

5. Sustainable marketing of organic fertilizer companies in the context of environmentalisation

Ukraine is one of the world leaders in grain cultivation thanks to its fertile soils and favourable climate. Ukrainian enterprises are key players in global food security. In order to maintain its role as a food leader and achieve sustainable development goals, Ukraine has emphasised the need to halt land degradation and biodiversity loss. Such greening processes require an increase in the production and use of organic fertilisers by households and farms. At the same time, rising gas prices increase the cost of mineral fertilisers and also catalyse an increase in the production of organic fertilisers.

Expanding the capacity of the organic fertiliser market requires active use of marketing, the development of effective tools to improve the environmental situation, and the creation of economic value through social responsibility. As a result, marketing is becoming increasingly important in the context of growing demand for environmentally friendly products and the need to minimise negative impacts on the environment. Research into the marketing of organic fertiliser companies in the context of environmentalisation is important for achieving sustainable development goals. However, there is almost no scientific research on this issue. This dissertation research is the first attempt at a scientific understanding of organic fertiliser marketing. Therefore, it is important to develop a theoretical and methodological basis for the marketing of organic fertiliser companies in the context of environmentalisation.

A significant contribution to the development of the theory of ecological marketing, the identification of organic marketing factors, and the patterns of socio-ethical marketing has been made in the works of many scientists. In particular, among foreign scientists, these are Andrews A., Castells M., Kotler F., Ottman J. Among domestic scholars, the works of S. Ilyashenko, Ya. Larina, D. Raiko, N. Savitskaya, O. Sadchenko and O. Shafalyuk should be noted.

The research is motivated by the need to develop scientific thinking on the use of organic fertiliser marketing, taking into account the greening of economic conditions and the possibilities of omnichannel influence on the formation of new consumer

behaviour patterns, which accordingly determined the choice of the topic, purpose and objectives of the research, and shaped the structure and content of the dissertation.

The purpose of the study is to develop theoretical and methodological foundations for the marketing of organic fertiliser companies in the context of environmentalisation.

Achieving the goal of the work necessitated solving the following tasks:

- to explore the evolution of the essence of ecological marketing;
- to study the Trends of greening in the context of sustainable development;
- to determine the place of development of the technology of production of organic fertilizers "Earth Revival" in the classification of green technologies.

The object of the study is the marketing process of organic fertiliser companies.

The subject of the study is the theoretical and methodological foundations of marketing organic fertiliser companies in the context of greening.

Research methods. To solve the tasks set in the dissertation the following research methods were used: analysis and synthesis – to study the theoretical foundations of environmental marketing; classification and systematisation – to construct a classification of fertiliser marketing; comparative, functional-cost, and economic analysis – for the economic and environmental justification of fertiliser production from sewage sludge; SWOT analysis – to monitor the marketing activities of a company producing fertilisers from sewage sludge.

The information base of the study consisted of the works of domestic and foreign scientists, as well as practitioners in the field of research, current legislation and regulatory acts, data from the State Statistics Service of Ukraine and open Internet sources, open analytical reports, enterprise data, and the results of our own research.

5.1 The evolution of the essence of ecological marketing

In the context of post-war recovery, the role of corporate social responsibility is growing. Businesses naturally need socio-economic transformation, and one of the key elements of such transformation is socially responsible marketing. We are now seeing a transformation in consumer habits (the desire to save time, engage in online shopping,

lead a healthy lifestyle, and consume in an environmentally friendly manner). To remain competitive, enterprises must respond to these changes.

The term "green marketing" is often used, but scientists have not yet reached a consensus on its meaning. Therefore, the debatable nature of the essence of green marketing is obvious. For many years, the main goal of marketing was to promote manufactured products. It used to be irrelevant at what cost to the environment this would be done. Now, it has become clear that if we continue to act in this way, the age of human activity on Earth will quickly come to an end. Already, many changes in nature are occurring as a result of human activity. The rapid economic growth of various countries through urbanisation and intensification of production has come at the cost of radical shifts in the ecological situation. Abrupt changes in biodiversity, deforestation, chemical emissions, water pollution, carbon emissions – this is far from a complete list of the destructive impact of humans on the environment [81].

Environmental marketing has gone through three stages of evolution [82]:

1) Environmental marketing is a concept that emerged in the 1970s, involves targeted efforts focused on reducing dependence on partially harmful products and views marketing from the perspective of contributing to the solution of environmental problems;

2) environmental marketing is a concept that emerged in the late 1980s and early 1990s and aims to reduce harmful impacts on the environment through the use of lean manufacturing techniques and the creation of new innovative products that reduce emissions and waste. This creates additional opportunities to gain competitive advantages by meeting the needs of environmentally conscious consumers.

3) Sustainable marketing is a concept that emerged in the early 2000s and seeks to cover the environmental costs of production and consumption in order to create a sustainable economy. In addition to environmental aspects, social and societal requirements are of particular importance in this concept. The evolution of environmental marketing required demands from society.

Castells M. writes about the complexity of the interaction between technology, society, space and ecology [83].

The following can be considered prerequisites for the creation of environmental marketing [83]:

- marketing – the emergence of concepts that allow for the balancing of several conflicting issues in order to reduce the negative impact of marketing on society;
- environmental – increased anthropogenic impact and disruption of the ecological balance caused by pollution of the air, water, forests and soil as a result of human activity;
- social – growing demand for environmentally friendly products and greening of business, resulting from the deterioration of human health due to environmental pollution;
- technological – rapid development of technological tools and solutions that promote the implementation of environmentally friendly production;
- economic – the existence of economic conditions that ensure the efficiency of environmentally friendly production and services.

F. Kotler, as a proponent of the concept of corporate social responsibility, supports the idea that companies should integrate environmental aspects into their marketing strategy to meet the demands of modern consumers and create a sustainable business [84]. He argued that the greening of marketing activities is necessary. His concept of social and ethical marketing confirms that "the task of a company is to identify the needs and interests of target markets and ensure their desired satisfaction in more efficient and productive ways (than competitors) while preserving and consolidating the well-being of consumers and society as a whole" [83]. The only ways to satisfy needs that are more effective and productive than those of competitors are those that provide customers with environmentally friendly food products, industrial goods, and a high-quality natural environment (clean air and water).

Larina Y.S., Remez Y.B., and Pereyradkina E.S. studied the environmental situation, the state of demand for eco-products, and environmental trends in the activities of Ukrainian enterprises. As a result, they supplemented the composition of the environmental marketing complex (eco-4P) in terms of sustainable development to 11P, which includes the elements of People, Publicity, Physical Evidence, Perceptual

Psychology, Package, Purchase, Probe. The following advantages are highlighted in the environmental marketing strategy: economic, marketing, social and environmental [85].

A. Andrews considers eco-marketing to be a special type of human activity aimed at satisfying needs through exchanges that do not disturb the ecological balance of the environment and do not affect the health of society [86].

J. Ottman defines environmental marketing as "a company's economic activity aimed at producing environmentally friendly products, creating demand for these products and bringing all of the company's resources into line with market requirements and opportunities without harming the environment" [87]. However, in her opinion, the implementation of environmental marketing principles does not yet guarantee competitive advantages.

To transform the opportunities of eco-marketing into competitive advantages, J. Ottman has developed five rules of environmental marketing [88].

The first rule is "know your customer". You need to make sure that potential consumers understand the benefits of the product and its importance, or that the product offers another, more obvious benefit that increases its value in the eyes of the consumer.

The second rule is "empower consumers." Consumers need to feel that their consumer behaviour will make a difference, which in turn will encourage them to buy environmentally friendly products.

The third rule is "we must act transparently". Consumers must believe that the product complies with legal standards and the manufacturer's claims about its benefits. Consumers often do not trust the information provided by manufacturers about improved environmental characteristics of products and production processes. Some abuse the environmental theme by using unfounded environmental declarations or their own eco-labels.

The fourth rule is "the need to convince buyers". Consumers are not willing to give up normal product quality for the sake of protecting the environment and therefore must believe that the products perform their stated function flawlessly.

The fifth rule is "pricing must be carefully considered". If the price is higher than

that of a conventional product, you need to make sure that consumers will accept this price and consider it appropriate. Of course, many consumers are not willing to pay a premium price for conventional or eco-friendly products, especially during a recession. This must be taken into account when determining the target audience for eco-friendly products.

The American Marketing Association provides the following three definitions of "green marketing" [89]:

- at the retail level: the promotion and marketing of products intended to be environmentally safe;
- from a social marketing perspective: the development, promotion and marketing of products designed to minimise or improve the quality of negative environmental impacts;
- from an environmental perspective: an organisation's efforts to produce, promote, package and dispose of goods in a manner that considers or addresses environmental issues.

K. Pitti believes that "environmental marketing is a management process aimed at identifying, anticipating and satisfying consumer and social needs in an effective and sustainable manner" [82].

A. Vychevych, T. Vaidanich, and I. Didovich define environmental marketing as "a management function for organising and directing consumer demand for goods and services that contribute to the preservation of key ecosystems at the qualitative and quantitative levels and satisfy the needs of individuals, organisations, and society as a whole. Also, in their opinion, it is a function of transforming consumer requests into environmentally oriented requests.

Sager L.Yu. and Nikonenets M.O. believe that environmental marketing is a specific type of marketing that involves directing all of a company's activities (product development, production, packaging, transportation, sales, promotion, processing and disposal) towards the formation and satisfaction of environmentally oriented needs in order to make a profit and protect the environment and human health [90].

Sadchenko O.V. and Kharichkov S.K. emphasise that environmental marketing

is designed "not only to ensure maximum growth in consumption, expansion of consumer choice, satisfaction of consumer needs and maximum improvement in quality of life, but also to support the sustainable and balanced development of the region and preserve the high quality of the environment" [90]. They identify six concepts of environmental marketing [87].

The first concept. Environmental marketing is the marketing of products and services that takes into account the most important elements of the external environment – environmental standards and norms.

The second concept. Marketing of environmental products and services is a special type of marketing that is the result of the emergence of people's environmental needs due to the deterioration of the environment and the growth of environmental awareness in society.

Third concept. Marketing of natural conditions and resources and marketing of environmental management is corporate-type environmental marketing, which is focused on local and national authorities, legal owners of natural resources in the regional and national territory.

The fourth concept. Marketing of environmental protection and habitat restoration is a non-commercial type of environmental marketing aimed at protecting the gene pool of the human habitat and the biosphere and taking appropriate measures to restore individual components of disturbed ecosystems and natural environments.

Fifth concept. Marketing of environmental knowledge and technologies is a type of idea marketing (according to F. Kotler). This type of concept is closely related to the previous concepts of environmental marketing, as eco-marketing provides the necessary environmental know-how in the marketing process (in a broad sense, this includes organising scientific research to obtain new environmental knowledge, developing environmentally friendly technologies, analysing and monitoring environmental legislation, environmental expertise, environmental auditing and consulting). The subjects of marketing are scientific organisations, universities, know-how companies, individual scientists, researchers and experts [87];

Sixth concept. The concept of network eco-marketing – marketing in a relational system of sustainable social development – is not a separate process of social

reproduction or a fragment of the movement of resources and goods in a single cycle, but rather views it as a single chain covering the entire process of the "natural resource-waste-goods" cycle, taking into account the side effects on the environment.

Yarema V.I. and Lendel O.D. believe that ecological marketing is a management function that organises and directs the activities of government bodies, state institutions and enterprises in assessing consumer demands and transforming them into environmental orientation. It is also a management function that organises and directs activities to transform consumer demand for goods and services that contribute to the preservation of key ecosystems at the qualitative and quantitative levels and satisfy the needs of individuals, organisations and society as a whole for environmentally oriented demand [91].

F. Kotler has developed a complex of marketing environmental services (Fig. 1.1).

Internal marketing, in particular, means paying attention to the environmental awareness of staff in the field of environmental services. In addition to ensuring the traditional key elements of the marketing mix (environmentally friendly products, pricing, promotion and distribution), it is necessary to train employees and service personnel. Creating an environmental department to provide environmental services is insufficient and ineffective [91].

External marketing, on the other hand, includes the formation of an environmentally conscious consumer market, cooperation with intermediaries, interaction with environmentally oriented parties and public organisations, political and legal support for environmentally balanced activities, information on environmental issues and forecasting of development trends. External and internal systems must interact closely through two-way marketing. Ultimately, the quality of services depends on the relationship between buyer and seller; interaction must ensure an understanding of the importance of environmental issues and the appropriate provision of environmental services.

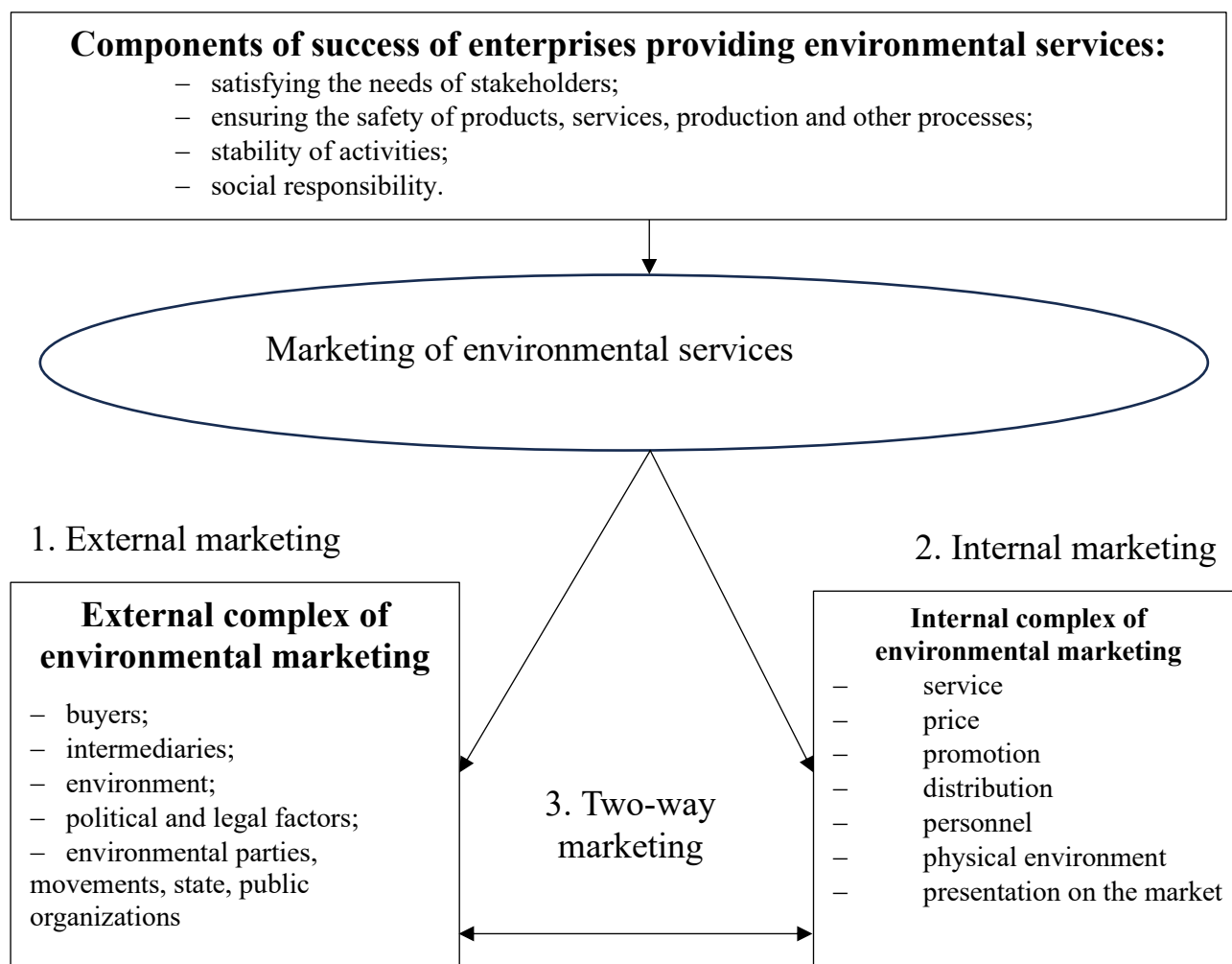


Figure 1.1 – Three marketing options in the environmental services sector

Source: [91]

Key scientific approaches to interpreting the concept of "environmental marketing" are presented in Table 1.1.

Table 1.1 – Analysis of scientific approaches to defining the concept "green marketing"

Authors	Scientific approach	Disadvantages of the scientific approach
Sager L. Yu., Nikonets M.O.	Environmental marketing is a special type of marketing that focuses corporate activities on forming and satisfying environmental needs in order to make a profit and protect the environment and human health	Ecological marketing is an integral part of corporate activity, and not a special type of marketing
K. Pitti	Environmental marketing is a management process aimed at identifying, anticipating and satisfying consumer and social needs in an effective and sustainable manner	The title mentions ecology, but this is not reflected in the definition.

Continuation of Table 1.1

Vychevich A., Vaidanich T., Didovich I.	Environmental marketing is "a management function for organising and directing consumer demand for goods and services that contribute to the preservation of key ecosystems in terms of quality and quantity and meet the needs of both individuals and as well as and organisations or society as a whole."	The definition is abstract in nature and does not explain how the conservation of key ecosystems is achieved
Sadchenko O.V., Kharichkov S.K.	Ecological marketing aims to maximise consumption growth, expand consumer choice, satisfy consumer needs and improve quality of life, as well as support sustainable and balanced regional development and maintain a high quality environment	There is no emphasis on green technologies that should satisfy buyers and preserve the environment

Source: [82, 87, 90]

Having analysed the positive aspects and shortcomings of existing scientific approaches, we offer our own interpretation of the essence of the concept of "green marketing". Green marketing is the marketing of goods produced using "green technologies" that adhere to an environmentally friendly approach.

Since organic fertilisers are a priori produced using "green technologies", ecological marketing is a generic concept for the marketing of organic fertilisers, i.e. the marketing of organic fertilisers is a type of ecological marketing.

Based on the author's approach, "environmental marketing" should be considered as a tool for economic development in the context of environmentalisation. The goal of environmental marketing is to make eco-products the standard. To achieve this, the following areas must be addressed: raising consumer environmental awareness; developing environmentally friendly products; promoting environmentally friendly products on the market; forming a community of "eco-consumers" on the market; and greening production.

We propose considering the following tasks of ecological marketing:

- 1) creating an environmentally responsible, environmentally positive image of enterprises;
- 2) increasing customer loyalty;
- 3) creating new eco-friendly products;

4) attracting opinion leaders (influencers);

5) introducing waste-free or safer production methods (using biodegradable or recycled packaging, refusing to use harmful chemical components in products).

At the present stage, environmental marketing is a key element of sustainable development based on a network concept.

The network concept is a chain that covers the entire cycle process "nature-resource-waste-commodity", and also takes into account secondary impacts on the environment [90].

Figure 1.2 shows the basic categories and principles of environmental marketing. When developing an environmental marketing mechanism, the collection and processing of information from customers must be taken into account.

Environmental marketing is based on the following principles [92]:

- compliance with legal norms regarding the use of natural resources;
 - compliance with ethical and moral standards;
 - acquisition of safe, innovative new technologies that do not generate waste, for example, the use of less hazardous chemical compounds and production methods;
 - innovation, i.e. the active development and implementation of eco-innovations that improve the environmental performance of products by reducing energy, water and raw material consumption, as well as reducing the use of non-renewable raw materials;
 - ensuring openness, integrity, reliability and transparency of corporate reporting;
 - ensuring trust and integrity (and eliminating "pseudo" green initiatives);
 - creating a positive image in the eyes of consumers, shareholders, etc.;
 - eco-labelling of products;
 - intensification of marketing communication tools – active advertising of eco-innovations and environmentally friendly ("green") products and services.
- Positive advertising of environmentally friendly products and services ("green" advertising).

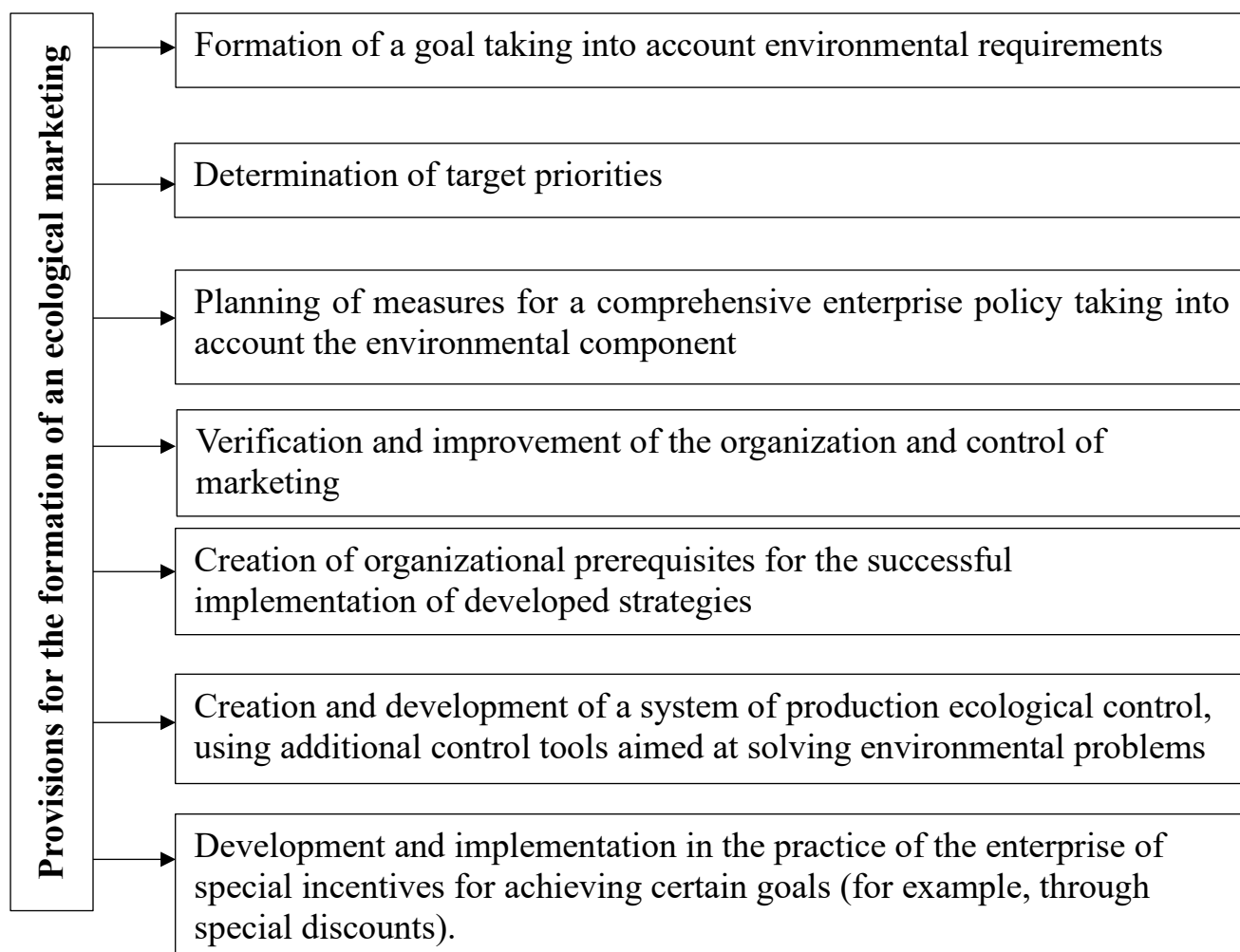


Figure 1.2 – Basic principles of environmental marketing

Source: [93]

In light of the concept of sustainable development of society, the following areas of eco-marketing research can be identified [93]:

- research of the market as a whole – identification of new segments in "green" markets, research of sources of new competitive advantages for making key marketing decisions, prediction of the future market situation;

- product research – studying the possibility of modifying the product itself, improving its production process (technology), methods of waste disposal, ecological, economical and creative (design) packaging of goods, the product's ability to be recycled and disposed of, energy-saving methods; determining the degree of danger of the product to human health and the environment;

- research on competitors – studying manufacturers of similar products, their strengths and weaknesses. Research on factors that shape consumer demand: shaping consumer attitudes and loyalty, informing target audiences about the competitive advantages of goods;

- research on increasing brand awareness (development of PR campaign) – improving the image and business reputation of the company in the market.

Rashchenko A.V. and Zinovchuk N.V. divided the bearers of environmental needs into two groups – individuals and certain social institutions [94].

1) Environmental needs in the economic sphere:

- needs of consumers – environmentally clean products food; environmentally friendly water; environmentally friendly consumer goods; means of protecting people in a polluted environment (water purification filters, air conditioners);

- manufacturers needs – eco-technology (equipment and devices for environmental pollution control; technology that ensures energy and resource conservation and reuse of industrial and household waste; purification equipment); eco-technologies (technologies for soil protection, decontamination and recultivation; technologies that ensure a reduction in the resource and energy intensity of products; technologies for recycling industrial and household waste; technologies for the production of environmentally friendly food, consumer goods and raw materials); new types of raw materials and energy resources; environmental services (cleaning of contaminated soil and water; waste disposal and wastewater treatment; advertising of environmentally friendly products and goods; eco-labelling of goods);

- needs of state and local authorities – environmental technology (equipment and devices for monitoring the natural environment; technology for energy and resource conservation and reuse of industrial and household waste; purification equipment); eco-technologies (technologies for soil protection, decontamination and recultivation; technologies that reduce the resource and energy intensity of products; technologies for recycling industrial and household waste); environmental services (cleaning up polluted soil and water; waste disposal and wastewater treatment; landscaping and afforestation, improvement of roads and urban natural parks;

continuous monitoring).

2) Environmental needs in the social sphere:

- consumer needs – environmental education and awareness; environmental information services (in particular, assessment of the environmental cleanliness of goods and services); nature reserves, zoos, botanical gardens, national parks, recreational areas);

- manufacturers' needs – general professional environmental education; professionally-oriented environmental education; environmental information services (assessment of the environmental impact of production, environmental certification of production processes and goods, publication of environmental literature, dissemination of environmental information in print); environmental consulting (consulting on the implementation of environmental management in enterprises, certification and environmental labelling, application of international and domestic environmental standards); environmental auditing (verification and assessment of production compliance with environmental standards);

- needs of state and local authorities – career-oriented environmental education; organisation of formal environmental education (in pre-school institutions, general education schools, extracurricular education institutions, vocational and technical schools); organisation of informal environmental education through the media (radio, television, newspapers, magazines, advertising), cultural institutions, healthcare, tourism, etc.; environmental information service (creation of an information base on the state and dynamics of changes in the natural environment; analysis of objects, causes and consequences of violations of environmental well-being of territories; assessment of the sustainability of environmental systems and the effectiveness of nature conservation measures).

Understanding environmental needs in the context of marketing means respecting the environment and understanding the role of the environment in a company's strategy and behaviour. The needs of environmental marketing are related to how companies take into account the impact of their activities on the environment and how they incorporate this responsibility into their marketing strategies, including

the use of environmentally friendly materials, production processes, packaging and the promotion of environmentally friendly, energy-saving products.

In a world where consumers are becoming increasingly aware and demanding of the environmental sustainability of goods, meeting environmental needs is becoming a key element of a successful marketing strategy.

Environmental needs include not only physical well-being, but also psychological and emotional well-being. This includes the need for clean air, healthy food, access to natural resources, and the opportunity to enjoy and stay in touch with nature.

Companies that successfully integrate environmental needs into their marketing strategy create a positive brand image.

The use of environmental marketing is standard practice among leading international companies.

Tesla, a manufacturer of electric cars and solar panels, actively uses environmental marketing, emphasising its contribution to reducing carbon emissions and the sustainability of the energy system. Its communications use slogans such as "Release more sustainable exhaust!", "Zero emissions" and "Zero exhaust". And the following ideas are always present in its image advertising.

Promotion of sustainable mobility. Promotes its electric cars as a greener alternative to traditional cars, which do not emit carbon and reduce the negative impact on the climate.

Emphasis on sustainability in production. Uses renewable energy in its factories to reduce greenhouse gas emissions.

Battery improvements. It is improving the efficiency of batteries for its electric cars, increasing the range per charge and reducing energy consumption.

Production of solar power stations. Manufactures solar power stations and panels for homes, reducing environmental impact and saving energy.

Charging station network. Created its own Supercharger Network of charging stations for cars to reduce dependence on traditional fuels.

Participation in sustainable projects. Invests in sustainable projects, such as the

construction of a large battery in Australia to stabilise the grid and provide energy even under excessive load conditions.

Patagonia, a manufacturer of clothing and accessories for outdoor activities, promotes the repair and recycling of clothing and funds nature conservation projects. They use the following ideas for advertising campaigns.

"Don't Buy This Jacket" communication messages encouraged consumers to think carefully about buying new things and choose products they really need.

Clothing recycling plants. Created the Worn Wear programme, which allows customers to buy used clothing and exchange old items for discounts. This helps to extend the life of products and reduce waste.

Transparency in production. Provides information about the origin and production of clothing, the location of production, and working conditions.

Environmental support funds. Allocates a significant portion of its profits to support projects that preserve nature and combat climate change.

Educational initiatives. Creates educational resources that help customers better understand environmental issues and the impact of their purchases.

Whole Foods Market is a supermarket chain specialising in organic products. The following ideas are used in its image advertising.

Organic products. Promotes organic products, emphasising their high quality and environmental friendliness.

Protection of nature and biodiversity. Supports programmes for the protection of nature and biodiversity.

Responsibility to suppliers. Establishes long-term relationships with suppliers who share their values in the field of sustainable development. Supports local producers who implement programmes to reduce environmental impact throughout the supply chain.

Educational activities. Conducts educational activities and provides information on healthy eating.

Environmentally friendly construction. Builds its stores using energy-efficient technologies.

Openness and transparency: Provides information about the origin of goods, their composition and production methods.

IKEA works to reduce the environmental footprint of its products, and the ideology of its communication programmes is always based on these principles.

Sustainable products. Offers a wide range of furniture and home goods made from environmentally friendly materials.

Energy efficiency. Increases the energy efficiency of its own production.

Recycling and reuse programme. Offers customers the opportunity to return old furniture for recycling or reuse in the secondary market.

Solar energy. Invests in renewable energy, installs solar panels on the roofs of its stores and warehouses.

Supplier responsibility. Works with suppliers who share their values in the area of social responsibility.

Educational initiatives. Provides information and educational materials on how to make your home environmentally friendly.

Unilever is a global consumer goods company that manufactures products such as ice cream, cosmetics and household chemicals. They promote the following green initiatives in their marketing campaigns.

Organic brands and products. Focuses its efforts on reducing waste and supporting a positive impact on the environment.

Doing Good programme. They have launched a programme that aims to reduce the environmental impact of their products by reducing carbon emissions and waste.

Transparency and education. They are working to raise consumer environmental awareness and provide information about the origin and composition of their products.

Innovations in packaging. Introducing innovative packaging methods to reduce plastic use.

Socially responsible initiatives. Support social and environmental projects (combating poverty and hunger, improving access to clean water).

Responsible advertising. Do not create intrusive or misleading advertising campaigns.

Starbucks uses green marketing and increases the use of renewable energy sources. The corporate philosophy is based on the following principles.

Organic coffee. They work directly with farmers to improve their working conditions and encourage organic farming.

Internal sustainability goals. They have set goals to reduce carbon emissions, increase energy efficiency, and reduce water consumption.

Internal recycling and disposal. They are working to reduce waste and recycle materials.

Environmentally friendly stores. They build new stores using environmentally friendly or recycled materials and reduce energy consumption.

Educational initiatives. They conduct educational events for customers and employees on the importance of responsible consumption.

In Ukraine, there is a trend towards greening of business (Table 1.2).

Considering the problems of the formation and development of green marketing in Ukraine [95], it should be noted that as a tool for sustainable development, it is not systematic or purposeful. However, there are factors that accelerate the process of implementing green marketing in enterprises. These factors include the following [95]: first, the need to promote Ukrainian manufacturers' products to foreign markets; second, growing environmental awareness among the population; third, the need to implement European standards; fourth, improving corporate image; fifth, the oversaturation of markets with manufacturers' goods; sixth, consumers' desire for a healthy lifestyle.

Table 1.2 – Top 20 corporate environmental programmes in Ukraine

Company name	Industry	Environmental programme
Nestlé	Food industry	Eco-modernisation of production
Philip Morris Ukraine	tobacco industry	
Interpipe	pipe manufacturing	
PFC	metallurgy	Waste processing, reclamation of the Central quarry, closed water supply system, third stage of gas purification
Clear Energy	Electricity generation	Construction and operation of biomass and biogas power plants

Continuation of Table 1.2

Ukrhydroenergo	Electricity generation	Eco-modernisation of hydroelectric power plants, solving environmental problems of the Dnieper and Dniester rivers
Continental	Car tyres	Production of tyres for hybrid and electric vehicles, EcoContact 6 tyres for cars
MHP Holding	Agro-industrial complex	Creation of an eco-friendly closed production cycle at Orel-Leader and other environmental protection programmes
Carlsberg Ukraine	food industry	Together Towards ZERO
Yves Rocher	Cosmetics	Yves Rocher brand eco-concept, Yves Rocher eco-projects
L'Oréal Ukraine	cosmetics	"Sharing beauty with everyone"
Greenville	Real estate	Eco-construction, urban greening
Foxtrot	Retail and commercial real estate	"Green Office" in the Foxtrot group of companies , Eco-class from the Foxtrot retail chain , support for the Green Institute programme
Intertop Ukraine	fashion retail	Opening of interactive eco-trails in Kyiv and other cities of Ukraine
Radisson Hotel Group	hotel business	Green Key eco-certificate and programme "Responsible Business" programme
Ukrgasbank	financial services	Financing of eco-projects

Source: [96]

Ukrainian consumers are concerned about environmental issues, with around 78% of the population worried about the state of the environment, 60% believing that Ukraine's further development and transition to European standards is impossible without solving environmental problems, and 64% of the Ukrainian population willing to pay more for eco-friendly products than for conventional goods [97].

The trend towards an increase in the number of consumers willing to pay more for eco-products, even at higher prices, indicates the need to develop eco-production technologies and environmental marketing tools and to strive to implement them as quickly as possible. Entrepreneurs are beginning to realise that eco-marketing is not only a tool for protecting the environment (which in itself is insignificant), but also a real competitive strategy in which they can invest from minimal to maximum effort, providing many competitive advantages [97].

Understanding environmental marketing, as noted, as the marketing of goods produced using "green technologies," we can offer a definition of the concept of green growth: economic growth that promotes the rational use of natural capital, prevents and

reduces environmental pollution, creates opportunities to improve overall social well-being by creating a green economy, and ultimately allows us to embark on the path of sustainable development.

5.2 Green trends in the context of sustainable development

The concept of sustainable development focuses on improving quality of life by ensuring the long-term ability of ecosystems to meet human needs. In 1972, the term "sustainable development" was first officially used at the UN Conference on the Human Environment. In 1983, the World Commission on Environment and Development (Brundtland Commission) was established, which developed the "Concept of Sustainable Development".

Research on sustainable development has been conducted in developed countries, but there is still a need for such research in the context of developing countries [98]. In 2015, the UN developed the Sustainable Development Goals (SDGs), which cover economic development, the fight against inequality, health care, education, and environmental protection. Seventeen sustainable development goals have been identified to achieve a just future [99]:

- 1) end poverty in all its forms and promote universal inclusion in the elimination of extreme poverty;
- 2) ending hunger, achieving food security and sustainable agriculture, and improving nutrition;
- 3) ensuring healthy lives and promoting well-being for all;
- 4) ensuring access to quality education and promoting lifelong learning;
- 5) gender equality– achieving full gender equality and empowering all women and girls;
- 6) clean water and sanitation– ensuring access to clean drinking water and sanitation for all;
- 7) access to clean energy– ensuring access to reliable, sustainable and modern energy for all;
- 8) full and decent employment and economic growth– promoting sustained,

inclusive and sustainable economic growth, full and productive employment and decent working conditions;

9) innovation and infrastructure– building infrastructure, promoting inclusive and sustainable industrialisation, and fostering innovation;

10) reduced inequalities– Reducing inequality within and among countries;

11) sustainable cities and communities– promoting sustainable cities and communities, including affordable housing and transport;

12) sustainable consumption and production– promoting sustainable consumption and production through resource efficiency;

13) climate action– taking action to combat climate change and its impacts;

14) conservation and sustainable use of marine resources;

15) conservation and restoration of terrestrial ecosystems, sustainable management of forest resources;

16) peace, justice and strong institutions – promoting peace, justice and strong institutions;

17) partnership for sustainable development – strengthening global partnership for sustainable development.

Sustainable development is the foundation for addressing global challenges such as combating poverty and hunger, protecting health, overcoming social inequality, unemployment, the impact of climate change, preserving biodiversity, ensuring water supply and sanitation, reforming the energy sector, and managing urbanisation.

If we group the seventeen goals together, we get three dimensions: environmental stability, economic stability, and socio-political stability.

Environmental stability means preserving the environment. This includes managing resources in such a way as to prevent their depletion and minimise negative impacts on ecosystems, reducing greenhouse gas emissions, sustainable use of natural resources, and protecting biodiversity.

Economic stability means creating economic systems that can ensure prosperity and living standards for current and future generations. This includes balanced use of resources, optimisation of consumption, efficient use of technology, job creation,

stimulation of innovation, and rational production methods.

Social and political stability is linked to ensuring social justice and the equitable distribution of resources. This includes respect for human rights, combating inequality, ensuring access to education and healthcare, improving quality of life, and citizen participation in decision-making processes.

The International Institute for Sustainable Development, a non-profit organisation specialising in research and recommendations in the field of sustainable development, plays an important role in sustainable development research [20, 21].

The International Institute for Sustainable Development has identified the following sustainable development trends [22], which are intertwined with the UN's sustainable development goals [99]:

- Circular Economy – goods are designed, produced and used in such a way as to reduce waste and promote the regeneration of natural systems;
- Climate Change Adaptation – accelerating efforts to adapt to current and expected future impacts of climate change;
- Climate Change Mitigation – implementing comprehensive solutions in the field of clean energy and progressive low-emission technologies;
- Energy – transition to electricity generation systems with reduced fossil fuel consumption;
- Environment, Conflict and Peacebuilding – managing natural resources to encourage unstable societies to pursue sustainable development;
- Food and Agriculture – investing in agriculture to reduce poverty and tackle the world's most pressing challenges, from hunger to climate change and rising inequality;
- Governance and Multilateral Agreements - regulating global economic activity and international environmental governance regarding online data privacy, the way countries share knowledge about food products, and the ability to purchase affordable and safe goods that meet social and environmental standards;
- Infrastructure – financing roads, bridges, power plants, water pipes and ports

that promote economic growth, taking into account carbon emissions, environmental impact, social cohesion, natural ecosystem management and project financial viability;

- Investment Law & Policy – developing innovative legal and policy instruments to ensure that international investment contributes to sustainable development;

- Just Transition – reforming all aspects of society based on fair decisions;

- Measurement, Assessment, and Modelling – the transition to a sustainable society requires appropriate data, models, and tools;

- Mining – using the mining industry for sustainable development, limiting negative impacts and forming environmental financial obligations;

- Public Procurement – public procurement accounts for an average of 15% of a country's GDP and has great potential to stimulate innovation and sustainable development;

- Responsible Business – by implementing sustainable practices, companies can gain a competitive advantage, increase market share and enhance shareholder value;

- Standards and Value Chains – demand and supply for products that meet key sustainability standards have grown, leading to the growth and spread of voluntary sustainability standards (VSS);

- Subsidies – The Global Grant Initiative (GSI) of the International Institute for Sustainable Development is widely recognised in the field of quantitative determination, evaluation and reform of grants.

- Sustainable Development Goals – a programme aimed at eradicating poverty, protecting the planet and ensuring peace;

- Sustainable Finance – financing sustainable projects;

- Taxation – sound tax policy and administration are key to ensuring the sustainability of government actions;

- Technology and Innovation – the use of innovative methods and technologies;

- Trade – international trade has the potential to promote sustainable low-carbon development, and the Sustainable Development Goals and climate

commitments of the Paris Agreement are fundamental challenges for trade policy;

- Water – human activity threatens the health of the planet's precious freshwater resources.

Based on the above developments of the International Institute for Sustainable Development, principles of sustainable development are proposed (Table 1.3).

To achieve sustainable development goals, the international community has concluded a number of international agreements.

- Paris Climate Change Conference. The agreement was adopted in 2015 in Paris at the COP21 conference and establishes countries' commitments to reduce greenhouse gas emissions and limit global warming.

- Convention on Biological Diversity — aimed at the conservation and sustainable use of biological diversity.

- Forest Conservation Initiative (REDD+). REDD+ (Reducing Emissions from Deforestation and Forest Degradation) aims to reduce greenhouse gas emissions by reducing deforestation and preserving forest ecosystems.

- The World Bank's Sustainable Development Initiative is a series of initiatives aimed at supporting sustainable development, including projects on clean energy, water management and combating climate change.

- Circular Economy and Sustainable Consumption – many countries and organisations are working on initiatives to promote a circular economy and sustainable consumption, including waste reduction, increased recycling and material recycling.

- Ocean conservation programme – initiatives are working to conserve and sustainably manage marine resources and oceans.

Table 1.3 – Proposed principles of sustainable development based on the developments of the International Institute for Sustainable Development

Principles	Aspects of sustainable development
Integration of social, economic and environmental aspects	Sustainable development involves taking into account and balancing the social, economic and environmental aspects of development in order to achieve harmony and justice
Management of natural resources	Effective management and conservation of natural resources for future generations, preventing overpopulation and excessive consumption

Continuation of Table 1.3

Contributing to the fight against climate change	Sustainable development includes measures to reduce greenhouse gas emissions, adapt to climate change and increase resilience to extreme weather conditions
Combating poverty and inequality	Sustainable development includes efforts to reduce poverty and inequality, ensure access to education, healthcare and resources for all segments of the population
Social justice and human rights	Sustainable development strives for respect for human and the equitable distribution of opportunities and resources

Source: author's own development

These initiatives are of significant importance for achieving sustainability at the global level and provide tools and action plans to combat global environmental problems.

We can explore the sequence of greening using the example of the "Quality Loop". The quality loop, introduced by the international standard ISO 9004-87, is a series of planned and systematic measures carried out by manufacturers (suppliers) that are necessary to ensure that consumers (customers) are confident that the products meet certain quality requirements.

The structure of the "quality loop" includes the following components and their interrelated subsystems: marketing, market research and analysis; design and/or development of technical requirements, products; material and technical supply; preparation and development of production processes; production; control, testing and inspection; packaging and storage; sales and distribution of products; installation and operation; technical assistance in maintenance; disposal after use.

A closed, continuous cycle of industrial production is the general idea of the "quality loop", which interconnects marketing, management and other subsystems.

It should be noted that the "3R" rule (reducing waste, reusing materials, recycling waste) is now emerging as a new integral norm of production and its modern environmental imperative.

The task of greening in the context of sustainable development must be addressed systematically. We can identify the following levels of addressing the task of greening:

- global level – general concern about the conflict between rapid economic development and the aggravation of environmental issues, improving relations between countries on improving methods of conflict resolution, cooperation and exchange of experience;

- national level – regulation and implementation of environmental trends at the level of laws and regulations, simplified taxation policy and the creation of other favourable conditions for development in the direction of environmental protection;

- local – a company that agrees to use technologies recognised at previous levels to achieve environmentalisation and is responsible for developing and implementing these technologies;

- public – conducting public initiatives to shape attitudes towards the impact of each person's activities and choices as a consumer of certain goods; raising awareness and promoting conscious behaviour among buyers.

There are a number of studies confirming the positive impact of the introduction of green technologies – not only in terms of the environmental situation, but also in economic terms: growth in demand, energy efficiency, brand recognition brands, and, as a result, increased financial success for companies [103].

While previously the issue of sustainable development was of greater concern to scientists and academics, now the level of awareness of environmental issues is growing. This is evidenced by the results of surveys and studies, such as the Journal of Business Ethics study.

Anna Watson, Rozenn Perrigot, and Olufunmilola (Lola) Dada, in their paper "The Impact of Green Brand Image on Brand Loyalty: The Case of Major Fast Food Brands," provided a review of the literature on the effect of a brand's environmental image [104].

Na Zhang a, Mingxuan Guo a, Xing Bu b, and Chunhua Jin, in their paper "Understanding Environmental Loyalty: A Literature Review Based on Bibliometric Content Analysis," reviewed the literature on the mechanism of environmental loyalty [105].

P. Vandhe investigated the relationship between environmental marketing and

sustainable development. He showed the trends, problems, and future of environmental marketing [106]. A positive relationship between environmental trust and environmental loyalty has been proven [107, 108]. This emphasises the importance of establishing trust in environmentally friendly brands.

Ukraine is also not standing aside from global processes and has a state environmental policy strategy to reform relevant laws and regulations, as well as to introduce international standards for environmental management systems in enterprises and companies.

Slockva M.G. and Pyankova O.V. conducted a detailed analysis of the dynamics of primary energy consumption and carbon dioxide (CO₂) emissions, but they do not propose any actions to promote greening and sustainable development [109].

After analysing the works of domestic authors, we can conclude that most of them only provide an analysis of the relationship between the economy and greening or conduct research on the integration of sustainable development, including in various spheres of the economy and the state. Among domestic scientists who have written about the relationship between economic development and the environmental component, the following can be noted: Z. Gerasymchuk, L. Hryniv, V. Hryshchenko, B. Danylyshyn, V. Dergachova, S. Doroguntsov, A. Zhikhareva, R. Korpan, Ya. Kulchitsky, A. Ralchuk, T. Tunitsa, A. Tsybulyak.

Among domestic authors who analyse the greening of production and green technologies in various areas of entrepreneurial activity, we can highlight: N.S. Remez, T.V. Grebenyuk, V.O. Bronitsky, Denisyuk S.P., I.A. Vasilenko, E.V. Chuprynov, A.V. Ivanchenko, M.I. Skyba, V.I. Vorobyova, V.V. Galish, Ivanova N.V. N.S. Remez, T.V. Grebenyuk, and V.O. Bronitsky do not provide a definition of the term, but note that green technologies are an integral part of the green economy.

I.A. Vasilenko, Ye.V. Chuprynov, A.V. Ivanchenko, M.I. Skiba, V.I. Vorobyova, and V.V. Galish interpret the term "green technologies" as innovative and environmentally friendly production based on the principles of sustainable development, reuse of raw materials, and conservation of natural resources. The main goal of such technologies is to reduce the negative impact on the environment, which

requires a new approach to business [109].

Ivanova N.V. and Adamenko O.V. express the opinion that there is no single definition of green or environmentally friendly (eco-friendly) technologies. The general approach is to achieve the main goal – reducing the negative impact on the environment, for example, by reducing waste, increasing energy efficiency or improving design to reduce the amount of resources consumed [97].

The concept of "green computerisation" can be interpreted as "green technologies in IT". Among domestic scientists who provide interpretations of the term "green technologies in IT", it is worth noting Sidorova M.O. [103] and Pavlenko O. Among foreign scholars, Chen A.J.W [110], R.T.Watson [104], T.Velte, A.Velte, R. Elsenpeter, Webbr L, and Schulz G are noteworthy.

Sidorov M.O. interprets "green information systems" as information systems that comply with the environmental principles of the concept of sustainable development [103].

Pavlenko O. expresses the opinion that "green information technologies can reduce costs for individuals, small and medium-sized enterprises, and large companies. They allow the development, production, use, and disposal of computer devices with minimal impact on the environment. Green IT technologies are aimed at reducing excessive energy consumption and increasing the efficiency of computer systems" [103].

Green information technology (Green IT) is a set of approaches to environmentally friendly computer and information technologies. It is the science and practice of designing, manufacturing, using, and disposing of computers, servers, and subsystems such as monitors, printers, data storage devices, networks, and communication systems in an efficient manner with minimal impact on the environment [111].

Environmental issues arise when developing a distribution system. A. McKinnon defines environmental logistics as: the movement of materials in any production process, their transformation into goods and production waste, the transfer of waste for disposal or safe storage in the environment, as well as the collection and segregation

of consumer waste to ensure its transport, disposal or storage. It is defined as "a science and a set of measures" [111].

J.-P. Rodrigues interprets green logistics as: "an environmentally safe and efficient transport distribution system" [112].

D. Rogers and R. Tibben Lambke understand green logistics as a set of actions to assess and minimise the impact of logistics activities on the environment [112].

L. Yambo clarifies the meaning of environmental logistics as follows: "It is defined by environmental principles, a system of planning, design and management using advanced logistics technologies and environmental design methods in the areas of pollution, reduction and resource consumption. The main goal is to coordinate logistics activities with social and environmental consequences" [86].

An analysis of scientific opinion on greening shows that the role of sustainable development in the context of greening and the environment is becoming a fundamental principle focused on the conservation and restoration of ecosystems. Sustainable development helps to reduce the negative impact of humans on nature, cut greenhouse gas emissions, prevent the destruction of ecosystems, and preserve biodiversity and soil fertility in agriculture. It also promotes more responsible use of natural resources and the creation of environmentally friendly technologies.

Society is raising questions about the relationship and balance between economic development and the environmental situation. This can be achieved through conscious consumption, foresight and awareness of the implementation of environmentally based tools.

There are several factors that limit the rapid introduction of the latest greening technologies around the world.

Firstly, most companies face financial difficulties associated with the implementation of expensive environmentally friendly technologies.

Secondly, insufficient regulatory support and unclear standards in many countries are an obstacle to the widespread implementation of innovations. Also, low environmental awareness of some consumers and uncertainty in effectiveness new technologies may slow down their rollout.

On the one hand, the primary task for enterprises is to meet consumer needs and make a profit while minimising resource costs. To this end, business processes are optimised and conditions are created in which the production of goods generates greater profits while reducing costs.

Therefore, it is understandable that entrepreneurs and manufacturers have doubts about radical changes in the process of creating goods in order to shift production to an environmentally friendly path.

The advantage in terms of the speed of return on investment when implementing eco-measures at a certain stage of production or completely greening the technological process is unclear. Indeed, the creation of eco-friendly products requires significant investment:

- renewable and recyclable materials used to manufacture such goods are often more expensive than traditional ones;
- environmentally friendly technologies also require significant investment in research and development;
- water purification technologies are expensive.

Many companies are holding back on the transition to environmentally friendly production because, at first glance, the concept does not seem to meet their business objectives.

These doubts arise for a number of reasons:

- 1) the difficulty of ensuring transparency in the supply of environmentally friendly raw materials;
- 2) the need to purchase and install new equipment;
- 3) the need to establish new processes;
- 4) the belief that most consumers will not be able or willing to pay a premium price for environmentally friendly products.

The lack of greening measures, including marketing practices, can have serious consequences. Increasing waste volumes, pollution of natural resources and climate impact can exacerbate environmental crises. In addition, consumers may turn away from companies that do not strive for environmental responsibility, leading to a loss of

market share and negatively impacting reputation.

In light of these challenges, accelerating the greening of marketing tools is critical to supporting environmental sustainability. Ensuring collaboration between business, government, and civil society will contribute to the creation of a more environmentally friendly and sustainable economy.

Environmentally friendly technologies (eco-technologies) are innovative methods, processes and materials developed to reduce negative impacts on the environment and increase sustainability in various areas of human activity. They are designed to minimise the use of natural resources, reduce emissions of harmful substances and reduce waste.

Eco-technologies can range from minor changes in production processes to radical innovations and can be applied in various industries. Consumer purchasing behaviour means that demand for "green" brands will grow over time.

Most companies strive to achieve a "green" image, i.e. environmentally responsible, because it is not only profitable but also necessary, as it makes it easier to achieve greater consumer loyalty, brand value and increased sales. This leads to profits, promotes consumer loyalty and increases brand awareness. Companies that use "green technologies" significantly increase their competitiveness, open up new markets and increase their market share.

The green economy has become a common driver of growth.

The use of environmentally friendly materials in production— is one of the most common trends. Companies produce goods in cardboard packaging, refuse to use plastic bags and use only recyclable polymers. Products are increasingly being produced with the ECO prefix, which means no chemicals or genetic modifications. These materials are designed to reduce the negative impact on the environment and make our lives more sustainable.

In this context, several important aspects can be highlighted:

- eco-materials include bio-components that can decompose naturally without harming nature;
- eco-materials are made from recycled materials (plastic, glass, metal), which

helps to reduce waste and save natural resources;

- eco-materials are made from natural materials (wood, cotton, stone), which makes them environmentally friendly;
- eco-materials have good thermal insulation properties, which reduces energy consumption in construction and helps to create energy-efficient buildings;
- eco-materials are used for packaging goods, which helps reduce the use of disposable plastic packaging.

Many countries have regulations that encourage or require the use of eco-materials.

Apple uses environmentally friendly materials to reduce the environmental impact of its products and is working to create packaging from recycled materials. For example, iPhone boxes are made from 100% recycled fibre and contain no plastic, while the MacBook Air enclosure is made from 100% recycled aluminium.

These and other initiatives enable Apple to avoid negative environmental impacts.

Many companies around the world that have achieved outstanding results by following greening trends specialise in wastewater treatment, providing technologies and solutions to improve water quality and reduce negative impacts on the environment (Table 1.4).

Table 1.4 – Leading global companies specialising in wastewater treatment

Name	Area of green technology implementation
Veolia Environnement	Water supply, treatment wastewater water, waste management
SUEZ	Technologies and services aimed at optimising water use and improving water quality
Xylem	Water treatment and transportation, wastewater treatment systems
Ecolab	Water supply, wastewater treatment for industry and the hotel business
AECOM	Engineering and consulting services, design and construction of wastewater treatment systems
Sulzer	Water supply, wastewater treatment and pumping systems for various industries and municipalities
Aqua America	Water supply, wastewater treatment services

Source: [100].

These companies play an important role in providing clean and safe water to millions of people and organisations around the world, as well as helping to reduce the environmental impact of wastewater. Their technologies and services are important for ensuring sustainable water management.

If businesses do not follow greening trends, the following negative consequences will arise:

- increased emissions of harmful substances, climate change, water pollution, destruction of ecosystems and deterioration of air quality;
- increased incidence of disease, emergence of epidemics;
- lawsuits, fines, obligations to remedy environmental damage;
- damage to reputation of the among consumers, investors, the public;
- decreased competitiveness and reduced resource efficiency;
- emergence of shortages of water, energy, raw materials;
- climate change.

Green trends in the context of sustainable development are manifested in the emergence of various "green technologies," the implementation of which results in the emergence of eco-products.

The ecological transition is a global trend that has spread to most countries in the world, including Ukraine. New challenges require effective measures aimed at reducing emissions of greenhouse gases and introducing green technologies in all sectors of the economy.

The Ministry of Energy and Environmental Protection of Ukraine has published a draft Concept for Ukraine's Green Energy Transition by 2050 [100]. This concept was developed due to the need to review the approach to energy development based on the practices of leading European countries. Ukraine intends to participate in the European Green Deal [113], which aims to transition the EU to a climate-neutral economy by 2050, as part of its strategic path towards European integration. As part of the European Green Deal initiative, an interdepartmental group has been set up to address the consequences of climate change. The document proposes to "reduce greenhouse gas emissions to ensure the transition to a climate-neutral economy in

Ukraine in 2070 in a socially acceptable and economically efficient manner" [113].

Greening is proposed through: firstly, decarbonisation of the economy and energy sector; secondly, ensuring low-carbon and resource-efficient production; thirdly, introducing environmentally friendly modes of transport. The Ministry of Energy and Environmental Protection of Ukraine pays particular attention to researching and supporting technologies and innovations in the areas of climate change mitigation and digitalisation of economic processes. As a result, the following technologies have already been developed and are beginning to be implemented.

Production of building materials. Sewage sludge can be used as raw material for the production of building materials such as bricks or blocks. Special technologies and processing can make sludge safe and suitable for construction.

Biofuel production. Sludge can be used to produce biofuels, such as biogas or biodiesel. This can be a source of renewable energy and help reduce dependence on fossil fuels. Recovery of valuable metals. Wastewater sludge may contain small amounts of valuable metals such as gold, silver or palladium. Developing technologies to recover these metals from sludge can be economically profitable.

Creation of materials for 3D printing. Sludge can be used as raw material for creating environmentally friendly materials used in 3D printing. This could become a new way of recycling sludge and reducing waste.

Use in rural tourism. In some cases, sludge can be used to create eco-friendly parks and rural tourism facilities where visitors can learn about wastewater treatment processes and participate in environmental activities.

Production of biologically active fertilisers. Sludge can be processed and converted into biologically active fertilisers for agriculture. This will help reduce the use of chemical fertilisers and lessen the negative impact on the environment.

One of the priority areas for the implementation of "green technologies" in economic practice is the use of wastewater sludge, which has the potential to reduce waste and create additional resources.

In Ukraine, various methods of wastewater treatment are used depending on the scale of treatment, the type of wastewater and specific requirements:

1) centralised treatment plants– are designed to treat wastewater from urban and industrial sources and include mechanical, biological and chemical treatment;

2) septic tanks– are small wastewater treatment systems used in suburban homes or settlements where there is no access to centralised treatment facilities. They perform mechanical and biological wastewater treatment;

3) water treatment facilities at enterprises– treatment of wastewater containing highly concentrated pollutants. Physical-chemical treatment and membrane technologies are used;

4) phytoremediation– wastewater treatment using plants (phytofilters);

5) sludge treatment– sludge undergoes settling, aeration, and dephosphatisation;

6) treatment of surface water from rivers, lakes and reservoirs– is carried out to maintain water quality in natural water ecosystems using mechanical and chemical methods;

7) wastewater treatment in agriculture– is carried out on farms and agricultural enterprises to prevent the pollution of water resources with fertilisers and pesticides.

Treated sludge can be used in agriculture as organic fertiliser after treatment and dehydration. This helps to restore nutrients to the soil. Processing wastewater sludge into organic fertiliser allows resources to be utilised, waste to be reduced and agriculture to be supported. The sludge produced after wastewater treatment usually contains a significant amount of moisture, which makes it inconvenient to store and transport. The dewatering and drying process reduces the moisture content of the sludge and reduces its volume, making it more transportable. After dewatering the sludge undergoes stabilisation and disinfection to destroy pathogens and reduce unpleasant odours. This is important for safety when using sludge in agriculture.

Sludge usually contains organic and mineral nutrients such as nitrogen, phosphorus and potassium, which can be beneficial for plant growth. After preparation and treatment, sludge can be applied to the soil as fertiliser, helping to improve soil fertility and enrich it with nutrients. This process also helps to reduce waste and lessen the negative impact on the environment. However, to ensure safety and compliance with regulations, the processing of sludge into fertiliser requires strict control, analysis

and adherence to standards.

When treating sewage sludge, there are a number of problems faced by treatment plants and operators in this field. Sewage sludge often contains a variety of contaminants, including heavy metals, organic matter, pathogens and other harmful substances, which creates a problem for sludge treatment and disposal as it can be hazardous to the environment and human health. During the treatment and storage of sludge, unpleasant odours and harmful gases such as hydrogen sulphide and methane can be released, which can not only be unpleasant for those around, but also pose health risks to workers at treatment plants.

Compliance with treated sludge quality standards and regulations is becoming increasingly important and requires investment in new technologies and processes to meet legal requirements. Sludge treatment and disposal can be costly, and treatment plant operators are looking for ways to optimise costs and improve process efficiency. Addressing these challenges requires innovation in treatment technologies, strict compliance with regulations, safe sludge treatment and disposal, and cooperation between authorities, the public and industry. Particular attention should be paid to minimising the negative impact on the environment and human health when handling sewage sludge. Within the concept of sustainable development, it is important to increase the production of organic fertilisers.

The production of organic fertilisers strengthens environmental stability and is aimed at achieving the second and fifteenth goals of the UN's sustainable development concept: "ensuring food security, supporting sustainable agriculture..." and "conserving and restoring terrestrial ecosystems..." by minimising the negative impact on ecosystems compared to synthetic fertilisers.

The production of organic fertilisers is in line with the first sustainable development trend formulated by the International Institute for Sustainable Development "circular economy and sustainable consumption..."

The production of organic fertilisers complies with the "Waste Utilisation" rule, which is a norm and an environmental imperative of sustainable development.

Given that Ukraine's socio-economic development vector is sustainable

development, and the carbohydrate raw material market is unfavourable and reduces the production of synthetic fertilisers, the priority task is to accelerate the implementation of green technologies to increase the production of organic fertilisers. Organic fertiliser production technologies are now critically important for Ukraine's economy.

5.3 The place of Earth Revival organic fertiliser production technology in the classification of green technologies

According to the Organisation for Economic Co-operation and Development (OECD) classification, "green technologies" cover the following areas [114]:

- general environmental management (waste management, water and air pollution control, land restoration, etc.);
- energy production from renewable sources (solar energy, biofuels, etc.);
- mitigation of climate change;
- reduction of harmful emissions into the atmosphere;
- improving fuel efficiency and energy efficiency in buildings and lighting devices.

According to I.A. Vasilenko, E.V. Chuprynov, A.V. Ivanchenko, M.I. Skiba, V.I. Vorobyova, and V.V. Galish, technologies are classified according to their ability to use natural resources efficiently and preserve the environment (Table 1.5).

This classification reflects the evolution of green technologies. From the first generation of "end-" technologies to the second generation "preventive technologies" that reduce environmental impact and increase production efficiency, to the third generation of "environmentally sustainable technologies" (systemically integrated to ensure all aspects of sustainable development – economic, environmental and social). Both require business incentives for effective implementation.

An additional feature, "scope of application," can be proposed for the classification of "green technologies":

- general environmental management (reduction of air and water pollution, waste management, soil restoration, environmental monitoring);

- energy production from renewable and alternative non-combustible resources;
- combustion with the potential to reduce greenhouse gas emissions;
- mitigation of climate change (capture and storage of greenhouse gases);
- indirect contribution to emission reduction (energy conservation, hydrogen production, fuel cells);
- reducing emissions and improving fuel efficiency in transport;
- improving the energy efficiency of buildings and lighting systems. This often includes green computing.

Table 1.5 – Grouping of clean technologies according to the degree of solving environmental problems

Feature	Functional purpose
Aimed at reducing emissions	Minimisation of pollutant accumulation during the production/consumption cycle (e.g., recovery and neutralisation of pollutants, absorption of carbon dioxide gas etc.). Management of pollutant emissions and/or waste
Prevention	Strive to reduce inefficiency and minimise losses of materials, energy and water (energy-efficient lighting and motors, fuel-efficient transport vehicles, cleaner technological processes). Prevent or minimise the accumulation of pollutants
Substitution	Introduction of renewable resources (photovoltaic systems, wind turbines, biofuel production) either in auxiliary processes or by replacing raw materials. Replacement of non-renewable resources for production and consumption, including energy sources, with renewable materials
Storage	Soft technologies that protect nature and ecosystems: methods of managing watersheds, forests, wetlands. Preserving nature and ecosystems in such a way that they remain healthy and support biodiversity, productivity and sustainability
Restoration	Aimed at physical and chemical cleaning (land reclamation, localisation and elimination of oil spills) and infrastructure restoration (rehabilitation of mines and settlements). Restoration of destroyed ecosystems and halting or stopping environmental degradation environment
Adaptation	Adaptation to climate change (coastal zone management, development of new crop varieties), adaptation to ozone depletion (increasing the resistance of coatings, plastics and clothing to ultraviolet radiation), adaptation to soil salinisation (e.g. integrated farming systems)

Source: [111]

With regard to the items "reducing emissions and improving fuel efficiency in transport", "mitigating the effects of climate change (capturing and storing greenhouse gases)" and "combustion with the potential to reduce greenhouse gas emissions", it should be noted that these items relate to several sustainable development goals, according to the UN: innovation and infrastructure, sustainable cities and settlements, sustainable consumption and production [99].

In the proposed classification, organic fertiliser production technology belongs to the group "general environmental management (reducing air and water pollution, waste management, soil restoration, environmental monitoring)". The generation of domestic wastewater in populated areas is one of the most significant factors negatively affecting the environment. Complete biological treatment of municipal wastewater, which is widely used today, involves the formation of large amounts of sludge. After fermentation and mechanical dewatering, the sludge is mostly stored in special sludge ponds. Such sludge disposal not only consumes significant land resources, but also pollutes the soil and groundwater with toxic components of the sludge [81].

A rational system for the treatment and disposal of industrial, surface and domestic wastewater is an essential component of ensuring the viability of a modern city, which must be achieved in the context of sustainable development goals. Although the technical schemes for wastewater treatment implemented in different countries have a similar structure, the use of waste generated in the water treatment process varies greatly. In this context, a wastewater treatment system based on recycling is necessary.

Currently, there are various systems and technologies for the treatment and disposal of sewage sludge, including discharge into water bodies, burial, drying, storage, and storage of sludge in sludge beds. The cheapest and simplest methods for removing and disposing of sewage sludge (SS) from technological processes are listed in Table 1.6.

The first step in implementing existing methods for removing sewage sludge is dewatering, which is associated with the high water content in the sludge. Dewatering

is carried out in several stages using various installations. First, the sludge is concentrated in a settling tank and then mechanically dewatered using vacuum filters, centrifuges, filter presses and other equipment.

Table 1.6 – Existing technologies and systems for wastewater treatment and disposal

Characteristic	Method			
	Incineration	Pyrolysis (thermal destruction)	Fertiliser production	Soil production
Restrictions on use depending on the composition of the OSW	No	Increased fire and explosion safety requirements	Compliance with regulatory requirements for the use of OSW	
Economic costs of implementation	High costs of OSW dewatering and flue gas cleaning flue gases	Average	Low	
Obtaining useful products	No	Pyrolysis gas (for thermal energy production)	Fertilisers for crops depending on composition	Soil
Environmental impact of use	Reduction in waste mass by 60–70% (dry matter). Environmental pollution from emissions into the the atmosphere	Reduction in waste mass by 60–70% (dry matter)	Minimal (if the relevant standards are met)	
Amount of secondary waste	30–35% of waste mass (ash)	From 50% of the mass of OSW. Solid pyrolysis products	No	
Recycling of secondary waste	Possibility of using ash in road construction	Possibility of use in road construction	Not required	

Source: [81]

In Germany, it is also possible to use liquid sewage sludge in agriculture without dewatering. To protect groundwater from contamination, the amount of sludge applied to the soil is strictly controlled.

In Norway and the Netherlands, sludge is dried and granulated before being applied to the soil as fertiliser.

Preliminary disinfection of sewage sludge can be carried out in the following ways:

- microbial transformation organic substances, in mainly applied to manure and litter;
- chemical neutralisation of pathogens: usually alkaline, depending on the further use of the treated sludge (reagent doses reach 300-400 kg per tonne of dry matter);
- disinfection of special surfaces using solar energy;
- destruction of pathogenic microorganisms using ionising radiation.

Such methods require chemical reagents, radiation sources and large areas (for surface disinfection).

The main contemporary problems that have arisen with the large amount of wastewater are related to:

- a lack of land for such a volume of sewage sludge;
- high costs of transporting and disposing of sewage sludge at landfills;
- the negative impact on the environment of landfills overflowing with sewage sludge.

Almost all existing wastewater treatment technologies and systems that produce sludge are not closed-loop systems, with the exception of those that produce fertilisers from sludge and meet environmental requirements (Table 1.7).

Wastewater treatment must be integrated into the municipal utility system to ensure a single closed-loop treatment system.

The system for supplying wastewater to the place of further treatment is closed, and the treatment process ends with the production of a final product that is used as fertiliser. On the other hand, the flow of materials shipped as organic must be formed taking into account the organic fertiliser supply chain. Thus, this approach solves two problems. Namely: creating a closed system and ensuring the development of new types of organic fertilisers.

The production of fertilisers from sewage sludge will solve the problem of the irrationality of traditional methods of sewage sludge management combined with a high impact on the environment. A rational solution to the problems of sewage sludge,

waste accumulation and soil restoration is to incorporate sewage sludge into the agricultural cycle based on a comprehensive approach and return sewage sludge to agricultural circulation.

Table 1.7 – Compliance of organic fertilisers from wastewater sludge with environmental requirements

Direction	Needs
Circular economy	No waste
Green course	No hazardous waste. Reduced use of hazardous mineral fertilisers. Improvement of agricultural land. Expansion of organic production. Provision of healthy food to the population, improvement of health. Improvement of the environment.
State	Food security. Soil restoration. Competitive economy. Increased export revenues. Solving the problem of sewage sludge disposal.
Municipal economy	Solving the problem of sewage sludge disposal. Greening cities, which also requires the use of fertilisers.
Agriculture	Restoring soil quality. Increasing the fertility of agricultural land. Solving the problem of significant costs for mineral fertilisers. The need for high-quality and effective fertilisers.
Private households	Need to increase yields on own plots. Need to landscape their own plots and support the healthy growth of ornamental plants.
Population	Need for safe food products. Need to ensure a healthy lifestyle. Need to live in ecologically clean cities.
Meeting needs	
Processing human waste — sewage sludge — into a product that is useful for agriculture, which restores the soil, helps reduce the negative impact on the environment, improves ecology, solves the problem of human waste, is suitable for organic production, and improves the nutritional properties and safety of agricultural products.	

Source: author's own work

For production of organic fertilisers from sludge wastewater uses Earth Revival technology, which is supported in the EU by the European Regional Development Fund (ERDF). This technology replaces the traditional composting process and significantly increases the speed of waste processing. Solid waste can be continuously processed into high-quality organic fertiliser in 4-6 days in a cost-effective manner and without harm to health or the environment. It is the fastest organic fertiliser production process in the world [115]. It retains all the positive aspects of the natural process while

eliminating the risk of pest and weed infestation. It reduces the level of metals and their migrants and destroys pathogenic microflora.

Earth Revival Ltd specialises in developing environmentally sustainable solutions for the efficient and environmentally friendly biological treatment of urban sludge, adhering to environmentally friendly methods. The company's achievement is the development of a bipolar protocol for both the collection of urban sludge and its simultaneous processing into "ready-to-use" high-quality organic fertilisers.

The problems of wastewater disposal and the costs associated with it are solved by the technology of producing organic fertilisers from it, while providing economic benefits.

The sources of profit from the use of Earth Revival technology are:

- the sale of Earth Revival equipment, which can be easily integrated into existing wastewater treatment systems and becomes infrastructure for municipal utilities;
- savings on waste disposal, as there is no need to store waste and, therefore, no need to build specially equipped landfills;
- stabilisation of waste (neutralisation of pathogenic microorganisms) and processing into fertilisers, which are a valuable product;
- use of basic organic fertilisers or various complex organic/organo-inorganic fertilisers to restore and maintaining soil fertility.

The company Earth Revival in as part of project No. 1.2.1.1/18/A/001 "Innovative technologies for the rapid processing of sewage sludge into organic fertilisers" conducted research on the experimental development and industrial implementation of an accelerated method for the production of high-quality organic fertilisers from municipal sewage sludge. Laboratory experiments and bench tests were used to determine the conditions for thermal disinfection of sludge (sludge layer thickness, air temperature in the disinfection oven, sludge treatment time), conditions for accelerated fertiliser maturation (selection of biological activators, their consumption, treatment time of pasteurised material with biologically active additives, and stirring intensity) [115]. Under industrial conditions, the temperature and speed

modes of the conveyor pasteurisation oven were tested, as well as the operation of the ripening machine with periodic stirring.

The Earth Revival project is designed to produce 15-17 tonnes of fertiliser per day (moisture content ~50%). Adapting production to existing premises and utilities should not cause any problems, provided that the premises and utilities meet the following criteria:

- production workshop (heated in winter, at least 150 m²) and equipment room (5-6 m², adjacent to the workshop);
- a warehouse (unheated, dry room, area depends on production volume and sales rate - if one unit processes 25–35 tonnes of OSV per day, it takes two days to fill a 40-foot container);
- administrative and sanitary facilities for personal and work clothing and personal hygiene;
- connection to the power grid (to power machines, ventilation, equipment and domestic lighting) and/or to the gas pipeline;
- transport and communications (vehicles of at least 18 tonnes);
- water supply and drainage;
- distance to the source of raw materials, availability of direct supply;
- establishment of a third-class safety sanitary zone.

One installation is designed to produce 15-17 tonnes of fertiliser per day and operates in three shifts. The annual capacity is 5,500 tonnes of fertiliser. The production cost is 30 US dollars per tonne of fertiliser, while the world price exceeds 130 US dollars per tonne, which allows for an income of over 500,000 US dollars per year. The project payback period is two to three years. Approximately 2,500 tonnes of dewatered solid waste are generated per day, which is approximately 0.15 kg of dewatered material per person/

To calculate the mass of fertilisers, it is necessary to calculate the mass of sludge formed at treatment facilities. In large cities with a population of 15-18 million people, approximately 11 million cubic metres of human excrement are produced per year,

which is equivalent to 0.9 million cubic metres of dewatered solid domestic waste per year [107].

The production cost based on the processing of sewage sludge is formed by energy costs, the basis of which is water evaporation. The cost of energy consumption is presented in Table 1.8.

Table 1.8 – Calculation of the cost of energy consumption at the Earth Revival plant in Ukraine

Specific heat evaporation of water (1 kg/MJ) at 70°C, normal pressure	22.3	MJ
1 MJ/kW	0.278	kW
Calorific value of natural gas (for example, indicator 36 MJ)	36	MJ/m ³
KVT/USD (based on the example of Ukraine).	0.1	USD
Gas infrared heater, efficiency 80%	0.8	USD
Electric heater, efficiency 90%	0.9	USD
Heat loss, approximately 20%	0.8	USD
Energy consumption (per hour) of various drive and mixing units and mechanisms	60	kW
Amount of OSB (80% moisture content), T/hour.	1	t
Amount of fertiliser (calculated at 50% moisture content), tonnes/year.	0.6	t

Source: author's own work

In the Odessa region, energy costs will amount to approximately USD 15 per tonne of sewage sludge with an initial moisture content of 80%. Thus, the cost of energy consumed to produce 1 tonne of fertiliser with a moisture content of 50% will be approximately 22 USD. The cost of the final product, taking into account salaries, social payments and internal logistics, doubles, amounting to approximately 40 USD per tonne of fertiliser.

Based on the fact that an adult produces an average of ~0.4 kg of wet (90%) faeces per day and ~15 kg of dry organic matter per adult per year [107], 15 kg of dry organic matter per year corresponds to 0.041 dry kg/day, which is 90% moisture and an increased natural (<10%) proportion of inorganic compounds corresponds to the same ~0.4-0.45 kg of faeces per adult per day. The discrepancies between the data obtained in cities and theoretical calculations based on the average adult are explained by the mixed age structure of the population.

All calculation options give 160-180 tonnes of organic fertiliser per million people per day (at 50% humidity), and without artificial age differentiation, the tonnage of dry OSW is about 60 tonnes per day, and wet OSW (80%) is about 300 tonnes per day or slightly less.

The environmental efficiency of the project to produce organic fertilisers from sewage sludge is as follows:

- solving urban and regional environmental problems in the disposal of sewage sludge. Large accumulations of this type of waste lead to soil, surface and groundwater pollution. Since urban sewage sludge is rich in nutrients, the main way to use it is as fertiliser;
- improving soil quality. The effectiveness of the fertilisers obtained has been tested on individual plants and has shown that they increase yields based on effective microorganisms that enhance the biological value of fertilisers.

The project to introduce technology for the rapid processing of sewage sludge into organic fertilisers is in line with the goals of sustainable development of enterprises, the concept of "green" city concept, and Ukraine's "green" course.

Although there is information in the literature about studies of effective microorganisms involved in the metabolism of nitrogen compounds obtained from organic fertilisers, this is the first case where such a study has been conducted on a product from activated sludge. For the first time, an attempt was made to create a consortium of these microorganisms and evaluate their effectiveness.

Detailed testing of microbial fertilisers on plants showed the following practically important results [102]:

- plants grow best when sewage sludge and mineral fertilisers are combined;
- in most cases, the addition of bacteria improves the physiological condition of plants compared to plants without them. In most cases, the results are better than those of free-living nitrogen-fixing bacteria (*Azotobacter* sp).

The effect of microbial fertilisers on plants was assessed using the example of growing tomatoes, cucumbers and corn. The assessments were carried out by

measuring the weight of the plants, the number of leaves, the thickness of the stems and the amount of chlorophyll in the green mass. The plants were grown on various peat-based substrates with the addition of vermicompost, proven organic fertilisers, mineral fertiliser additives for NPK regulation, nitrogen fixers and a carefully selected microbial consortium.

The Earth Revival technology for accelerated conversion of sludge into organic fertiliser is designed for use with standard dewatered sludge. The resulting organic fertiliser can be used to increase crop yields and restore soil fertility, or as a base product for more complex organic and organo-inorganic fertilisers.

Two target segments of the organic fertilizer market from wastewater have been identified: agro-industrial enterprises and households (Table 1.9).

Table 1.9 – Target segments of the market for organic fertilisers from wastewater

B2B market (business to business, for business entities)	B2C (business to consumer) market for households
1. Large agricultural enterprises. Product: universal dry granular fertiliser in bags. Purchased in bulk. Often combined with mineral fertilisers.	1. Consumers who have garden plots and grow vegetables, fruits, berries, and greens. Product: liquid fertilisers in bottles, universal, for soil, for vegetables, for fruit trees, for berries.
2. Medium and small farms. Product: universal dry granules in bags. Purchased in small and medium wholesale quantities. Often combined with mineral fertilisers.	2. Consumers who have garden plots and lawns. Product: liquid fertilisers in bottles for lawns.
3. Organic farming enterprises. Product: universal dry granular fertiliser in bags. Purchased more often in medium wholesale quantities. Use exclusively organic products for soil and plant nutrition.	3. Consumers who have garden plots (have summer cottages or live in private houses) and have coniferous and ornamental plants. Product: liquid fertilisers in bottles for conifers, ornamental crops, and flowers.
4. Decorative nurseries and landscape designers. Product: universal dry granular fertiliser in bags; liquid fertilisers in bottles for lawns, conifers, decorative crops, and flowers.	4. Consumers who have indoor plants. Product: liquid fertiliser in bottles for indoor plants.

Source: author's own work

The different needs of the identified target market segments require the use of differentiated marketing. A separate group of consumers in the B2B market are companies and private entrepreneurs offering landscape design services and companies offering decorative nurseries. The former offer services for the decorative finishing of

plots, while the latter grow decorative plants. These products and services can be combined in a single enterprise. Consumers in this segment purchase both dry granular organic fertiliser and liquid fertiliser for the cultivation of ornamental plants and landscape decoration of plots. For private households, liquid fertiliser in bottles is convenient. It is advisable to differentiate products according to the type of plant.

The SWOT analysis for organic fertilisers from wastewater on the Ukrainian market is presented in Table 1.10.

Table 1.10 – SWOT analysis for organic fertilisers from wastewater on the Ukrainian market

Strengths: 1. High profitability of fertilizer sales. 2. Moderately low overhead costs. 3. Investment attractiveness. 4. Experienced and motivated founders. 5. Fastest processing time for raw materials into fertiliser (4-6 days). 6. Restores and improves soil health in the long term. 7. Suitable for organic farming. 8. Clean product (no pathogenic microorganisms or weeds). 9. Compliance with the circular economy and the European Green Deal. 10. Supports the “Clean City” programme.	Opportunities: 1. Increase in production and sales volumes. 2. Spreading the technology and organising production in other regions of Ukraine. 3. Increase in organic production areas. 4. Increased demand for organic food products. 5. Increase in points of sale. 6. State support for the "green" course.
Weaknesses: 1. Lower concentration of nutrients than in mineral fertilisers. 2. Plants do not absorb nutrients as quickly as with mineral fertilisers. 3. Weak marketing of the company producing organic fertilisers from sewage sludge. 4. Weak online presence, lack of a website, SMM sales, and other omnichannel marketing tools.	Threats: 1. Low consumer awareness in the B2B and B2C markets regarding the usefulness of this type of organic fertilizer. 2. The desire of agricultural enterprises to obtain quick and high yields and profits, and therefore the preference for mineral fertilisers. 3. Continued disregard for soil degradation and depletion. 4. Increased competition. 5. Further increase in inflation, which increases operating costs.

Source: author's own work

Strengths – opportunities. The production of fertilisers from sewage sludge has significant advantages over the production of mineral fertilisers, as it improves and restores the soil, promotes the cultivation of more useful and safer crops, is suitable for organic farming, and is in line with the transition to a circular economy and green course. The advantages of producing this type of fertiliser over other organic fertilisers lie in the safe processing of waste, which, when accumulated, has a negative impact on the environment and requires disposal in any case. Processing sewage sludge into fertiliser and using it in agriculture is the best option for obtaining economic and environmental benefits, prevent pollution, and solve the problem of soil restoration. The ease of installing the equipment and implementing Earth Revival technology makes it possible to do this in other cities of Ukraine and improve the overall environmental condition of the areas. If necessary, additional capital should be raised for further business development, using the above calculations of the economic justification for implementing Earth Revival technology. In addition, long-term partnerships should be established with organic crop farms and more active promotion on the organic produce market.

Strengths – threats. It is important to provide informative support and disseminate information about the beneficial features of the production and use of fertilisers from sewage sludge to consumers in the B2B and B2C markets. After all, it is precisely the low awareness of consumers about this product that is hindering its further development. The omnichannel marketing system should be used to its fullest extent.

Weaknesses – opportunities. In order to exploit the potential of organic fertiliser production from sewage sludge, attention should be focused on informing fertiliser market consumers about its advantages. At the same time, the rapid effect of mineral fertilisers should be compared but with subsequent depletion and degradation of agricultural land, which will lead to critical consequences and even worse problems in the agricultural sector, or the gradual restoration of land through organic fertilisers, which will improve soil quality in the long term and the quality of agricultural products. Establish relationships with operators in the organic agriculture sector. Make more

active use of digital marketing opportunities.

Weaknesses – threats. Building a comprehensive omnichannel marketing system with large-scale information campaigns for various consumer segments on the benefits of organic fertilisers made from sewage sludge, attracting all the necessary digital marketing tools. The main problem is weak representation on the Internet. However, this is where modern consumers get most of their information. In addition, fertilisers are goods of prior choice, so consumers collect and compare information about these products before buying. When promoting organic fertilisers, emphasis should be placed on the fact that they are eco-friendly products.

The production of organic fertilisers from sewage sludge fully meets the current needs of society and solves the problems of ecology and further sustainable development of agriculture.

Conclusions

Research into the theoretical foundations of fertiliser marketing as a type of environmental marketing has led to the following conclusions:

1. Environmental marketing has gone through several stages of evolution in the world's major industrialised countries: environmental marketing, environmental marketing, sustainable marketing. Evolution of development The emergence of environmental marketing is driven by the demands of society and additional efforts by businesses. In addition to providing the traditional key elements of the marketing mix (environmentally friendly products, pricing, promotion and distribution), it is necessary to train and motivate employees and all service personnel involved in the provision of environmental services to work in environmentally conscious teams united by common goals.

2. The term "environmental marketing" is often used, but scientists have not yet reached a consensus on its interpretation. After analysing the advantages and disadvantages of existing scientific approaches to defining the concept of "environmental marketing", the author's interpretation of this concept was proposed. Environmental marketing is the marketing of goods that have been produced "green

technologies." That is, those manufactured using modern technologies that comply with the rules and concepts of sustainable development. Environmental marketing should be viewed as one of the modern tools of economic development, and pollution is, first and foremost, an economic problem that should be solved by economic means. The main goal of eco-marketing is to make eco-products the norm, which can be achieved by implementing the following tasks: raising consumer environmental awareness; developing eco-friendly products; promoting environmentally friendly products and services on the market; forming a community of "eco-consumers" on the market; and making production more environmentally friendly. Since organic fertilisers are a priori produced using "green technologies", environmental marketing is a generic concept for the marketing of organic fertilisers, i.e. the marketing of organic fertilisers is a type of environmental marketing.

3. At the present stage, environmental marketing is a key element of sustainable development, and therefore it is advisable to use the following environmental marketing methods: creating an environmentally positive image of the company; increasing customer loyalty; creating new environmentally friendly products and services; attracting opinion leaders (influencers); introducing waste-free or safer production methods.

4. Understanding environmental needs in the context of marketing means respecting the environment and understanding the role of the environment in a company's strategy and behaviour. Environmental marketing is based on how companies assess the impact of their activities on the environment and how they take this responsibility into account in their marketing strategies. Meeting environmental needs is becoming a key element of a successful marketing strategy. This means not only providing products and services that do not harm the environment, but also actively engaging in dialogue with consumers about the importance of environmental responsibility and sustainability.

5. The factors that determine the need to implement environmental marketing and accelerate this process in Ukrainian companies are as follows: the need to promote Ukrainian manufacturers' products to foreign markets; growing environmental

awareness among the population; the need to implement European standards; improving corporate image; oversaturation of markets with manufacturers' goods; consumers' desire for a healthy lifestyle. Most manufacturers in Ukraine today are unwilling to apply environmental marketing policies because enterprises are guided in this matter not by consumers but by legislation, which cannot fully regulate work in the field of environmental production.

6. The issue of greening in the context of global trends and strategies must be addressed systematically. However, there are factors that limit the rapid introduction of the latest greening technologies in the world: many enterprises face financial difficulties associated with the introduction of expensive environmentally friendly technologies; insufficient regulatory support and unclear environmental standards in many countries; low environmental awareness among some consumers and uncertainty about the effectiveness of new technologies; the advantage in terms of the speed of return on investment in the case of the implementation of eco-measures at a certain stage of production or the complete greening of the technological process is unclear.

7. The role of sustainable development in the context of greening and the environment is that it becomes a fundamental principle focused on the conservation and restoration of ecosystems. Sustainable development helps to reduce the negative impact of humans on nature, reduce greenhouse gas emissions, prevent the destruction of ecosystems and preserve biodiversity. It also promotes more responsible use of natural resources and the creation of environmentally friendly technologies. Thus, we interpret the concept of sustainable development as a process of current changes and modernisations that will not have harmful consequences for future generations.

8. The global energy transition is a worldwide trend that has swept across most countries in the world, including Ukraine. New challenges require effective measures aimed at reducing greenhouse gas emissions and introducing green technologies in all sectors of the economy. For Ukraine's green energy transition, the following is needed: decarbonisation of the economy and energy sector; ensuring low-carbon and resource-efficient production; introduction of environmentally friendly modes of transport.

9. The classification of green technologies reflects their evolution. From the first

generation of "end-" technologies to the second generation "preventive technologies" that reduce environmental impact and increase production efficiency, to the third generation of "environmentally sustainable technologies" (systemically integrated to ensure all aspects of sustainable development – economic, environmental and social). All green technologies require business incentives for effective implementation.

The conclusions and assumptions obtained allowed us to formulate *the following working hypothesis for the study*: in the processes of orientation towards sustainable development of humanity, one of the three directions for implementing this strategy is greening. Green marketing is the marketing of goods produced using "green technologies", i.e. in compliance with the environmentally-oriented nature of operations. In the context of greening, the public demand for organic fertilisers is growing, as they are produced using "green technologies". Therefore, the marketing of organic fertilisers is a type of green marketing. It is necessary to develop relevant marketing tools that can be used to increase the demand for organic fertilisers.