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THEORETICAL AND APPLIED CONCEPTS: ENVIRONMENTAL MARKETING IN THE CEMENT INDUSTRY OF UKRAINE

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Abstract. *The article is devoted to the introduction of environmental marketing in the cement industry, which meets modern environmental challenges and trends in sustainable development. The problems associated with the negative impact of the cement industry on the environment, including high CO_2 emissions, significant energy and natural resources consumption, are considered. The author analyzes the legislative requirements and prospects for integrating environmentally responsible practices, such as the transition to dry production, the use of alternative fuels and the introduction of modern technologies. The article emphasizes the role of environmental marketing as a tool for increasing competitiveness, strengthening the reputation of enterprises and helping to reduce the negative impact on the environment.*

Keywords: *environmental marketing, green marketing, green product, cement industry, CO_2 emissions, sustainable development, alternative fuel, environmental responsibility, energy saving.*

Introduction.

Environmental marketing, or “green” marketing, is a response to the global challenges posed by the negative environmental impact of industrial enterprises. This is especially important for environmentally sensitive industries such as the cement industry, which is known for its high greenhouse gas emissions and significant consumption of energy and natural resources. Amid the current environmental crisis, the role of companies in reducing their environmental impact is becoming one of the key areas of business development strategies.

The legal requirements for cement companies are constantly increasing worldwide. Many governments, especially in developed countries, are introducing strict standards for CO2 emissions, energy consumption and the use of natural resources, forcing companies to review their production processes and marketing strategies. Implementation of environmental marketing allows not only to meet these requirements, but also to increase your reputation in the market.

Consumers are increasingly aware of the importance of companies’ environmental responsibility. In many countries, there is a trend towards environmentally friendly products, which is driving the development of green marketing. Cement companies can use this trend to position their products as environmentally friendly, attracting the attention of socially responsible buyers and companies seeking to use building materials with a smaller environmental footprint.

Companies that are the first to implement environmental initiatives can gain significant advantages over their competitors. Companies with a well-developed environmental strategy enjoy greater consumer trust, better access to markets and opportunities to cooperate with other environmentally responsible businesses.

The introduction of environmental marketing not only enhances the image of the company, but also helps to optimize costs. The use of renewable energy sources,

waste recycling, and emissions reduction all contribute to increased production efficiency and cost reduction, which directly affects the financial results of companies.

The cement industry has a significant impact on climate change, so implementing sustainable practices is not only a business necessity but also a social responsibility. A sustainable development strategy based on the principles of environmental marketing can help companies maintain their market position and reduce their negative impact on the planet.

Environmental marketing is becoming increasingly important for industrial enterprises, particularly in the cement industry, due to stricter environmental requirements and a growing focus on sustainable development.

Analysis of recent research and publications. The topic of environmental marketing has been the subject of many works by both domestic and foreign scholars.

K. Peattie [1] defines environmental marketing as the process of planning and executing the conception, pricing, promotion and distribution of products with regard to their environmental impact. He emphasizes that companies should respond to the growing public interest in environmental issues. He points out that new environmental requirements create both challenges and opportunities for businesses that can use these changes to build an environmental strategy. The book discusses the importance of integrating environmental considerations into all aspects of business, from product design to marketing. Peattie offers a model of environmental marketing that takes into account elements such as environmental responsibility in supply chains, resource efficiency, and environmental innovation. The author also analyzes the segmentation of consumers by their environmental awareness and consumption habits. He distinguishes between several types of green consumers and provides recommendations on how to target each of them.

According to D.A. Fuller (1999) [2], environmental marketing is the process of planning, implementing and controlling the development, pricing, promotion and distribution of goods that satisfy consumer needs with minimal negative impact on natural resources and the environment. Fuller defines sustainable marketing as a process that takes into account the environmental and social impacts of a company's activities, focusing on the long-term benefits for all stakeholders - from companies to consumers and society as a whole. He emphasizes that marketing strategies should be not only cost-effective but also environmentally friendly. He emphasizes product life cycle analysis as a key element of sustainable marketing. He examines how companies can reduce the negative impact on the environment at each stage of the life cycle, from resource extraction to product disposal after use. The author analyzes how environmentally responsible companies can increase their competitiveness in the market. He offers specific strategies for marketers to consider environmental issues, such as waste reduction, energy conservation, and emissions minimization.

Fuller also looks at changing consumer behavior in response to environmental issues. He analyzes how companies can use consumer environmental awareness to promote their products and strengthen their reputation.

M.J. Polosky [3] also emphasizes that green marketing includes not only caring for the environment, but also considering public expectations and consumer behavior.

He believes that green marketing should be based on transparent strategies and be part of long-term changes in companies' business practices. Polonsky offers a broad definition of green marketing as a marketing process that takes into account the environmental interests of companies and consumers. He describes it as a process that involves not only selling environmentally friendly products, but also responsible production and management of all stages of the product life cycle.

The author emphasizes the need to consider environmental aspects in marketing due to the growing concerns of society about the state of the environment. Polonsky points out that consumers are becoming more environmentally conscious, which requires companies to change their strategies. He notes that implementing green marketing can provide companies with a competitive advantage. He highlights such benefits as customer loyalty, improved brand reputation, and compliance with increasing environmental regulations. In addition, the author raises the issue of ethical challenges associated with green marketing, in particular, the transparency of companies in communicating their environmental efforts and avoiding so-called "greenwashing" - when companies claim to be environmentally responsible without taking real action.

J.A. Ottman [4] emphasizes that traditional marketing rules no longer meet modern requirements and proposes new approaches that take into account environmental and social aspects. She emphasizes the need to adapt to the changing expectations of consumers who are increasingly paying attention to environmental issues. The author provides practical strategies for creating and promoting sustainable brands. She discusses how companies can effectively develop products, communicate their environmental responsibility, and engage consumers through social media and other channels. The author offers a variety of tools and resources for businesses to implement green marketing strategies. It includes examples of successful campaigns and case studies that demonstrate how companies can succeed by implementing green initiatives. It also raises the issue of ethics in green marketing, emphasizing the importance of clarity and honesty in communication. It warns of the risks of "greenwashing," where companies try to trick consumers by presenting their products as environmentally friendly without actually making efforts in this area.

In general, green marketing is characterized by the promotion of products based on their environmental benefits, which includes responsible manufacturing practices, sustainable branding, and active communication about environmental impact. Each author emphasizes different aspects, but in general emphasizes the importance of integrating environmental considerations into marketing strategies.

Identification of previously unresolved parts of the overall problem. Analyzing the existing specifics of the use of environmental marketing tools in the activities of cement producers will allow them to understand the potential challenges and benefits they can gain from implementing green marketing strategies in their operations.

Setting the goals of the article (statement of the task).

The article is aimed at studying the impact of environmental marketing on enterprises of the cement industry and developing recommendations for the implementation of environmental marketing strategies to increase environmental

responsibility, competitiveness and sustainable development of these enterprises.

The objectives are to assess the environmental problems of the cement industry (to identify the main sources of pollution and environmental challenges associated with cement production, to assess the impact of the cement industry on the environment and society), to define the basic principles of environmental marketing (to reveal the essence and significance of environmental marketing, to identify key principles and approaches to the implementation of environmental marketing in the industry), to analyze examples of environmental strategies at cement enterprises, to develop recommendations for the implementation of environmental marketing in the industry.

Environmental marketing (also known as “green marketing”) is a concept of marketing approaches and strategies aimed at developing, promoting and selling products or services that reduce negative environmental impact. It has become a key part of companies' sustainability strategies in response to global environmental challenges such as climate change, air and water pollution, and the depletion of natural resources.

The main components of environmental marketing include:

Green product - a product designed to meet environmental requirements, using environmentally friendly materials or technologies. This can include reducing waste, using recycled materials, reducing energy consumption and emissions during production.

Green packaging means using environmentally friendly packaging that can be recycled or composted, as well as minimizing the amount of packaging materials.

Green branding is the creation and promotion of a brand associated with environmental responsibility. Companies implementing environmental initiatives communicate this through marketing channels to increase consumer trust and loyalty.

Green processes - optimization of production processes to minimize emissions, save energy and resources, and introduce innovative environmental technologies.

The main principles of environmental marketing are:

Sustainable development - the use of marketing strategies that promote the company's sustainable development and minimize its environmental impact.

Transparency - open communication about the company's environmental efforts to build consumer trust.

Innovations - the introduction of new technologies and approaches to reduce harmful environmental impact.

Environmental marketing is an important component of a sustainable development strategy, as it helps companies not only reduce their negative impact on the environment but also meet the needs of modern consumers who increasingly value environmental initiatives. It contributes to the formation of consumer habits that favor environmentally friendly products. Companies that integrate environmental practices into their strategy can attract conscious consumers who are looking for products that align with their values. This, in turn, supports sustainable development as demand for environmentally friendly products grows.

Through the implementation of environmental marketing, businesses can optimize their production processes, reduce resource consumption, and reduce waste.

This is directly related to sustainable development, as such changes help to conserve natural resources and reduce environmental pollution.

"Green marketing stimulates innovation as companies look for new ways to create sustainable products and services. This may include the use of renewable materials, development of energy-efficient technologies, etc. Innovations in green marketing allow businesses to remain competitive in a market that is constantly changing under the influence of environmental trends.

Given the fact that the cement industry is the world's leading CO2 emitter, accounting for 7-8% of emissions, the focus in Ukraine will be on reducing emissions by Ukrainian cement producers.

The total CO2 emissions by cement enterprises per ton of cement are shown in Figure 1. As can be seen from the diagram, until 2018, there was a steady increase in greenhouse gas emissions and reached a maximum value in 2021 (0.58 tons per ton of cement produced). The forecast for 2030 is 0.46 tons of CO2/ton of cement [5].

Cement production is one of the most energy-intensive and environmentally harmful industries due to significant CO2 emissions, the use of natural resources, and air and water pollution. The production of 1 ton of cement emits approximately 0.5-0.9 tons of CO2. The main sources of these emissions:

– decarbonization of limestone: A chemical process in which calcium carbonate (CaCO3) is broken down into calcium oxide (CaO) and CO2;
– fuel burning: Fossil fuels (coal, natural gas) are used to heat the cement kiln to temperatures above 1400°C, which also leads to large greenhouse gas emissions.

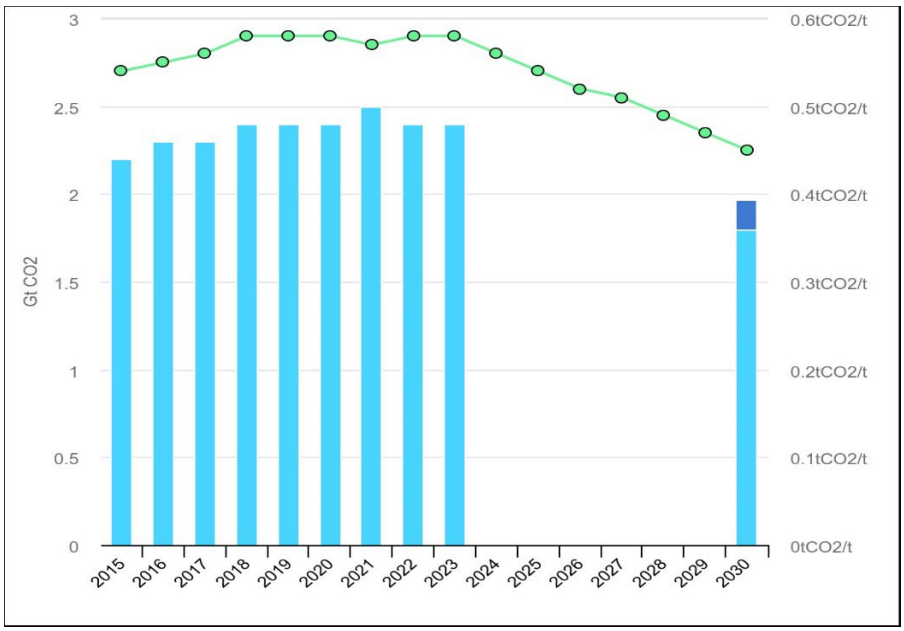

Figure 1 - CO2 emissions from the cement industry in the world [5]

Cement production requires a significant amount of natural resources. The main raw materials for cement production are limestone, chalk and clay. The extraction of these materials can have a significant impact on ecosystems, leading to soil destruction and loss of biodiversity.

The high energy intensity of cement production is linked to the use of fossil fuels to heat the cement kiln. This also leads to increased resource use and air

pollution.

Cement production emits numerous pollutants into the atmosphere: small dust particles emitted during the grinding of raw materials, which can lead to respiratory illnesses in people living near cement plants; nitrogen oxides (NOx) and sulfur oxides (SOx) generated from fuel burning, which can lead to acid rain and negatively affect air quality.

Air pollution from cement production has a significant impact on public health, especially in regions with a high concentration of cement plants.

One of the most harmful parameters at all cement plants is noise pollution. Various resources, including gas-dynamic, mechanical and electromagnetic noise, have been declared as noise-forming factors in such premises, generating noise in the range from 68.8 to 103.3 dBA. Gas-dynamic noise is created by compressors, manifolds, and blowers. Mechanical noise refers to pollutants caused by grinding and crushing devices. In addition, electric motors are the main cause of electromagnetic noise. Workers in the cement industry are at risk of hearing loss due to noise pollution. In addition, prolonged work in such conditions leads to neurasthenia syndrome, which can lead to high blood pressure, memory loss, and insomnia. Therefore, noise-induced hearing loss has been introduced to evaluate the health issues of the laborers annually via using audiometric examinations [6].

Cement production also has an impact on water resources. Water is used to cool equipment and processes in cement plants, which can lead to a shortage of local water resources. Industrial wastewater can contain pollutants such as heavy metals and alkaline components that can drain into water sources, affecting water quality and aquatic ecosystems.

Compared to other pollutants emitted from cement plants, water waste has received the least attention due to its low consumption and environmental hazards during the production procedure. Thus, it has not received much attention due to the lack of literature in this area.

In general, the sources of pollution from cement production are shown in Figure 2.

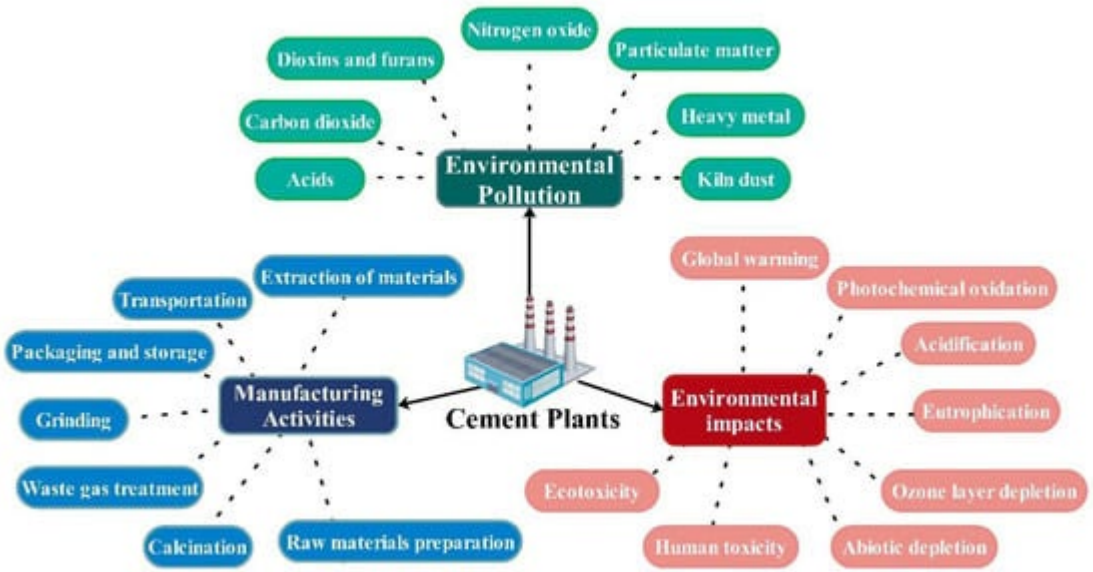

Figure 2 - Sources of pollution from cement production [6]

The combination of high CO2 emissions, intensive use of natural resources and air pollution makes the cement industry one of the most environmentally challenging. Reducing this impact is essential due to its global environmental consequences.

Legal requirements for environmental responsibility of cement companies.

The cement industry in Ukraine is obligated to comply with a number of legal requirements regarding environmental responsibility aimed at protecting the environment and ensuring environmental safety. The main ones include:

- compliance with environmental standards and regulations: According to the Law of Ukraine "On Environmental Protection", companies must ensure the rational use of natural resources, prevent their damage and pollution, and comply with the established standards of harmful environmental impacts [7];
- environmental impact assessment (EIA): Before constructing or reconstructing facilities, companies are required to carry out an EIA to identify potential environmental risks and develop measures to minimize them;
- obtaining environmental permits: In order to carry out certain activities that may have a significant impact on the environment, businesses must obtain the relevant permits from governmental authorities. This refers in particular to air emissions, discharges into water bodies and waste management;
- implementation of an environmental management system: Enterprises are encouraged to implement environmental management systems in accordance with international standards such as ISO 14001, which promotes a systematic approach to managing environmental aspects of their operations [8];
- waste management: The Law of Ukraine "On Waste" regulates the procedure for waste management, including its collection, transportation, processing and disposal. Businesses must ensure proper waste management to minimize its negative impact on the environment;
- payment of environmental tax: companies whose activities have a negative impact on the environment are required to pay environmental tax. The amount of the tax is calculated depending on the volume of emissions, discharges and other parameters characterizing the environmental impact.

Nevertheless, failure to comply with all of these requirements may result in administrative, civil or criminal liability, including fines, suspension of operations or other sanctions as provided by law.

To ensure compliance with all legal requirements, it is recommended that you conduct regular environmental audits and consult with environmental law professionals.

Implementing environmental marketing at enterprises involves the use of various methods to integrate environmental aspects into business strategies.

Today, Ukrainian producers are already trying to reduce emissions in various ways, the main ones being: switching to a dry production method; replacing coal with more environmentally friendly fuels; using waste in production; improving technological processes; increasing the production of cement with additives (slag, ash, limestone, etc.) instead of admixtures, etc.

Switching to dry cement production from wet cement production significantly

reduces CO_2 emissions due to several important factors. In wet cement production, more energy is used to remove water from the slurry (a mixture of limestone and clay with water). Since the moisture content of the raw material mixture is much lower in the dry process, there is no need for energy for evaporation. This reduces the consumption of fuel, usually coal or natural gas, and thus reduces CO_2 emissions.

In the dry process, the raw material mixture is subjected to less processing at lower temperatures and heats up faster. Since the moisture content of the raw material is much lower in the dry process, the amount of heat energy required to dry the material is minimized. This reduces the additional CO_2 emissions associated with the energy costs of drying.

Dry production requires less energy for each ton of cement produced, which has a direct impact on reducing carbon dioxide emissions. It is estimated that switching to dry production can reduce energy consumption by up to 40%. Thus, dry cement production is more environmentally friendly and efficient in terms of energy consumption, which significantly reduces CO_2 emissions.

More than 65% of cement is already produced using the dry process. And those producers that are still working on a wet or semi-dry basis have projects to convert to a dry process.

There are five cement plants in Ukraine: Ivano-Frankivsk, Kamianets-Podilskyi, Zdolbuniv, Olshanske, and Kryvyi Rih. The first two are already operating using the dry process. The latter is using a semi-dry process, while Zdolbuniv and Olshanka are using a wet process. However, it is worth emphasizing that before Russia's invasion of Ukraine, these producers had developed projects to switch to the dry method, but these plans have been suspended. It is possible that after the change of ownership at the wet process plants, these plans will be resumed and the preparation process for the transition to the dry process will begin. However, there is no such information yet, and the existing equipment has been modernized to reduce fuel and electricity consumption. In other words, work to reduce emissions is already underway.

Switching to a dry process is very expensive. This transition actually means building a new plant, so during the war, producers consider other ways to reduce emissions. Switching to other fuels and using waste in their own production is one of them. In Europe, the vast majority of cement plants use waste as an alternative fuel. There, waste recycling companies sort and supply waste (paper, wood, dried organic waste, tires, etc.) to manufacturers. The waste goes through final preparation and is fed into a kiln at the enterprises themselves. This type of fuel has an advantage over coal due to lower CO2 emissions.

Replacing the wet process with a dry one will not fully decarbonize production, but it will significantly reduce carbon dioxide emissions.

Innovative technical upgrades such as changing the production method or switching to alternative fuels are very expensive. Over the past few decades, cement producers have relied on traditional methods to reduce their emissions, such as improving fuel efficiency and replacing clinker and traditional fuels with greener options. However, to achieve zero emissions by 2050, annual capital expenditures will need to nearly double to US$60 billion on average from 2021 to 2050. These costs, as well as the costs of developing new decarbonization technologies and

processes, have made industry players cautious about adopting new innovations.

There has also been some attention paid to cement industrial zones that contribute to water treatment. As a solution, the water used in cooling systems is then recycled by installing cooling towers and reused for raw material preparation and dust washing [9].

The Multilateral Carbon Credit Fund (MCCF), established by the European Bank for Reconstruction and Development (EBRD) and the European Investment Bank (EIB), has agreed to purchase carbon credits from Ivano-Frankivsk Cement (IF Cement). The project with Ivano-Frankivsk Cement amounts to USD 80 million, co-financed by the State Export-Import Bank of Ukraine (UkrEximBank) and USD 15 million from the EBRD through the UK Energy Efficiency Program (UKEEP). UKEEP aims to reduce energy consumption and carbon emissions by more than 50 percent through the introduction of new production technologies. This is the first project under the UKEEP framework to benefit from a carbon finance transaction. This is a market-based approach to addressing global climate change that uses international partnerships to reduce greenhouse gas emissions in a cost-effective manner [10].

By installing high-efficiency dust collectors at IF Cement, dust is reduced by two-thirds. In addition, water will be recycled, leading to an 80 percent reduction in water consumption.

Regarding noise pollution in cement plants, the use of management and technical control systems is strongly recommended. Four aspects are introduced as a management monitoring system, including reducing shift hours, updating machinery and equipment, regularly maintaining and adjusting devices, and using a reasonable and proper scheme for machine installation. In addition, the technical control system refers to vibration absorption, noise absorption and isolation, and uses sound insulation systems. In developed countries, hearing conservation programs consisting of noise resource identification and control, labor training, and the use of hearing protection equipment are used to reduce the impact of noise pollution in cement plants.

Summary and conclusions.

The use of green strategies in the cement industry helps to reduce the environmental impact of enterprises, in particular by reducing CO_2 emissions and optimizing resources. This is in accordance with current trends in sustainable development and increases the competitiveness of enterprises in the market. Companies that are the first to implement environmentally responsible practices gain an advantage in building a positive image among consumers and partners. It also helps to develop loyalty from environmentally conscious consumers.

Increasing environmental requirements at the legal level encourage cement companies to implement more responsible production methods and marketing strategies, reducing their negative impact on the environment. To reduce emissions, companies are modernizing their processes, switching to more environmentally friendly fuels, and using alternative materials. Although this requires significant financial investment, it is a promising strategy for achieving long-term environmental goals. Building a brand with environmental values helps to attract new customers and

strengthen the company's position in a market focused on environmental responsibility. It also helps to avoid reputational risks.

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