

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
NATIONAL AVIATION UNIVERSITY
Faculty of Transport, Management and Logistics
Logistics Department

APPROVED
Acting Head of the Department

Smerichevska S.V.
(signature, surname and name)
«11» December 2023

MASTER THESIS

(EXPLANATORY NOTES)
OF GRADUATE OF ACADEMIC DEGREE
«MASTER»

THEME: **«Implementation of the recycling strategy in the cardboard and paper mill activities»**

Speciality 073 «Management»

Educational and Professional Program « Logistics »

Done by Dikariev Mykyta
(surname and name) (signature, date)

Supervisor Karpun Olga
(surname and name) (signature, date)

Standards Inspector Karpun Olga
(surname and name) (signature, date)

*I certify that in this master thesis
there are no borrowings from the works of other authors
without appropriate references*

Dikariev M.A.
(signature) (surname and name)

Kyiv 2023

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
НАЦІОНАЛЬНИЙ АВІАЦІЙНИЙ УНІВЕРСИТЕТ
Факультет транспорту, менеджменту і логістики
Кафедра логістики

ЗАТВЕРДЖУЮ
В.о. завідувача кафедри логістики
Смерічевська С.В.
(підпис, П.І.Б)
«11» грудня 2023 р.

КВАЛІФІКАЦІЙНА РОБОТА

(ПОЯСНЮВАЛЬНА ЗАПИСКА)
ЗДОБУВАЧА ОСВІТНЬОГО СТУПЕНЯ
«МАГІСТР»

ТЕМА: «Впровадження стратегії рециклінгу в діяльність картонно-паперового комбінату»

зі спеціальності 073 «Менеджмент»
(шифр і назва)
освітньо– професійна програма «Логістика»
(шифр і назва)

Здобувач: Дікареєв Микита Андрійович
(прізвище, ім'я та по батькові) (підпис, дата)

Науковий керівник: Карпунь О.В.
(прізвище та ініціали) (підпис, дата)

Нормоконтролер: Карпунь О.В.
(прізвище та ініціали) (підпис, дата)

*Засвідчую, що у цій кваліфікаційній роботі
немає запозичень з праць інших авторів
без відповідних посилань*
(підпис) Дікареєв М.А.
(прізвище та ініціали здобувача)

Київ 2023

NATIONAL AVIATION UNIVERSITY
Faculty of Transport, Management and Logistics
Logistics Department

Academic Degree Master

Speciality 073 «Management»

Educational and Professional Program « Logistics »

APPROVED
Acting Head of the Department

Smerichevska S.V.
(signature, surname and name)
«02» October 2023

TASK

FOR COMPLETION THE MASTER THESIS OF GRADUATE

Mykyta A. Dikariev
(surname and name)

1. Theme of the master thesis: «Implementation of the recycling strategy in the cardboard and paper mill activities» was approved by the Rector Directive №1952/CT. of September 27, 2023.
2. Term performance of thesis: from October 02, 2023 to December 31, 2023.
3. Date of submission work to graduation department: December 11, 2023.
4. Initial data required for writing the thesis: general and statistical information about cardboard and paper mill activities, production and operations data, comprehensive information on the current waste management system, data related to the environmental impact of the cardboard and paper mill's activities, capital investments for the recycling strategy implementation, Internet source.
5. Content of the explanatory notes: introduction, the essence of the information system; research of existing waste, their types and significance; conceptual basics of the recycling strategy and role of logistics in the recycling system, analysis of the cardboard and paper industry market situation in Ukraine and in the world; analysis of logistics at the Kyiv Cardboard and Paper Mill; existing problems in the activity of the cardboard and paper mill and directions for their solution Justification of the project resource and financial provision; conclusions and appendix.
6. List of obligatory graphic matters: tables, charts, graphs, diagrams illustrating the current state of problems and methods of their solution.

7. Calendar schedule:

№	Assignment	Deadline for completion	Mark on completion
1	2	3	4
1.	Study and analysis of scientific articles, literary sources, normative legal documents, preparation of the first version of the introduction and the theoretical chapter	02.10.23-18.10.23	Done
2.	Collection of statistical data, timing, detection of weaknesses, preparation of the first version of the analytical chapter	19.10.23-09.11.23	Done
3.	Development of project proposals and their organizational and economic substantiation, preparation of the first version of the project chapter and conclusions. Editing the first versions of maser thesis	10.11.23-30.11.23	Done
4.	Preparing the final version of the master thesis, checking by standards inspector	01.12.23-08.12.23	Done
5.	Approval for a work with supervisor, getting of the report of the supervisor, getting internal and external reviews, transcript of academic record	05.12.23-09.12.223	Done
6.	Submission work to Logistics Department	10.12.23	Done

Graduate _____
(signature)

Supervisor of the master thesis _____
(signature)

8. Consultants of difference chapters of work:

Chapter	Consultant (position, surname and name)	Date, signature	
		The task was given	The task was accepted
Chapter 1	Associate Professor, Karpun O.V.	02.10.23	02.10.23
Chapter 2	Associate Professor, Karpun O.V.	19.10.23	19.10.23
Chapter 3	Associate Professor, Karpun O.V.	10.11.23	10.11.23

9. Given date of the task October 02, 2023.

Supervisor of the master thesis: _____
(signature of supervisor)

Karpun O.V.
(surname and name)

Task accepted for completion: _____
(signature of graduate)

Dikariev M.A.
(surname and name)

ABSTRACT

The explanatory notes to the master thesis «Implementation of the recycling strategy in the cardboard and paper mill activities» comprises of 101 pages, 15 figures, 17 tables, 64 references and 1 appendix.

KEY WORDS: RECYCLING STRATEGY, CARDBOARD AND PAPER MILL, WASTE MANAGEMENT, LIFE CYCLE ASSESSMENT, ENVIRONMENTAL IMPACT, EMPLOYEE INVOLVEMENT, PRODUCTION PROCESS

The purpose of the master thesis is the generalization of theoretical, practical analysis and development of scientific and methodological recommendations for the implementation of the recycling strategy in the cardboard and paper mill activities. The research aims to provide insights into the effectiveness of the recycling strategy, potentially uncovering opportunities for improvement, and contributing to the broader understanding of sustainable practices in the cardboard and paper industry.

The subject of our research is the latest technologies that contribute to the implementation of the recycling strategy in the activities of a cardboard and paper mill. The subject encompasses an in-depth exploration of waste management systems, the utilization of recycled materials, and the overall impact of the recycling strategy on the environmental, economic, and operational aspects of the mill's activities.

The object of our research is recycling in the cardboard and paper industry.

Methods of research are scientific inquiry, empirical, analysis and synthesis, modeling, expert assessments, induction, deduction, generalization.

Materials of the thesis are recommended for use during scientific research, in the educational process and in the practical work of specialists of logistics departments.

CONTENTS

	page
NOTATION	7
INTRODUCTION	8
CHAPTER 1 THEORETICAL PRINCIPLES OF RECYCLING AND ITS APPLICATION IN THE CARDBOARD AND PAPER INDUSTRY	12
1.1 Research of existing waste, their types and significance	12
1.2 Conceptual basics of the recycling strategy and role of logistics in the recycling system	19
1.3 Specifics of recycling at enterprises of the cardboard and paper industry ..	24
Chapter 1 summary	29
CHAPTER 2 MARKET RESEARCH OF THE CARDBOARD AND PAPER INDUSTRY OF UKRAINE AND PROSPECTS FOR IMPLEMENTATION OF RECYCLING	31
2.1 Analysis of the cardboard and paper industry market situation in Ukraine and in the world	31
2.2 Analysis of the activity of «Kyiv Cardboard and Paper Mill»	39
2.3 Advantages of the Kyiv Cardboard and Paper Mill among competitors from Europe and Ukraine	50
2.4 Analysis of logistics at the «Kyiv Cardboard and Paper Mill»	53
Chapter 2 summary	59
CHAPTER 3. DEVELOPMENT OF PROPOSALS FOR THE IMPLEMENTATION OF THE RECYCLING STRATEGY IN THE ACTIVITIES OF THE PAPER AND CARDBOARD MILL	61
3.1 Existing problems in the activity of the cardboard and paper mill and directions for their solution	61
3.2 Implementation of the waste management system	73
3.3 Justification of the project resource and financial provision	78
Chapter 3 summary	88
CONCLUSIONS AND RECOMMENDATIONS	89
REFERENCES	94
APPENDIX	101

NOTATION

CEPI	– Confederation of European Paper Industries;
CPI	– Circular Economy Performance Indicator;
CSR	– Corporate Social Responsibility;
EWU	– Environmental Waste Management;
KCPM	– Kyiv Cardboard and Paper Mill;
KPI	– Key Performance Indicators;
LCA	– Life cycle assessment;
MSW	– Municipal Solid Waste;
RBR	– Recycling Benefit Ratio;
REV	– Retained Environmental Value;
ROE	– Return on Equity.

INTRODUCTION

In the context of the modern world of business and economics, logistics becomes an integral part of the success and efficiency of any organization. An increasing number of companies realize that logistics is not just a function within the enterprise but a true engine of the process that affects every aspect of the business, from production and storage to delivery and meeting consumer needs.

In today's world, supply chain management is becoming increasingly crucial to the success of any organization. The growing demand for environmentally sustainable and innovative solutions and strategies for sustainable development makes this topic relevant and significant. In this context, supply chain management of cardboard and paper materials becomes a crucial component of ensuring business success, not only in terms of high-quality raw materials but also in meeting the requirements of sustainable development and environmental responsibility.

The current increase in global oil prices, the heightened attention to climate change issues, and the threat of depletion of natural resources have led to a reevaluation of business strategies worldwide. Today, organizations understand that effective supply chain management, considering the principles of sustainable development, not only enhances their competitiveness but also ensures the sustainability of their business in times of uncertainty and negative environmental impact.

Currently, the Ukrainian market of cardboard and paper materials, like many others, is undergoing a transition to more sustainable and stable practices. Successful enterprises in this sector understand that the ability to provide high-quality and environmentally sustainable packaging for food and other industries becomes a competitive advantage.

In today's world, where economic development is closely intertwined with issues of environmental sustainability and responsible use of resources, the problem of recycling stands out as a key component of a sustainable development strategy.

The constantly growing amount of waste, harmful emissions and degradation of natural resources require not only conscious consumption, but also active measures to optimize production cycles and material circulation.

Recycling is one such strategy capable of changing the landscape of production and consumption. Its essence lies in the transformation of waste into secondary raw materials, which can serve as the basis for new products. In this context, recycling becomes especially important for the cardboard and paper industry, which is one of the main branches of production and consumption of materials.

The essence of recycling is the efficient use of waste, which, instead of becoming a problem, turns into a resource. However, this concept goes beyond simple waste processing. Recycling opens up wide opportunities for rethinking production approaches, recreating value in waste and contributing to environmental sustainability.

Describing recycling as an integral part of environmental and economic sustainability, we need to address fundamental questions: why recycling is necessary and what benefits it can bring. In the context of the cardboard and paper industry, these questions become especially relevant, since this industry has a huge potential for the introduction of innovative approaches and optimization of production processes.

The choice of the topic of the thesis is due to insufficient attention to the ecological aspects of production, which is becoming an integral part of the modern global economy. Recycling in the cardboard and paper industry today is recognized as a key tool for achieving important environmental and economic goals. Exclusively, this topic is relevant due to the fact that the cardboard and paper industry is recognized as one of the largest energy-intensive and water-intensive industries of production.

Global demand for cardboard and paper is growing rapidly, challenging the industry to meet this demand while maintaining environmental sustainability and environmental responsibility. In such a context, recycling becomes sufficient, as it

allows to reduce the ecological footprint of production and promote the use of secondary raw materials.

The relevance of the research is also increased by global trends in noting the importance of preserving natural resources and reducing greenhouse gas emissions. The global community is constantly paying attention to the impact of industry on climate change, and effective recycling can be a key factor in strategies for the health of the planet.

The purpose of the master thesis is the generalization of theoretical, practical analysis and development of scientific and methodological recommendations for the implementation of the recycling strategy in the cardboard and paper mill activities.

In this study, we will examine recycling as a strategic tool for the paperboard industry, identifying its role in conserving natural resources, reducing emissions, and improving production cycles.

The main objective of this master thesis is to identify strategic approaches to supply chain management of cardboard and paper materials that would allow companies to achieve not only economic efficiency but also meet the requirements of sustainable development and contribute to the preservation of natural resources for future generations.

The object of our research is recycling in the cardboard and paper industry. We will look at recycling processes and technologies, their impact on the industry's economy and environmental performance.

The subject of our research is the latest technologies that contribute to the implementation of the recycling strategy in the activities of a cardboard and paper mill. The subject encompasses an in-depth exploration of waste management systems, the utilization of recycled materials, and the overall impact of the recycling strategy on the environmental, economic, and operational aspects of the mill's activities.

The scientific novelty of the obtained research results lies in the deepening of the theoretical provisions and the development of the conceptual foundations of the formation of a recycling strategy in the activity of a cardboard and paper plant, which

is based on Environmental Waste Utilization system and monitoring environmental waste utilization scores.

Research methodology. In the master thesis we will use a comprehensive approach to research, which includes the analysis of scientific articles, the study of statistical data, as well as interviewing representatives of industries and environmental organizations. We plan to conduct a comparative analysis of recycling in the cardboard and paper industry on the example of different countries and companies, developing their approaches and achievements.

Structure of work. The master thesis will be divided into logical blocks for better understanding and analysis. Starting with a review of the literature and theoretical foundations of recycling, we will move on to studying its specific issues in the cardboard and paper industry. Next, we examine global trends and innovations affecting this process, and conclude the study with conclusions and recommendations for further practical applications.

This thesis is devoted not only to the theoretical study of recycling, but also to the active implementation of its principles in the field of cardboard and paper production, which, we hope, will determine new ways to preserve the environment and develop the industry as a whole.

In the process of writing the master thesis, materials from the company's internal reporting, data from statistical directories, and materials from practitioners in the field of logistics and management, published in periodicals, monographs, textbooks, and electronic sources, were used.

CHAPTER 1

THEORETICAL PRINCIPLES OF RECYCLING AND ITS APPLICATION IN THE CARDBOARD AND PAPER INDUSTRY

1.1 Research of existing waste, their types and significance

According to the results of the conducted research, waste is unwanted or unusable materials. Waste can be any substance discarded after primary use, or is worthless, defective and of no use. A by-product, by contrast is a joint product of relatively minor economic value. A waste product may become a by-product, joint product or resource through an invention that raises a waste product's value above zero.

Waste is divided into solid and liquid, industrial and domestic, production and consumption (Fig. 1.1).



Figure 1.1 – Types of waste [19]

Production waste is everything that is formed during the production process or after the completion of its cycle, except for products in the form of energy or matter – production items. According to this definition, production waste includes the remains of multi-component natural raw materials after extraction of the target product from them, for example, empty ore rock, overburden of mining, slag and dust of thermal power plants, blast furnace slag and burnt earth of metallurgical production, metal shavings of machine-building enterprises, etc. In addition, they include significant waste from forestry, woodworking, textile and other industries, the road construction industry and the modern agro-industrial complex (unused chemical fertilizers and pesticides, unequipped cemeteries of animals killed during epidemics, etc.). In principle, production waste is also substances contained in outgoing process gases (flue gas) or in waste water of enterprises that use water in technological processes. These gaseous and liquid types of waste are usually considered within the framework of environmental problems of atmospheric air pollution and the Earth's water basin and their protection.

In industrial ecology, production waste is defined as waste in a solid aggregate state (some gaseous and liquid waste can turn into a solid phase, for example, in filters or clarifiers). The same applies to consumer waste – industrial and household.

Consumption waste.

Consumer waste – products and materials that have lost their consumer properties as a result of physical (material) or moral wear and tear.

Industrial consumption waste – machines, machine tools and other obsolete equipment of enterprises.

Household waste – waste generated as a result of people's life activities and which they throw away as unwanted or useless. Solid household waste includes cardboard, newsprint, packaging or consumer paper, all kinds of containers (wooden, glass, metal) that are out of use or have lost their consumer properties, objects and products made of wood, metal, leather, glass, plastic, textiles and other materials, broken or outdated household appliances – garbage, as well as agricultural and communal food waste – emissions.

Toxic waste poses a great danger to the environment, including some of the waste that is safe at the stage of its appearance and acquires toxic properties during storage.

Production waste.

Extraction and processing of raw materials necessary for the production of energy, various materials and, ultimately, the satisfaction of certain needs of society, leads to the depletion of natural resources of the Earth, the destruction of natural ecosystems, the disruption of biosphere processes and unprecedented pollution of the environment, including as a result of the accumulation of waste production

Characteristic for the modern world, the expansion of industrial production is accompanied by the use of a huge amount of raw materials and energy resources aimed at the production of material goods. At the same time, there is a stereotype formed over the centuries that it is the extensive growth of industrial production that determines the well-being of society; industrial production is considered the basis of economic development and the socio-economic standard of living of society, and the amount of raw materials and resources consumed is regarded as an indicator of economic prosperity.

The structural restructuring of the economies of developed countries in the last quarter of the 20th century (the development of high-tech industries that produce electronic equipment, computers, pharmaceuticals, etc.) led to a decrease in the rate of consumption of raw materials (it is needed mainly to replace equipment, not to create new infrastructure) and energy. At the same time, the levels of consumption of raw resources in developing countries have risen sharply. However, the volume of raw materials entering the economic system does not say anything about its final use, nor about its contribution to people's well-being. But this indicator makes it possible to clearly assess the damage caused to the surrounding natural environment both at the initial and final stages of the production cycle.

Extraction of raw materials is not only the most destructive type of human activity, during which a huge amount of soil and rock is moved, but also the main source of industrial waste. Most of the waste is generated at the initial stage. To access

raw materials, it is necessary to remove a layer of soil and rocks (overburden), while the volumes of overburden in the open method of raw material extraction, which is now widespread, are much larger than in the underground method. A clear example of this is the mountains of empty rock – tericones in the areas of coal mining, dumps near quarries during surface mining of ore. After the process of beneficiation of mined ore, mountains of empty rock ("tails" of beneficiation) also appear.

Importance of waste recycling.

1. First, the resources of many materials on Earth are limited and cannot be replenished in terms comparable to the time of existence of human civilization.
2. Second, once in the environment, materials usually become pollutants.
3. Third, waste and end-of-life products are often (but not always) a cheaper source of many substances and materials than natural sources.

Technologies of secondary processing.

Many different types of waste can be reused. There is a suitable processing technology for each type of raw material.

Different types of separation are used to separate waste into different materials, for example, magnetic separation is used to extract metal.

Technologies used:

The generally accepted method of disposal of both hazardous and municipal solid waste (MSW) is landfill burial. According to experts' estimates, 24 million tons of hazardous waste is generated annually in European countries, of which 75% is hidden.

At the same time, landfill is considered the least preferable for waste that can be recycled, disposed of or used in other ways. In the EU, waste incineration, which originated as a means of disposing of solid waste and later turned into an energy industry, is more popular than the direct placement of waste in landfills, because according to the heat equivalent, 1 ton of solid waste = ½ ton of coal.

Incineration of garbage:

Combustion of MSW allows to significantly reduce their volume and weight; convert substances (including dangerous ones) into inert solids; to destroy substances

that would lead to the formation of biogas during direct burial in landfills. It is possible to utilize energy due to the burning of organic components of waste.

Disadvantages of waste incineration usually include:

- high costs compared to other types of processing (\$280-750 per ton of waste per year);
- problems of operation due to the variable composition of waste and the use of slag and ash;
- not all types of waste can be burned;
- the possibility of dispersal into the environment of substances formed in the process of combustion.

As an alternative to incineration at temperatures of 700-800 °C, scientific and technical developments are being intensively conducted abroad today to create processes and units for high-temperature processing (1350-1600 °C), such as pyrolysis.

Waste recycling.

Recycling is the only civilized way of handling solid household waste.

According to the general provisions of the Law of Ukraine "On the basic principles (strategy) of the state environmental policy of Ukraine for the period until 2020", the low life expectancy of Ukrainians (about 66 years on average) is largely due to environmental pollution. One of the acute environmental protection problems in Ukraine is the management of solid household waste. Today, waste generation rates average 220-250 kilograms per person per year, and in large cities, they even reach 330-380 kilograms per year. In general, the total mass of this waste reaches 13 million tons per year, and this figure is growing exponentially. Moreover, among solid household waste, the share of waste that does not undergo rapid decomposition and requires significant areas for storage is increasing. At the same time, the number of overloaded landfills is constantly increasing, and some of these landfills, unfortunately, do not meet environmental safety standards. Today, the number of landfills and landfills in Ukraine is about 4.5 thousand, however, there is another problem – unauthorized landfills, the number of which exceeds 35 thousand. Among

European countries, Ukraine ranks first in terms of the level of harmful effects of landfills on the environment.

At the same time, Ukraine is not the only European country facing problems in the field of solid household waste management. Most of the developed European countries are trying to protect the environment and quite effectively implement modern technologies for processing and disposal of solid waste to ensure ecological well-being, environmental protection and resource conservation, and some of them even plan to completely stop burying solid household waste in landfills in the near future. Thus, European and global practice in the field of solid household waste management aims to prevent and reduce the production of waste and its harmful effects, which, in turn, is achieved through the secondary use of waste through recycling, reuse of waste, development of appropriate final technologies disposal of hazardous substances, use of waste as a source of energy. In this practice, European states are guided by a number of EU directives and regulations. The basic EU law in the field of waste management is the "EU Framework Directive on Waste", which applies to all waste streams and establishes the so-called waste hierarchy, rules for waste management planning, their qualified collection and processing, and also requires compliance with mandatory permits procedures for processors (Fig. 1.2).

World experience offers three basic ways in the field of solid household waste management, namely:

- landfill (in order to prevent harmful effects on the environment);
- destruction of solid household waste by burning it;
- purification of solid household waste from harmful components and their utilization in order to extract valuable components.

It should be noted the negative consequences of using landfill and incineration of waste. Storing solid household waste in landfills is an imperfect and environmentally dangerous way of handling it, because toxic leachate (wastewater from landfills) pollutes the soil, surface and ground water of places located next to landfills, and self-combustion and decay of waste leads to air pollution.



Figure 1.2 – The essence of Circular economy [20]

Burning waste is extremely dangerous for the environment and has an extremely negative impact on people's health, because burning waste leads to the formation of toxic substances and compounds that settle in the atmosphere. In addition, this method is the most backward and expensive way of handling waste. That is why today many countries direct their legislation to a partial ban on incineration of waste, and some of them completely ban their incineration. So, the only civilized and safe way of handling solid household waste is recycling (it should be added that almost all components of solid household waste can be reused) and minimizing the generation of garbage, which is connected with the spread of environmental awareness among the population of Ukraine.

1.2 Conceptual basics of the recycling strategy and role of logistics in the recycling system

The recycling strategy is a comprehensive approach to waste management aimed at maximizing the use of secondary raw materials and reducing the negative impact on the environment. This strategy is based on several key concepts that are focused on ensuring the sustainable use of resources and maintaining environmental efficiency (Fig. 1.3).

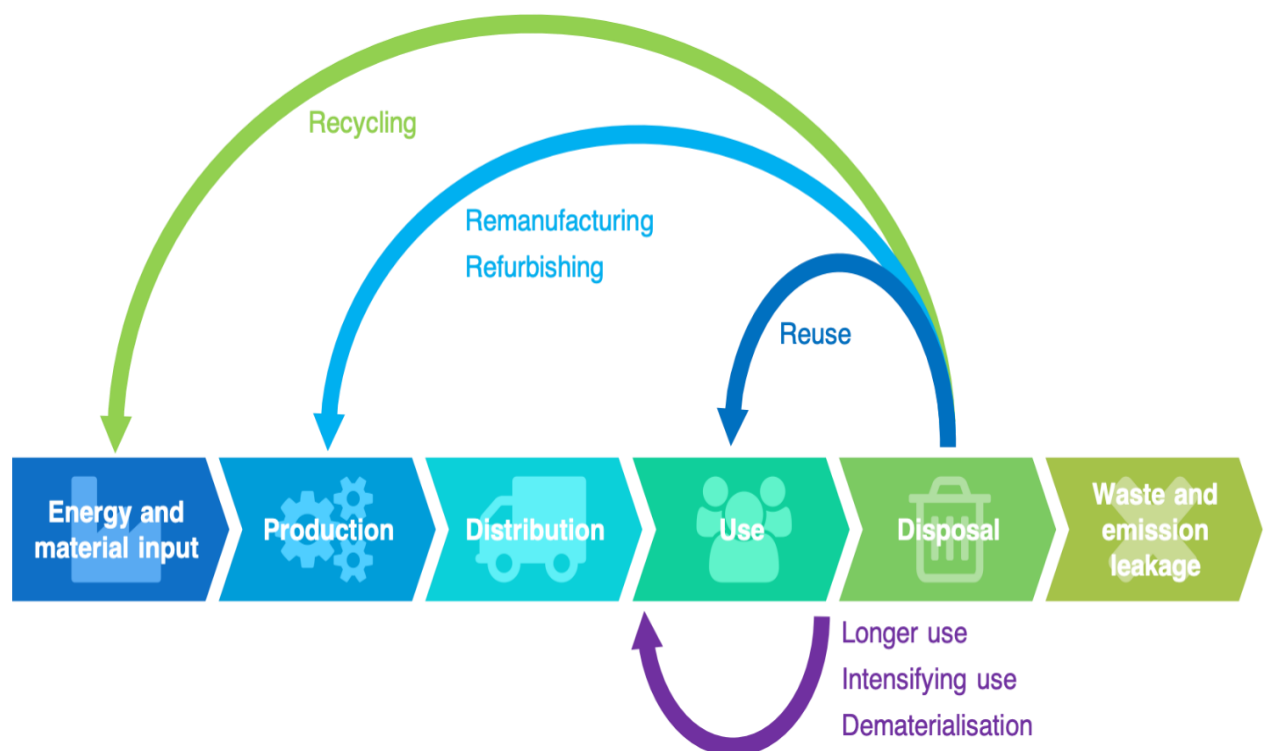


Figure 1.3 – Conceptual Basics of the Recycling Strategy [20]

1. Principle of the Closed Cycle of Resource Use:

The principle of a closed cycle of resource use is fundamental to the recycling strategy and aims to create an effective resource management system in which waste is converted into secondary raw materials and not simply thrown away. The implementation of this principle has several key aspects:

- Collection and Sorting of Waste:

The first step in a closed cycle is the efficient collection and sorting of waste. This requires a developed infrastructure for the separate collection of waste at production sites and among the population. Sorting waste allows you to separate different materials that can be further processed.

– Processing Technologies:

The use of advanced processing technologies is a key element. This may include mechanical, chemical, or biological treatment of waste to extract useful materials. Mechanical processing may involve sorting, magnetic separation, or grinding, while biological processing uses microorganisms to break down organic materials.

– Use of Secondary Raw Materials:

Saving and using secondary raw materials is the next stage. This may include the production of secondary materials that can be used in production processes. For example, using recycled glass or plastic to produce new packaging materials.

– Reuse and Advertising:

Reuse of products or packaging is another way to solve the problem of waste. Advertising and popularization of goods using secondary raw materials can stimulate demand for such goods and contribute to maintaining a closed cycle of resource use.

– Implementation of the Circular Economy:

In addition to just recycling, this principle also includes the ideas of the circular economy. This means not only the use of secondary raw materials, but also the minimization of resource losses in the production and consumption process.

This principle helps to create a more efficient and sustainable resource management system, taking into account environmental, economic and social aspects. A closed cycle of resource use becomes a step towards sustainable development and preservation of the environment for future generations.

2. Environmental Responsibility and Synergy with Nature:

The principle of environmental responsibility includes the use of natural processes and interaction with ecosystems for optimal use of secondary raw materials. Waste is processed through natural processes such as biodegradation to

reduce the negative impact on nature and create more environmentally friendly materials.

3. Implementation of Innovations and Technological Solutions:

The recycling strategy actively uses innovative technologies to optimize recycling processes and the use of secondary raw materials. This includes improving waste sorting methods, developing new recycling methods and applying advanced solutions to maximize the use of resources.

4. Consideration of Social and Economic Aspects:

Social responsibility in a recycling strategy means creating jobs and improving the quality of life in communities. Recycling can become the basis for the development of new economic models, increasing the reproducibility of resources and ensuring the availability of recycling services for all segments of the population.

5. Global and Local Dimension:

The recycling strategy has a global character in solving the problem of waste and environmental protection. At the same time, local initiatives allow taking into account the unique characteristics of different regions, their infrastructure and consumer habits, contributing to a more effective solution to specific problems.

6. Implementation of Circular Economy Principles:

The principle of the circular economy involves the creation of an economic system in which resources are used as efficiently as possible and without loss. Waste becomes a resource that is returned to production, which reduces the need for new materials and reduces the impact on natural ecosystems.

These principles are the guiding principles of the recycling strategy and determine its environmental, social and economic efficiency.

In the modern context of the cardboard and paper industry, recycling requires not only effective processing technology, but also careful organization of logistics processes. Logistics, in the context of recycling, becomes a key element that determines the quality and efficiency of the use of secondary raw materials. Below, we will take a closer look at the impact of logistics on recycling and possible ways to optimize these processes (Fig 1.4).

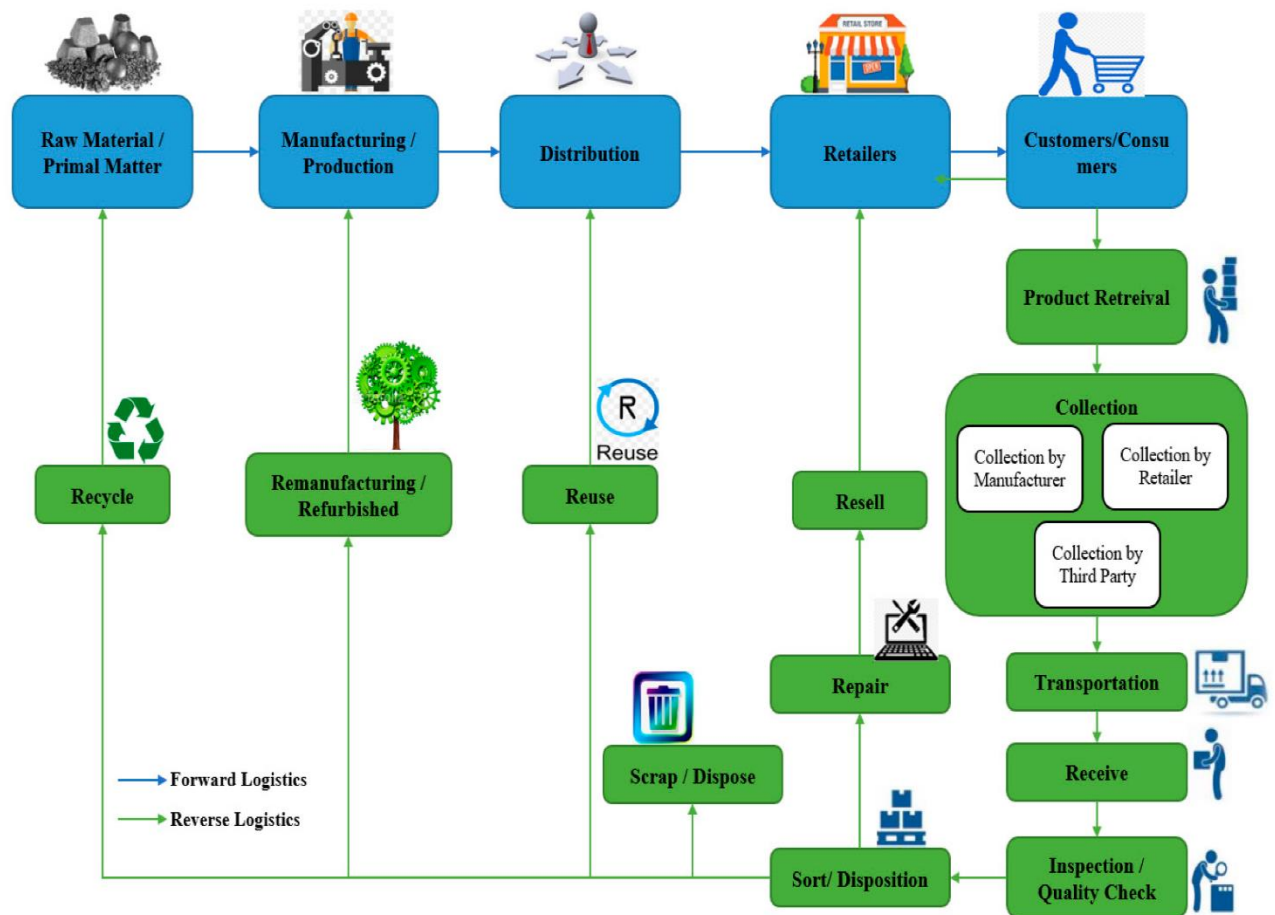


Figure 1.4 – Logistics in the recycling system [15]

1. Collection and Sorting of Waste: Optimization of Primary Links

Logistics in recycling begins with the phase of waste collection and sorting. It is important to implement optimal waste collection routes, ensuring maximum coverage of the territory with minimal transport costs. Effective logistics also includes improved sorting at collection points to maximize the recovery of secondary materials and reduce the volume of unused waste.

2. Transportation and Transportation: Emissions Reduction and Efficiency

One of the main requirements for logistics in recycling is to minimize the environmental footprint of waste transportation. The use of environmentally friendly vehicles and the improvement of transport routes are key aspects. The development of integrated logistics systems that take into account not only the efficiency of delivery, but also emissions, may be appropriate to ensure the sustainable transportation of recyclable materials.

3. Processing and Production: Cycle Optimization

Logistical challenges in recycling also apply to the processing and production phases. It is important to ensure the efficient flow of secondary raw materials through production lines, minimize storage time and optimize production processes to meet market requirements. It also includes improving tracking and control systems to be able to respond effectively to changes in consumer demand and choices.

4. Secondary Distribution and Consumption: Market Stimulation

Logistics in recycling is also important at the stage of secondary distribution and consumption. An optimized system of delivery of secondary materials to manufacturers and end consumers will determine the efficiency of the secondary raw materials market. Here it is important to take into account the environmental aspects of the choice of materials and to stimulate the demand for secondary products among manufacturers.

5. Reverse Chain: Implementation of Circular Economy Principles

The logistical aspects of recycling are related to the reverse chain, where secondary materials are returned to the system. This includes improving the system of collecting secondary raw materials from consumers and developing take-back programs. Logistics in this context aims to ensure the maximum amount of secondary raw materials that can be used for new products.

6. Technological Innovations in Recycling Logistics: Implementation of Intelligence and Automation.

The introduction of modern technologies in recycling logistics, such as artificial intelligence systems and automated processes, can greatly facilitate and improve the management of all stages of the recycling cycle. The use of sensors to track the movement of secondary raw materials and optimize transportation routes is becoming an important part of modern logistics practices.

Logistics in the recycling system requires an integrated approach and the implementation of modern technologies. Optimizing each stage of the logistics chain helps to increase the efficiency of recycling and ensures the sustainability of the management of secondary raw materials. Taking into account environmental aspects

and improving logistics technologies can determine success in implementing the principles of the circular economy in the cardboard and paper industry.

1.3 Specifics of recycling at enterprises of the cardboard and paper industry

In today's world, where there is a growing awareness of the need to conserve natural resources and reduce the impact on the environment, recycling plays an important role in sustainable development. The cardboard and paper industry, which is based on the use of valuable forest resources, has a significant potential for the implementation of recycling processes and the use of secondary raw materials. In this study, we will consider the specifics of recycling at enterprises of the cardboard and paper industry, focusing on the processes of collection, processing and use of secondary raw materials.

1. Collection of secondary raw materials.

The first stage of recycling at enterprises of the cardboard and paper industry is the collection of secondary raw materials. Typically, this process takes place through specialized collection systems that include waste containers located in streets, industrial areas, offices and public spaces. In addition, paperboard companies can enter into agreements with specialized subcontractors to collect recyclables directly from their industrial sites.

The collection of recyclable materials can include different types of paper and cardboard, such as used packaging, newspapers, magazines, boxes, etc. To ensure efficient collection of recyclable materials, cardboard and paper companies cooperate with local authorities, public organizations and the population, conducting educational work on the importance of separate collection of waste.

2. Processing of secondary raw materials.

After collecting secondary raw materials, the next step is its processing at specialized enterprises. Recycling of secondary raw materials includes processes such as sorting, cleaning, grinding and recovery of fibers.

Sorting is a process in which recycled materials are separated into different types of paper and cardboard, taking into account their characteristics, for example, color, thickness and composition. This helps enterprises to prepare the material for further processing.

After sorting, the secondary raw materials undergo a cleaning process in which impurities such as metal particles, plastic and other unwanted materials are removed from it. This ensures high quality of secondary raw materials before further processing.

Grinding is the next stage of processing, during which the secondary raw materials are ground into fibers. This process may involve bed mills, mechanical mills, or chemical methods, depending on the type of feedstock and end product requirements.

After grinding, the fibers undergo a recovery process. This means that they are chemically treated to remove paint, glue and other contaminants. The fibers can then be mixed with fresh pulp to create new raw materials for paper and board production.

3. Use of secondary raw materials.

Recycled cellulose obtained from secondary raw materials is used for the production of various types of paper and cardboard. Cardboard and paper companies use recycled materials to produce packaging, cardboard boxes, corrugated cardboard, magazines, newspapers, stationery and much more. The use of secondary raw materials has several advantages. First, it allows you to save natural resources, as less wood is needed to produce paper from recycled materials. Second, recycling helps reduce the amount of waste that ends up in landfills, helping to reduce the negative impact on the environment. In addition, the use of secondary raw materials can be economically beneficial, as they are cheaper than fresh pulp.

4. Challenges and Innovations in Recycling.

While recycling in the cardboard-paper industry offers numerous benefits, there are also challenges that need to be addressed. One of the main challenges is the presence of contaminants in the recycled materials. Contaminants can include plastic films, adhesive residues, and other non-paper materials. These contaminants can negatively affect the quality of the recycled pulp and the final paper products. To overcome this challenge, recycling facilities employ advanced sorting technologies and manual inspection processes to remove contaminants and improve the purity of the recycled materials.

In recent years, there have been notable innovations in recycling technologies. For instance, advancements in paper deinking processes have improved the ability to remove ink and coatings from recycled paper. This allows for higher-quality recycled pulp, which can be used to produce a wider range of paper products. Additionally, research is being conducted to develop more efficient pulping methods that require less energy and water consumption, further reducing the environmental impact of the recycling process.

5. Environmental Impact and Sustainability.

Recycling in the cardboard-paper industry plays a significant role in reducing the environmental impact of the sector. By utilizing recycled materials, companies can reduce their reliance on virgin fibers sourced from forests, preserving valuable natural resources and habitats. Recycling also helps minimize the energy consumption and greenhouse gas emissions associated with the production of paper from virgin fibers. Additionally, recycling diverts waste paper from landfills, reducing the generation of methane, a potent greenhouse gas, during decomposition.

To enhance the sustainability of recycling operations, companies in the cardboard-paper industry are increasingly adopting circular economy principles. This involves designing products and packaging with recyclability in mind, using eco-friendly and easily separable materials. Furthermore, collaboration among stakeholders, including manufacturers, consumers, and waste management entities, is crucial to establishing efficient recycling systems and promoting a culture of responsible waste management.

6. Regulatory Framework and Government Initiatives.

Government regulations play a vital role in promoting and regulating recycling practices in the cardboard-paper industry. Many countries have implemented legislation to encourage recycling, including setting recycling targets, imposing waste disposal fees, and providing incentives for the use of recycled materials. These regulations create a favorable environment for businesses to invest in recycling infrastructure and technologies.

Government initiatives often involve partnerships with industry associations, waste management organizations, and recycling facilities. They aim to educate the public about the importance of recycling, improve collection systems, and support research and development efforts in recycling technologies.

7. Market Demand and Economic Benefits.

Recycling in the cardboard-paper industry is driven by both environmental considerations and market demand. There is a growing global demand for sustainable packaging solutions, and recycled cardboard and paper products are an attractive option for businesses and consumers looking to reduce their environmental footprint. As a result, companies engaged in recycling cardboard and paper can benefit economically by meeting this demand and offering environmentally friendly alternatives to traditional packaging materials.

Moreover, the recycling industry contributes to job creation and economic growth. Recycling facilities require a skilled workforce for operations such as collection, sorting, processing, and quality control. Additionally, recycling operations generate revenue through the sale of recycled materials, which can be used to support further investments in recycling infrastructure and technologies.

8. Life Cycle of Recycled Cardboard and Paper Products.

The life cycle of recycled cardboard and paper products typically involves several stages. It begins with the collection of used cardboard and paper materials, which are then sorted and processed at recycling facilities. During the processing stage, the materials are pulped, cleaned, and deinked to remove contaminants and

create a pulp suitable for papermaking. The pulp is then used to manufacture new cardboard or paper products.

Once the recycled cardboard or paper products are manufactured, they enter the market and are used by consumers or businesses. After their useful life, these products can be collected and recycled again, continuing the cycle. It's important to note that not all cardboard and paper products can be recycled indefinitely due to the degradation of fibers during the recycling process. However, the recycling process can typically be repeated multiple times before the fibers become too short and lose their strength.

9. Consumer Participation and Awareness.

Consumer participation and awareness are crucial for the success of recycling in the cardboard-paper industry. Effective recycling relies on individuals and businesses properly separating and disposing of their cardboard and paper waste in dedicated recycling bins. It is essential to educate the public about the importance of recycling, the correct procedures for sorting materials, and the environmental benefits of using recycled products.

To encourage consumer participation, many communities and municipalities have implemented comprehensive recycling programs that provide convenient recycling collection services and educate residents about recycling practices. Additionally, businesses can play a role by adopting sustainable packaging practices and using recycled cardboard and paper products in their operations.

10. Future Outlook and Innovations.

The future of recycling in the cardboard-paper industry looks promising, with ongoing efforts to improve recycling technologies and increase recycling rates. Researchers and engineers are continuously exploring innovative methods to enhance the efficiency of the recycling process, such as developing new sorting techniques, improving pulping processes, and finding ways to recycle more challenging materials, including laminated or coated cardboard and paper.

Advancements in digital technologies, such as artificial intelligence and machine learning, are also being utilized to optimize recycling operations and

improve the accuracy of sorting and quality control processes. These technologies can help increase recycling rates, reduce contamination, and streamline the overall recycling workflow.

Furthermore, as sustainability becomes a more significant concern for consumers and businesses, there is a growing focus on reducing overall packaging waste through initiatives like light weighting packaging and promoting reusable alternatives. These efforts aim to minimize the reliance on single-use cardboard and paper products and encourage the adoption of more sustainable packaging practices.

In conclusion, recycling in the cardboard-paper industry is a dynamic and evolving process that offers numerous environmental and economic benefits. Through continued innovation, increased consumer awareness, and collaboration among stakeholders, the industry can further improve recycling rates and contribute to a more sustainable future.

Chapter 1 summary

Chapter 1 explores various aspects related to recycling and the pulp and paper industry. At the beginning of the chapter, the classification of waste into solid/liquid and industrial/household is given. It is noted that recycling strategies are aimed at maximizing the reuse of waste as secondary raw materials and reducing the negative impact on the environment. Next, the key principles of the recycling strategy are discussed, which include: closed resource cycles, environmental synergy with natural processes, the introduction of innovative solutions and technologies, taking into account social and economic aspects.

Special attention is paid to logistics processes in the recycling system. Efficient logistics is key at all stages of the chain - from waste collection to the final consumption of recycled products, including optimizing transportation and establishing reverse flows.

The following discusses the features of recycling at pulp and paper industry enterprises. It is noted that recycling in this industry includes the collection, sorting, cleaning and processing of secondary raw materials for the production of new products. This allows us to significantly save forest resources and reduce the load on landfills by redirecting waste, as well as meet the demand in the market for environmentally friendly goods.

The chapter concludes by suggesting that while there are a number of challenges associated with contaminants and quality control, the development of innovative technologies such as artificial intelligence and machine learning, as well as government regulation and consumer participation, can significantly improve the situation. Overall, recycling plays an important role in the pulp and paper industry's transition to sustainable development by significantly reducing its negative impact on the environment.

CHAPTER 2

MARKET RESEARCH OF THE CARDBOARD AND PAPER INDUSTRY OF UKRAINE AND PROSPECTS FOR IMPLEMENTATION OF RECYCLING

2.1 Analysis of the cardboard and paper industry market situation in Ukraine and in the world

The Confederation of European Paper Industries (CEPI) publishes an industry overview every year. Let's analyze the situation in recent years.

According to the data, the production of paper and board in CEPI member countries fell by 5.9% in 2022 compared to the previous year, reflecting the significant impact on the industry of high energy prices and a sharp slowdown in the growth rate of the European economy in the second half of last year. The total volume of production in 2022 reached 84.8 million tons, while a decrease was registered for almost all grades of paper and cardboard, with the exception of household and sanitary grades (Fig. 2.1).

At the same time, paper consumption remains steady despite a slowdown in economic growth in the EU, whose GDP grew by 0.3% in the third quarter and stagnated in the final quarter of 2022, according to the latest estimates. The EU economy is now forecast to grow by just 0.8% in 2023 and 1.6% in 2024.

The gap between declining production and stable consumption led to a sharp deterioration in the paper trade balance. At the same time, a decrease in production was also observed in the world's largest producing countries. Canada, Japan, the United States and South Korea recorded declines in paper production ranging from 0.5 to 3.5%. In Europe, the downward trend can be explained by a number of factors, the main of which is the cost of energy, due to which many factories are forced to temporarily stop their machines.

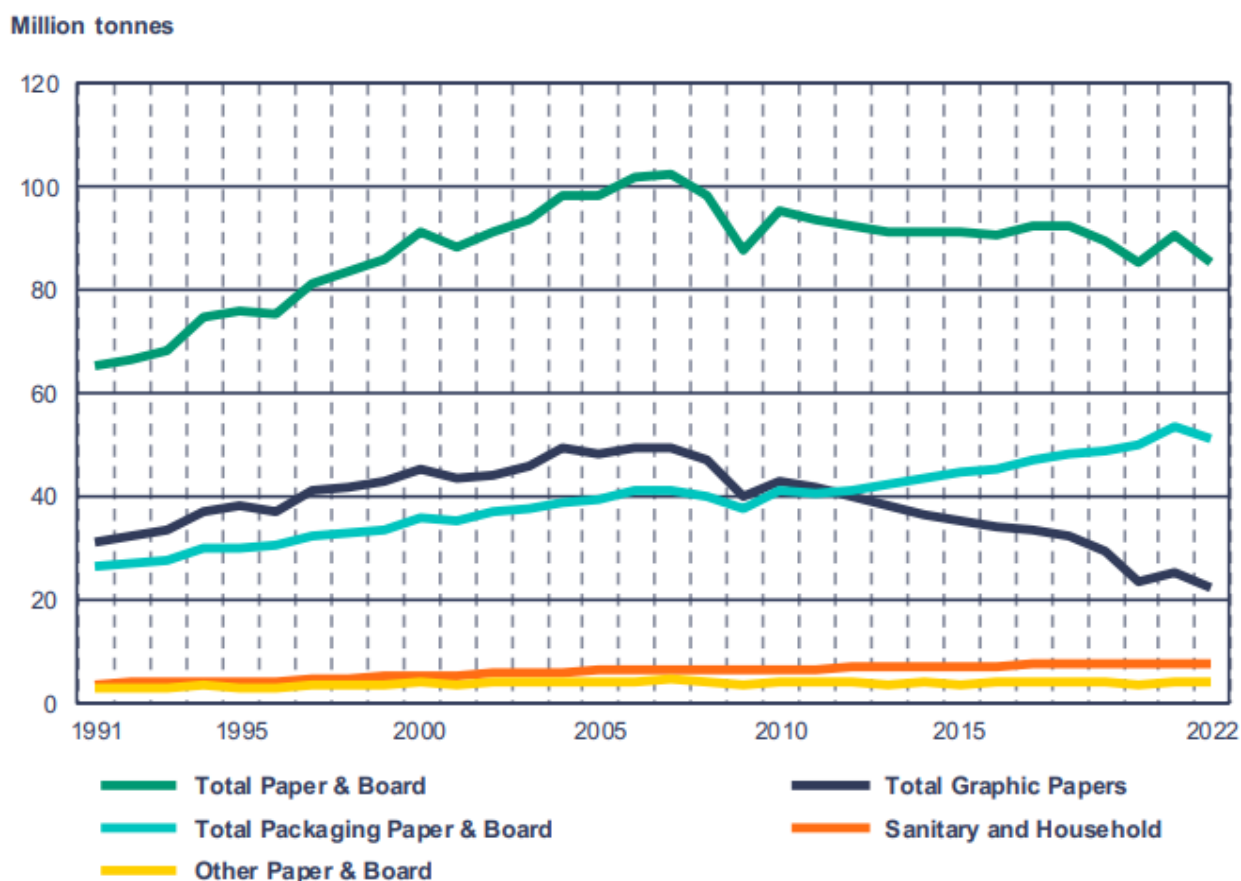


Figure 2.1 – Production of paper and board in Cepi countries in 2022 [10]

As for individual paper grades, in 2022, the structural divergence in the production trends of printing and packaging paper, as well as sanitary and household paper, and household paper remained (Fig. 2.2). The use of recycled paper by companies in the geographical area covered by CEPI's members has decreased by 6.4% compared to 2021. High electricity and gas prices have had a significant impact on refineries and non-integrated paper mills, particularly in the second half of 2022. Paper recycling in Europe is even greater than before: 96% of European paper for recycling is recycled by European paper mills, while exports have fallen by almost 10%, partly due to continued restrictions in Asia.

According to the latest data, the total consumption of paper and board in the CEPI countries in 2022 remained stable compared to 2021. This was helped by the favorable economic situation observed in the first half of the year, which was followed by a sharp slowdown in the economy in the second half of the year.

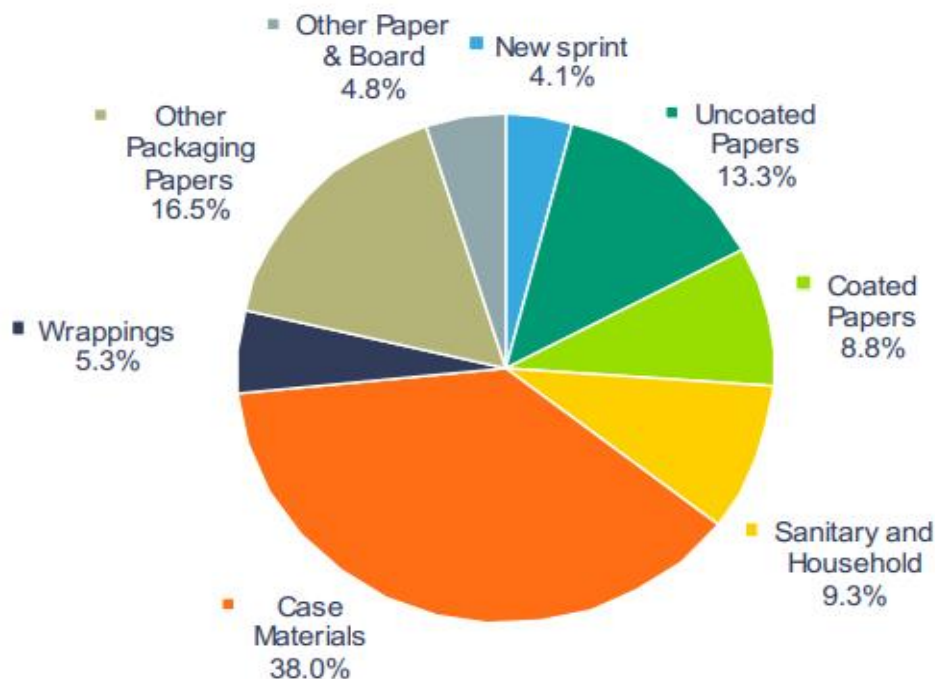


Figure 2.2 – Production of paper and board by grade in Capi countries in 2022
[10]

Demand for printing paper remained negatively impacted in 2022 (–1.8%) due to lower demand seen in printing and publishing. Demand for packaging paper and board remained relatively stable (+0.5%), based on data available for the first 9 months of last year.

According to estimates, the production of packaging materials decreased by 4.6% compared to 2021.

In the packaging categories, box materials, which are mainly used for transport packaging and corrugated boxes, recorded a decrease of 4.8%. The production of cardboard and other packaging cardboard, which is mainly used for retail packaging, decreased by 4.1%. The production of packaging materials used to make paper bags decreased by 5.2%. Packaging stamps account for 59.8% (59.1% in 2021) of the total volume of paper and cardboard production, printing stamps account for 26.1% (27.7% in 2021). The output of other types of paper and cardboard – mainly for technical and special purposes – decreased by 6.1%, their share in the total volume of paper and cardboard production was 4.8%.

The production of sanitary paper increased by about 2.2% compared to 2021, to a level close to that reached during the COVID crisis, and accounted for 9.3% of the total production of paper and paperboard. Production of printing stamps decreased by 11.3%. After the upswing in 2021, it looks like there is now a downward trend. Newsprint production decreased by 9.9%, while printing and writing paper production decreased by 11.5% due to machine closures and conversions. Paper production used for magazines and catalogs, direct mail, directories, etc. declined at different rates depending on the specific categories. Production of coated mechanical paper and uncoated mechanical paper decreased by 19.5% and 13.2%, respectively. Non-coated woodless grades – copy paper – fell in price by 5.8%, and coated woodless – by 12.0%.

Overall, this means that the production of coated and uncoated printing paper decreased by 15.8% and 8.5% respectively. The production of wood-free graphics decreased by 8.0%, and the production of machine printing – by 16.3%.

Based on aggregated data, it was found that total paper and board shipments for 2022 decreased by 3.3% compared to 2021, and exports to non-Cepi countries decreased by 13.3%. This reflects last year's decline in paper production in Europe, which particularly affected exports, as well as the global slowdown in economic growth. By the end of September 2022, the supply of printing stamps decreased by 10.1%, while the supply of packaging stamps decreased slightly by 1%.

According to a report published by the European Paper Recycling Council (EPRC), we can say that the paper value chain is still on track to achieve a 76% paper recycling rate. This goal should be achieved by 2030. However, paper recycling already surpasses all other materials in terms of recycling and sets the standard for the rest of the world.

A comparative analysis of paper recycling and paper consumption is presented in Fig. 2.3. In 2021, the European paper value chain committed to recycle 76% of all paper consumed by 2030, i.e. a «recycling rate» target of 76% was set.

PAPER RECYCLING VS PAPER CONSUMPTION

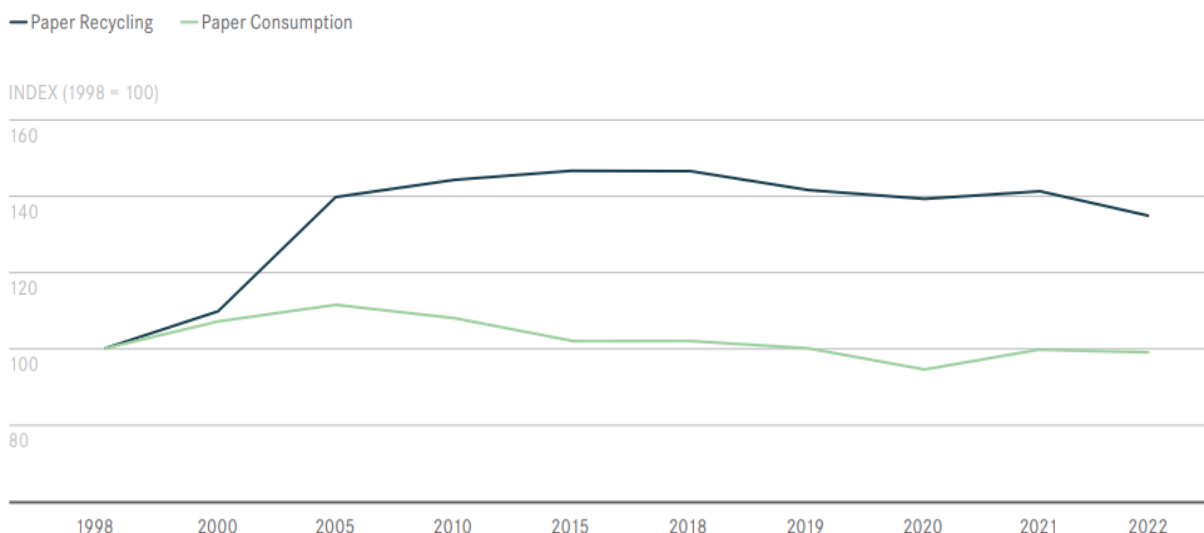
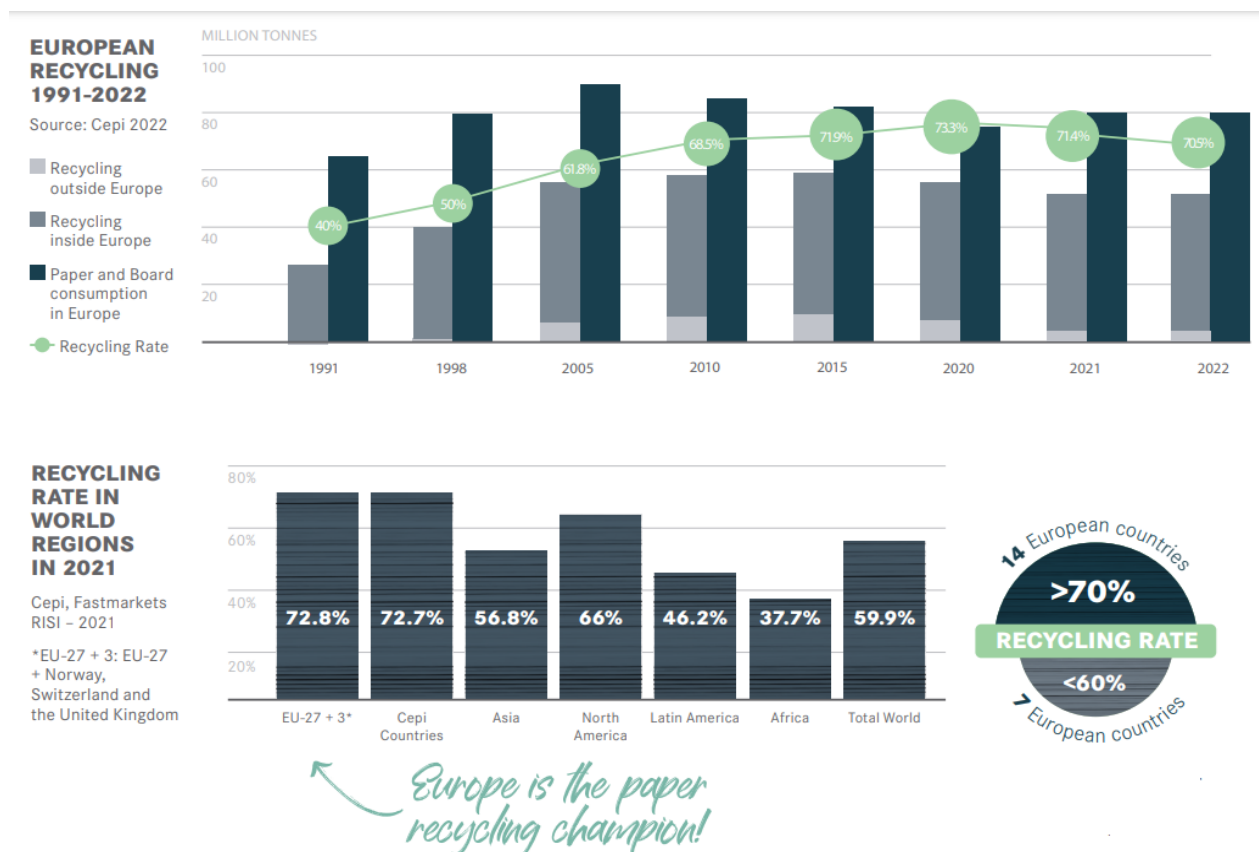


Figure 2.3 – Comparative analysis of paper recycling and paper consumption

The recycling ratio is defined as the ratio between the recycling of used paper, which includes the net trade of paper for recycling, and the consumption of new paper and board (Fig. 2.4).



Europe is the paper recycling champion!

Figure 2.4 – Recycling rates [8]

Paper recycling is an industry that can be called "made in Europe" because the collection, sorting and recycling usually takes place on site. This is the result of significant industry investments over many years, estimated at several billion euros.

Based on the results of the analysis, the recycling rate decreased compared to 2021, although by less than one percentage point. This evolution is explained, in addition to the decrease in production, by record high electricity and gas prices, which disproportionately affected paper recycling enterprises. The current recycling rate is 70.5%. But this level puts Europe far ahead of the rest of the world. The average global recycling rate was 59.9% in 2021.

In order to increase the quantity and efficiency of paper recycling, the value chain is actively working towards several «quality goals». These primarily include instructions on how to introduce separate collection of paper for recycling, which would be the best way to improve recycling. Second, it concerns eco-design projects to increase the recyclability of paper products and educational campaigns for the public.

Another initiative is the cross-industry alliance 4evergreen, which offers industry guidance on harvesting methods and sustainable design. Its aim is to increase the contribution of fiber-based packaging to the circular bioeconomy and to represent some of the biggest companies worldwide, demonstrating Europe's potential for global leadership in recycling and the ongoing transition to a more climate-compatible economy.

The modern pulp and paper industry of Ukraine can be conditionally divided into two groups according to the types of raw materials used by the latter. The role of the first group is to create a complete raw material for the industry – cellulose.

The basis for the production of cellulose is wood of both coniferous and deciduous species. The main ways of processing wood into cellulose are the sulfate process and sulfite cooking. Pulp production in Ukraine is carried out by PJSC «Zhydachiv pulp and paper mill», JSC «Izmail pulp and paperboard mill» and JSC «Lutsk cardboard and roofing material plant». The role of the second group consists in the reuse of polymer raw materials as an alternative to cellulose – waste paper – secondary plant fiber.

Recycling of waste paper in Ukraine is carried out by «Kyiv Cardboard and Paper Mill», LLC «Poninkivska Cardboard and Paper Factory – Ukraine», «Malynska Paper Factory – Weidmann», «Cardboard and Paper Company», LLC «Dnipropetrovsk Paper Factory» and others enterprises, they are united together by a national association «Ukrpapyr». It is known that the pulp and paper industry is extremely water-intensive – on average, 1 ton of paper consumes up to 60 m³ water. It is important to note that wastewater from enterprises (especially cardboard and paper) always contains fibers, so the technological scheme for their treatment is designed in such a way as to ensure the removal of foreign substances and compounds, in particular, fibers of plant polymers, in order to comply with the established levels of MPC. One of the compounds removed from sewage treatment plants is fibrous scum.

Waste from the pulp industry of Ukraine.

To analyze the generation of waste from the pulp industry, consider the technological process of pulp production in Ukraine, which, as a rule, is reduced to the following stages:

- wood preparations of coniferous and deciduous tree species;
- wood processing into technical chips;
- pulp cooking;
- preparation of chemical reagents and their subsequent regeneration
- reuse;
- industrial wastewater treatment.

During the harvesting and processing of wood, waste is generated, including branches and tops of trees, trunks, bark and sawdust. All the mentioned wastes are full-fledged raw materials, therefore they are fully processed by the woodworking industry enterprises.

During the pulping process, uncooked pulp is formed, which contains impregnations of resin, coarse fibers and mineral impurities in the form of sand, etc. According to the State Statistics Service, it was established that in 2018, 2,194.86 tons of undigested waste, which cannot be used as intended, was stored in landfills.

During the preparation of chemical reagents for cooking pulp liquid aggressive compounds are formed, which are subsequently recovered for reuse in the technological process. The largest amount of waste in the production of cellulose is generated as a result of wastewater treatment, including garbage retained by the grates of the mechanical sewage treatment system, sediment from sand traps and excess activated sludge of the biological sewage treatment system. Garbage includes large plastic, glass, rags, metal inclusions, etc. Sediment from sand traps contains stones, sand and organic matter. According to the data, it was established that in 2020, up to 8,361.43 tons of 17 wastewater treatment wastes and up to 122.9 tons of excess activated sludge were generated and transported to landfills (including cardboard and paper industry enterprises).

Thus, in 2020, 10,679.191 tons of industrial waste were stored at the industrial landfills of Ukraine as a result of the activities of pulp industry enterprises.

In the Table 2.1 shows the percentage content of extraneous inclusions contained in secondary raw materials.

Table 2.1 – Waste paper and its extraneous inclusions

№	Name of inclusion	Content, %
1	2	3
1	Wastepaper	87
2	Textile	5
3	Organic substances	4,4
4	Films	2,2
5	Plastic	0,6
6	Metal	0,5
7	Wood	0,2
8	Others	0,1

Unlike the pulp industry, the cardboard and paper industry is focused on the processing of secondary raw materials, which causes the formation of a larger amount of production waste compared to the first group of enterprises. The main feature of secondary raw materials is that they have undergone a complete recycling cycle at least once. It is known that the recycling of waste paper is characterized by a partial loss of paper-making properties, which manifests itself in the shortening of fibers, a decrease in the ability to swell, a partial loss of elasticity, etc. This implies the impossibility of processing secondary raw materials an infinite number of times.

A significant feature of waste paper is the presence of so-called pollution – substances of a non-fibrous nature.

2.2 Analysis of the activity of «Kyiv Cardboard and Paper Mill»

The history of the «Kyiv Cardboard and Paper Mill» (KCPM) is rich and fascinating, given the significant role that this combine plays in the Ukrainian and global paper industry. This history, which began over half a century ago, represents a journey of development and a commitment to quality and improvement (app. A) [9].

Foundation and Early Years (1962-1980s).

KCPM was founded in 1962 in Kiev, Ukrainian SSR. At that time, it was one of the key enterprises in the Soviet paper and packaging industry. The initial stage of its development involved the construction of a massive production complex, including paper and cardboard workshops, packaging lines, and warehouses.

From its early days, KCPM focused on producing high-quality paper and cardboard materials for various sectors of the economy. This included the production of packaging for food, pharmaceuticals, textiles, as well as various paper products.

Development and Modernization (1980s-2000s).

In the 1980s and 1990s, KCPM continued to grow and modernize actively. Production capacities were expanded, and new technologies were introduced into the

manufacturing process. This allowed for increased production and improved product quality.

KCPM also began actively working on improving its environmental performance, which became an important aspect in the context of sustainable development. One of the key achievements was the adoption of more efficient and environmentally friendly raw material processing technologies, reducing the negative impact on the environment.

Market Development and Product Range Expansion (2000s-2010s).

In the early 2000s, KCPM actively engaged with new markets and aimed to diversify its product range. This included the development and production of new types of packaging, as well as more environmentally friendly and innovative materials.

One significant milestone was obtaining quality and compliance certificates with international standards, enabling KCPM to enter the global market with high-quality paper products.

Present Day (2010s-Present).

Today, KCPM continues its operations as one of the leading enterprises in the Ukrainian and international paper and packaging industry. The combine actively invests in modern technologies, production automation, and the development of new materials.

Environmental sustainability and responsibility remain integral parts of its business strategy, and KCPM strives to reduce its negative impact on the environment by implementing efficient waste disposal methods and reducing resource consumption.

The combine also collaborates actively with various sectors of the economy, providing them with innovative packaging solutions and paper materials. This enables KCPM to remain at the forefront of development and continue as a key player in the global paper and packaging industry.

In conclusion, the history of the Kiev Cardboard and Paper Combine reflects its continuous adaptation to changing market conditions and its commitment to product quality, sustainable development, and the adoption of new technologies. This combine

remains a key participant in the Ukrainian and global paper and packaging industry, contributing to economic development and the principles of sustainable growth.

Information about the activities and the main products of the Kiev Cardboard and Paper Combine (KCPM) includes the following aspects:

Main Activities of KCPM:

1. Production of Paper and Cardboard Materials: KCPM specializes in the production of a wide range of paper and cardboard materials, including:

- printing and writing paper;
- packaging cardboard;
- boxes and containers of various sizes and shapes for packaging food products, goods, and industrial items;
- paper products such as notebooks, diaries, books, magazines, and other printed materials;
- specialized paper and cardboard materials for specific industrial and technical purposes.

2. Packaging Solutions: KCPM provides a wide range of packaging solutions, including various types of boxes, packaging materials, and containers suitable for the food industry, pharmaceuticals, household chemicals, textiles, and other industries.

3. Innovation and Development of New Materials: KCPM actively incorporates new technologies and innovative materials into its production. This may include the development of more environmentally friendly materials and packaging, as well as adaptation to changing consumer demands and market trends.

Main Products of KCPM:

1. Packaging Cardboard: KCPM produces various types of packaging cardboard used to create boxes and containers for packaging products from various industries.

2. Paper: The combine produces paper of different quality and texture, intended for both office use (printing, copying) and the production of printed materials.

3. Food Packaging: KCPM offers packaging solutions for food products, including pizza boxes, corrugated trays, fast-food packaging, and others.

4. Specialized Solutions: The combine develops and produces specialized paper and cardboard materials tailored to the needs of clients in various industries.

5. Paper Goods: KCPM can manufacture various paper goods such as notebooks, diaries, books, and magazines.

6. Environmental Packaging Solutions: Considering the relevance of environmental issues, KCPM develops and produces environmentally sustainable packaging materials and containers.

It is important to note that the «Kyiv Cardboard and Paper Mill» caters to both the domestic market in Ukraine and the global market, providing its products and packaging solutions to customers worldwide.

A SWOT analysis is a strategic tool employed to gauge a company's competitive standing and formulate strategic plans. This framework evaluates both internal and external factors, as well as current and future possibilities.

SWOT analysis aims to provide an objective, data-driven assessment of an organization's strengths and weaknesses, whether within the company itself, its initiatives, or its industry. It's crucial to maintain the accuracy of the analysis by steering clear of preconceived notions or vague assessments and instead grounding it in real-world scenarios. Businesses should view it as a helpful guideline rather than a rigid formula.

SWOT analysis of «Kyiv Cardboard and Paper Mill» is presented in Table 2.2.

Certainly, let's expand on each recommendation to provide a more comprehensive perspective:

1. Quality Assurance:

- continuously invest in quality control processes and technologies to maintain and enhance the high quality of your paper and cardboard products;

- conduct regular quality audits and seek feedback from customers to identify areas for improvement;

- train and empower employees to take ownership of quality control at every stage of production.

Table 2.2 – SWOT analysis of «Kyiv Cardboard and Paper Mill»

	Strengths	Weaknesses	
Strengths	<p>1. High-Quality Products: KCPM is known for its reputation as a producer of high-quality paper and cardboard products.</p> <p>2. Localization: The combine is located in Ukraine, providing access to local raw materials and markets.</p> <p>3. Technological Capabilities: KCPM likely possesses modern equipment and technologies for the production of paper and cardboard products.</p> <p>Resilience to Currency Fluctuations: Being in Ukraine, KCPM may be less exposed to currency risks compared to companies dealing in foreign currencies.</p> <p>4. Local Markets: KCPM can use Ukraine as a testing ground for new products and ideas before scaling them to international markets.</p>	<p>1. Dependency on Raw Materials: If KCPM depends on imported raw materials, it may become vulnerable to fluctuations in global commodity prices.</p> <p>2. Economic Instability: Ukraine may be subject to economic instability, which could affect KCPM's financial position.</p> <p>3. Competition: KCPM faces competition from other paper and cardboard product manufacturers in both local and global markets.</p>	Weaknesses
Opportunities	<p>1. Export: KCPM can explore opportunities to increase exports of its products to international markets.</p> <p>2. Innovation: Developing new products and technologies can help KCPM remain competitive.</p> <p>3. Environmental Sustainability: The growing interest in environmentally friendly products presents opportunities for KCPM to implement eco-friendly standards.</p>	<p>1. Competition: Intense competition in the paper and cardboard product market may put pressure on prices and profitability.</p> <p>2. Legislative Changes: Changes in tax or trade legislation may impact KCPM's operations.</p> <p>3. Rising Energy Prices: Increases in the cost of energy resources could affect production costs.</p> <p>4. Environmental Threats: KCPM may face threats from stringent environmental regulations and requirements.</p>	Threats

2. Diversify Raw Material Sources:

- explore multiple suppliers for raw materials, both locally and internationally, to reduce dependence on a single source;
- develop strategic partnerships with suppliers to secure stable and cost-effective access to raw materials;
- monitor commodity markets to make informed decisions on sourcing based on price trends.

3. Market Expansion:

- conduct thorough market research to identify potential international markets that align with your product offerings;
- develop market-specific strategies, including pricing, distribution, and marketing, to effectively penetrate new markets;
- consider establishing local distribution centers or partnerships to streamline access to international customers.

4. Innovation and R&D:

- allocate resources to research and development efforts to foster innovation in product design, materials, and production processes;
- encourage cross-functional collaboration and idea-sharing among employees to drive innovation;
- stay updated on industry trends and emerging technologies to identify opportunities for product improvement.

5. Environmental Sustainability:

- implement sustainable practices such as recycling, waste reduction, and responsible sourcing of materials;
- certify your products with recognized environmental labels or certifications to demonstrate your commitment to sustainability;
- communicate your eco-friendly initiatives to customers and stakeholders to build trust and loyalty.

6. Cost Management:

- regularly assess production costs, including energy consumption, labor, and raw materials, to identify areas for cost reduction;
- invest in energy-efficient technologies and processes to minimize energy expenses;
- implement lean manufacturing principles to optimize resource utilization and reduce waste.

7. Risk Management:

- diversify geographically to reduce exposure to political and economic instability in a single region;
- establish a risk management team to identify potential risks, develop mitigation plans, and regularly review their effectiveness;
- maintain a financial reserve or contingency fund to address unexpected challenges or disruptions.

8. Legislative Compliance:

- stay informed about changes in tax laws, trade agreements, and environmental regulations that may impact your operations;
- work closely with legal and compliance experts to ensure full adherence to all relevant legislation;
- maintain transparency and openness in dealings with government agencies to build a positive regulatory relationship.

9. Customer Focus:

- implement a customer relationship management (CRM) system to track customer interactions and preferences;
- actively seek customer feedback through surveys and direct communication;
- develop a responsive customer service team to address inquiries, complaints, and requests promptly.

10. Training and Development:

- establish regular training programs to upskill employees and keep them informed about industry advancements;

- encourage employees to pursue professional development opportunities relevant to their roles;
- foster a culture of learning and innovation within the organization.

11. Monitoring and Metrics:

- define and track key performance indicators (KPIs) for logistics and production processes, such as delivery timeliness, waste reduction, and energy efficiency;
- use data analytics tools to gain insights from KPIs and identify areas that require improvement.;
- implement a continuous improvement approach to enhance operational efficiency over time.

12. Environmental Responsibility:

- develop a comprehensive sustainability strategy that includes goals and targets for reducing the company's environmental footprint;
- engage with environmental organizations or initiatives to showcase your commitment to eco-conscious practices;
- communicate your sustainability efforts through marketing campaigns and product labeling to raise awareness among customers.

These recommendations, when tailored to KCPM's specific circumstances, can help the company navigate challenges and capitalize on opportunities for growth and sustainability in the paper and cardboard industry.

The basic activity data of «Kyiv Cardboard and Paper Mill» are presented in Fig. 2.5.

A company's economic indicators reflect its financial condition, productivity and overall efficiency. The main economic indicators for the company include the following:

Net Income: This is the amount of money a company has left over after deducting all expenses, taxes, and interest. Net profit is a key indicator of a company's financial health.

Sales volume (Revenue): This is the total income from the sale of goods or services. It can be broken down into different segments or geographic markets.

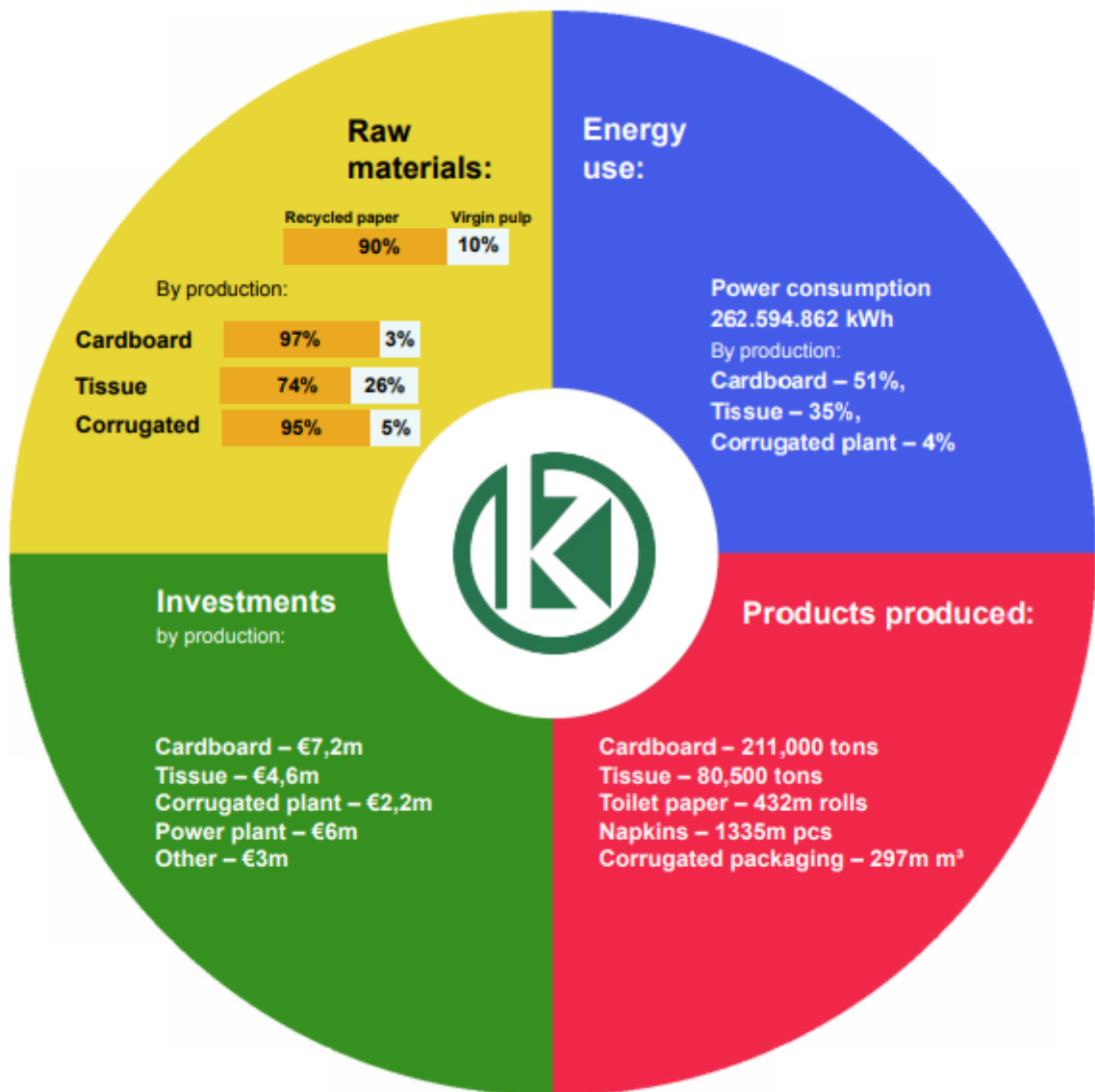


Figure 2.5 – The basic activity data of «Kyiv Cardboard and Paper Mill» [2, 9]

Gross Profit: This is the difference between sales revenue and costs of production or purchase of goods. This indicator indicates the efficiency of production.

Profitability: Profitability can be measured in various ways, such as return on assets, return on capital, return on sales, etc. It indicates how efficiently the company generates profit from invested capital.

Asset Turnover: This indicator indicates how efficiently the company uses its assets to generate income. It is calculated as the ratio of sales volume to total assets.

Net Working Capital: This is the difference between current assets and current liabilities. Indicates the financial liquidity of the company.

Debt-to-Equity Ratio: Indicates the degree of financial leverage of the company and its dependence on borrowed funds.

Return on Equity (ROE): This indicator indicates the profitability for the company's shareholders and investors.

Production/Service Volume: Important for manufacturing companies, this indicator indicates the amount of goods a company produces or services it provides.

Stock Price: The value of a company's shares on the stock market can be an important indicator of a company's financial health and investment attractiveness.

These indicators help company management and investors determine how well the company is meeting its financial goals and strategies, and they can be used to make decisions about the future development of the company.

Results of KCPM activities are presented in Table 2.3.

Table 2.3 – Results of KCPM activities

№	Indicator	2022	2021	Deviation 2021/2022
1	2	3	4	5
1	Net income from sales of sales products	6472462 UAH	6418457 UAH	+0.84%
2	Cost of goods sold	4983671 UAH	5169114 UAH	-3.58%
3	Gross profit	1488791 UAH	1249343 UAH	+19.16%
4	Operating result	693902 UAH	551470 UAH	+25.82%
5	Financial result before taxes	544355 UAH	557525 UAH	-2.36%
6	Net financial result	446959 UAH	455689 UAH	-1.91%
7	Elements of operating costs	6104568 UAH	5947421 UAH	+2.64%
8	Percentage Change= $\frac{\text{Old Value}-\text{New Value}}{\text{Old Value}} \times 100$			

Certainly, here are the recommendations based on the provided financial indicators of the Kyiv Cardboard and Paper Mill (KCPC) for 2021 and 2022:

- increase Net Income from Sales of Sales Products: A slight growth in net income by 0.84% indicates that KCPC is continuing to expand. To further increase profitability, consider strategies like market expansion or introducing new products and services;

- reduce Cost of Goods Sold: The reduction in the cost of goods sold by 3.58% suggests room for operational optimization. Explore opportunities to decrease costs, possibly through supply chain optimization or more efficient production technologies;

- enhance Gross Profit: The 19.16% growth in gross profit is positive. However, for long-term stability and growth, KCPC should focus on cost management and product quality control;

- improve Operating Result: The 25.82% growth in the operating result indicates more effective business management. Continue to enhance operational efficiency, potentially through cost reduction, productivity improvement, and process optimization;

- lower Financial Result Before Taxes: Despite the decrease in financial results before taxes by 2.36%, consider opportunities for further tax optimization to reduce this figure;

- decrease Net Financial Result: The 1.91% decrease in net financial results might result from various factors, including investments and financial strategies. Conduct a detailed analysis of financial operations to identify ways to increase net financial profit;

- increase Elements of Operating Costs: The 2.64% increase in elements of operating costs requires expense management attention. Conduct a more detailed analysis and identify specific areas where cost savings can be achieved.

In summary, KCPC has positive financial indicators. However, for long-term success, the company should continue working on optimizing operations, cost management, and developing a growth strategy.

2.3 Advantages of the Kyiv Cardboard and Paper Mill among competitors from Europe and Ukraine

Before 2022, the Kyiv Cardboard and Paper Mill (KCPM) in Ukraine had several competitors in the production of cardboard and paper products. Some of the well-known competitors of KCPM in Ukraine could have included the following companies:

1. Troyanda: This is one of the large companies specializing in the production of cardboard products, paper, and packaging materials in Ukraine.

2. MANI Print: This company is also a major player in the market for paper and cardboard products in Ukraine.

3. PAT "Kyivmiskbud": This is another well-known company that could compete with KCPM in the production of paper and cardboard packaging.

4. Photo Center "Mystets": This company specializes in the production and printing of paper products, including various types of packaging.

5. Paper-Service: The company was also active in the market for paper and cardboard products in Ukraine and could be considered a competitor to KCPM.

For a detailed comparison of the Kyiv Cardboard and Paper Mill (KCPM) with its competitors and an understanding of why it may be considered one of the best in Ukraine, various aspects need to be taken into account, such as product quality, technological capabilities, innovation, reputation, and other factors. Below are some possible differences and advantages of KCPM:

1. Product Quality: One of the key factors that can distinguish KCPM is the high quality of its cardboard and paper products. If the company is known for its reliable and high-quality products, it can attract customers and ensure loyalty.

2. Technological Capabilities: KCPM may have modern equipment and technological processes that allow it to produce products with higher efficiency and quality compared to competitors.

3. Innovation: The ability to innovate and develop new products or improve existing ones can give KCPM a competitive advantage.

4. Production Scale: If KCPM is a large enterprise with significant production capacity, it can offer more favorable conditions and prices to its customers.

5. Reputation and Brand: If KCPM has a good reputation and a recognizable brand, it can be an advantage in attracting customers and establishing long-term relationships.

6. Environmental Standards: If KCPM adheres to high environmental standards and cares about the sustainability of production, it can attract customers who value environmentally friendly products.

7. Customer Service: The quality of customer service, delivery times, and flexible collaboration terms can also play an important role in competitiveness.

8. Price and Pricing: KCPM may offer competitive prices and flexible pricing conditions, which can also impact its market position.

It's important to note that these factors can change over time, and KCPM's competitive advantage may depend on the current market situation and the company's strategic decisions.

The Kyiv Cardboard and Paper Mill (KCPM) could have several potential advantages over competitors from Europe or Ukraine, depending on specific aspects and the field of activity. Below are some possible advantages:

1. Localization: As a company in Ukraine, KCPM may have local advantages such as proximity to the market and customers, which can reduce logistics and delivery costs.

2. Understanding of Local Markets: KCPM likely has a deeper understanding of local markets, consumer preferences, and cultural nuances, allowing it to adapt its products and services more effectively to meet customer needs.

3. Pricing: KCPM may offer more competitive prices due to lower operating costs and more affordable labor resources in Ukraine compared to some European countries.

4. Resilience to Currency Fluctuations: Being located in Ukraine, KCPM may have an advantage in price stability and production costs, as its expenses in Ukrainian hryvnia may be less susceptible to foreign currency exchange rate fluctuations.

5. Regulations and Standards: KCPM can benefit from using Ukrainian regulations and standards, which may reduce administrative barriers and simplify business processes.

6. Environmental Standards: KCPM can adhere to local and international environmental standards, which can be important for customers who value environmental sustainability.

7. Local Networks and Connections: KCPM may have established business connections and partnerships at the local level, making it easier to access resources and markets.

However, the final outcome will depend on the specifics of KCPM's business model, strategy, and activities, as well as the particular competitors and their advantages. KCPM should actively leverage these advantages to build its competitiveness in the market.

Certainly, let's take a closer look at some of the potential advantages of the Kyiv Cardboard and Paper Mill (KCPM) over competitors from Europe and Ukraine:

1. Access to Ukrainian Raw Materials: Ukraine boasts abundant natural resources, including forests and cellulose. This can provide KCPM with access to raw materials on more favorable terms, potentially influencing production costs and pricing.

2. Infrastructure and Logistics: Ukraine has a well-developed infrastructure and a network of transportation routes, which can facilitate logistics and the distribution of products to both domestic and export markets.

3. Skilled Workforce: Ukraine possesses a skilled workforce, including in the field of paper and cardboard product manufacturing. This can provide KCPM with access to highly qualified talent.

4. Innovation and Technology: KCPM can collaborate with Ukrainian scientific and educational institutions for the development and implementation of new technologies and innovations, strengthening its competitiveness.

5. Flexible Strategy: Being a local company, KCPM may have a more flexible strategy, enabling it to adapt to changing market conditions and customer needs.

6. Customization: KCPM can offer customers individualized solutions and product customization, which can be important for clients with specific requirements.

7. Cultural Understanding: KCPM may have a better understanding of local nuances and consumer preferences, contributing to a more successful marketing strategy.

8. Ukrainian Market: KCPM can use Ukraine as a test market for new products and ideas before scaling them to international markets.

These advantages can play a significant role in KCPM's competitiveness, both within Ukraine and on the global market. However, success will depend on KCPM's ability to adapt to changing market conditions, invest in innovation, and effectively manage its resources and production processes.

2.4 Analysis of logistics at the «Kyiv Cardboard and Paper Mill»

Logistics in the paper industry, including the operations of the Kyiv Cardboard and Paper Mill (KCPM), plays a crucial role in ensuring efficient production and product delivery. Let's consider the key aspects of logistics in this industry using KCPM as an example:

1. Raw Material Procurement: The process begins with the procurement of raw materials such as cellulose and wood. This stage involves finding reliable suppliers and ensuring deliveries align with KCPM's production needs.

2. Production: In the production process, raw materials are transformed into paper and cardboard products. This includes various stages such as wood processing, cellulose production, corrugation, and printing.

3. Inventory Management: KCPM must efficiently manage inventory of raw materials, semi-finished products, and finished goods. This involves optimizing inventory levels to avoid excesses and shortages.

4. Internal Production Logistics: Within the production complex, KCPM needs to maintain a smooth flow of materials and components between different production stages. This includes the use of conveyor systems and automation.

5. Packaging and Labeling: Finished paper and cardboard products require packaging and labeling before being shipped to customers. This may involve processes such as packing items into boxes and applying tags and labels.

6. Distribution and Delivery: KCPM must organize the logistics of delivering finished products to customers. This includes selecting appropriate transportation methods, optimizing routes, and ensuring timely delivery.

7. Reverse Logistics: In the paper industry, managing reverse logistics, including returns and the recycling of non-compliant or defective products, is crucial.

8. Warehousing: KCPM likely utilizes warehouses for temporary storage of raw materials and finished products. Optimizing warehousing processes can save time and resources.

9. Information Systems: To facilitate effective logistics, KCPM may use information systems and software for tracking and managing all stages of operations.

Logistics in the paper industry is essential for ensuring efficiency and competitiveness, especially considering the global nature of the industry and the need for accurate deliveries and quality customer service.

Continuing with the topic of logistics in the paper industry, let's delve deeper into some specific challenges and trends that companies like the Kyiv Cardboard and Paper Mill (KCPM) might encounter:

1. Environmental Sustainability: Sustainability is becoming increasingly important in the paper industry. Companies like KCPM must consider environmentally sustainable practices throughout their supply chain, from responsible sourcing of raw materials to eco-friendly packaging and recycling programs.

2. Supply Chain Management: Effective supply chain management is crucial for ensuring a smooth flow of materials and minimizing disruptions. KCPM needs to maintain strong relationships with suppliers, monitor supply chain risks, and have contingency plans in place.

3. **Customs and Export Regulations:** If KCPM exports its products beyond Ukraine, it faces customs and export regulations. Compliance with international trade rules, tariffs, and import/export documentation is essential.

4. **Data Management:** Data collection and analysis play a significant role in optimizing logistics. Utilizing technologies such as IoT sensors and data analytics can help KCPM make informed decisions about inventory, production, and distribution.

5. **Resilience to Demand Fluctuations:** The paper industry can experience demand fluctuations due to economic conditions and seasonality. Efficient production and logistics planning help companies like KCPM adapt to these changes in demand.

6. **Safety and Compliance:** Ensuring safety in the workplace and compliance with industry standards and regulations is critical. Logistics operations should prioritize the well-being of employees and the adherence to safety protocols.

7. **Innovation in Logistics:** Embracing innovative logistics practices is a key trend. This includes automation, predictive analytics, real-time tracking, and using AI-powered systems to optimize routes and deliveries.

8. **Employee Training and Development:** Competent and skilled personnel are essential for successful logistics operations. Ongoing training and development programs can enhance the capabilities of the logistics workforce.

9. **International Markets:** For companies like KCPM looking to expand globally, understanding the logistics and market dynamics of different countries is vital. Adapting logistics strategies to fit international markets is a challenge and an opportunity.

10. **Circular Economy Initiatives:** Many paper companies are focusing on circular economy initiatives, which involve reducing waste, reusing materials, and recycling. Logistics can play a pivotal role in these efforts by efficiently managing the return and recycling of materials.

11. **E-commerce Integration:** With the growth of e-commerce, paper and packaging companies may need to adapt their logistics to serve online retailers and meet the demands of direct-to-consumer shipments.

Efficient logistics management is not only about moving products from point A to point B but also about adapting to changing market conditions, environmental concerns, and technological advancements. Staying competitive in the paper industry requires a proactive approach to logistics that aligns with industry trends and challenges.

Continuing the discussion on logistics in the paper industry, let's consider several more important aspects:

- **Quality Management:** Quality control of products and materials is essential to prevent defects and issues throughout the logistics chain. Implementing strict quality standards and control systems helps reduce losses and enhance a company's reputation. **Risk Management and Crisis Planning:** Understanding and managing risks, such as supply chain disruptions, natural disasters, or geopolitical crises, helps minimize negative impacts on logistics. Crisis planning involves measures to ensure business continuity.

- **Digitization and Innovation:** The adoption of digital technologies, such as warehouse management systems, route planners, and IoT solutions, streamlines logistics processes. Innovation may also include the use of drones and autonomous vehicles for deliveries.

- **Training and Employee Development:** The skills and competencies of logistics personnel are crucial. Investing in the training and development of staff ensures more professional logistics management.

- **Customer-Centric Approach:** Customer orientation and meeting their needs are the foundation of successful logistics. Working with customers, considering their feedback and preferences, facilitates better adaptation of logistics solutions.

- **Effective Warehouse Management:** Optimizing warehouse operations, including storage, order picking, and inventory management, helps reduce costs and speed up product delivery.

- **Monitoring and Performance Evaluation:** Regular monitoring and evaluation of logistics operations help identify weaknesses and drive improvements. Performance metrics like OTIF (On-Time In-Full) measure delivery quality.

– Network and Route Optimization: For companies with multiple locations and customers, optimizing the logistics network and routes becomes critical for reducing delivery costs.

Logistics in the paper industry is a complex and multifaceted process that requires continuous development and improvement. Considering modern technological changes and environmental requirements, effective logistics management becomes even more crucial for the success of companies in this sector.

Fulfillment is a service provided by logistics companies or e-commerce platforms to process and execute customer orders (Fig 2.6).

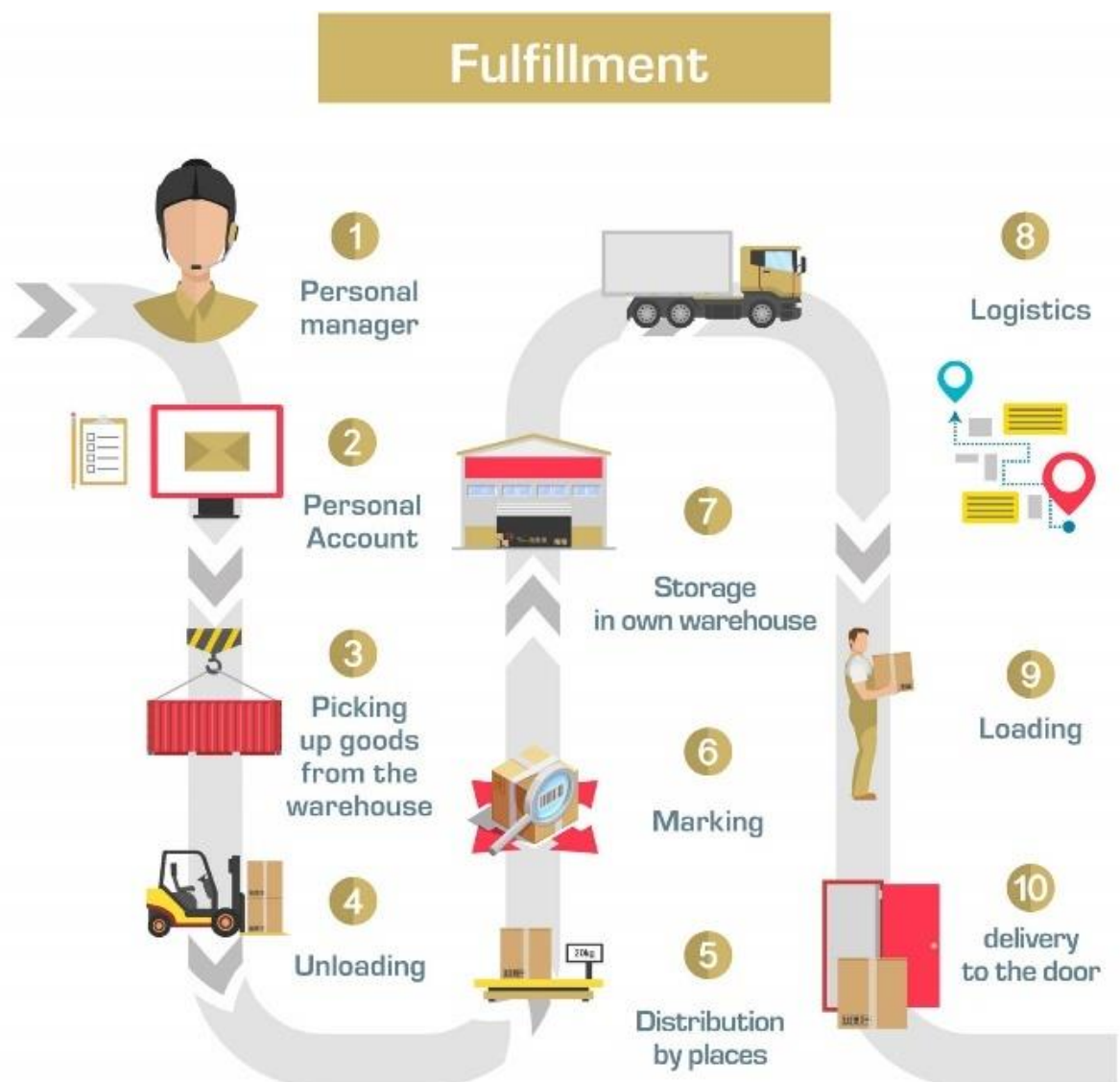


Figure 2.6 – Scheme of fulfillment

The primary goal of fulfillment is to provide customers with goods and fulfill their orders quickly and efficiently. An essential component of fulfillment services includes order processing, storage, preparation, and delivery of goods.

Key aspects of fulfillment:

Receiving and Storage: Fulfillment centers receive goods from suppliers and store them until orders are processed.

Order Processing: Companies prepare orders, including selecting products, packaging, and preparing them for shipment.

Delivery: Fulfillment services may include organizing the delivery of goods to customers using various delivery methods, including courier services and postal services.

Inventory Management: Effective inventory management ensures the availability of goods in stock and readiness to ship when orders are placed.

Inventory and Tracking: Fulfillment centers maintain inventory records and provide tracking of the status of goods.

Customer Service: Fulfillment companies may offer customer service, including responding to inquiries and resolving issues.

Returns Handling: When necessary, fulfillment centers may accept returns from customers and process returns.

Fulfillment services are widely used in the e-commerce industry and help businesses focus on their core operations without expending time and effort on logistical operations. They enable businesses to provide customers with goods and services quickly and efficiently, contributing to revenue growth and customer satisfaction.

In summary, General Trans Alliance Logistics is a comprehensive logistics company with a broad spectrum of services, advanced facilities, and a strong commitment to meeting customer needs efficiently and effectively.

Chapter 2 summary

Kyiv Cardboard and Paper Mill (KCPM) is a company with a rich history and diverse activities, situated at the heart of Ukraine's paper and cardboard industry. In this conclusion, we will examine key aspects of KCPM's operations, including its history, primary products, competitive advantages, logistics, warehouse complex features, order fulfillment, SWOT analysis, as well as the analysis of the company's financial and economic indicators.

Company Activity.

The history of Kyiv Cardboard and Paper Mill spans decades of successful work in the field of paper and cardboard production. Founded on principles of quality and innovation, the company has become a recognized leader in the industry. Over the years, KCPM has solidified its position as a reliable partner and supplier of high-quality materials.

Primary Products of KCPM.

KCPM specializes in the production of a wide range of paper and cardboard products. Its products find applications in various industries, including packaging, stationery, printing, and many others. The high quality of its materials and products makes KCPM the preferred choice for customers.

Competitive Advantage.

One of the main competitive advantages of KCPM is its focus on product quality. The paper and cardboard produced by the company meet the highest standards, making it popular both in domestic and international markets. KCPM also benefits from logistical and infrastructure advantages, ensuring timely deliveries and supporting operations.

Logistics at KCPM.

Logistics play a crucial role in KCPM's successful operations. The company actively invests in the development of its logistics network and warehouse complexes, ensuring timely product deliveries to customers. This allows for reduced lead times and improved customer service levels.

Warehouse Complex.

Features KCPM's warehouse complex is a modern and high-tech facility. Its features include efficient storage and inventory management, allowing the company to maintain stable supplies and minimize the risks of product shortages.

Order Fulfillment.

KCPM excels in order fulfillment with maximum precision and professionalism. The company specializes in customized solutions for customers and is ready to meet even the most complex requirements. This makes it a preferred supplier for many businesses.

SWOT Analysis.

The SWOT analysis highlighted KCPM's strengths, such as product quality and logistics, as well as weaknesses, including dependence on global market factors. Assessing growth opportunities and threats enables KCPM to develop strategies to strengthen its position.

Financial and Economic Indicators.

The analysis of KCPM's financial indicators confirmed its financial stability and potential for long-term growth. Increasing revenue and profit, along with efficient cost management, indicate the company's stable financial position.

CHAPTER 3

**DEVELOPMENT OF PROPOSALS FOR THE IMPLEMENTATION
OF THE RECYCLING STRATEGY IN THE ACTIVITIES OF THE PAPER
AND CARDBOARD MILL**

3.1 Existing problems in the activity of the cardboard and paper mill and directions for their solution

If we analyze the report and the very structure and infrastructure of the KCPM, we can identify a number of problems and we will start with the first one, namely how to solve the problem with jobs and turnover within the KCPM itself, how can this be influenced and solved taking into account the military factor?

1. Creating a Stable Work Environment:

– Safety Level Assessment: Conduct an audit to assess workplace safety and health considering potential risks in the event of a military conflict.

– Crisis Management Plan Development: Create an action plan for emergencies, including employee evacuation and workplace preservation.

2. Social Guarantees and Bonuses:

– Competitiveness Analysis: Research the labor market to determine salary levels and benefits offered by competitors.

– Benefits Package Development: Create an attractive benefits package, including medical insurance, pension programs, and tenure-based bonuses.

3. Employee Training and Development:

– Training Plan: Develop an annual training and professional development plan for employees at all levels.

– Individual Career Paths: Establish a career growth support system by providing opportunities for skill enhancement and internal advancement.

4. Motivation and Employee Retention:

- Motivation Level Monitoring: Regularly assess employee satisfaction and motivation levels to identify issues and reasons for turnover.

- Individualized Approach: Create a system for incentivizing and rewarding employees based on their individual achievements and contributions.

5. Communication and Transparency:

- Regular Communication: Organize regular meetings, feedback sessions, and dialogues with employees to identify and address issues.

- Transparency in Information: Ensure transparency in informing employees about the company's current situation and future plans.

6. Developing the Ukrainian Market:

- Product Range Expansion: Analyze the market to identify new products and segments where KCPM can strengthen its position.

- Seeking New Clients: Actively promote products in the Ukrainian market and attract new customers.

7. Strategic Planning:

- Long-Term Strategy Development: Set long-term goals and development plans for the company, considering the changing environment.

- Risk Analysis: Evaluate risks and potential challenges in the future, and develop strategies to mitigate them.

8. Innovation and Environmental Sustainability:

- Innovative Projects: Research and implement new technologies to optimize production and reduce environmental impact.

- Compliance with Standards: Adhere to environmental standards and certifications to meet the demands of environmentally conscious customers.

9. Global Markets:

- International Market Research: Assess the possibility of entering global markets considering KCPM's competitive advantages.

- Seeking International Partners: Look for strategic partners and distributors to expand exports.

10. Balanced Management:

- **Balancing Cost Reduction and Quality Maintenance:** Develop a balance between the need to reduce costs and maintaining high product and service quality.

- Successful resolution of these issues will help KCPM overcome current challenges, strengthen its market position, and ensure a stable future in the context of a military conflict.

There is also another important problem, such as KCPM, resolving the issue of supplying their materials abroad, taking into account the rising prices for cellulose and materials for the production of paper, cardboard, packaging, etc.

If we take into account the military factor and, unlike previous years, the demand for products was greater + the infrastructure and the field of doing business was open, then how can we achieve the desired result and return competitively to the market of Europe and Ukraine?

To solve this problem we can use methods like:

1. Diversification of Supply Sources:

- **Supplier Assessment:** Conduct an in-depth evaluation of potential alternative suppliers, both locally and internationally. Consider their reliability, pricing, and proximity to mitigate risks.

- **Supply Chain Redundancy:** Establish contingency plans for supply chain disruptions, which might include backup suppliers and strategic stockpiling of critical materials.

- **Negotiation Strategies:** Develop negotiation strategies to secure long-term contracts with favorable terms and pricing.

2. Optimization of Production Processes:

- **Lean Manufacturing:** Implement lean manufacturing principles to reduce waste and enhance efficiency in material usage.

- **Process Automation:** Invest in automation and digital technologies to optimize resource utilization and minimize production costs.

- **Alternative Materials:** Explore alternative raw materials that might be more cost-effective and readily available.

3. Development of In-house Raw Material Production:

- Feasibility Study: Conduct a feasibility study to assess the viability of in-house production of cellulose or other necessary materials.
- Investment Planning: If feasible, plan investments in production facilities, technology, and skilled personnel.
- Quality Control: Ensure strict quality control measures to maintain the required standards.

4. Innovation and Environmental Sustainability:

- Research and Development: Allocate resources for research and development to discover innovative materials or production methods.
- Sustainability Initiatives: Promote eco-friendly practices in the supply chain and production to meet growing market demand for sustainable products.

5. Product Diversification:

- Market Analysis: Identify market segments with potential for product diversification, considering changing material costs.
- Product Development: Invest in research and development to expand the product range, potentially using materials with lower cost volatility.
- Marketing Strategy: Develop marketing strategies to introduce new products effectively.

6. Collaboration with Ukrainian Organizations:

- Industry Associations: Collaborate with industry associations to leverage collective bargaining power and negotiate better deals with suppliers.
- Government Support: Explore opportunities for government incentives or subsidies to support the procurement of raw materials.

7. Market Research and Competitiveness:

- Competitor Analysis: Continuously monitor competitors' strategies, pricing, and product offerings to adapt and remain competitive.
- Customer Feedback: Collect and analyze customer feedback to identify areas for improvement and innovation.

- Quality Assurance: Maintain high-quality standards to differentiate products in the market.

8. Logistic Optimization:

- Route Optimization: Implement route optimization software and systems to minimize transportation costs.

- Inventory Management: Improve inventory management to reduce carrying costs while ensuring a steady supply of materials.

9. Monitoring Market Changes:

- Market Intelligence: Invest in market intelligence tools to stay informed about global material price trends and geopolitical developments.

- Scenario Planning: Develop contingency plans for various market scenarios, including price spikes and supply chain disruptions.

10. Balanced Budget:

- Financial Analysis: Continuously assess the financial health of the company, making informed decisions to allocate resources effectively.

- Cost Control: Implement cost control measures, focusing on areas with the highest impact on profitability.

11. International Market Expansion:

- Export Strategy: Develop an export strategy targeting stable international markets to diversify revenue streams.

- Market Entry Research: Research potential international partners and distributors to facilitate market entry.

12. Customer and Partner Engagement:

- Customer Relationship Management: Strengthen customer relationships through personalized communication and tailored solutions.

- Strategic Partnerships: Explore strategic partnerships with customers or suppliers to secure long-term commitments.

13. Social Responsibility:

– Corporate Social Responsibility (CSR): Invest in CSR initiatives to enhance the company's image and attract ethically-conscious customers.

14. Seeking External Support:

– Government Grants and Support: Investigate government programs or grants designed to assist businesses with raw material procurement during challenging times.

In conclusion, addressing the raw material supply challenge requires a multifaceted strategy that considers supply chain resilience, operational efficiency, innovation, and market adaptation. By implementing these strategies, KCPM can navigate the complexities posed by rising material costs, geopolitical factors, and changing market dynamics while maintaining its competitiveness in the European and Ukrainian markets

Let's take a closer look at the prospects of introducing recycling into the activities of PJSC «Kyiv Cardboard and Paper Mill». The implementation of recycling can have a number of advantages and important consequences both for the enterprise itself and for the environment. A few key aspects to consider are presented in Table 3.1.

Table 3.1 – Advantages and important consequences of recycling implementation into the activities of PJSC «Kyiv Cardboard and Paper Mill»

№	Key aspects	Their characteristics
1	2	3
1	Environmental benefits	The introduction of recycling will reduce the impact of the enterprise on the environment. Instead of throwing used cardboard and paper into a landfill or burning them, these materials can be recycled and used again. This will reduce emissions of harmful substances into the atmosphere, save water resources, and reduce the amount of waste that ends up in landfills.
2	Economic benefits	Recycling can bring economic benefits to a business. The implementation of the recycling program will reduce the cost of purchasing new raw materials, as used cardboard and paper can be reused. In addition, the enterprise can receive additional income from the sale of recycled products, such as recycled cardboard or paper.

The end of the Table 3.1

1	2	3
3	Competitive advantages	The implementation of recycling can give the enterprise a competitive advantage in the market. Today, consumers pay more and more attention to the environmental responsibility of companies and prefer products that are manufactured taking into account the principles of sustainable development. By implementing recycling, PJSC "Kyiv Cardboard and Paper Mill" can position itself as an environmentally conscious organization that produces sustainable and environmentally friendly products.
4	Legislative support	Many countries have legislation in place to promote recycling. Legislation may provide for tax breaks, subsidies or other incentives for businesses that implement recycling. PJSC "Kyiv Cardboard and Paper Mill" can use such support to reduce costs and stimulate the implementation of recycling processes.
5	Reputational benefits	The implementation of recycling can positively affect the reputation of the enterprise. Companies that actively engage in environmental initiatives typically have greater trust from consumers and other stakeholders. PJSC "Kyiv Cardboard and Paper Mill" can become a positive example in the field of renewable production and environmental responsibility, which strengthens its reputation and helps attract new customers and partners.
6	Compliance with environmental management standards	Implementing recycling will help a company comply with environmental management standards such as ISO 14001. This can be an important factor when interacting with other companies, entering into contracts or obtaining certifications and licenses.
7	Strengthening corporate culture	The introduction of recycling can contribute to the formation of an ecological corporate culture. This means that employees will be more conscious about waste, use resources more efficiently and promote environmental responsibility as part of the work environment.
8	Innovative potential	The introduction of recycling can stimulate the development of innovative technologies and processes. A business can make internal changes to improve resource efficiency, reduce energy and water consumption, and develop new methods of recycling and recycling.

The implementation of recycling in the activities of «Kyiv Cardboard and Paper Mill» may have additional environmental advantages that should be taken into account (Table 3.2).

Table 3.2 – Environmental advantages of recycling implementation into the activities of PJSC «Kyiv Cardboard and Paper Mill»

№	Key aspects	Their characteristics
1	2	3
1	Conservation of natural resources	Recycling helps to conserve natural resources such as wood. Cardboard and paper are made from wood, and the use of recycled materials reduces the need to cut down new trees. This helps preserve forest ecosystems, reduce tree felling and preserve biodiversity.
2	Reducing greenhouse gas emissions	Burning waste, including cardboard and paper, releases greenhouse gases such as carbon dioxide (CO ₂) and methane (CH ₄), which contribute to global warming. The introduction of recycling will reduce the amount of waste that is burned and reduce greenhouse gas emissions.
3	Reduced energy consumption	The production of recycled materials usually requires less energy than the production of new materials. The introduction of recycling will reduce the company's energy costs, since the processing of secondary raw materials requires less energy than the production of raw materials from scratch.
4	Reducing the use of water resources	The production of paper and cardboard requires significant amounts of water. The introduction of recycling will reduce the need for water resources, since the processing of secondary raw materials requires less water than the production of new materials.
5	Reducing waste in landfills	Recycling helps reduce the amount of waste that ends up in landfills. This is important because landfills can be a source of soil, air and water pollution. Reducing the amount of waste in landfills helps improve the quality of the environment and preserve natural resources.
6	Processing of hazardous substances	The implementation of recycling allows to control and effectively process hazardous substances contained in waste. For example, some types of printing ink or glue contain harmful substances. Recycling allows you to remove these substances and treat them properly, reducing the risk of environmental pollution
7	Stimulation of environmental awareness	The introduction of recycling into the company's activities can contribute to increasing environmental awareness among employees and consumers. This can stimulate conscious consumption, the use of secondary raw materials and the reduction of waste in general. The enterprise can also act as an example of environmentally responsible activity for other organizations and help attract them to recycling.

The implementation of recycling in the activities of «Kyiv Cardboard and Paper Mill» has the potential not only to reduce the company's impact on the environment, but also to contribute to the creation of a sustainable cycle of resource use and the preservation of natural ecosystems.

Cardboard and paper recycling has numerous advantages for economic development. One of them is the creation of new jobs. The implementation of recycling requires the presence of specialized enterprises that are engaged in the collection, sorting, processing and management of secondary raw materials. This opens up opportunities for reducing unemployment and raising the standard of living of the population.

Recycling also contributes to the development of the secondary market of raw materials. Enterprises that process secondary materials can buy secondary raw materials at favorable prices. This creates a demand for secondary raw materials and promotes the development of the secondary market. Such a market can become the basis for new opportunities for entrepreneurs and enterprises engaged in the collection and processing of secondary materials.

In addition, the recycling of cardboard and paper contributes to the creation of new products. Secondary raw materials obtained from recycling can be used to produce new products, such as recycled paper products, packaging, cardboard boxes and other materials. This creates new opportunities for the development of manufacturing and business sectors, which contributes to economic growth.

In addition to economic benefits, cardboard and paper recycling also has significant environmental benefits, such as conserving natural resources, reducing greenhouse gas emissions, and reducing environmental pollution. This helps create a more sustainable and healthy environment for future generations.

So, cardboard and paper recycling is not only an important environmental measure, but also a powerful catalyst for economic development. It contributes to the creation of jobs, the development of the secondary market of raw materials, the production of new products and the reduction of raw material costs. Wider implementation of cardboard and paper recycling can have a positive impact on the

economy and contribute to the sustainable development of societies. Recycling of cardboard and paper has numerous advantages for economic development. When cardboard and paper are recycled, it creates new jobs. Enterprises that collect, sort and process secondary raw materials create new jobs for people. This can contribute to reducing unemployment and raising the standard of living of the population.

Cardboard and paper recycling also contributes to the development of the secondary market of raw materials. When recycled materials from cardboard and paper recycling become available, businesses can use them to produce new products. This creates a demand for recycled materials and promotes the development of a market where businesses can buy and sell these materials.

In addition to economic benefits, cardboard and paper recycling contributes to the preservation of natural resources. Recycling of used cardboard and paper allows you to use them again, instead of extracting new raw materials. This helps reduce the need for deforestation and the energy costs associated with the production of new cardboard and paper.

Recycling also helps reduce greenhouse gas emissions. When cardboard and paper decompose in landfills, they can release methane, one of the powerful greenhouse gases. But when they are recycled, the process reduces landfill waste and methane emissions.

Thus, cardboard and paper recycling not only has environmental benefits, but also contributes to the creation of jobs, the development of the market for secondary raw materials and the preservation of natural resources. Implementation of this process can have a positive impact on the economy, contribute to sustainable development and create a more sustainable future.

The existing cardboard and paper supply chain looks as follows (Fig. 3.1). In order to ensure high-quality cardboard and paper products for customers, it must be improved environmental protection through the use of raw materials, resource-saving technologies and the production of environmentally friendly products.

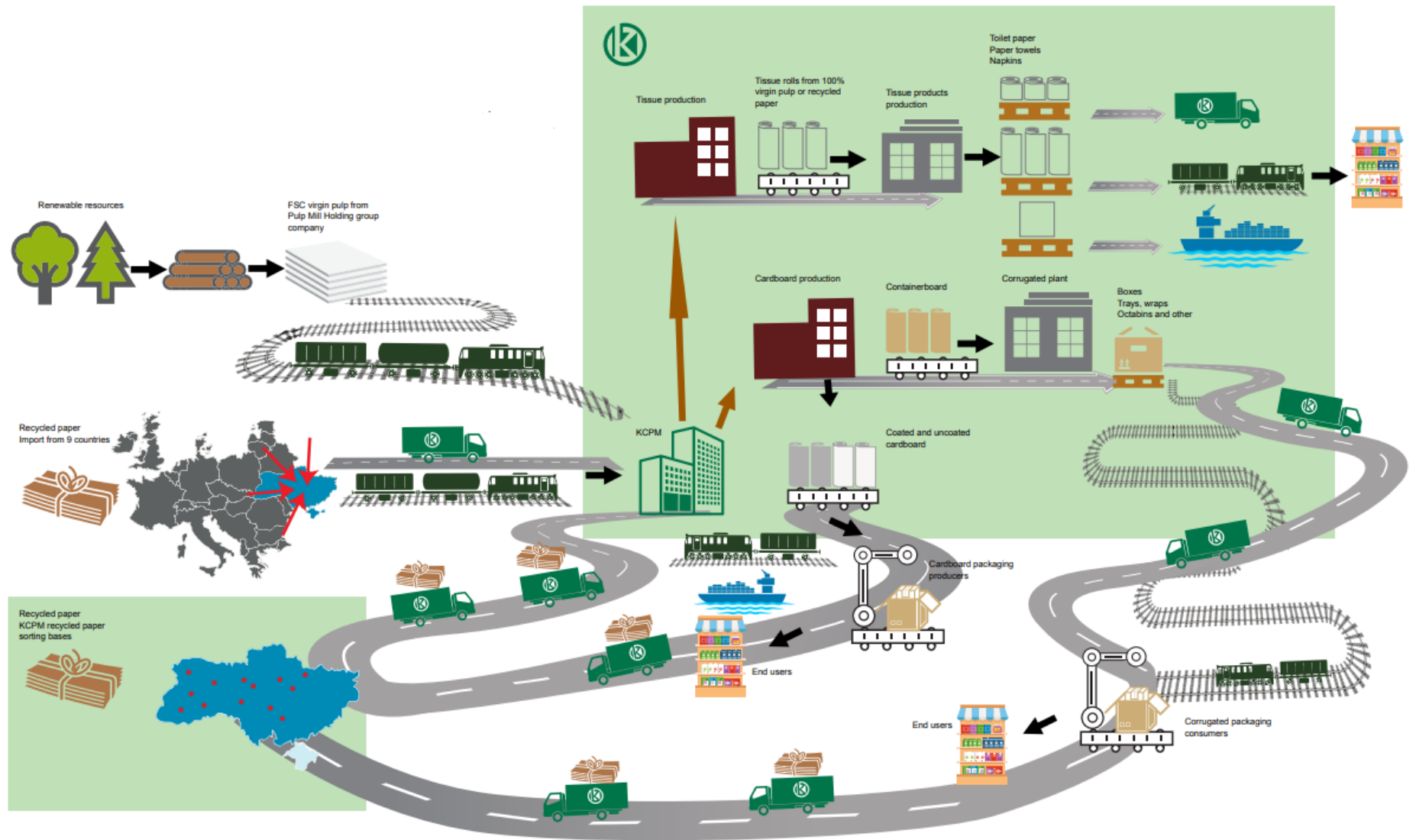


Figure 3.1 – Cardboard and paper supply chain

We suggest that «Kyiv Cardboard and Paper Mill» must to implement measures to prevent the placement of production waste in landfills through their further processing.

A significant part of the waste generated in the production process is fiber waste – this is the primary waste that is generated as a result of the recycling of waste paper. To ensure compact storage and transportation, such waste must be dried. Such waste serves as raw material for the production of building materials, biobricks for the cultivation of microorganisms, etc.

To mitigate the impact on the environment, we suggest developing a strategy for effective industrial waste management, which includes the following steps (Fig. 3.2).

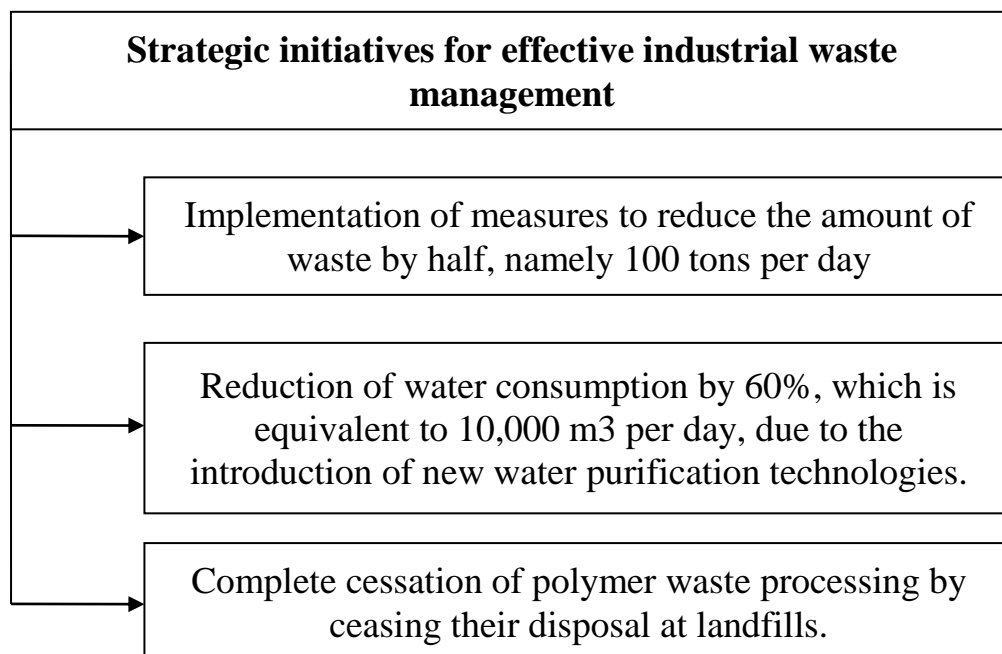


Figure 3.2 – Strategic initiatives for effective industrial waste management

A company «Kyiv Cardboard and Paper Mill» must focus on running a sustainable business that will improve customer service and impact employees, shareholders and the communities in which they operate. We offer the following strategic goals of sustainable development until 2030 (Fig. 3.3).

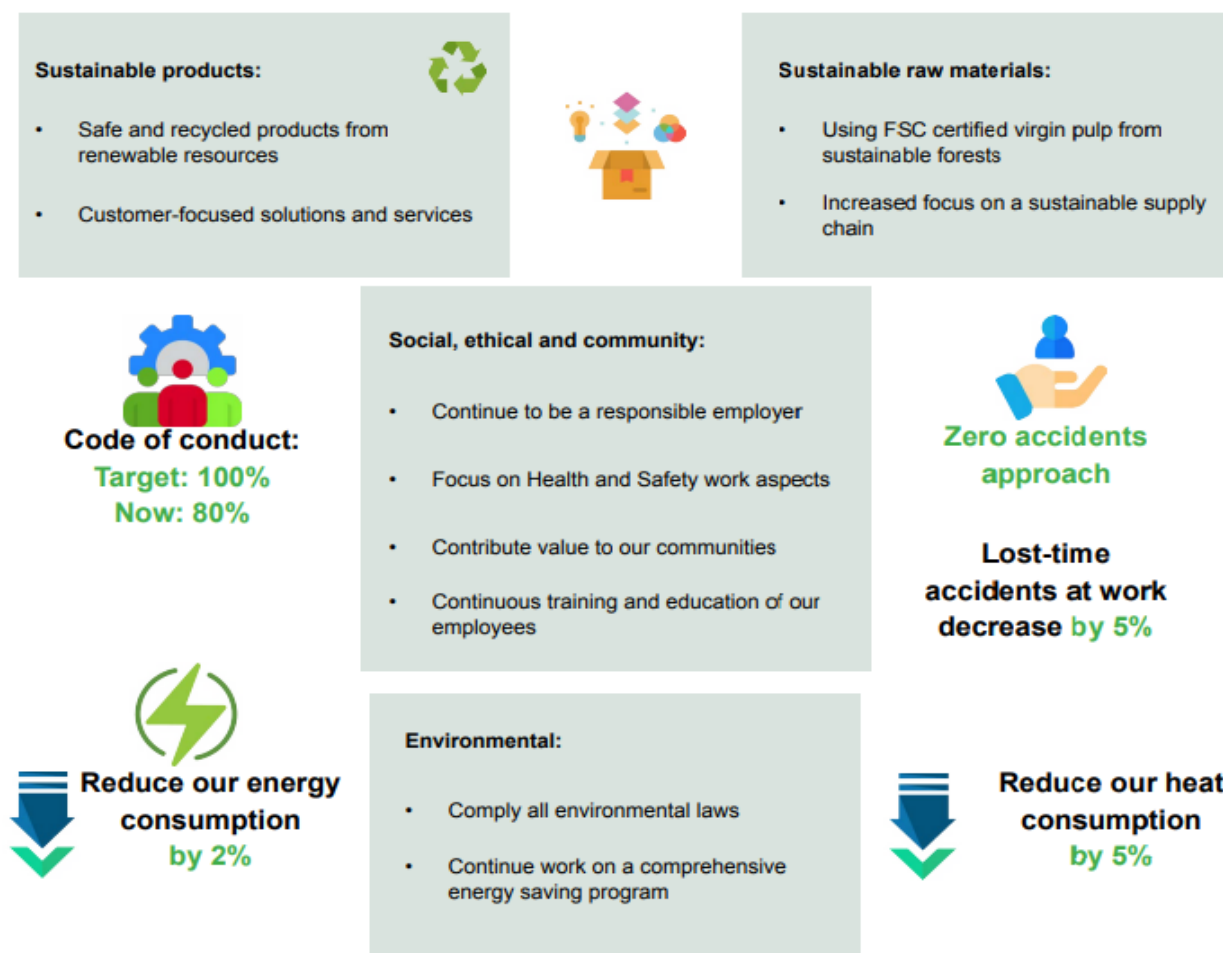


Figure 3.3 – Strategic goals of sustainable development

Thus, «Kyiv Cardboard and Paper Mill» can demonstrate its commitment to social responsibility and environmental protection, constantly implementing new measures for effective waste management.

3.2 Implementation of the waste management system

In order to increase the accessibility and usefulness of the implementation of the recycling strategy in the practical activities of the cardboard and paper mill, we offer the use of a waste management system (Environmental Waste Utilization system – EMW) (Fig. 3.4).

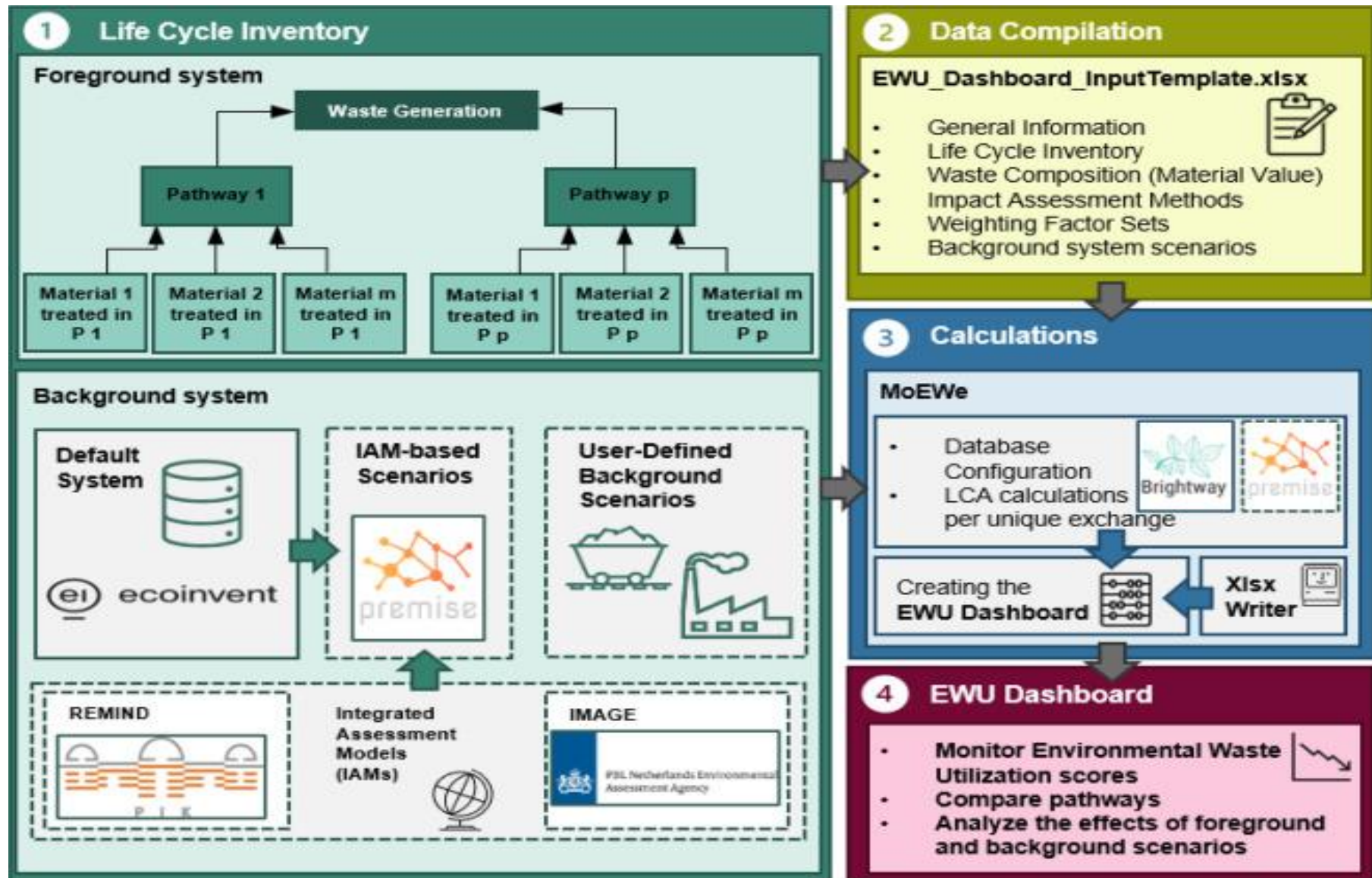


Figure 3.4 – Environmental Waste Utilization system – monitoring environmental waste utilization scores

It includes the Environmental Waste Management Dashboard (EWU Dashboard), which is a spreadsheet-based tool optimized for MS Excel that allows you to explore EWU results for different waste management systems. The modular Life cycle assessment (LCA) is the basis for the LCA calculations performed on the EWU dashboard. Instead of directly calculating LCA scores for the entire waste management system, the EWU dashboard performs LCAs for sharing without further processes on the front end of the waste management system. This modular approach makes it possible to calculate LCA scores for any possible front-end system configuration based on pre-calculated LCA scores of each interchange.

The Environmental Waste Utilization (EWU) dashboard facilitates the dynamic adjustment of exchange volumes, including process efficiency, enabling real-time adaptation to changes in the waste management system. This flexibility supports the comparison of diverse waste management concepts. Within the EWU dashboard, Life Cycle Assessment (LCA) calculations are transparently documented in a standardized format suitable for third-party verification. The graphical presentation of results aids in identifying primary contributors to EWU evaluations, allowing for comparisons between baseline and background system scenarios to analyze the environmental performance of future waste management concepts.

The implementation of a recycling strategy in the operations of a cardboard and paper mill aims to safeguard human health and the environment by preventing waste generation and reducing associated impacts. Life Cycle Assessment (LCA) serves as a tool to quantify environmental, health, and resource depletion issues related to waste management, facilitating comparisons between different waste management concepts.

Implementation of this system in the activities of «Kyiv Cardboard and Paper Mill» should become the basis of the development of its recycling strategy (Fig. 3.5). In addition, to evaluate the effectiveness of the proposed strategy, it is necessary to use certain monitoring criteria.

However, environmental impacts are typically not directly monitored during the evaluation of waste management system effectiveness. Instead, Key Performance Indicators (KPIs) are proposed.

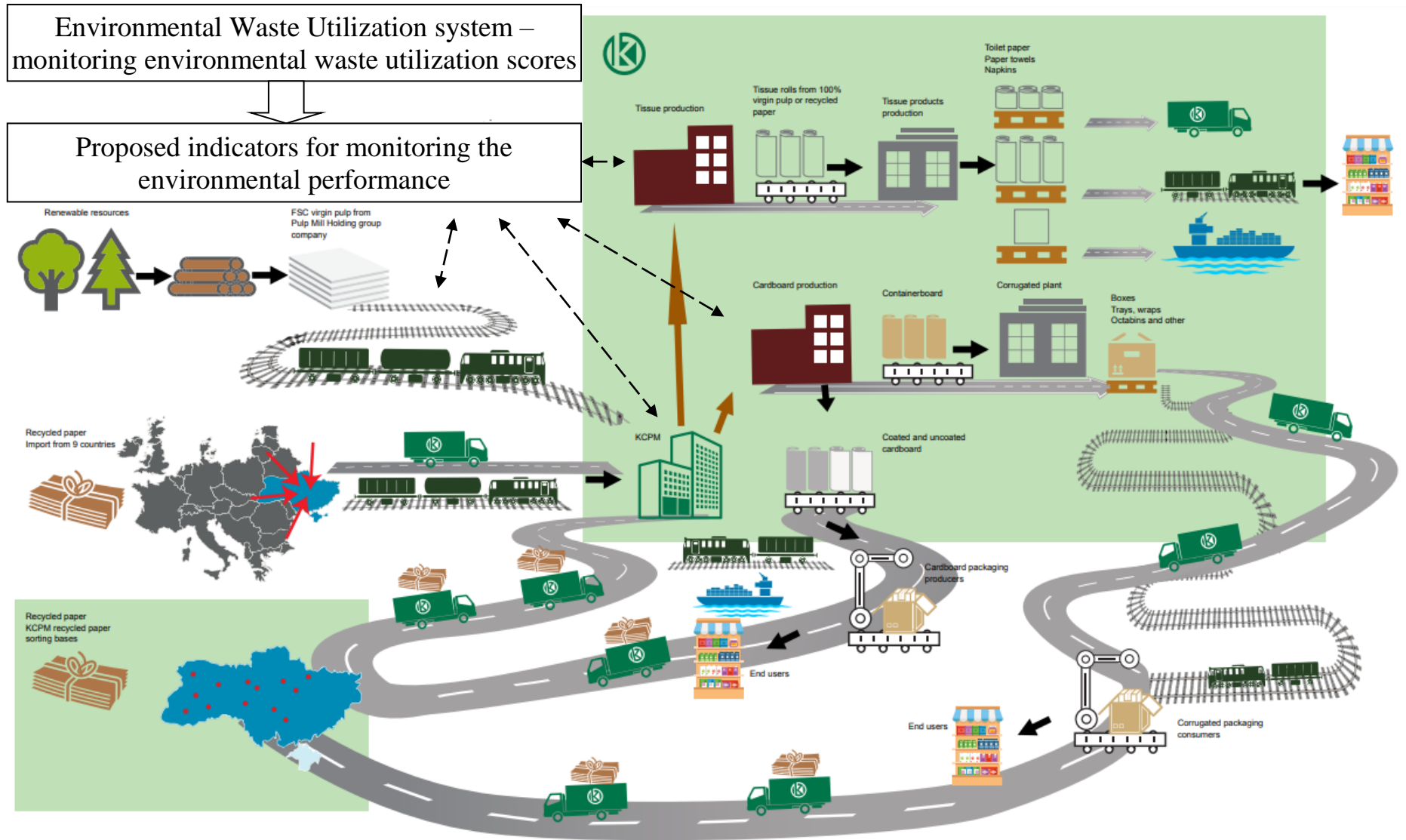


Figure 3.5 – Recycling strategy for the «Kyiv Cardboard and Paper Mill's» supply chain

Proposed indicators for monitoring the environmental performance of waste management systems in the operations of the cardboard and paper mill are presented in Table 3.3.

Table 3.3 – Proposed indicators for monitoring the environmental performance of waste management systems in the operations of the cardboard and paper mill

№	Indicator	Calculation Method	Description
1	2	3	4
1	Environmental Performance (EP)	$EP = \frac{\sum_{d=1}^D w_d \text{desirable treatment}_d}{\sum_{u=1}^U v_u \text{undesirable treatment}_u}$	EP is a measure of the environmental performance of waste treatment. It is calculated as a ratio of an indicator for desirable waste treatment (weighted sum of waste treated to recycling and recovery) over an aggregated indicator for undesirable waste treatment (weighted sum of waste landfilled or incinerated).
2	Circular Economy Performance Indicator (CPI)	$CPI = \frac{\text{actual benefit}}{\text{ideal benefit according to quality}}$	CPI is an indicator to compare the circular economy performance of different plastic waste treatment options. The CPI is defined as the ratio of the environmental benefit associated with an applied waste treatment option over the maximum achievable environmental benefit according to quality.
3	Recyclability Benefit Rate (RBR)	$RBR = \frac{RCR(V_{a0} + D_{a0} - R_{a0})}{V_{a0} + D_{a0}}$ <p>(simplified formula)</p>	RBR measures potential environmental savings related to the recycling of a product over the environmental burdens of virgin production followed by disposal. RBR is not intended to assess waste management systems, but to measure improvements regarding resource efficiency in product policies.
4	Recycled Content Benefit Rate (RCBR)	$RCBR = \frac{m_{r,p,1} (V_{a1}^* - R_{a0}^* + a_1)}{V_{a1} + M_{a1,v} + U_{a1,v} + D_{a1,v}}$	RCBR quantifies the environmental benefits achieved by introducing recycled materials in product manufacturing.
5	Retained Environmental Value (REV)	$REV = \frac{\sum_{j=1}^n (EI_{disp,j} - EI_{orp,j}) - EI_{surplus}}{\sum_{i=1}^n (EI_{original,i})}$	The REV is defined as the share of the original environmental value of a product that can be retained through value retention processes.

Efficiency indicators in waste management encompass waste generation rates, final waste treatment, prices for materials intended for secondary processing, recovery levels, and recycling levels. These indicators are crucial for monitoring progress toward a circular economy. Diversion ratios, measuring the proportion of waste diverted from landfills, serve as target indicators. Yet, the informative value of recovery factors, recycling factors, and diversion factors is limited by material efficiency considerations, making them less suitable for evaluating the environmental performance of waste management systems.

In addition to these indicators, various waste-related metrics focus on different aspects of waste management, including technical, health, social, environmental, and economic aspects. Environmental efficiency indicators are not directly correlated with the impact of waste on the environment within the studied control system. Circular indicators, such as the Circular Economy Performance Indicator (CPI), Recycling Benefit Ratio (RBR), Recycled Content Benefit Ratio (RCBR), and Retained Environmental Value (REV), have a more direct link to environmental impact. For instance, REV measures the fraction of a product's original environmental value that can be preserved through value preservation processes. However, circular indicators may not cover all aspects of waste management, especially those related to environmentally beneficial options for the disposal of non-recyclable waste.

3.3 Justification of the project resource and financial provision

The following types of resources are planned to be used: material, capital, intellectual, labor, and intangible. Material resources include MCPS, PVC film, PVA-based pressing adhesive; capital resources include workshop equipment and the purchase of hydraulic heat presses; intellectual resources include scientifically and commercially valuable information on the technology of producing a three-layer

board; labor resources include employees involved in the production of products, maintenance of equipment, ensuring the smooth functioning of the production enterprise and the search for markets for products, etc.

Table 3.4 substantiates and summarizes the amount of capital investment required to implement a startup project.

Table 3.4 – Justification of capital investments for project implementation

No	Capital investment items	Value, UAH
1	2	3
1	Direct material costs:	267 260,64
2	– costs of raw materials and supplies excluding returned waste	221 491,35
3	– cost of purchased semi-finished products and components	6 120,58
4	– fuel and energy costs	5 034,66
5	– other material costs	34 614,0
6	Direct labor costs of production employees:	207 833,51
7	– wages and salaries at production workers' rates and tariffs	157 449,6
8	– bonuses, incentives, compensation payments to production employees	15 745,0
9	– social contributions to the Pension Fund – 22% of production employees' salaries	34 638,91
10	Cost of fixed assets and intangible assets for production purposes:	1 007 870
11	– the initial cost of fixed assets and non-current intangible assets used in the production process (including transportation, installation and dismantling)	1 007 870
12	Other direct costs:	276 367,92
13	– expenses for services of third-party companies (security, advertising)	156 000,0
14	– expenses for utilities	34 614,0
15	– costs from defects	4 551,78
16	– transportation costs	81 046,08
17	General production costs:	200 292,74
18	– production management costs (remuneration of management personnel of all company's divisions together with unified social security tax to the Pension Fund)	141 715,2
19	– repair of production equipment	50 400,0
20	– environmental protection costs (damage and tax)	3 177,54
21	– expenses for obtaining permits for pollutant emissions	5 000
22	Total capital investments for the project implementation	1 959 624,81

We will substantiate the necessary costs, the formation of the cost of implementing a startup project business idea and the formation of its price on their basis. The cost justification of the price of a product involves the justification of the cost of production. The cost price summarizes the company's expenses for the production and sale of goods. The most generalized approach to the classification of costs, provides for five economic elements:

- direct material costs;
- direct labor costs;
- social contributions to the Pension Fund;
- depreciation of fixed assets and intangible assets for own production purposes;
- other direct costs;
- general production expenses.

Accordingly, in «Costs» we will justify the direct material costs per unit of production – the cost of raw materials, components, fuel, energy, utilities, spare parts, low-value non-current assets.

To justify the electricity consumption in the case of installing two Schulz BIGomatik 70100 hydraulic presses with electric drive, the annual electricity consumption is determined by the formula:

$$\text{Annual Electricity Consumption (kWh)} = \text{Power Consumption per Press (kW)} \\ \times \text{Number of Presses} \times \text{Operating Hours per Year} \times \text{Efficiency} = 9.035 \text{ MBt}$$

in this formula:

- power consumption (kW): this is the power consumed by one hydraulic press in kilowatts;
- hours of operation per year: this is the number of hours the hydraulic press operates per year;

– efficiency: this factor takes into account the efficiency of the hydraulic presses. It is usually expressed as a decimal from 0 to 1.

For electrically driven Schulz BIGomatik 70100 hydraulic presses, you will need to refer to the technical specifications or documentation provided by the manufacturer to obtain specific energy consumption and efficiency figures. Once you have these values, you can plug them into a formula to calculate the annual energy consumption for one press. Multiply this value by two to account for the installation of two presses. At the same time, electricity costs are simplified by the formula:

$$C_{\text{элек.}} = 9035,3 + 419,56 = 5034,66 \text{ UAH,}$$

where a – is the tariff cost of electricity, UAH/MWh.

These costs are summarized in Table 3.5.

Table 3.5 – Direct material costs

№	Resource name	Unit of measurement.	Price	Quantity of resource	Demand per month	Demand per year
1	2	3	4	5	6	7
1	PVC film	UAH/m ²	80,0	2535	16 896,0	202 752,0
2	PVA glue for pressing	UAH/kg	36,92	506,88	1 561,61	18 739,35
3	Costs of purchased semi-finished products (MCPF)	UAH/kg	8,05	760,32	510,05	6 120,58
4	Electricity	UAH per kWh	0,55724	9035,3	419,56	5 034,66
5	Utilities	UAH/m ²	57,69	50	2 884,5	34 614,0
Total					22 271,72	267 260,64

Labor costs and expenses.

This step involves analyzing the structure of the company's personnel and distinguishing between employees whose remuneration is based on official salaries

and employees whose remuneration is based on piecework, taking into account the employee's grade.

For administrative and technical staff, hourly bonus pay is calculated using the the pay rate multiplied by the time spent working on the project yields the direct labor cost, or Direct Labor Cost= Pay Rate * Project Time. Total - 9680,0UAH

For production personnel, the piece-rate progressive payroll system is calculated using the following formula:

$$\text{Total Earnings} = (\text{Number of Units Produced} \times \text{Piece Rate}) + \text{Base Rate} = 6560,4\text{UAH}$$

In this formula:

- number of units produced: this represents the quantity of units or pieces that the employee has produced within a given period;
- piece rate: this is the rate paid for each unit or piece produced. It may vary based on different factors such as the complexity of the task or the overall production volume. Importantly, in a progressive system, the piece rate may increase as the production quantity surpasses certain thresholds;
- base rate: the base rate is a fixed amount that an employee earns regardless of the production quantity. It serves as a guaranteed minimum payment;
- coefficient of the increased price for exceeding the norm by at least 10%.

The data on the structure of personnel and payroll are summarized in Table 3.6. Justification of the cost of fixed assets used and depreciation charges.

According to the "Property, Plant and Equipment", the company's fixed assets include a building (production premises; administration) and equipment (two Schulz BIGomatik 70100 hydraulic heat presses). To calculate depreciation of fixed assets, the straight-line method was chosen, which provides for the equal distribution of depreciation charges over the useful life of the fixed asset until it reaches its residual value.

Table 3.6 – Staff structure and payroll

№	Position	Form of payment	Number of employees	Salary (UAH)		
				per month	per quarter	per year
1	2	3	4	5	6	7
Administrative and technical staff						
1	Master	Hourly-premium	1	9 680,0	29 040,0	116 160,0
Total				9 680,0	29 040,0	116 160,0
Social contributions to the Pension Fund (22%)				2 129,6	6 388,8	25 555,2
Payroll fund				11 809,6	35 428,8	141 715,2
Production personnel						
2	Hydraulic press operator	Piecework progressive	2	6 540,4	19 621,2	78 484,8
Total				13 120,8	39 362,4	157 449,6
Social contributions to the Pension Fund (22%)				2 886,58	8 659,73	34 638,91
Payroll fund				16 007,38	48 022,14	192 088,56

Let's summarize the cost of fixed assets and depreciation charges in Table 3.7.

Table 3.7 – Justification of the cost of depreciation of fixed assets of the enterprise for 2021

№	Name of the object fixed assets	Quantity, pcs.	The cost at the beginning of the year, UAH	The annual rate of depreciation, %	Depreciation charges in the current year, UAH				
					I quarter	II quarter	III quarter	IV quarter	Per year
1	2	3	4	5	6	7	8	9	10
1	Building (workshop)	1	500 000	4	20 000	20 000	20 000	20 000	80 000
2	Schulz hydraulic heat press BIGomatik 70100	2	507 870	4	20314,8	20314,8	20314,8	20314,8	81259
3	Total	3	1 007 870	4	40314,8	40314,8	40314,8	40314,8	161259

Other direct costs.

Other direct costs include research and development expenses, third-party services, utilities, losses from rejects due to technological reasons, etc. Other direct costs are summarized in Table 3.8.

Table 3.8 – Justification of direct other expenses

№	Types of services	Data source	Cost of services, UAH	
			Per month	Per year
1	2	3	4	5
1	Security of the premises	Agreement	7 000	84 000
2	Online advertising	Google Ads	6 000	72 000
3	Utilities	Agreement	2 884,5	34 614
4	Costs of defects	Up to 2% of the total volume of manufactured products (cost of materials used) materials	379,32	4 551,78
5	Transportation costs	Calculation.	6 753,84	81 046,08
6	Total:		23 030,66	276 367,92

Let's summarize the general production costs in Table 3.9.

Table 3.9 – General production costs

№	Types of services	Data source	Cost of services, UAH	
			Per month	Per year
1	2	3	4	5
1	Repair of production equipment	Agreement.	4 200	50 400
2	Expenses for environmental protection (damages for damage to the environment from formaldehyde emissions)	Calculation	264,8	3 177,54
3	Obtaining a permit for pollutant emissions	Agreement	–	5 000
4	Total:		4 464,8	58 577,54

Contingent variable costs.

Contingent variable costs include the cost of producing a three-layer environmentally acceptable board. Their value varies depending on the change in the

volume of production. We summarize the contingent variable costs of the enterprise in Table 3.10.

Table 3.10 – Contingent variable costs of the enterprise

№	Cost items	Expenses, UAH			
		For 1 unit	Per month	Per quarter	Per year
1	2	3	4	5	6
1	Direct material costs	10,55	22 271,72	66 815,16	267 260,64
2	FOP of production personnel	7,58	16 007,38	48 022,14	192 088,56
3	Transportation costs	3,2	6 753,84	20 261,52	81 046,08
4	Repair of production equipment	1,99	4 200	12 600	50 400
5	Total:	23,32	49 251,81	147 755,52	591 022,08

Contingent fixed costs.

Fixed production costs include the costs of servicing and managing production that remain unchanged or almost unchanged with changes in the volume of activity. They include depreciation and amortization, payroll of administrative and technical staff with accruals, rent of the enterprise, utility tax, environmental pollution fee, etc. The calculation of the company's fixed costs is shown in Table 3.11.

Table 3.11 – Contingent fixed costs of the enterprise

№	Cost items	Expenses, UAH			
		For 1 unit per month	For 1 unit per month	Per quarter	Per year
1	2	3	4	5	6
1	Individual entrepreneurs of administrative and technical staff	5,59	11 809,6	35 428,8	141 715,2
2	Depreciation and amortization expense	6,36	13 438,26	40 314,8	161 259,2
3	Security	3,31	7 000	21 000	84 000
4	Advertising	2,84	6 000	18 000	72 000
5	Costs of defects	0,18	379,32	1 137,96	4 551,78
6	Environmental protection costs	0,12	264,8	794,4	3 177,54
7	Utilities	1,37	2 884,5	8 653,5	34 614
8	Total:	19,77	41 754,24	125 262,72	501 050,88

Overhead costs.

Conditional fixed costs are overhead costs, i.e., they are distributed among all types of products of the enterprise, if the enterprise produces such products. The data for calculating overhead costs are recorded in Table 3.12.

Table 3.12 – Calculation of overhead costs of the enterprise

№	Indicators.	Per unit	Per month	Per quarter	Per year
1	2	3	4	5	6
1	Contingent fixed costs, UAH	19,77	41 754,24	125 262,72	501 050,88
2	The share of output in the total production volume, %	<1	<1	<1	<1
3	Overhead costs, UAH	0,2	417,54	1 252,63	5 010,51

We will evaluate the efficiency of the project implementation thanks to the calculation of the net present value (NPV), the ratio of the loan to the cost of the project and its value; simple payback period, efficiency ratio and net discounted value.

Data for calculating the net present value are presented in Table 3.13.

Table 3.13 – Data for calculating the NPV of the project

№	Year (period)	2024 (0)	20250 (1)	2026 (2)	2027 (3)	2028 (4)
1	2	3	4	5	6	7
1	Sales revenue, UAH	0	350 553,02	350 553,02	350 553,02	350 553,02
2	Costs, UAH	1 959 624,81	66 159,02	66 159,02	66 159,02	66 159,02
3	Investments, UAH	2 000 000	0	0	0	0
4	Discount rate, %	17	17	17	17	17

Let's calculate the net present value of the project using the formula:

$$NPV = \sum_{i=0}^3 \frac{CF_i}{(1+r)^i} - CF_0$$

Where CF_i – flow of payments in the i -th year, UAH; r – discount rate, %;
 CF_0 – capital investment, UAH.

NPV = 64550 UAH,

Taking into account the investment volume of UAH 2,000,000 and monthly profit of UAH 88,171.24, a simple payback period was calculated:

$$T_{OK} = \frac{2000000}{284394,0} = 7,03$$

years.

Table 3.14 summarizes the preparation of the innovation project and summarizes the main indicators.

Table 3.14 – Summary indicators of the project

№	Indicators	Value
1	2	3
1	Capital investment, UAH	2 000 000,0
2	Forecasted profit, UAH /month	284 394,0
3	Profitability, %	27,12
4	Coefficient of economic efficiency	0,142
5	Return period of capital investments, years	7,03

Thus, we can state that our project proposal is economically beneficial and can be recommended for implementation in the cardboard and paper plant in order to improve the recycling strategy.

Chapter 3 summary

The implementation of recycling strategy in the activities of the cardboard and paper mill is an important step towards sustainable environmentally responsible production. The transition to the use of secondary raw materials instead of primary wood resources will significantly reduce the negative environmental impact of the enterprise. This is reflected in the preservation of valuable forest areas, reduction of production waste due to its reuse, as well as in the reduction of harmful emissions to landfills and the atmosphere.

In addition to the undoubted environmental dividends, the introduction of recycling opens up new economic opportunities for the cardboard and paper mill. The use of cheaper secondary raw materials instead of expensive primary materials will reduce the cost of the company's production and increase its profitability. The transition to the production of environmentally friendly products from waste also meets the modern requirements of the consumer market, which will improve the image of the mill and allow it to reach new segments of "green" customers.

Undoubtedly, the introduction of a large-scale recycling system at production facilities will require considerable initial investments. Investments are needed in infrastructure modernization, procurement of equipment for waste collection and processing, and personnel training in the field of recycling. However, in the strategic perspective, the economic and reputational dividends from the ecologization of production will repeatedly outweigh the initial costs, which makes recycling a highly effective area of modernization of the cardboard and paper enterprise.

CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis conducted, the following conclusions can be drawn regarding the prospects of implementing recycling in the activities of KCPM. Recycling is an important environmental process that helps reduce the negative impact of waste on the environment. Implementing recycling in the operations of KCPM can have a significant positive impact on the plant's environmental sustainability and its interaction with the surrounding environment.

The analysis of the prospects of implementing recycling in the activities of KCPM has shown that it can be achieved using modern technologies and methods. A detailed waste audit is necessary to determine their composition, volumes, and identify opportunities for their further processing and utilization.

Implementing recycling can have positive economic effects for KCPM. Processing and utilizing secondary raw materials can become an additional source of income for the plant. Moreover, recycling can help reduce costs associated with waste disposal and management.

Introducing recycling in the activities of KCPM also brings social benefits. It can create new job opportunities in the waste processing sector and contribute to the development of a green economy.

Additionally, it can improve the plant's image in the eyes of the public and consumers who increasingly value environmentally responsible companies.

To successfully implement recycling in the activities of KCPM, it is necessary to establish appropriate infrastructure and ensure proper waste management. It is also important to involve the plant's employees in recycling programs and provide them with necessary training and skills.

Compliance with legislative and regulatory requirements related to waste disposal and processing should be taken into account. Environmental standards and norms regarding the treatment and storage of secondary raw materials need to be adhered to. Additionally, collaboration with local authorities, environmental

organizations, and other stakeholders is important to ensure effective implementation of recycling.

Overall, implementing recycling in the activities of KCPM has the potential to improve the plant's environmental sustainability, reduce its negative impact on the environment, promote economic growth, and bring social benefits. However, to achieve success, technological, organizational, and legal aspects need to be considered, and the involvement of all stakeholders is crucial.

Kyiv Cardboard and Paper Mill (KCPM) is a company with a rich history and diverse activities, situated at the heart of Ukraine's paper and cardboard industry. In this conclusion, we will examine key aspects of KCPM's operations, including its history, primary products, competitive advantages, logistics, warehouse complex features, order fulfillment, SWOT analysis, as well as the analysis of the company's financial and economic indicators.

Company Activity

The history of Kyiv Cardboard and Paper Mill spans decades of successful work in the field of paper and cardboard production. Founded on principles of quality and innovation, the company has become a recognized leader in the industry. Over the years, KCPM has solidified its position as a reliable partner and supplier of high-quality materials.

Primary Products of KCPM

KCPM specializes in the production of a wide range of paper and cardboard products. Its products find applications in various industries, including packaging, stationery, printing, and many others. The high quality of its materials and products makes KCPM the preferred choice for customers.

Competitive Advantage

One of the main competitive advantages of KCPM is its focus on product quality. The paper and cardboard produced by the company meet the highest standards, making it popular both in domestic and international markets. KCPM also benefits from logistical and infrastructure advantages, ensuring timely deliveries and supporting operations.

Logistics at KCPM

Logistics play a crucial role in KCPM's successful operations. The company actively invests in the development of its logistics network and warehouse complexes, ensuring timely product deliveries to customers. This allows for reduced lead times and improved customer service levels.

Warehouse Complex

Features KCPM's warehouse complex is a modern and high-tech facility. Its features include efficient storage and inventory management, allowing the company to maintain stable supplies and minimize the risks of product shortages.

Order Fulfillment

KCPM excels in order fulfillment with maximum precision and professionalism. The company specializes in customized solutions for customers and is ready to meet even the most complex requirements. This makes it a preferred supplier for many businesses.

SWOT Analysis

The SWOT analysis highlighted KCPM's strengths, such as product quality and logistics, as well as weaknesses, including dependence on global market factors. Assessing growth opportunities and threats enables KCPM to develop strategies to strengthen its position.

Financial and Economic Indicators

The analysis of KCPM's financial indicators confirmed its financial stability and potential for long-term growth. Increasing revenue and profit, along with efficient cost management, indicate the company's stable financial position.

Summary

The Future of Paper Industry Logistics and Recycling

The prospects for introducing recycling into the activities of the KCPM are very promising. Recycling is an important environmental process that helps reduce the negative impact of waste on the environment. The introduction of recycling in the activities of the KCPM can have a significant positive impact on the environmental sustainability of the plant and its interaction with the environment.

The analysis of the prospects for introducing recycling into the activities of the KCPM showed that it can be done using modern technologies and methods. It is necessary to conduct a detailed audit of waste, determine its composition and volume, and identify opportunities for its further processing and use.

The introduction of recycling can have a positive economic effect for the KCPM. Recycling and utilization of secondary raw materials can become an additional source of profit for the plant. In addition, recycling can help reduce the cost of utilization and waste management.

The introduction of recycling into the operations of KCPM also has social benefits. It will help create new jobs in the waste management sector and contribute to the development of a green economy. In addition, it can improve the plant's image in the eyes of the public and consumers, who increasingly value environmentally responsible businesses.

The paper industry's logistics landscape is set to undergo substantial transformations. As the world moves towards a more sustainable future, logistics in the paper sector will face increasing pressures to minimize its environmental footprint. This will necessitate the adoption of eco-friendly transportation modes, streamlined supply chain processes, and a greater reliance on digital solutions for real-time monitoring and optimization. Moreover, the paper industry is global in scope, with supply chains crisscrossing continents. In this context, geopolitical shifts, trade policies, and disruptions like the COVID-19 pandemic underscore the importance of agility and resilience in logistics operations. To remain competitive, paper companies will need to continuously invest in modernizing their logistics infrastructure, optimizing routes, and enhancing last-mile delivery efficiency. Furthermore, embracing digital technologies like Internet of Things (IoT) for inventory management and artificial intelligence for predictive analytics will be essential to stay ahead in an increasingly dynamic market.

In conclusion, Kyiv Cardboard and Paper Mill's legacy of excellence provides a strong foundation for its future endeavors. By staying true to its core values of quality, innovation, and sustainability, KKBK can navigate the evolving landscape of

the paper industry and emerge as a leader, while the broader logistics sector for paper companies will evolve in response to global trends and demands, requiring proactive adaptation and innovation. The future holds promise for those who can balance tradition with transformation.

REFERENCES

1. Alkahtani M., Ziout A., Salah B., Alatefi M. An Insight into Reverse Logistics with a Focus on Collection Systems. URL: <https://www.mdpi.com/2071-1050/13/2/548>.
2. Company Kyiv Cardboard and Paper Mill. Sustainability Report 2018. URL: <https://www.kcpm.com.ua/wp-content/uploads/2019/06/SR2018.pdf>.
3. Conceptual principles, methods and models of greening logistics activities: collective monograph / ed. S.Gritsenko, L.Savchenko, B.B.Матвеев, ect. Primedia eLaunch, Boston, USA, 2023. 218 p.
4. Ellen MacArthur Foundation. Research and resources on the circular economy. URL: <https://www.ellenmacarthurfoundation.org/>.
5. Environmental Protection Agency. Section dedicated to waste and recycling. URL: <https://www.epa.gov/>.
6. European Environment Agency – Waste. Research and reports on waste management in the European Union. URL: <https://www.eea.europa.eu/>.
7. Hryhorak M. Isaienko V., Karpun O.V., Semeriahina M. Towaroznawstwo i zarzadzanie magazynem w logistyce lotniczej. Miedzynarodowej wyzszej szkoly logistyki I transport we Wroclawiu, 2021 / Commodity Science & Warehouse Management in Aviation Logistics. Textbook, Wroclaw 2021. 200 p.
8. Monitoring report 2022. European Declaration on Paper Recycling 2021-2030. URL: https://www.cepi.org/wp-content/uploads/2023/09/EPRC-Monitoring-Report-2022_Final.pdf.
9. Official website of the Kyiv Cardboard and Paper Mill. URL: <https://www.kcpm.com.ua/>.
10. Preliminary statistics 2022. URL: https://www.cepi.org/wp-content/uploads/2023/02/Cepi_Preliminary-statistics-2022_15022023.pdf.

11. Press release: The Paper value chain reached a 70,5% recycling rate in 2022. URL: <https://www.cepi.org/press-release-the-paper-value-chain-reached-a-705-recycling-rate-in-2022/>.
12. Recycling International. International news and articles on recycling and waste management. URL: <https://recyclinginternational.com/>.
13. Recycling Today. Information on global recycling and recovery practices. URL: <https://www.recyclingtoday.com/>.
14. Reducing waste and adopting a circular economy approach will benefit the environment and create economic opportunities. URL: <https://www.towardszerowaste.gov.sg/circular-economy/>.
15. Rubio S., Jiménez-Parra B., Chamorro-Mera A. Reverse Logistics and Urban Logistics: Making a Link. URL: <https://www.mdpi.com/2071-1050/11/20/5684>.
16. Savchenko L., Bugayko D., Smerichevska S. Environmental and social responsibility in supply chains. Розділ монографії. Economics, management and administration in the coordinates of sustainable development: scientific monogr. Ed. by S. Smerichevskyi, T. Kosova. Riga, Latvia, Izdevniecība "Baltija Publishing". 2021. 716 p. P. 596-615.
17. Sustainable Brands. Sections addressing sustainability and the circular economy across various industries. URL: <https://sustainablebrands.com/>.
18. The Balance Small Business – Waste Management. Articles and resources for businesses on effective waste management. URL: <https://www.thebalancesmb.com/>.
19. The concept of waste. Waste related problems. URL: <https://sisu.ut.ee/waste/book/module-1-concept-waste-waste-related-problems>.
20. The Essence of a Circular Economy. URL: <https://www.upcircle.app/post/the-essence-of-a-circular-economy>.
21. Waste 360. Information on news and events in the waste management industry. URL: <https://www.waste360.com/>.

22. Waste Management World. News and articles on contemporary waste management trends. URL: <https://waste-management-world.com/>.

23. Wikipedia, the free encyclopedia. URL: https://en.wikipedia.org/wiki/Main_Page.

24. World Bank – Waste Management. Resources related to waste management and sustainable development. URL: <https://www.worldbank.org/>.

25. Варфоломєєв М. О., Чуріканова О. Ю. (2020). Циркулярна економіка як невід’ємний шлях українського майбутнього в аспекті глобалізації. URL: <http://www.economy.nayka.com.ua/?op=1&z=7929>.

26. Власенко В.А. Розробка та реалізація стратегії розвитку підприємства в умовах трансформації ринкових відносин: принципові підходи та інструменти. Економіка. Менеджмент. Підприємництво. 2019. № 26(1). С. 32–41. URL: [http://nbuv.gov.ua/UJRN/есмері_2019_26\(1\)_6](http://nbuv.gov.ua/UJRN/есмері_2019_26(1)_6).

27. Григорак М.Ю., Карпунь О.В., Катерна О.К., Молчанова К.М. Логістика постачання, виробництва і дистрибуції: навч. посібник. К.: НАУ, 2017. 364 с.

28. Гриценко С.І., Матвєєв В.В., Савченко Л.В. Ecologistics. Навчальний посібник для здобувачів ОС «Бакалавр» спеціальності «Менеджмент». К.: НАУ, 2022. 260 с.

29. Григорак М.Ю., Марчук В.Є. Реверсивна логістика та рециклінг наукомісткої продукції. Науково-методичне видання. К.: Логос, 2013. 132 с.

30. Григорак М.Ю., Чичкан-Хліповка Ю.М. Теоретичні засади реверсивної логістики. Електронний науковий архів Науковотехнічної бібліотеки Національного університету «Львівська політехніка». URL: <https://ena.lpnu.ua:8443/server/api/core/bitstreams/5fb8979d-2088-41c5-8661-6d70e2d0d954/content>.

31. Гриценко С.І., Матвєєв В.В., Савченко Л.В. Проєктування ланцюгів постачання. Навчальний посібник для здобувачів ОС «Бакалавр» спеціальності «Менеджмент». К.: НАУ, 2023. 292 с.

32. Гриценко С.І., Савченко Л.В. Екологістика Навчальний посібник для здобувачів ОС «Бакалавр» спеціальності «Менеджмент». К.: НАУ, 2021. 240 с.
33. Гудзь О.І. Стратегія розвитку підприємства: сутність та класифікація. URL: https://economyandsociety.in.ua/journals/18_ukr/48.pdf.
34. Гурочкіна В.В., Будзинська М.С. Циркулярна економіка: українські реалії та можливості для промислових підприємств. Економічний вісник. Серія: фінанси, облік, оподаткування. 2020. №5. с. 52–64.
35. Дзюбенко О.М. Інвестиційно–інноваційне забезпечення целюлозно-паперових виробництв в контексті нарощення експортного потенціалу лісового сектора України: еколого-економічний вимір. Вісник ХНАУ ім. В.В. Докучаєва. Серія «Економічні науки». 2019. № 4, т. 1. С. 280–296. URL: <https://doi.org/10.31359/2312-3427-2019-4-1-280>.
36. Європейська ЦПП: короткий перепочинок. URL: <https://gofromagazine.com/evropejska-czpp-korotkij-perepochinok.html>.
37. Економіка замкненого циклу: принципи та перспективи впровадження в Україні. URL: <https://ecolog-ua.com/news/ekonomika-zamknenogo-cyklusu-pryncypu-ta-perspektyvu-vprovadzhennya-v-ukrayini>.
38. Економіка замкненого циклу: чи існує досконала система? URL: <https://climatescience.org/ru/advanced-circular-economy>.
39. Eco-friendly «вбрання» для продуктів: як Київський КПК переймає європейські тренди. URL: <https://www.papir.kiev.ua/eco-friendly-vbranna-dla-produktiv-jak-kyjivskyji-kpk-perejimaje-jevropejiski-trendy/>.
40. З чистого аркуша: як працює і чим вигідна циркулярна економіка (2020). URL: <https://bit.ly/3f4cipj>.
41. Закон України «Про Основні засади (стратегію) державної екологічної політики України на період до 2030 року» від 28 лютого 2019 року № 2697-VIII. URL: <https://bit.ly/3cfFqII>.
42. Зінченко Д.В., Дунська А.Р. Проблеми та перспективи розвитку целюлозно-паперової промисловості України в умовах світового ринку.

Актуальні проблеми економіки та управління. 2014. Вип. 8. URL: https://ela.kpi.ua/bitstream/123456789/14132/1/2014_4_Zynchenko.pdf.

43. Інноваційна логістика: концепції, моделі, механізми : колективна монографія / за наук. ред. М.Ю. Григорак, Л.В. Савченко. К.: Логос, 2015. 548 с.

44. Карпунь О.В., Нагорняк Д.О. Управління ланцюгами постачання як основа економіки замкнутого циклу в післявоєнний період. Проблеми та перспективи поствоєнної розбудови України: міжнародна конференція, 7 грудня 2023 р.: URL: <https://peers.international/paper/upravlinnya-lancyugami-postachannya-yak-osnova-ekonomiki-zamknutogo-ciklu-v-pislyavoenniy>.

45. Колотило П.В., Харчук О.Г. Целюлозно-паперова галузь у контексті інноваційного розвитку і виробництва продукції в Україні та за кордоном. Вчені записки ТНУ імені В.І. Вернадського. Серія: Економіка і управління. 2020. № 1. Т. 31 (70). С. 29-35. <https://doi.org/10.32838/2523-4803/70-1-5>.

46. Кузьмак О.І. Інноваційна стратегія як засіб стабілізації розвитку промислового підприємства. Інноваційна економіка. 2016. № 1–2. С. 114–118. URL: http://nbuv.gov.ua/UJRN/inek_2019_1-2_20.

47. Кузьо Н.Є., Косар Н.С., Тарасенко М. В. Тенденції розвитку та конкурентна структура ринку целюлозно-паперової продукції України. URL: <https://science.lpnu.ua/sites/default/files/journal-paper/2022/jun/28243/220373menedzhment-115-126.pdf>.

48. Методологічні аспекти стратегії сталого розвитку. URL: https://pidru4niki.com/15010922/ekonomika/metodologichni_aspekti_strategiyi_stalogo_rozvitku.

49. Орловська Ю.В., Синицький С.О. Сучасні трансформації світового ринку целюлозно-паперової продукції. Економічний простір. 2020. № 163. С. 41-45. URL: <https://doi.org/10.32782/2224-6282/163-7>.

50. Офіційний сайт Державної служби статистики України. URL: <http://www.ukrstat.gov.ua>.

51. Офіційний сайт ПрАТ «Київський картонно-паперовий комбінат». URL: <https://www.papir.kiev.ua>.

52. Полякова І. Актуальність реверсивної логістики як інструменту ведення бізнесу в сучасних умовах. URL: <http://logistic.iclick.in.ua/index.php/uk/studentu/studentska-nauka/studentskakonferentsiya?id=98>.

53. Попадинець Н.М. Ринок целюлозно-паперової промисловості: тенденції, проблеми та напрямки розвитку. Науковий вісник НЛТУ України. 2021. Вип. 21.8. С. 278–284.

54. Путінцева С.В. Сучасний стан і проблеми світового та українського ринків целюлознопаперової продукції. Вісник ХНТУ. 2018. № 1(56). С. 126–130.

55. Ринок гофрокартону і гофротари в Україні: папір особливої конструкції для забезпечення надійного захисту. URL: <https://pro-consulting.ua/ua/pressroom/rynok-gofrokartona-i-gofrotary-v-ukraine-bumagaosoboj-konstrukcii-dlya-obespecheniya-nadezhnoj-zashity>.

56. Розпорядження КМУ «Про схвалення Національної стратегії управління відходами в Україні до 2030 року» від 8 листопада 2017 р. № 820-р. URL: <https://bit.ly/3reNCg8>.

57. Скоробогатова Н.Є., Гурін Д.В. Конкурентоспроможність українських підприємств целюлозно-паперової промисловості в умовах індустрії 4.0. Ефективна економіка. 2018. № 12. URL: <http://www.economy.nayka.com.ua/?op=1&z=6745>.

58. Семюк С.Є., Голодюк Г.І., Гургула Н.М. Сучасний стан і проблеми українського ринку целюлозно-паперової продукції. Товарознавчий вісник. 2020. № 1(13). С. 216–228. <https://doi.org/10.36910/6775-2310-5283-2020-13-18>.

59. СЕРІ: основні показники 2022 року. URL: <https://gofromagazine.com/seri-osnovni-pokazniki-2022-roku.html>.

60. Смерічевська С. В., Жаболенко М.В., Чернишева С.В. та інш. Маркетинг і логістика: концептуальні основи та стратегічні рішення. Навч. посібник у схемах і таблицях /За загальною редакцією С.В. Смерічевської. Львів: «Магнолія 2006», 2013. 552 с.

61. Сталий розвиток, як один із шляхів розвитку бізнесу на перспективу.
URL: <https://www.bdo.ua/uk-ua/news-2/2020/sustainable-development-as-one-of-the-ways-of-business-development-for-the-future>.

62. Ступчук С.М. Формування системи цільових показників як складова стратегії розвитку підприємства. Вісник Хмельницького національного університету. Серія «Економічні науки». 2019. № 3. Т. 3. С. 168–172.

63. Сумець О. М., Григорак М.Ю., Костюченко Л. В. і ін. Актуальні проблеми логістики та дистрибуції монографія За заг. ред. проф. О. М. Сумця Харків : Студцентр, Харк. ін-т ПрАТ «ВНЗ «МАУП», 2021. 202 с.

64. Тарасенко А.В., Федоренко О.П. Проблеми та перспективи розвитку підприємств целюлозно-паперової промисловості України. Вісник Чернігівського державного технологічного університету. Серія: Економічні науки. 2013. № 4 (70). С. 193-197.

KCPM history

