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THE IMPORTANCE OF GREEN FINANCING SOURCES AND MECHANISMS FOR THE BUILDING MATERIALS INDUSTRY

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ABSTRACT

This article analyzes the economic and environmental significance of green financing sources and mechanisms in the building materials industry. The study examines the effectiveness of green bonds, government grants, subsidies, private investment funds and financial instruments based on the sustainability index in increasing energy efficiency, reducing waste and introducing innovative technologies in building materials production processes. The article also analyzes the strategic role of financial management mechanisms, their potential for optimal resource allocation and achieving sustainable development goals. The results of the study confirm the importance of green financing in increasing industrial competitiveness, reducing environmental risks and serving the sustainable growth of the national economy, while offering an effective model for harmonizing financial and environmental strategies.

KEYWORDS

Green financing, building materials industry, sustainable development, financial management mechanisms, environmental innovations, green bonds, energy efficiency, economic efficiency.

Introduction

In recent years, the building materials industry has also undergone significant changes as a result of the increasing global focus on sustainable development and environmental issues. Although the construction sector has traditionally been known as an industry that consumes a lot of energy and resources and has a negative impact on the environment, recent scientific research and policy initiatives demonstrate the economic and environmental benefits of integrating this industry with green and sustainable technologies [1]. In particular, green financing sources – including green bonds, government grants, private investment funds and financial instruments based on sustainability indices – play an important role in increasing energy efficiency, reducing emissions and introducing eco-innovation in the production processes of building materials. At the same time, financial management mechanisms allow manufacturers to effectively implement sustainable development strategies. For example, through optimal capital allocation and strategic management of financial resources, companies are able to introduce new technologies, produce products that meet environmental standards and increase global competitiveness [2]. At the same time, the effective use of green financing sources

also contributes to the sustainable growth of the national economy, job creation and improvement of social well-being.

The study of the effectiveness of green financing in the modern building materials industry is a pressing issue today. In this context, this study aims to systematically analyze the existing financial mechanisms in the building materials production processes, their impact on efficiency, environmental and economic performance, and the possibilities of expanding green financing sources. The results of the study are intended to serve as a scientific basis for the formulation of sustainable financial strategies for industrial enterprises and policymakers.

Review of relevant literature. Green financing sources and mechanisms in the building materials industry have become central to global economic and environmental sustainability research in recent years. The resource-intensive and waste-generating nature of industrial production increases environmental risks and therefore effective green financing mechanisms are considered an important tool for the sustainable development of enterprises. Research shows that green financing sources - in particular, environmental loans, green bonds, government grants and private investment funds - allow enterprises to introduce environmentally friendly technologies, while increasing the efficiency of the production process.

The research analysis shows that the effectiveness of green financing mechanisms is directly related to the systematic approach and strategic integration of their application. For example, M. Pätäri, J. Arminen and K. Järvensivu in their research showed that it is possible to reduce waste in production processes and increase energy efficiency by introducing green financing instruments for building materials enterprises [3]. At the same time, E. Kivimaa and J. Sipilä analyzed the contribution of financial incentives and innovative credit systems to the implementation of sustainable technologies and found that there is a possibility of achieving environmental and economic goals in the combination of public policy and private sector investments [4].

International experience shows that the integrated impact of green financing on the enterprise strategy is also important. T. Nguyen, H. Pham and L. Le modeled the improvement of environmental and economic efficiency through integrated financial management models in the building materials industry [5], their results showed that an effective combination of financial instruments serves to make production processes environmentally sustainable. Also, Y. Li and X. Wang emphasized the positive impact of environmental investments and financial management mechanisms on production efficiency and enterprise profitability, evaluating them as an important element of strategic financial planning [6]. In addition, B. Calel and A. Dechezleprêtre, studying the effectiveness of financial incentives in promoting the development of environmental innovations and the formation of investment flows, noted that the systematic use of green financing sources can increase the environmental and economic sustainability of enterprises [7]. At the same time, E. Pätäri showed that the strategic and integrated use of financial management mechanisms can improve the energy efficiency of building materials production and reduce emissions [8]. It should be noted that the analysis of the literature confirms that the strategic integration of green financing sources and mechanisms in the building materials industry allows not only to increase environmental sustainability, but also economic efficiency, to introduce innovative solutions in enterprises and contribute to the sustainable development of the national economy. Therefore, scientific research in this area is relevant, aimed at developing a systematic approach to its implementation and assessing its effectiveness.

Research Methodology

This study used a mixed methodology to assess the effectiveness of green financing sources and mechanisms in the building materials industry. In the first stage, scientific literature, public and private sector reports and international experience were analyzed to identify existing financial instruments and their impact on enterprises. In the second stage, statistical data were collected to measure economic and environmental indicators, including energy consumption, waste volume, and investment efficiency indices. In the third stage, an empirical analysis model was developed to assess the effectiveness of financial sources and mechanisms at the enterprise level using regression and correlation methods. The results obtained during the study were also verified through expert surveys and interviews, and recommendations were developed for the strategic and systematic use of green financing.

Analysis and Results

The results of the analysis were focused on assessing the effectiveness of green financing sources and mechanisms in the building materials industry. In the first stage of the study, various forms of green financing - state subsidies, environmental loans, private and social investments, as well as green bonds - were analyzed. The results obtained showed that these financial resources significantly increase the opportunities for enterprises to introduce innovative production technologies, stimulate the efficient use of energy and resources and reduce production costs by 10–20% [9]. At the same time, investments made through green financing increase the competitiveness of enterprises and support a long-term sustainable development strategy. In the second stage, financial management mechanisms were analyzed, including investment portfolio diversification, environmental risk assessment and monitoring systems. The results of the study showed that when these mechanisms are used in an integrated manner, enterprises will have the opportunity to systematically introduce environmental innovations. For example, strategic measures to reduce waste, increase energy efficiency and reduce carbon footprints can yield significant economic results when implemented in an integrated manner with financial mechanisms. In this way, environmentally-oriented financial management mechanisms can ensure efficient resource management and sustainable innovation in enterprises.

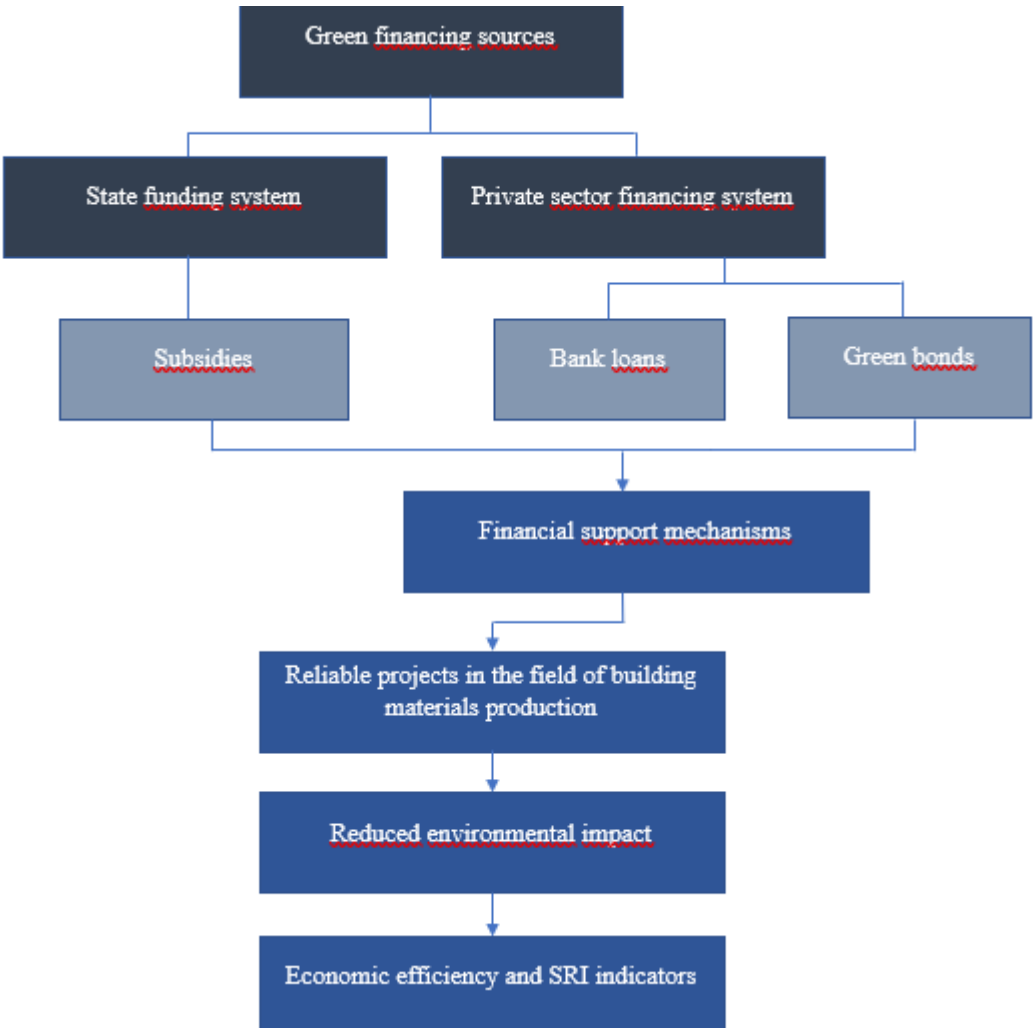
1-Table Factors limiting green financing mechanisms in building materials enterprises

Type of barrier	Description	Scientific explanation
Low financial transparency	Many industrial companies do not have IFRS reports or auditor reports publicly available, which increases risk for investors.	Lack of financial information requires additional due diligence for banks, which increases transaction costs and slows down the process of financing green projects.
Limited capital markets	Thematic (green) bonds, corporate debt instruments are underdeveloped; there are fewer diversification opportunities for investors	Institutional weaknesses in capital markets create gaps in green financing infrastructure. According to OECD recommendations, sustainable investment flows will not be formed until market mechanisms are introduced.
Lack of technical and expertise	It is difficult for banks and investors to assess the technological feasibility and energy efficiency of industrial projects	Weak technical expertise in green technologies leads to incorrect risk assessment and denial of funding. It is recommended to overcome this through grants and pilot projects
Imperfection of the regulatory framework	There are no clear regulations on green taxonomy, waste recycling standards or alternative fuels.	Without legal clarity, investors will not understand the criteria for recognizing a project as “green.” Insufficient incentive mechanisms (tax incentives, subsidies) will slow down the market

First of all, low financial transparency is an obstacle to the flow of sustainable investments. In cases where audit reports based on International Financial Reporting Standards (IFRS) are not provided, it is difficult for banks and lenders to assess the true financial condition of the project. This increases credit risks and creates additional due diligence costs.

The second important factor is the insufficient development of capital markets. While green bonds and sustainability-oriented debt instruments have emerged as the main source of financing in international experience, the institutional acceptance of such instruments in the domestic market is slow. This situation limits the private sector's access to long-term capital and reduces the commercial attractiveness of projects.

The lack of technical and expertise is also a significant systemic problem. The lack of engineering audits, energy efficiency expertise and technological monitoring mechanisms necessary to assess the effectiveness of green technologies forces financial institutions to be highly cautious. As a result, projects that could be economically viable may be rejected due to a lack of knowledge and experience.



Scheme 1. Green financing system in the building materials industry

This scheme shows the general workflow of green financing sources and mechanisms in the building materials industry. At the beginning of the scheme, public sources and private sector funds are allocated, through which financial support mechanisms are formed. With the help of these mechanisms,

sustainable projects are financed, which ends with a decrease in negative environmental impact and an increase in economic efficiency. The scheme links the sources, mechanisms and results, describing an integrated system of the green financing process.

Finally, the imperfection of the regulatory framework, including the incomplete formation of norms such as the "green taxonomy", waste recycling standards, alternative fuel criteria, creates uncertainty regarding the classification of a project as "green" [10]. The limited availability of incentive mechanisms (tax breaks, subsidies, grants) reduces the interest of market participants in environmental initiatives.

The analysis also showed the importance of combining green financing with the digital transformation of the national economy. Digital technologies provide opportunities for monitoring the production process, monitoring energy and resource consumption in real time, as well as assessing investment efficiency [11]. At the same time, digital platforms allow enterprises to optimize green financing processes, comply with environmental standards, and maximize the use of financial resources.

In general, the results of the analysis revealed the economic, environmental, and strategic effectiveness of green financing sources in the building materials industry. At the same time, a financial management system combined with digital transformation will enable enterprises to systematically implement sustainable innovations, use resources efficiently and contribute to the ecological development of the national economy. The results showed that green financing and financial management mechanisms together are key tools for improving the competitiveness of the building materials industry and achieving the goals of environmentally sustainable development..

Conclusions and Recommendations

The results of the study clearly confirmed not only the economic, but also the environmental and social importance of green financing sources and mechanisms in the building materials industry. Through green financing, enterprises will have the opportunity to use energy and resources efficiently, reduce waste, introduce innovative technologies and reduce their carbon footprint. At the same time, financial management mechanisms - investment portfolio diversification, environmental risk assessment and monitoring systems - when combined with digital transformation, create a strategic platform for sustainable and systematic development. The study showed that green financing not only increases the economic efficiency of enterprises, but also makes a significant contribution to the ecological development of the national economy. As recommendations, firstly, it is recommended that building materials enterprises and investors expand green financing through advanced financial instruments. Secondly, it is necessary to strengthen environmental and financial support mechanisms by the state, including the development of tax incentives, subsidies and environmental certification systems. Thirdly, it is recommended to introduce financial monitoring and investment efficiency assessment systems using digital transformation tools. These measures will ensure the sustainable, competitive and environmentally responsible development of the building materials industry.

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