UDC 330.34:502.3
JEL: Q01, Q56
DOI: https://doi.org/10.32983/2222-4459-2023-9-70-77

THE ROLE OF ECO-INNOVATION IN SUPPORTING RESOURCE EFFICIENCY AND CORPORATE STABILITY FOR SUSTAINABLE ECONOMIC GROWTH

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UDC 330.34:502.3
JEL: Q01, Q56

Paduraru T. The Role of Eco-Innovation in Supporting Resource Efficiency and Corporate Stability for Sustainable Economic Growth

In the context of the growing global concern for sustainable economic growth, the importance of managing limited natural resources and minimizing the impact on the environment is becoming increasingly evident. In this direction, joint efforts must focus on developing an economy that meets the needs of the present without jeopardizing the ability of future generations to meet their own needs. To achieve this goal, eco-innovation becomes essential, by promoting the development and implementation of innovative technologies aimed at supporting resource efficiency and reducing the negative impact on the environment. In this context, the paper aims to analyze the role of eco-innovation in resource efficiency, where the author presents and explains the interdependence between the 2 concepts in the context of sustainable economic growth. At the same time, the paper aims to analyze the activities undertaken by companies from the Republic of Moldova in terms of resource efficiency and the impact of climate change on strategies. The methodology is based on the survey method, methods of analysis and synthesis of data interpretation and relevant comparisons. The research results illustrate different ways in which companies are adapting to changes in their environment, including climate change, and various efforts to improve resource efficiency, which remain very modest. This underlines the importance of developing and implementing resource optimization strategies within companies, through eco-innovations, while monitoring the impact of these strategies, which is a way to respond to permanent challenges in the business environment and to contribute to strengthening a more sustainable economy.

Keywords: *sustainable economic growth, eco-innovation, resource efficiency, sustainable development, corporate stability, Republic of Moldova.*
Fig.: *5.* ***Bibl.:*** *13.*

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УДК 330.34:502.3
JEL: Q01, Q56

Педурару Т. Роль екоінновацій у підтримці ресурсоефективності та корпоративної стабільності для сталого економічного зростання

У контексті зростаючої глобальної стурбованості щодо сталого економічного зростання важливість управління обмеженими природними ресурсами та мінімізації впливу на навколишнє середовище стає все більш очевидною. У цьому напрямку спільні зусилля мають бути спрямовані на розвиток економіки, що відповідає потребам сьогодення, не ставлячи під загрозу здатність майбутніх поколінь задовольняти свої власні потреби. Для досягнення цієї мети необхідні екоінновації, що сприяють розробці та впровадженню інноваційних технологій, спрямованих на підтримку ефективності використання ресурсів і зниження негативного впливу на довкілля. У даному контексті стаття спрямована на аналіз ролі екоінновацій в ефективності використання ресурсів, наводить і пояснює взаємозалежність між двома концепціями в контексті сталого економічного зростання. Водночас стаття спрямована на аналіз діяльності компаній із Республіки Молдова з погляду ефективності використання ресурсів і впливу зміни клімату на стратегії. Методика заснована на методі опитування, методах аналізу та синтезу, інтерпретації даних і відповідних порівняннях. Результати дослідження ілюструють різні способи, в які компанії адаптуються до змін у навколишньому середовищі, включно зі зміною клімату, та їхні зусилля щодо ефективності використання ресурсів, які залишаються дуже скромними. Це підкреслює важливість розробки та реалізації стратегій оптимізації ресурсів усередині компаній за допомогою екоінновацій, одночасно відслідковуючи вплив цих стратегій, що є способом реагування на постійні проблеми в бізнес-середовищі та сприяння зміцненню більш сталої економіки.

Ключові слова: *стале економічне зростання, екоінновації, ресурсоефективність, сталий розвиток, корпоративна стабільність, Республіка Молдова.*
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INTRODUCTION

Sustainable economic growth is a growing global concern, as limited natural resources and the impact on the environment require us to focus on economic development that meets the needs of the present without compromising the ability of future generations to meet their own needs. To achieve this goal, eco-innovation is essential through the development and implementation of innovative technologies that support resource efficiency and the reduction of environmental impact.

In terms of resource economics, sustainable economic growth policies must first guide industry to decouple environmental degradation from economic growth or sales by reducing resource use per unit of value added (also called relative decoupling). At the same time, it is important to make further efforts to achieve the absolute reduction of energy and material use to a sustainable level (also called absolute decoupling).

In this work, the author analyzes the concept of sustainable economic growth and presents the role of

eco-innovation in resource efficiency through a representative figure in which he shows and explains the interdependence between the 3 concepts. The author also analyzes the main results of an own study, carried out in 2022, regarding the eco-innovation potential of enterprises in the Republic of Moldova in terms of resource efficiency and the impact of climate change on strategies. The results of the study undertaken within the enterprises of the Republic of Moldova show a picture of how companies adapt to changes in their environment, including climate change and efforts to improve resource efficiency, which remain very modest.

It is important for businesses to persist in developing and implementing strategies to adjust and optimize resources through eco-innovations and to monitor the impact of these strategies. This is one way to respond to the ongoing challenges in the business environment and to help build a more sustainable economy.

LITERATURE REVIEW

Sustainable economic growth is a central concept in the economic and social development of modern society. This term does not only refer to the steady growth of a country's gross domestic product (GDP) or income but emphasizes long-term development that is equitable, ecological and capable of ensuring the current and future well-being of the population. At a fundamental level, sustainable economic growth combines three key dimensions: economic, social and ecological.

Sustainable economic growth has been addressed by numerous authors, economists and theorists over time, and each has brought a distinct perspective to the concept. Also known as the World Commission on Environment and Development (Brundtland Commission), it defined sustainable economic growth in its 1987 report as follows: "*Sustainable economic growth is that development that meets the needs of the present without compromising the ability of future generations to meet their own needs own needs*" [11]. Economist Daly proposed a definition that emphasizes the idea of resource limits: "Sustainable economic growth is qualitative growth that does not exceed the supporting capacity of the environment and that ensures social equity" [7]. In another perspective, Amartya Sen [6], awarded with the Nobel Prize for Economics, argued that sustainable development must focus on improving individual and social capacity so that people have real opportunities to improve their quality of life. Economist Solow brought an economic perspective, emphasizing that sustainable economic growth must be based on innovation and capital accumulation, but also be able to adapt technology and practices to meet new challenges. Environmental economics expert Paul Ekins defines sustainable economic growth as "economic growth that reduces its impact on the environment and increases its contribution to human well-being" [9].

These definitions reflect varied approaches to sustainable economic growth, highlighting the economic, social and ecological aspects of this complex concept. It is important to note that sustainable development can have different interpretations depending on the cultural and political context, but in general, it aims to create a fair and ecologically responsible society for current and future generations.

Recently, much attention has been paid to innovation as a way for industry and policymakers to achieve more radical improvements in corporate environmental practices and performance. Many companies have begun to use the term "eco-innovation" or similar terms to describe their contributions to sustainable development. For example, using more sustainable materials (59%), improving energy efficiency (59%), or developing green products and services (49%) are among the changes that organizations have implemented in their daily routine to fight against change climate [5]. Also, there are governments that promote the concept of eco-innovation, as is the case of the Republic of Moldova, as a way to fulfill the objectives of sustainable development, while maintaining, at the same time, a competitive industry and the economy. However, while the promotion of eco-innovation by industry and government involves the pursuit of both economic and environmental sustainability, the scope and application of the concept tend to differ.

In recent decades, the need to use natural resources more efficiently has become a major concern for our society. Climate change, pollution and the destruction of natural habitats are just some of the major environmental problems facing the population today. Global material consumption has tripled in the last 50 years, per capita consumption has nearly doubled the safety threshold, and in the last six years, the global economy has extracted and used more than in the entire 20th century, creating, thus, major natural imbalances and unsustainable prospects for several regions, species and industries [1]. For this reason, green innovation (or eco-innovation) has become increasingly important in the effort to improve efficiency in the use of resources and reduce the negative impact on the environment.

Eco-innovation is a relatively recent concept that emerged during the 1990s according to Kemp (2010). Although there is no universal agreement on the definition of this term, the most frequently used definitions in the international literature come from Kemp and Pearson (2008) and OECD (2009). The diversity of definitions related to eco-innovation is reflected in a varied range of terms and concepts. Various expressions are used in research, such as environmental innovation, eco-innovation, green innovation, environmental technologies, sustainable innovation, or sustainability-oriented innovation. The analysis of the scholarly literature shows that the first three terms have a similar meaning. However, sometimes "environmental innovation" is taken very narrowly and is identified with environmental technologies (European Commission definition, developed in 2004) [4]. Accord-

ing to the European Commission, eco-innovation refers to "*all forms of innovation – technological and non-technological – that create opportunities for the development of economic activities and that have a positive effect on the environment by preventing or reducing the impact of these activities or by optimizing the use of resources*" [3]. Thus, eco-innovation has the potential to support sustainable economic growth by improving resource efficiency and reducing greenhouse gas emissions by providing long-term, environmentally friendly solutions.

METHODS AND MATERIALS APPLIED

When preparing this article, the author resorted to the investigation of theoretical and practical sources regarding the concept of sustainable economic growth and eco-innovation, using various research methods, such as the method of analysis and synthesis of the literature in the researched field, the comparative method, induction and deduction logic, etc., followed by dissemination of the results in order to express some personal opinions. Informational support, bibliographical resources, studies and research, normative acts, reports and official documents from the Republic of Moldova, Europe and other countries in the field of sustainable development, sustainability and eco-innovation were used. Also, the author chose a quantitative analysis for this investigation, for a better understanding of the activities undertaken by companies in the Republic of Moldova in order to make resources more efficient. Therefore, in this study, the survey approach was adopted as the main research method, and the analysis and synthesis of the results are based on the processing and summarization of the collected data.

RESEARCH RESULTS AND DISCUSSIONS

Sustainable economic growth is a key concept in the development of modern societies. This implies a balanced approach between economic growth, protecting the environment, and promoting long-term social well-being, and this is also reflected in the actions of the business environment.

According to the Deloitte CxO Sustainability Report 2023 [5], three-quarters of companies have increased their investments in sustainability in the past year, of which 20% say the resources allocated were significantly higher than in previous years, despite economic uncertainty and increasing operational costs. While companies are showing increasing interest in sustainability, sustainable production and undertaking a number of corporate social responsibility initiatives in recent years, progress is falling short of pressing global challenges such as climate change, energy security and the depletion of natural resources. OECD analysts predict that global greenhouse gas (GHG) emissions will increase by 70% by 2050, while G8 leaders have agreed to aim to halve global emissions over the same period (OECD, 2009) [12]. It is not enough to have incremental improvement to meet today's challenges. However, industry restructuring and more innovative applications of existing and next-generation technologies are needed to ensure green and sustainable economic growth. Improving efficiency in the use of resources and energy, together with the development of innovations to improve environmental performance can lead to the creation of new industries and jobs in the future. Therefore, the current crises (economic, climate, natural) and climate change negotiations should be seen as an opportunity to move towards a greener economy.

At the heart of transforming an economy is innovation, which results in new ideas, new products and services, or new business models. Innovation contributes to the creation of new markets, to the creation of new jobs and is an essential element in increasing the quality of people's lives. Addressing major environmental issues will be extremely difficult and costly without investment in innovation. Estimates of the cost of mitigating climate change, for example, suggest that if two carbon-free renewable technologies from the electricity and non-electric sectors can become competitive, then mitigation costs in 2050 would be halved – from about 4% of world GDP to below 2% – compared to a scenario without such technologies [8]. Thus, innovation becomes essential for sustainable economic development.

In this context, eco-innovation plays a crucial role in promoting sustainable economic growth. First of all, eco-innovation has a vital role in the development of new technologies with the aim of using natural resources more efficiently and reducing the negative impact on the environment. Examples are technological innovations such as LED lighting systems, solar panels or recyclable batteries, which have revolutionized the way we use energy and resources. Also, the development of new and more sustainable materials and more efficient recycling technologies can help reduce the amount of waste generated and increase efficiency in the use of resources. Secondly, eco-innovations can help create new business opportunities and grow the economy. For example, the development of renewable energy technologies can open new markets and jobs in the green energy sector. At the same time, the implementation of more efficient technologies and practices in the use of resources can help reduce production costs and increase competitiveness within the industry.

In addition, eco-innovation can play an important role in meeting global environmental and sustainable development goals. Implementing cleaner and more efficient technologies can help reduce greenhouse gas emissions, conserve biodiversity and protect natural resources for future generations. However, implementing green innovations can be expensive and requires adequate political and financial support. Governments and organizations should invest in research and development in eco-innovation and provide tax incentives and other forms of support to businesses that develop and implement cleaner and more efficient technologies.

So by using natural resources more efficiently, we can lead healthier lives, save resources and money, create jobs and boost the economy, while respecting the limits of the planet. According to the European Commission [2], resource efficiency makes economic sense and is the single fundamental principle that underlies the entire circular economy strategy and is fundamental to green growth. By using fewer resources, more efficiently, Europe can maintain its competitive edge, create sustainable growth, sustainable jobs and better protect the environment. For a sustainable economy, resource efficiency and eco-innovation are important and come to support sustainable development. To achieve this goal, it is necessary to take resource efficiency into account at every stage of the product life cycle: harness green innovation to design smarter and more environmentally friendly products, produce and consume in a smarter way, recycle and completely reduce waste, or give it another life. According to a study by Circle Economy and Deloitte (2023) [1], the circular economy can reduce the global consumption of resources and materials by almost a third [13], without affecting the supply and quality of goods. Thus, we can deduce that there are solutions, which need to be implemented both by political decision-makers, the business environment, civil society, and consumers.

In developing countries, achieving sustainable economic growth has been approached by considering eco-innovation and resource efficiency as two essential factors. Yunpeng Sun et al. (2023) find that green innovation and resource efficiency have a positive and significant impact on sustainable economic growth in the E7 countries (China, Indonesia, Mexico, Russia, Turkey, Brazil and India) and can be an effective tool to improve the concept of economy green in these countries. In addition, the development of eco-innovation can activate the engines of green economic growth in a country and increase the capabilities of using new technologies in the production of goods, electricity production, transportation, urban management and resource management [13]. According to the authors, this is possible by developing green foreign direct investment, promoting green financing instruments and improving green job creation through SMEs.

Sustainable economic growth does not mean, however, the reduction of economic development, but rather an intelligent and responsible approach to it. Moreover, it can contribute to reducing poverty, increasing the standard of living and improving the quality of life, by creating jobs, improving public services and reducing the costs associated with traditional energies. Sustainable economic growth is not only a viable option but also necessary to ensure a sustainable future for future generations. By promoting a sustainable economy, we can ensure a balance between development and protection of the environment and society to build a better future for all.

So, sustainable economic growth, eco-innovation and resource efficiency are interdependent and can be represented by *Fig. 1*.

In the author's view, sustainable economic growth is linked to eco-innovation in that it can only be sustained through innovation and the development of technologies that reduce the impact on the environment and allow more efficient use of natural resources. Eco-innovation includes the development of green technologies, the use of renewable energies, as well as the promotion of the circular economy, which is based on the reduction and recycling of waste. Resource efficiency is also related to sustainable economic growth and eco-innovation. The efficient use of resources enables sustainable economic growth and reduces the impact on the environment, by reducing the amount of resources needed to produce the same economic value. For example, through the use of innovative technologies, we believe that energy and water consumption can be reduced, and through the circular economy, resources can be recycled and reused, instead of being disposed of by storage or burning.

Taking into account the analysis carried out above, in the period August-September 2022, the author initiated an extensive study among enterprises in the Republic of Moldova (Central Region and Municipality of Chisinau), the basic objective being the analysis of the eco-innovation potential of enterprises, through investigation method. The sample was made up of 200 companies from the Industry, Agriculture and Services fields.

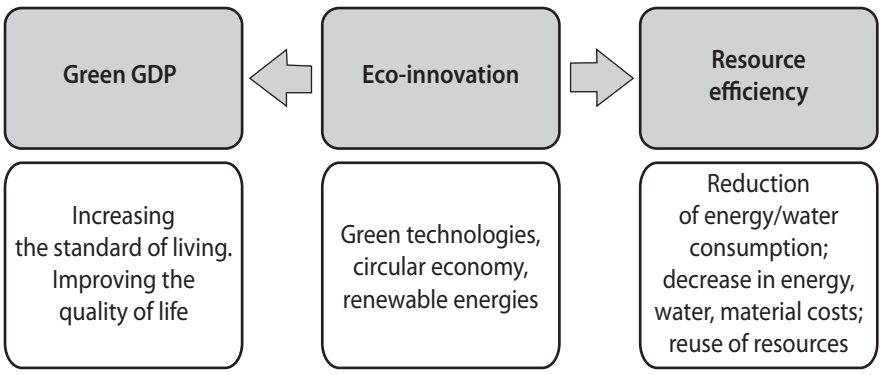

Fig. 1. The interdependence between sustainable economic growth, eco-innovation and resource efficiency

Source: elaborated by the author.

The study was carried out on the basis of a probabilistic, stratified, random sample, respecting the quotas of the size of the enterprise, the sphere of activity and the region. The study includes several objectives, namely: the analysis of the behavior, attitudes and expectations of entrepreneurs towards the development and adoption of eco-innovation in companies in the context of the increase in resource prices and their scarcity. In this paper, we will refer to the results related to resource efficiency and eco-innovation activities undertaken. According to the results, a significant part of the interviewed companies do not have a concrete sustainability/eco-innovation strategy or a strategy to reduce their carbon footprint, improve resource efficiency or minimize negative impact [10]. However, it is promising to note that a notable percentage (32%) expressed their intentions to define a strategy in the future, indicating a growing recognition of the importance of sustainability.

According to the data in *Fig. 2*, the majority of companies participating in the survey (74%) expect some level of impact of climate change on their strategy and operations, be it high or moderate, in the next 3 years, with a significant share of 41% of them, anticipating a smaller impact. According to the chart, we can note that the Agriculture and Industry sector expects the most that climate change will affect their development strategy, while the Services sector feels this pressure less or not at all. The results suggest that more and more companies are beginning to realize the importance of climate change and include it in their strategic discussions. However, there is still a need for more awareness and action on climate change adaptation to reduce risks and take advantage of emerging opportunities in an ever-evolving context.

As part of the study, we aimed to analyze the changes implemented by companies in order to make resources more efficient. Thus, according to *Fig. 3*, we can note that the results indicate that a variety of changes have been implemented by enterprises in this direction. Nearly half of businesses have opted to replace expensive materials with cheaper ones in the past 5 years, indicating a concern for cost control and finding more affordable alternatives. A significant proportion of businesses (43%) have invested in improving the flow of materials in their supply chain, which can lead to more efficient inventory management and reduced supply chain losses. At the same time, only 26% of businesses chose to purchase more efficient technologies, which may be a sign that technology investments are more expensive or complex. Also, around one in five businesses have opted to change their business model to increase resource efficiency. This may involve moving to more sustainable or circular economy-oriented business models. Consequently, according to Fig. 3, we observe that a similar percentage of businesses have adopted recycling practices to manage resources more efficiently and reduce environmental impact. However, companies' adoption of these changes varies by type of change and industry, and certain strategies may be more complex or less applicable in certain business contexts. It is important that businesses continue to explore ways to make resources more efficient in order to reduce costs and become more sustainable in the future.

In *Fig. 4* we can see that the conducted research demonstrates that a relatively small number of enterprises have introduced eco-innovations in different fields. Thus, we find that approximately 1 in 5 companies (21%) have implemented marketing eco-innovations. Also, 18% of businesses have implemented a new or significantly improved eco-innovative production process or method. Regarding eco-innovative organizational methods, only 14% of enterprises have introduced them. A similar proportion (14%) developed and brought to market new or significantly improved eco-innovative products or services. Most of the enterprises did not implement or could not answer clearly about the introduction of eco-innovations within the enterprise, regardless of its type.

In the framework of the research, we also explored the relevance of the innovations introduced by companies in the last 5 years in terms of resource efficiency and, more precisely, we analyzed the weight of the reduc-

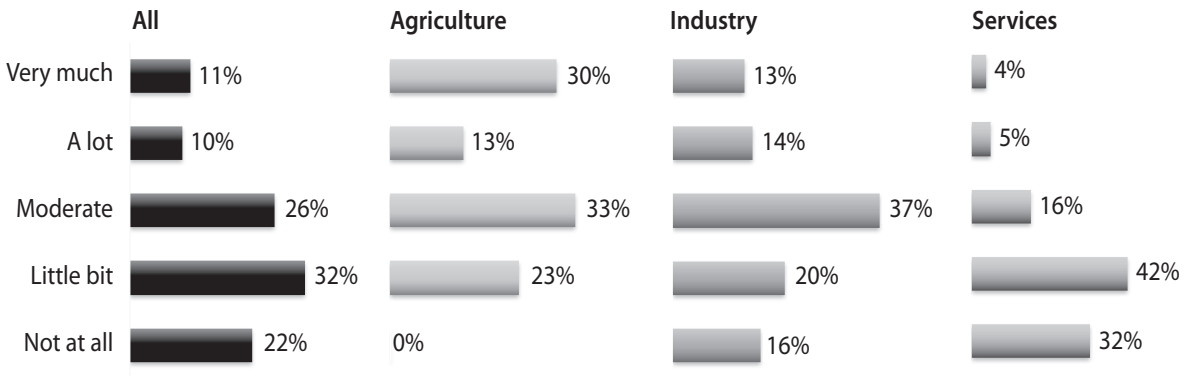

Fig. 2. How much do companies expect climate change to affect their strategy and operations over the next 3 years

Source: elaborated by the author.

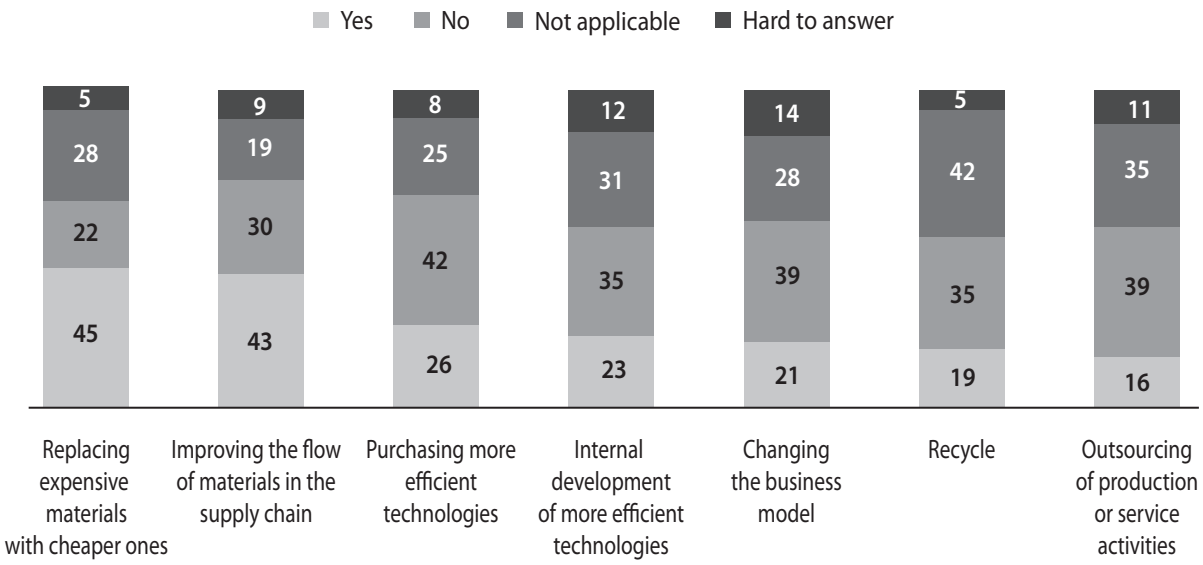

Fig. 3. Changes implemented by companies to enhance resource efficiency over the last 5 years

Source: elaborated by the author.

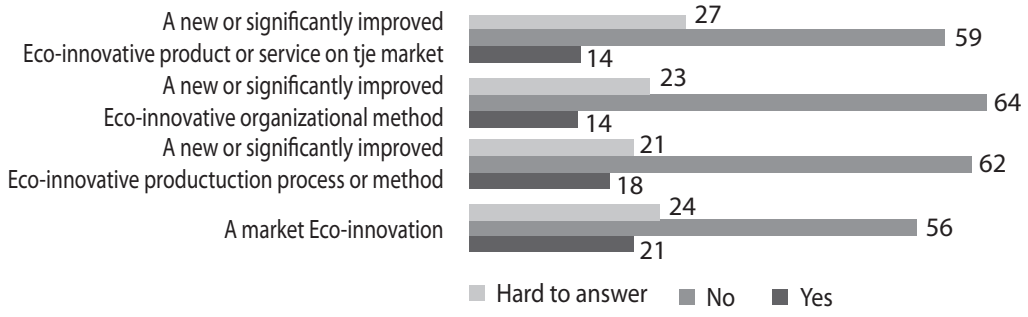

Fig. 4. Eco-innovations introduced by companies from 2017 to 2021

Source: elaborated by the author.

tion in the use of materials per unit of production obtained. Thus, according to the results presented in Figure 5, we can see that, in general, most companies have not achieved significant improvements in resource efficiency through the innovations introduced recently. At the same time, 18% of companies reported achieving less than a 5% reduction in material use per production unit as a result of the innovations introduced, indicating a relatively modest improvement in resource efficiency for these companies. Most of these companies reported or found it difficult to answer the exact level of reduction in material use per unit of production.

This situation is also due to the very low share of eco-innovations introduced in the company (*Fig. 5*) and may also indicate the need for these companies to pay more attention to their resource efficiency strategies and to measure the impact of these strategies. It is possible that the implementation of innovations in this area will require more rigorous planning and monitoring to achieve significant results in terms of efficient use of materials.

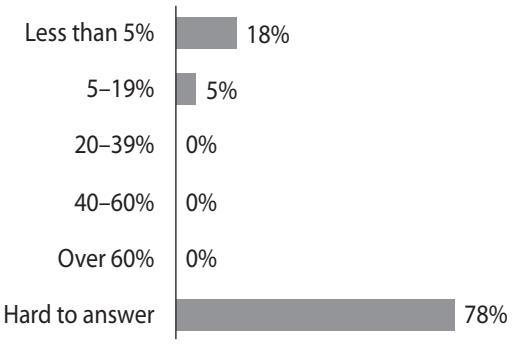

Fig. 5. The relevance of the innovations introduced by the companies in terms of resource efficiency (what reduction they achieved in terms of material use per production unit)

Source: elaborated by the author.

CONCLUSIONS

As a result of the analysis carried out, we summarize that sustainable economic growth is a concept that takes into account both economic development and its impact on the environment and society. In essence, the

sustainable economy is based on the idea that natural resources are limited, and economic growth must be managed in such a way that it does not generate the depletion of these resources or damage to the environment. Thus, eco-innovation plays a vital role in both resource efficiency and the corporate stability process for sustainable economic growth. In this sense, significant investments are needed in clean and efficient technologies, such as those based on renewable energies and alternative energy sources, as well as in sustainable infrastructure. Governments and companies must also promote a culture of responsible consumption by encouraging the use of sustainable products and services, as well as by facilitating the development and promotion of eco-innovation.

The results of the study undertaken within the enterprises of the Republic of Moldova show a picture of how companies adapt to changes in their environment, including climate change and efforts to improve resource efficiency, which remain very modest. Here are some key points:

- ***Increased sensitivity to climate change.*** Most of the surveyed companies show an increased sensitivity to climate change and expect a significant impact on their strategies and operations in the coming years, suggesting a growing awareness of climate change as a factor that can influence business.
- ***Different approaches to resource efficiency.*** The results of the study on changes implemented for resource efficiency show that there are a variety of strategies adopted by companies, from replacing expensive materials with cheaper ones to improving the flow of materials and purchasing more efficient technologies. However, not all companies achieved significant reductions in resource use, indicating that there is still room for more innovation and efficiency.
- ***The need for monitoring and measurement.*** The research results suggest that some companies may have difficulties in measuring and quantifying the results obtained by implementing changes. This underlines the importance of developing robust methods for monitoring and measuring the impact of innovations and strategic changes.

In conclusion, we mention that companies seem to be increasingly aware of the impact of climate change and the need to improve resource efficiency. However, there is significant variation in their approaches and outcomes. It is essential that companies continue to develop and implement strategies for adaptation and resource efficiency through eco-innovations, while monitoring their impact in order to face the challenges of the ever-changing business environment and to contribute to a more sustainable economy. sustainable. ■

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