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INFLUENCE OF THE SUSTAINABLE DEVELOPMENT CONCEPT ON THE FORMATION OF ECO-FRIENDLY PACKAGING FIELD IN LOGISTICS

Vladyslav Marchenko. «Influence of the sustainable development concept on the formation of eco-friendly packaging field in logistics». *In this article, it was explained that nowadays, humanity faces a great number of complex challenges. Among them are such serious problems as the depletion of natural resources, the growth of volumes of waste, environmental pollution and climate change. The lack of attention to these important questions in the past has caused their complication and led to serious consequences for both humanity and the planet as a whole. One of the most critical problems of our time is the increase of the amount of waste. The use of non-ecological and inefficient packaging has led to a significant accumulation of its volumes. The challenge has become so global that humanity simply could no longer just stand by. Modern society saw the way for its solution in the implementation of sustainable development principles in this area. This can be best seen on the example of the logistics industry. In the article, the history of packaging development in logistics was explained, the importance and key advantages of eco-friendly packaging were considered, and the impact of environmental norms on various types of packaging was described. Similarly, in this work the impact of the concept of sustainable development on the formation of the field of eco-friendly packaging in logistics was explained, key circular practices in the field of packaging were presented, examples of the application of artificial intelligence in the field of packaging were described, the development of the field of eco-friendly packaging in Ukraine and the European Union was compared, and their development prospects were indicated. As a result of the work, a conclusion was made on why it is so important to continue to study, research and develop this direction.*

Keywords*:* development, ecology, sustainability, packaging, transportation, logistics, prospects, efficiency, management

Владислав Марченко. «Вплив концепції сталого розвитку на формування сфери екологічного пакування в логістиці». *В даній статті було пояснено, що в наш час, людство стикається з величезною кількістю комплексних викликів. Серед них є такі серйозні проблеми, як вичерпання природних ресурсів, зростання обсягів відходів, забруднення довкілля та зміна клімату. Недостатня увага до цих важливих питань в минулому, спричинила їх ускладнення та призвела до серйозних наслідків, як для людства, так і планети в цілому. Однією з найбільш критичних проблем нашого часу є збільшення кількості відходів. Використання неекологічного та неефективного*

пакування призвело до відчутного накопичення їх обсягів. Виклик став настільки глобальним, що людство просто більше не могло стояти осторонь. Сучасне суспільство побачило шлях до його вирішення в впровадженні принципів сталого розвитку в дану сферу. Найкраще це видно на прикладі саме логістичної галузі. У статті було пояснено історію розвитку пакування в логістиці, розглянуто важливість та ключові переваги екологічного пакування, описано влив екологічних норм на різні види пакування. Аналогічним чином, в цій роботі було пояснено вплив концепції сталого розвитку на формування сфери екологічного пакування в логістиці, представлено ключові циркулярні практики у сфері пакування, описано приклади застосування штучного інтелекту в сфері пакування, здійснено порівняння розвитку сфери екологічного пакування в Україні та Європейському Союзі, зазначено їх перспективи розвитку. Як результат роботи, було зроблено висновок чому так важливо продовжувати вивчати, досліджувати та розвивати цей напрямок

Ключові слова: розвиток, екологія, сталість, пакування, перевезення, логістика, перспективи, ефективність, управління.

Intraduction. In our time, modern society faces serious challenges. The depletion of natural resources, the growth of volumes of waste, environmental pollution and climate change are global problems in their scope. Today, the issues connected with them are on the agenda of the international community and require innovative ideas and thoughtful actions for their solution. One of the most critical problems of today is the increase in the amount of waste. The use of non-environmentally friendly and insufficient packaging has had a significant impact on the accumulation of waste, and ignoring this problem throughout history has only made it more complex. Humanity simply could no longer turn a blind eye to this question and therefore began to actively search for effective ways to resolve it. One of such most promising and modern options was the implementation of sustainable development principles in this area. The main emphasis in the work was placed on the logistics industry, as on its example it is possible to perfectly track the development of these processes. The field of sustainable packaging is extremely important. It is primarily aimed at reducing the amount of waste, minimizing environmental pollution and more efficient use of natural resources. Progress in the sector of eco-friendly packaging can have a positive impact on preserving our planet for future generations. Nowadays, social pressure on the environmental responsibility of companies is growing, and therefore the direction of eco-friendly packaging continues to gain popularity, as it is really able to positively influence on this question. The sphere of eco-friendly packaging has a really big undiscovered potential, and that is why it is so important for modern society to continue working on its study, analysis and development.

The purpose of the article is to explain the impact of the concept of sustainable development on the formation of the field of eco-friendly packaging in logistics, to indicate the main benefits that can be obtained from the use of eco-friendly packaging, to compare the development of the field of eco-friendly packaging in Ukraine and the European Union, and to describe the key prospects for the development of this field in the coming years

Presentation of the main results. Nowadays, environmental challenges pose a serious threat to both humanity and the harmony of ecosystems in general. The gradual growth of the population and global urbanization processes have led to an increase in the amount of waste and its accumulation. Every day they are dumped both in designated sites and in unauthorised areas of the natural environment and in the oceans, causing terrible harm to biodiversity and the well-coordinated functioning of ecosystems. The increase in the amount of waste negatively affects the flora and fauna of

our planet, and the factor of the long-term decomposition of many types of wastes makes this question much more serious, as the natural recovery of ecosystems can take not just years or decades, but hundreds of years. A modern example of a river polluted by waste at Freedom Island in Paranaque, the Philippines can be seen in Fig. 1.

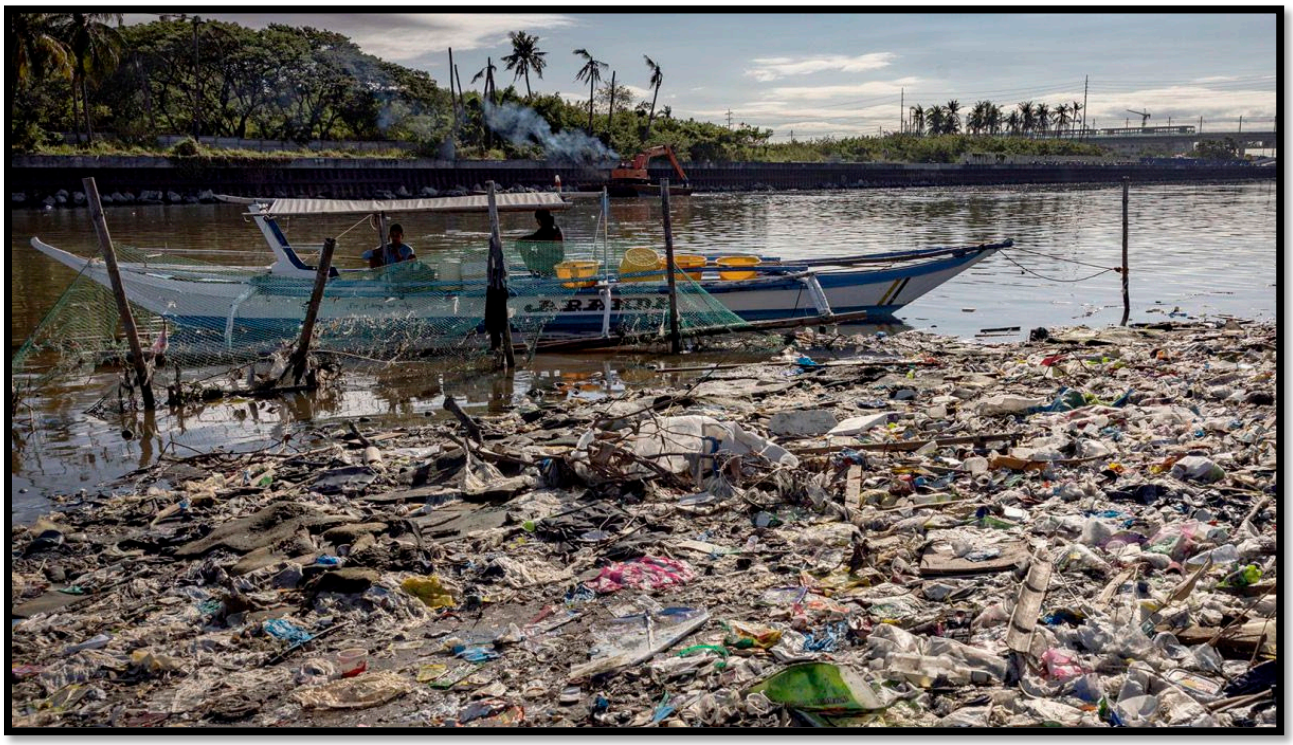

Figure 1 – An example of river polluted by waste at Freedom Island in Paranaque, the Philippines.
Source: https://edition.cnn.com/2023/05/16/world/plastic-pollution-unep-climate-intl/index.html

Modern society is constantly looking for decisions that can both decrease the amount of waste and minimize the negative impact of human activity on the planet. It is not surprising that today the policy of applying the principles and practices of the sustainable development concept has gained such high popularity. The concept of sustainable development has become an effective response to the aggravation of the previously mentioned global challenges. It set a goal to find a balance between environmental preservation, economic development and social well-being. Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs [1].

This concept played an enormous role in the development of green logistics. Its main goal became the optimization of logistics processes in a way that minimizes their negative impact on the environment. The policy of sustainability in logistics has become a new, effective approach to preserving our planet. With each new year, an increasing number of citizens are becoming interested in it, exploring the possibilities of green technologies and researching the full potential of the circular economy.

Of course, one of the most modern and promising solutions that can reduce the level of environmental pollution is still the improvement of packaging. It is an integral part of the green logistics sphere. Packaging has many different roles [2]. It performs many

functions, starting with the storage of goods and their transportation and ending with marketing questions. But at the same time, despite all these moments, we cannot forget or turn a blind eye to the negative impact it can have on the environment.

The development of the eco-friendly packaging field has an extremely important, strategic value. Every day, millions of tons of different products are transported all around the world, and the correct selection of appropriate materials and packaging methods determines how serious the impact of humanity on the environment will be.

Today, the level of pollution of existing ecosystems directly depends on the usage of environmentally friendly or biodegradable, as well as reusable or recyclable ones, and that is why researches in this direction are more relevant than ever and should remain a priority.

To fully disclose the chosen topic, the historical development of packaging in logistics was analysed and its key events were highlighted in Table 1.

Table 1. Key events in the development of packaging in logistics

Period	Key events	Development in the field of packaging
Until the mid-19th century	The use of natural materials.	The use of barrels, wooden boxes, and fabric bags. The focus is on preserving products during transportation.
Mid-19th century – Early 20th century	Development of industrial packaging.	Creation of corrugated cardboard, growing popularity of its use. The application of different types of paper, metal and glass as packaging materials.
1920 – 1940	The impact of mass production on the improvement of packaging technologies.	The standardization of various packaging, its sizes and shapes, has allowed to significantly optimize logistics operations. No less important was the development of packaging machines and the acceleration of the pace of their implementation.
1950 – 1970	The use of plastics and disposable packaging.	The popularity of using various polymers for packaging is growing. Disposable packaging is becoming an important and widespread practice in logistics.
1980 – 1990	Growth of environmental awareness and development of recycling technologies.	The course towards the use of recycled materials in logistics and minimization of packaging waste has begun to gain popularity. Of particular importance was the creation and establishment of recycling systems for used packaging.
2000 – 2010	Popularization of the sustainable development concept and the use of innovative materials.	Development of green logistics and introduction of ecological decisions in logistics processes in order to achieve sustainable development goals. More and more popular becomes the policy of using biodegradable materials and reusable packaging.
2010 – Present	Development of digital technologies and eco-friendly packaging.	Application of modern artificial intelligence with the aim of improving packaging, optimizing its size and shape. Massive use of environmentally friendly materials for packaging, development of reusable packaging.

Source: Developed by Vladyslav Marchenko

This table demonstrates the key events in the historical development of packaging in logistics. It briefly describes the progressive solutions and tendencies that have occurred in packaging technologies, materials and methods over the past decades. It reflects gradual changes in production approaches and presents new practices for recycling and utilization of packaging materials. It can be seen that the original use of natural materials

has changed significantly with the advent of industrialization. And the 20th century became a truly breakthrough, as it was marked by the standardization of packaging units and the beginning of the widespread use of many different polymers. Although they have considerably increased the efficiency of products transportation, however, materials such as plastics have created new, serious challenges for the environment. After 1980, different ecological initiatives were launched to reduce the negative impact of packaging on the environment. At present, the concept of sustainable development and the use of digital technologies have a noticeable impact on the packaging sphere in logistics.

The policy of recycling packaging, its reducing and turning it into the most efficient constructor is also becoming more popular. Modern technological advances make it possible to create safe, sustainable and reliable packaging. The analysis showed that the packaging industry has repeatedly undergone periods of reforms that have led it from outdated, poorly thought-out packages to the present-day, truly innovative solutions. This difference has become a reflection of global efforts to protect the environment and achieve the most efficient use of natural resources.

To fully reveal the chosen topic of the work, an important task was to explain the benefits of sustainable packaging. Their key examples are presented in Table 2.

Table 2. The key advantages of eco-friendly packaging

Advantage	Description
Less extraction of natural resources	Eco-friendly packaging allows to reduce the extraction of new natural resources for the production of packaging.
Reduced carbon dioxide emissions	The use of lighter materials for packaging can significantly reduce the level of fuel consumption during transportation.
Biodegradability of materials	The use of modern, environmentally friendly, safely biodegradable materials allows to minimise the negative impact on the surroundings after disposal.
Recyclability and reusability of packaging	Sustainable packaging made from materials that can be recycled or reused can significantly reduce the amount of waste and the extraction of new natural resources.
Optimisation of packaging size	There are many ways to optimise the size of packaging which can reduce wasted space and improve efficiency of transportation.
Minimisation of the level of pollution	The use of ecological, biodegradable or recycled materials helps to decrease soil, air and water pollution.
Reduction of the use of disposable packaging	By using environmentally friendly, durable and reusable packaging, it is possible to reduce the volumes of disposable waste.
Use of renewable resources	Application of various materials made from renewable resources helps to limit the negative impact on the planet's flora and fauna.
Energy saving in the process of packaging production	Advanced methods of producing eco-friendly packaging help to save energy.

Source: Developed by Vladyslav Marchenko

Today, it is possible to clearly see that humanity has made significant progress in the field of packaging in recent decades. Prior to the emergence of modern ecological norms and standards, traditional packaging was not well thought out in terms of balancing ecological, economic and social aspects and usually had a rather high impact on the environment. In most cases, people used materials that were both unsuitable for recycling and required a huge amount of time for decomposition in nature. This undoubtedly led to their gradual accumulation and environmental pollution. The negative impact on existing ecosystems

became so dramatic that it was simply impossible to ignore it.

For a better understanding of the changes in ecological policy in packaging, a few illustrative examples can be mentioned to describe the approaches of the past and the present. Looking at the past, the first thing to mention is plastic. Despite the fact that it is a popular material, we should not forget that it is very difficult for recycling and is practically not biodegradable. The situation is similar with polystyrene foam. Although it has been widely used for packaging of fragile goods, it is impossible not to mention that this material can take more than 1000 years to naturally decompose. The situation is no better with a wide spectrum of metal packaging that has gained such great popularity. Despite their widespread use, it is impossible to neglect the fact that they require a large amount of energy to recycle, and their accumulation leads to serious environmental pollution.

But today, the approach to packaging is much more innovative and attentive to the aspects of sustainability. The main attention is paid to packaging efficiency, in the context of conserving resources and minimising the level of ecological pollution. First of all, materials that have a much lower environmental impact are selected. With each new passing year, more and more biodegradable materials are being used to create packaging. They are of enormous importance, as such packaging naturally and safely decomposes over a defined period of time, usually from several months to several years. Cardboard and paper have especially grown in popularity, as they are easily recyclable and can be used to make completely new packaging. Packaging made with biodegradable polymers is becoming more and more valued, as it does not leave any harmful residues, which is undoubtedly important for the environment protection. Renewable materials are also becoming increasingly popular in the packaging industry. They allow to noticeably reduce dependence on fossil resources, minimise waste and decrease the negative impact on the environment in general.

In order to fully explain the selected topic, the impact of ecological norms on different types of packaging was demonstrated in the form of Table 3.

Table 3. Impact of ecological norms on different types of packaging

Packaging	Material (Before)	Estimated time of decomposition in nature	Possibility of reuse, recycling or disposal	Material (Now)	Estimated time of decomposition in nature	Possibility of reuse, recycling or disposal
Film packaging	PVC, polyethylene	From 500 to 1000 years	Difficult to recycle, usually disposed of.	Biodegradable plastic (PLA/PHA)	From 1 to 3 years	Easy to recycle and compost.
Bags	Polyethylene bags	More than 500 years	Disposable, usually thrown away right after use.	Fabric bags	From 1 to 2 years	Disposable, can be reused.
Protective packaging	Polystyrene foam	From 500 to 1000 years	Difficult to recycle, usually disposed of.	Cardboard, paper	From 1 to 5 years	Easy to recycle, can be reused.
Beverage containers	Aluminium cans	From 200 to 500 years	Recyclable, but requires a lot of energy to process, often disposed of.	Bioplastic cans (PLA/PHA)	From 1 to 3 years	Easy to recycle and compost.

Source: Developed by Vladyslav Marchenko

This table demonstrates the considerable difference between traditional and more modern packaging. The packaging industry is undergoing a remarkable transformation, driven by the need for sustainability and consumer demand for eco-friendly solutions [3]. Over the past decades, there has been truly great progress in minimising the ecological impact of this sphere on the environment. These simple examples perfectly demonstrate the change in approach to this question. Materials that were used in the past and had a huge impact on the environment have been replaced by more modern and efficient analogues that can be reused, recycled and biodegraded. Moreover, in the case of the last one, this process no longer takes hundreds of years, as it used to, but short periods.

Today, humanity is confidently moving in the direction of more sustainable practices and eco-friendly solutions. This allows to significantly reduce the amount of waste, simplify the process of its safe disposal and minimise the level of environmental pollution in general. The rapid spread of the sustainable development concept has formed global tendencies in the field of eco-friendly packaging. These include modern policies on the use of safe materials, reuse of packaging, reduction of the size of packages, use of environmentally friendly inks, improved packaging construction, and the use of easily compostable materials.

In our time, one of the main trends is the use of safe materials that do not harm either human health or the environment. Outdated materials are gradually being replaced by more «green» alternatives that decompose naturally without harmful residues in a few months or years.

A no less important task is to reduce the volume of packaging. Avoiding excessive packaging allows to both decrease the amount of waste and reduce the need for regular extraction of such a high quantity of natural materials. The fight against over-packaging encourages a reduction in the size of packages, minimising their weight, making them more effective and suitable for transportation. A relevant example is the Apple company, which, after changing the content of the iPhone box, seriously reduced its size, as shown in Fig. 2.

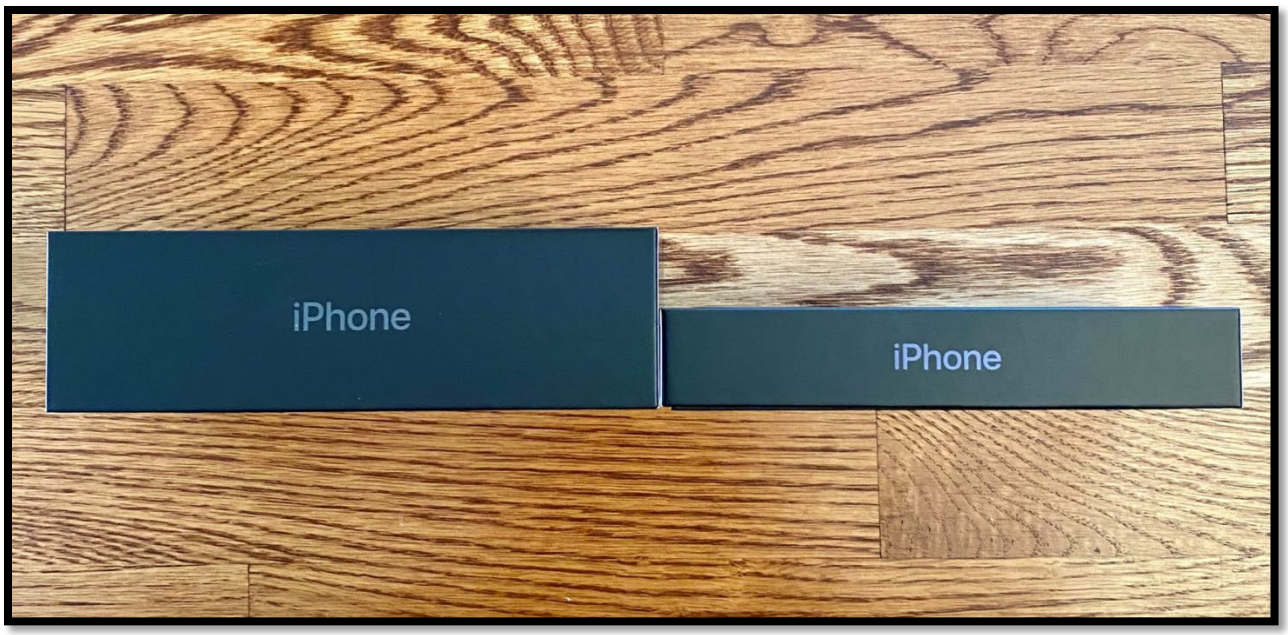

Figure 2 – Comparison of iPhone 11 Pro Max and iPhone 12 Pro boxes size
Source: https://x.com/neilcybart/status/1318576553475932160/photo/1

Such a simple decision allowed the company not only to conserve natural resources and economise huge amounts of money on packaging, but also made the shipping of these products more efficient. The smaller size of the box has allowed us to significantly reduce the number of transportations, which has an undoubtedly positive effect on the preservation of the environment.

It is impossible not to mention the pricelessness of the innovative packaging design. New formats of packaging and its well-thought-out layouts allow to achieve the most efficient use of space. The market is setting the trend of packaging transformation into well-designed constructors, where each element has its own function. Such approaches increasing the efficiency of logistics and reducing the need in large volumes of supplies of materials needed for the production of relevant packaging. A modern example of the design of such cardboard boxes can be seen in Fig. 3.

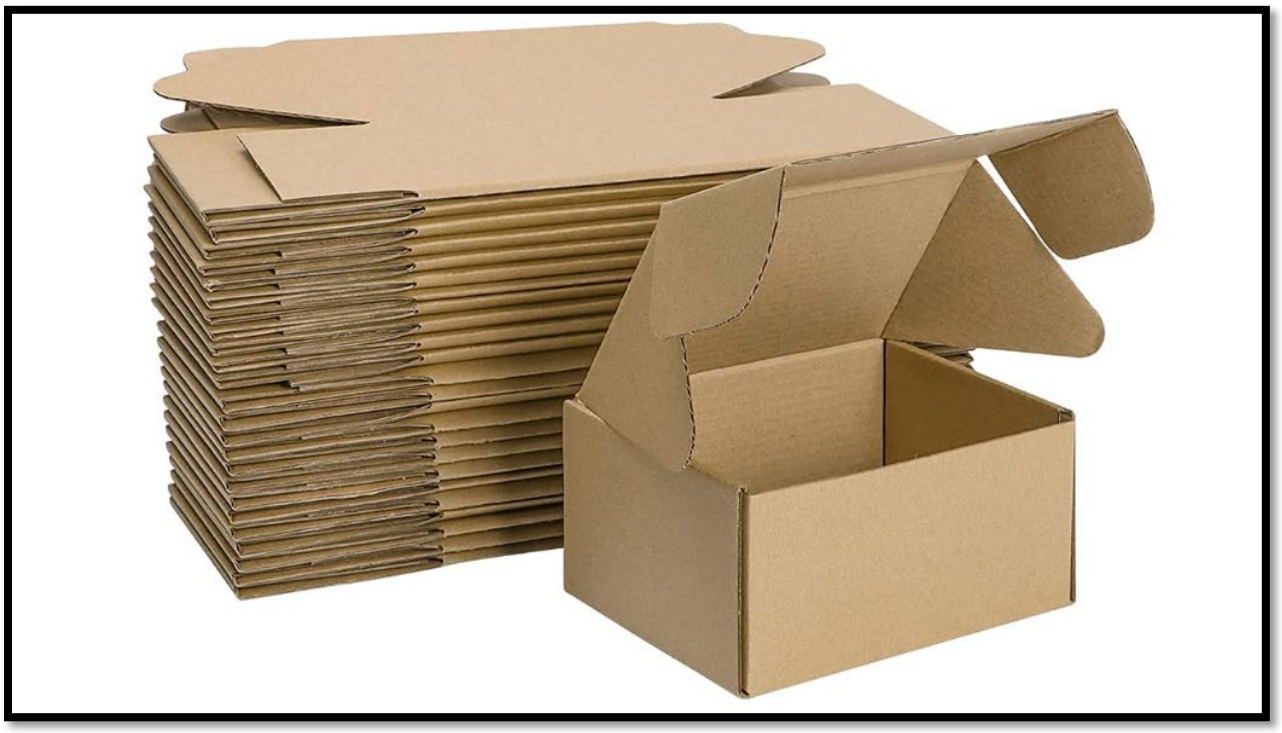

Figure 3 – Example of a cardboard shipping boxes constructor
Source: https://www.amazon.de/-/en/HORLIMER-Shipping-Cardboard-Corrugated-Packaging/dp/B09DCPZNYQ?th=1

A special role is played by advanced packaging recycling technologies. Recycling helps protect the environment [4]. The concept of eco-friendly packaging focuses on the reuse of waste, its recycling and further transformation into new packaging. This policy helps to substantially lower the amount of waste and minimise the level of ecological pollution. An example of packaging waste collection for recycling is demonstrated in Fig. 4.

Figure 4 – An example of collecting cardboard for further recycling
Source: https://recyclinginside.com/recycle-cardboard/

The approach of using packaging materials that can be composted efficiently is of utmost importance. The use of this practice on a global level allows to safely and efficiently decompose such packaging in a natural way. This not only helps to preserve the environment, but also to get rid of waste without harming the flora and fauna of our planet.

In recent years, the direction of reusable packaging has been developing rapidly. Their key advantage is that they can be reused over and over again. Such packaging is more ecologically friendly, in the context that it reduces the demand for the regular production of a huge number of other, new packages.

It is also worth mentioning the modern practice of using materials extracted by local companies to create packaging. The use of local materials simplifies logistics, speeds up supply chains, reduces carbon dioxide emissions and decreases the need to import huge amounts of materials from other parts of the world.

It's hard not to point out the current tendency to use eco-friendly paints, inks and labels for packaging. This practice helps to visibly reduce the level of environmental pollution. Customers highly value market players that pay attention to these aspects and use innovative types of inks or biodegradable labels. A modern example of Eco-inks can be seen in Fig. 5.

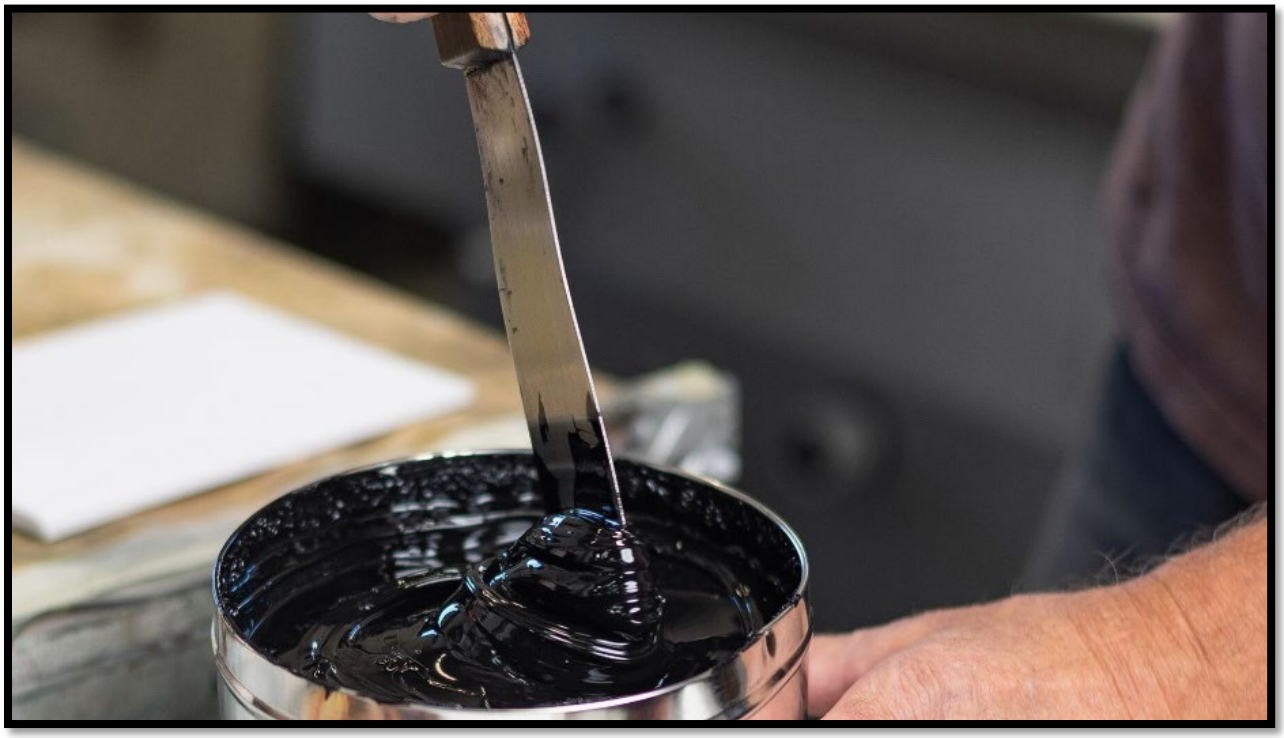

Figure 5 – A modern example of Eco-inks
Source: https://www.mohawkconnects.com/article/mohawk-blog/what-are-eco-friendly-inks

Taking all of these examples into account, it can be emphasised that the global spread of the concept of sustainable development has indeed formed quite promising tendencies in eco-friendly packaging. Its introduction in this sphere has become an important step towards reducing the negative impact of humanity on the environment, preserving our planet and creating a more sustainable future in general.

Also, in this article, it is simply impossible not to note the interconnection between the concept of sustainable development and the concept of circular economy. Nowadays, they are very closely related. They have a comprehensive goal - to achieve a balanced development of the economy, environment and society.

Today, a growing number of countries are beginning to actively work on establishing a circular economy, which is an effective instrument for achieving a wide range of global sustainable development goals. It uses highly efficient practices that create new production cycles where all possible materials and products are reused in economic turnover. This policy allows us to reduce our ecological footprint by minimising the amount of waste and reduces the need to extract such a large amount of natural resources.

Sustainable packaging is an integral part of the «circular economy» [5]. Thanks to it, it is now possible to achieve a considerable reduction in the negative impact on the environment and ensure more effective use of resources. The key circular packaging practices in the field of packaging and their main advantages are shown in Table 4.

Table 4. The key circular packaging practices in the field of packaging and their main advantages

Circular practices	The idea of the practice	Main advantages
Reuse of packaging	Returning packaging to the logistics cycle with the aim of reusing it in the future. As an example, it is possible to mention various plastic containers.	● Smaller expenses. ● Less need in new packaging. ● Lower amount of waste.
Return of packaging to the production process	Collecting and partial processing of used packaging with the aim of re-producing packaging materials. As an example, it is possible to mention the production of new boxes from waste cardboard.	● Lower greenhouse gas emissions. ● Minimisation of production costs. ● Development of innovations in the field of packaging.
Full recycling of packaging	Collecting and forwarding used packaging to factories with the aim of complete recycling and production of similar or absolutely new products.	● Less energy consumption. ● Lower demand for raw materials. ● Minimisation of waste.
Packaging in the form of a temporary service	A system where the manufacturer retains ownership of the packaging and the customer receives it only for the duration of the delivery, after which the packaging is returning back to the manufacturer.	● High responsibility of the manufacturer for packaging. ● Smaller need in new packaging. ● Lower carbon footprint. ● Less amount of waste.

Source: Developed by Vladyslav Marchenko

Taking into consideration the information provided in the table, it can be emphasised once again that packaging is an important element of the circular economy concept. The widespread adoption of its existing practices, as well as the use of new and perspective solutions, is a fundamental step towards achieving a more harmonious, modern, secure and sustainable economy in the nearest future.

It is also impossible to pass over the question of artificial intelligence in the packaging sphere. It has an enormous potential, and its capabilities are only growing every year. The gradual development of AI is one of the reasons for the rapid spread of the circular economy concept. It can make the packaging industry more innovative, productive and ecologically friendly. Nowadays, there is a huge list of options for using the powerful analytical functions of artificial intelligence. The key examples of ways to apply AI in the packaging sphere and the benefits it provides are included in Table 5.

Table 5. The key examples of ways to apply AI in the packaging sphere and the benefits it provides

№	Example of ways to apply AI	Explanation of use	Benefits
1	Innovative supply chain management	Artificial intelligence is able to collect, process and analyse a variety of data on packaging usage, packaging stocks and packaging waste. This information can then be used to improve the effectiveness of packaging usage in supply chains.	● Optimisation of logistics processes. ● Reduced resources consumption. ● Minimisation of excess packaging.
2	Improving packaging design	Artificial intelligence is able to select the most appropriate materials for packaging, determine the optimal packaging shape, its size, density	● Improving the efficiency of transportation.

		and strength. This direction allows to increase packaging efficiency and create the most compact and environmentally friendly design.	● Reducing the level of greenhouse gas emissions. ● Minimisation of the amount of waste.
3	Tracking the life cycle of packaging	The use of artificial intelligence allows to monitor packaging data in detail at all stages, starting from the moment of its production at the enterprise and up to the final disposal. Their analysis helps to improve the productivity of packaging, find ways to recycle and reuse it.	● Increase the effectiveness of operations. ● Recycling and reuse of packaging. ● Transparency of processes.
4	Automation of the packaging recycling process	Artificial intelligence can successfully recognise packaging, identify its types and sort all kinds of materials. This allows to automate the packaging recycling process, making it much faster and more effective.	● Less need in manpower. ● Higher speed of the packaging recycling process. ● Lower energy costs.
5	Determination of demand for packaging	Artificial intelligence can calculate the current demand for packaging. Similarly, it is able to predict future demand for packaging and future available supply, taking into account extracted resources and recycled material flows.	● The possibility to adapt to the needs. ● More efficient supply chains. ● Lower expenses on resources.

Source: Developed by Vladyslav Marchenko

Thus, it can be emphasised that artificial intelligence is of utmost importance in our time. It has tremendous prospects for both the development of the packaging industry and the establishment of a circular economy. The analysis has shown that there are a wide range of practices for its application in these questions. Already today, the use of AI in the field of packaging can provide companies and ordinary people with a huge number of opportunities and benefits. There is no doubt that it will continue to develop and become even more innovative and powerful.

At present, the sphere of sustainable packaging is facing serious challenges on its development path. Such challenges do not allow it to reach its full potential and slow down the implementation of sustainable development practices in packaging. The key challenges for the development of sustainable packaging are shown in Fig. 6.

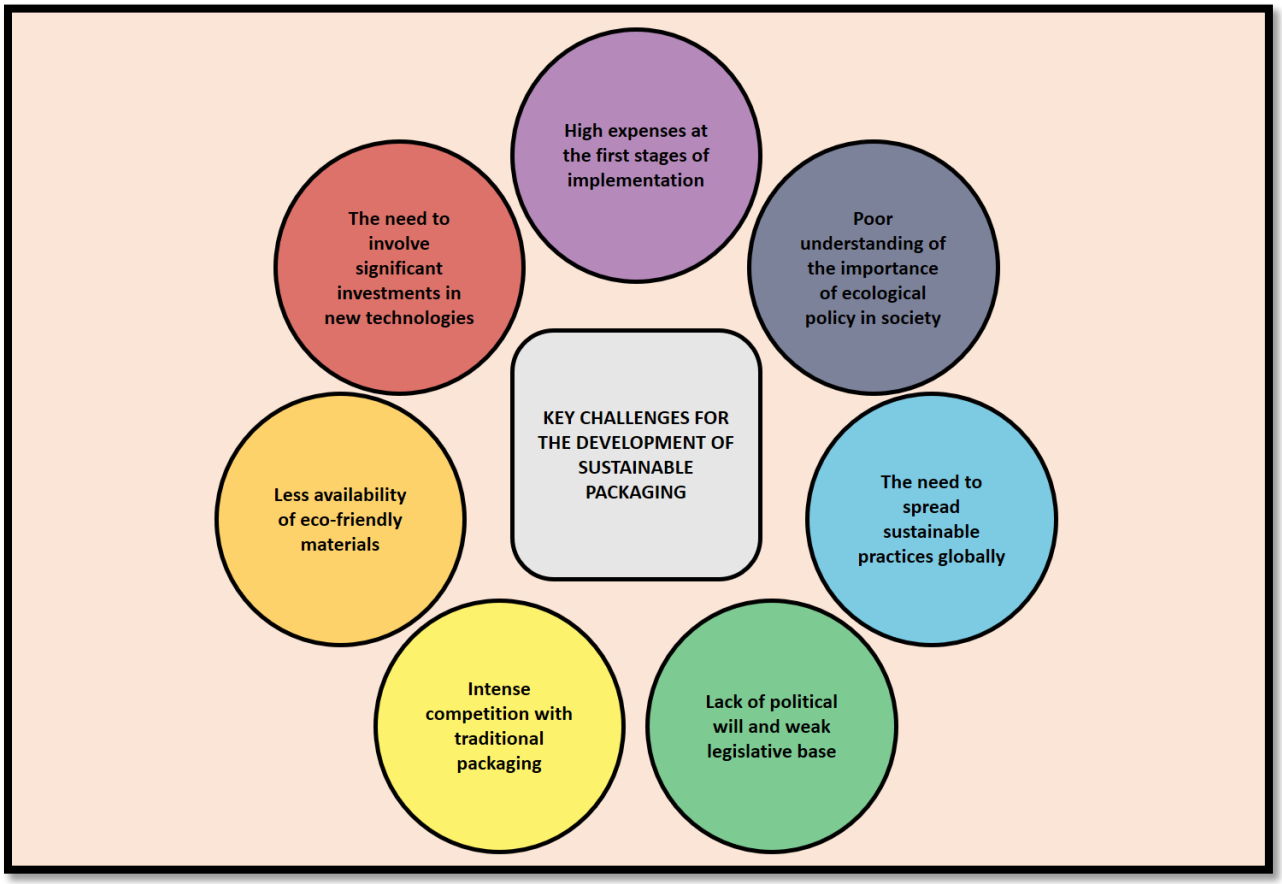

Figure 6 – The key challenges for the development of sustainable packaging
Source: Developed by Vladyslav Marchenko

The above mentioned information perfectly demonstrates the complexity of the existing problems. All of them require effective solutions, and most importantly, a long period of time. At this stage of our society's development, none of these challenges can be solved instantly, and this will undoubtedly happen gradually. The current issues clearly demonstrate that further development of the eco-friendly packaging sector is only possible in case of finding reliable, well-thought-out approaches that can improve recycling technologies, reduce the financial expenses for the production of materials, create appropriate educational programmes and promote sustainable practices among both ordinary people and business representatives. It is also important to underline that eco-friendly packaging can only become a truly new standard if governments strongly support it, develop relevant packaging technologies and increase environmental awareness of citizens.

A comparison of the development of eco-friendly packaging in Ukraine and the European Union became the next element of this article. The progress of this direction in the EU and our country has a huge number of crucial differences, which have become the key to the rapid leadership of one of these parties. This is particularly evident when comparing their economic capabilities, existing technologies and regulatory frameworks. It will not be a big surprise to note at the very beginning that the European Union has a clear lead in the field of sustainable packaging. For many, many years, it has been paying special attention to the development of the circular economy concept and actively working to popularise the sphere of sustainable packaging, while our country, although it has had some success in this, is still just beginning its path of adaptation to these complex practices. A comparison of the development of the field of

ecological packaging in Ukraine and the EU can be seen in Table 6.

Table 6. A comparison of the development of the field of ecological packaging in Ukraine and the EU

Parameter	Ukraine	EU
Technologies	The development of eco-friendly packaging technologies has a very slow pace. Most promising projects are at the initial stages of implementation. There are initiatives in the country for packaging reuse, packaging waste recycling, and the implementation of biodegradable materials, but these are rare cases and not a widespread phenomenon.	The European Union is constantly investing significant financial resources in the development of innovations and new technologies that aim to reduce the ecological impact of packaging. EU countries support scientific researches in this area and finance different start-ups.
Level of environmental awareness and responsibility of citizens	The country has a low level of environmental awareness of citizens. The government does not pay enough attention to explaining the significance of eco-friendly packaging, which results in a lack of willingness to choose it. At the same time, the popularity of eco-friendly products among young people is gradually increasing, which is contributing to the growth of interest in eco-friendly packaging and the concept of sustainable development.	Citizens of EU countries have a fairly high level of environmental awareness. Most EU citizens are responsible when it comes to choosing the proper packaging. Eco-friendly packaging is in demand among citizens who want to minimize the impact of humanity on the surrounding. The government supports companies that implement ecological initiatives and pays more attention to these issues in education.
Regulatory framework	The relevant legal framework is still in the process of development. The government is actively adopting the experience of other countries. For example, in 2021, a law was approved to restrict the use of plastic bags in Ukraine. The country does not have a well-planned approach to the development of the eco-friendly packaging segment.	The European Union has an advanced regulatory framework. It has developed not only laws, directives and strategies for the development of a circular economy and the recycling of packaging, but also established clear obligations for member countries on reducing the amount of packaging.
Stimulation of companies	Stimulation is quite limited. The country supports such environmental projects, initiatives, and waste recycling programs, but this is not a widespread practice. In a similar way, their financial support is also currently inadequate. Many companies just close their eyes to environmental issues.	Stimulation is very active. The EU is constantly working on the transition to sustainable packaging. A balanced system of benefits and strict obligations has been developed. It provides companies with new technologies, supports them with subsidies and tax benefits, but sets clear requirements to reduce their environmental footprint.
Overall level of implementation and future development prospects	The country is still at the initial stage of the development of eco-friendly packaging sphere. Ukraine is actively studying existing practices and plans to implement European approaches step by step. The country has significant prospects for improvement, but due to a large number of barriers, progress in this area is currently slow.	The EU has a good level of development in the field of eco-friendly packaging. This applies to both established policies and environmental practices. The EU has a great potential for development in this direction. Experts predict the further spread of eco-friendly packaging policy and the establishment of a circular economy.

Source: Developed by Vladyslav Marchenko

This table clearly demonstrates the significant difference between the development of this sphere in Ukraine and the EU. The EU have already made significant achievements and gained considerable success, while our country is still actively developing this area, studying international experience and trying to adapt existing practices. At present, the creation of a strong regulatory framework and the implementation of reforms remain a top priority for Ukraine. Conducting public awareness campaigns and changing approaches to this issue in the education system can also play an important role in accelerating the development of sustainable packaging sphere.

Thus, it can be emphasized that the sustainable development concept has a great impact on the field of eco-friendly packaging and aims to balance its environmental, economic and social aspects. The article is a logical continuation of the author's scientific research in the direction of developing environmental aspects of logistics.

Conclusions. The conducted research and analyses in this article have allowed to achieve all the previously set goals. In this work, it has been clearly emphasized that problems such as environmental pollution, climate change and depletion of natural resources are complex challenges that are global in scope. The lack of attention to them in the past has led to terrifying consequences that are now pushing humanity to look for innovative ideas that can improve the current situation. Nowadays, one of the most serious problems is still the increase in the amount of waste. The implementation of the principles of the concept of sustainable development in the field of packaging has become one of the most innovative solutions to this problem. The concept of sustainable development is a powerful basis for the evolution of packaging in the direction of ecological friendliness. Eco-friendly packaging in logistics is a crucial element necessary to achieve sustainable business. The development of eco-friendly packaging can bring many benefits, starting with environmental protection, financial cost savings or reduced need in such large volumes of materials, and ending with optimization of energy consumption and improvement of the company's reputation in the market. After analyzing the impact of environmental regulations on various types of packaging and the history of packaging in general, it is possible to see how sustainability practices are indeed making changes in the packaging industry step by step. A comparison of the development of eco-friendly packaging in Ukraine and the EU has shown that although our country has implemented many positive solutions in recent years, we still have a lot of work to do. Despite all the mentioned problems and challenges that Ukraine is facing today, the development of the eco-friendly packaging sector is still on the rise in our country. Summarizing all the information above, the sphere of eco-friendly packaging has great prospects for further development, and that is why it is so important to continue to study this direction.

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