1755-1315/666/3/032081