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PROJECT MANAGEMENT FOR THE IMPLEMENTATION OF RESOURCE-SAVING TECHNOLOGIES

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ABSTRACT

Duan Musen. Project Management for the Implementation of Resource-Saving Technologies.

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The project for the implementation of resource-saving technologies is an initiative or activity aimed at developing and implementing approaches that contribute to the creation of sustainable and efficient resource use systems within the framework of resource conservation. These projects may include the introduction of technologies that ensure efficient use of resources, the use of renewable energy sources, the development of products with easily replaceable components, as well as the use of digital technologies for monitoring and optimizing resource use, stimulating innovation, and startups in this field. The main goal of such projects is to reduce the consumption of natural resources, decrease environmental pollution, and improve the economic efficiency of enterprises. This work covers the analysis of current trends in the field of resource conservation, the methodology of project management for the implementation of advanced technologies, as well as practical aspects of implementing such projects in various industries. The research includes an examination of successful project examples in this field, an assessment of their impact on the environment and economy, and recommendations for enhancing the efficiency of managing resource-saving technologies. The project also addresses the interaction between various stakeholders, such as government organizations, businesses, academic institutions, and the public, to ensure the successful implementation and dissemination of innovative solutions. An important aspect of the research is the analysis of barriers and challenges that companies may face during the implementation of resource-saving technologies, as well as the development of strategies to overcome them. The work presents recommendations for optimizing change management processes, increasing awareness and training of personnel, and creating incentives for companies implementing innovative technologies. This research will contribute to a better understanding of the mechanisms and tools necessary for the successful implementation of resource-saving technologies in contemporary conditions.

Keywords: project management, resource conservation, sustainable development, project management methodology.

АНОТАЦІЯ

Дуань Мусень. Управління проєктом запровадження ресурсозберігаючих технологій.

Магістерська робота на здобуття ступеня «магістр» за спеціальністю 073 «Менеджмент». Волинський національний університет імені Лесі Українки. Луцьк, 2024.

Проєкт запровадження ресурсозберігаючих технологій є ініціативою або діяльністю, спрямованою на розробку та впровадження підходів, які сприяють створенню стійких та ефективних систем використання ресурсів у рамках ресурсозбереження. Ці проєкти можуть включати впровадження технологій, що забезпечують ефективне використання ресурсів, використання відновлюваних джерел енергії, розробку продуктів з легкозамінними компонентами, а також використання цифрових технологій для моніторингу та оптимізації використання ресурсів, стимулювання інновацій та стартапів у цій сфері. Основна мета таких проєктів полягає у зменшенні споживання природних ресурсів, зниженні рівня забруднення навколишнього середовища та покращенні економічної ефективності підприємств. Ця робота охоплює аналіз сучасних тенденцій у сфері ресурсозбереження, методологію управління проєктами з впровадження новітніх технологій, а також практичні аспекти реалізації таких проєктів у різних галузях. Дослідження включає розгляд прикладів успішних проєктів у цій сфері, оцінку їхнього впливу на екологію та економіку, а також рекомендації щодо підвищення ефективності управління ресурсозберігаючими технологіями. Проєкт також приділяє увагу питанням взаємодії між різними зацікавленими сторонами, такими як урядові організації, бізнес, наукові установи та громадськість, для забезпечення успішного впровадження та поширення інноваційних рішень. Важливим аспектом дослідження є аналіз бар’єрів та викликів, з якими можуть зіткнутися компанії під час впровадження ресурсозберігаючих технологій, а також розробка стратегій для їх подолання. У роботі представлені рекомендації щодо оптимізації процесів управління, підвищення рівня інформованості та навчання, а також створення стимулів для компаній, що впроваджують інноваційні технології.

Ключові слова: управління проєктами, ресурсозбереження, сталий розвиток, методологія управління проєктами.

CONTENT

INTRODUCTION

The relevance of the research topic is determined by the acute need to address issues of sustainable development and resource regeneration worldwide. The increasing volume of waste and its negative impact on the environment necessitate a transition to resource-efficient methods of resource utilization. Project management in this field requires a comprehensive approach, as it involves the development and implementation of new technologies, the creation of circular production models, the engagement of various stakeholders, and the resolution of challenges related to sustainable resource utilization. In the context of global awareness of environmental issues and the pursuit of sustainable development, research on project management for the implementation of resource-saving technologies becomes essential for overcoming contemporary environmental challenges and contributing to the construction of an economy focused on resource utilization within a balanced and sustainable system.

Such scientists and economists were engaged in the study of resource efficiency and sustainable development: Daniel Heller, Janez Potočnik, Ernst Ulrich von Weizsäcker, Cecilia Condei-Szabó, John D. Sterman, Donella Meadows, Tim Jackson, Kate Raworth. Project management is studied in the works of such scientists: Frederick Winslow Taylor, George Kerzner, Rita Mulcahy, David I. Cleland, Carlos Martin-Rios, Kathy Schwalbe, Gary Heerkens, Harvey Maylor, Lawrence Leach, Michael Greer.

The aim of the master's thesis is to explore effective strategies and methods of project management for the implementation of resource-saving technologies to ensure sustainable resource utilization and waste minimization.

To achieve this aim, the following *objectives* have been defined:

- Investigate the essence and types of projects for the implementation of resource-saving technologies.
- Analyze international experience in implementing projects for the introduction of resource-saving technologies.

- Examine methodological aspects of project management for the implementation of resource-saving technologies.
- Conduct an analysis of the problem and project idea development.
- Analyze the relationship between the goal, objectives, and tasks of the project.
- Investigate the technical analysis of the project for the implementation of resource-saving technologies.
- Analyze the procedure and peculiarities of developing project summaries and strategies.
- Explore the process of project budget planning.
- Analyze methods of project risk management.

The object of the research are the processes and practices of project management aimed at implementing resource-saving technologies.

The subject of the research are specific methods and tools of management that contribute to the successful implementation of projects for the introduction of resource-saving technologies and promote sustainable resource utilization.

The theoretical basis for writing the master's thesis consists of scientific articles and publications addressing project management and resource conservation, international regulatory acts, data from official websites of international organizations, and so forth.

Research methods. The master's thesis utilizes methods of systemic analysis, synthesis, statistical-economic method, forecasting, observation, study of regulatory framework, comparative and logical-structural methods.

Practical significance lies in the fact that certain recommendations and conclusions formulated in the master's research can be directly used in the educational process for the study and teaching of disciplines of the relevant direction, as well as for the development of plans and strategies for community development.

Structure of the thesis. The master's thesis consists of an introduction, three chapters, conclusions, and a list of references.

CHAPTER 1.
THEORETICAL AND METHODOLOGICAL FOUNDATIONS OF PROJECT MANAGEMENT FOR THE IMPLEMENTATION OF RESOURCE-SAVING TECHNOLOGIES

1.1. Essence and Types of Projects in the Field of Resource Conservation

Resource-saving projects are an integral component of modern society as they address pressing issues related to the ecological crisis and depletion of natural resources. In the context of increasing awareness of the necessity for sustainable development, resource conservation becomes an urgent need to ensure an environmentally stable future. Implementing such projects helps reduce the negative impact on the environment, conserve vital natural resources, and improve the quality of life for people. Considering the growing demands for environmental safety and energy efficiency, resource-saving projects become essential instruments for achieving these objectives. They contribute to reducing environmental pollution, lowering emissions and waste, and creating conditions for sustainable economic growth. Thus, implementing resource-saving projects is a step towards preserving the planet and securing its future for future generations.

Resource conservation is a system of measures aimed at the rational use of natural resources, energy, and materials to reduce consumption, minimize waste, and mitigate negative environmental impact. This concept involves the efficient use of resources through optimizing production processes, implementing energy-efficient technologies, waste recycling, and promoting sustainable development. Resource conservation is an important component of sustainable resource management and contributes to economic, environmental, and social stability [16].

Resource-saving technology refers to innovative methods, processes, or systems aimed at reducing the consumption of natural resources, energy, and materials during production, use, and recovery of products and services. These technologies may include improving production processes, using energy-efficient

equipment and systems, reducing waste and implementing recycling, as well as utilizing renewable energy sources and materials. Resource-saving technologies contribute to conserving natural resources, reducing emissions of harmful substances and environmental pollution, as well as increasing production efficiency and competitiveness of enterprises.

The implementation of resource-saving technologies project is an initiative aimed at implementing specific measures and strategies to introduce effective technologies that reduce the consumption of natural resources, energy, and materials in production processes or everyday life. These projects aim to improve environmental efficiency and reduce negative impact on the environment, while also contributing to cost reduction and enhancing the competitiveness of businesses and society as a whole.

The essence of resource-saving projects lies in a conscious and systematic approach to the efficient use of resources, reducing material and energy costs, as well as avoiding or minimizing negative impacts on the environment. Here are some key aspects of the essence of resource-saving projects:

The main goal of resource-saving projects is to reduce the consumption of natural resources (such as water, forests, minerals), energy (fuel, electricity), and materials (paper, plastic, metal) through rational planning, implementation of effective technologies, and process optimization. Additionally, resource-saving projects aim to reduce emissions of pollutants, waste, and other negative environmental impacts, thereby contributing to the preservation of natural ecosystems and biodiversity.

Resource-saving projects can be implemented at various levels, from small-scale initiatives (e.g., implementing energy-saving measures in households) to large-scale initiatives (e.g., transitioning to renewable energy sources at the national level).

They may include both technical solutions (e.g., implementing new energy-saving technologies or waste recycling) and organizational aspects (e.g., implementing energy management systems or environmental standards).

The implementation of resource-saving projects often requires collaboration and interaction among various stakeholders, including government structures, the business sector, civil society organizations, and local communities. Stakeholders may have different interests and purposes for participating in the project, but they work together to achieve common goals of resource conservation and environmental protection.

Resource-saving projects often involve the implementation of innovative technologies, addressing complex engineering and organizational challenges, as well as considering social and economic aspects.

The effectiveness of resource-saving projects is assessed through monitoring resource consumption, emissions, waste, and other indicators, as well as considering social, environmental, and economic benefits. Continuous monitoring and evaluation allow for identifying opportunities for further improvement and optimization of projects [45].

In summary, the essence of resource-saving projects lies in the search for and implementation of innovative and effective solutions to ensure sustainable use of natural resources and preservation of the environment for future generations. Table 1.1 systematizes the main types of resource-saving projects.

The implementation of projects on the implementation of resource-saving technologies has great potential for promoting the transition to a circular economy. Resource-saving technologies help to reduce the consumption of natural resources and energy, and also increase the efficiency of the use of materials and resources in production processes. This helps to reduce waste and emissions, as well as increase the use of secondary materials and resources. The introduction of these technologies is an important step in the transition to a circular economy, which is based on the principles of resource conservation, the use of secondary resources and the reduction of waste. The circular economy promotes a closed loop of resource use, where materials and products are recycled and reused instead of becoming waste. Resource-saving technologies can be a key element in this transition, as they help ensure the

efficient use of resources and materials throughout the production and consumption life cycle.

Table 1.1

Classification of resource-saving projects *

Types of resource-saving projects	*Description*	*Examples*
Energy efficiency	Projects aimed at reducing energy consumption in buildings, transport, industry and other areas. This may include improving building insulation, using energy efficient equipment and energy efficiency management systems.	"Energy Star" program in the USA, "Energieeffizienz" initiative in Germany
Use of renewable energy sources	Projects aimed at implementing solar, wind, hydro and other renewable energy sources to replace traditional energy sources such as coal and oil.	The company Tesla with its solar cells, wind farms in Denmark
Water resources management	Projects aimed at optimizing the use of water resources, reducing water losses and implementing wastewater treatment technologies.	Water metering program in Australia, Clean Water for All project in India
Use of secondary materials and recycling of waste	Projects aimed at reducing waste production and their further processing into secondary materials.	The Coca-Cola Company with a plastic bottle recycling program
Establishment of local waste management systems	Projects aimed at organizing an effective system of collection, sorting and recycling of waste at the local level.	Waste sorting program in Sweden, "Zero Waste" project in Japan
Ecological mobility	Projects aimed at reducing vehicle emissions by introducing electric vehicles, using public transport and encouraging cycling and walking.	The program for the development of electric vehicles in Norway, the "Citi Bike" campaign in New York
Environmental educational and informational initiatives	Projects aimed at increasing public awareness of resource conservation, energy efficiency and environmental protection issues.	"Go Green" campaign in Great Britain, Energy Conservation Education Program in Japan

* Compiled by the author according to [8]

The development of the circular economy became a response to the challenges of the modern world related to environmental, economic and resource aspects. The modern linear model of production, based on extraction, use and disposal, leads to environmental pollution, depletion of natural resources and uneven distribution of wealth. The circular economy, on the other hand, aims to reduce waste, maximize the use of resources and create sustainable economic development. This not only helps to reduce the negative impact on the environment, but also creates opportunities for innovation, new business models and a balanced distribution of resources. The introduction of circular economy is due to the need for sustainable production, reduction of energy consumption, recovery of secondary resources and creation of a closed cycle of material use. It not only meets the challenges of nature conservation, but also helps businesses reduce costs and risks, promotes innovation and green technology development, and promotes business social responsibility.

The principles of the circular economy are reduction, reuse and recycling aimed at solving the serious problem of waste, which is becoming more and more important for the environment. In modern conditions, disposal costs exceed production costs. To achieve this goal, the following strategies must be implemented: create closed cycles of production and service of goods, recover energy during production for economic and environmental benefits, develop systems thinking to abandon fast consumption in favor of long-term planning. Implementation of the circular economy can be carried out with the help of various approaches and initiatives aimed at reducing waste, optimizing the use of resources and stimulating sustainable consumption (Fig. 1.1).

In the modern world, where attention to environmental problems and efficient use of resources is growing, the implementation of resource-saving technology implementation projects is becoming an increasingly urgent task. These projects not only help to reduce the negative impact on the environment, but also have significant potential from an economic point of view.

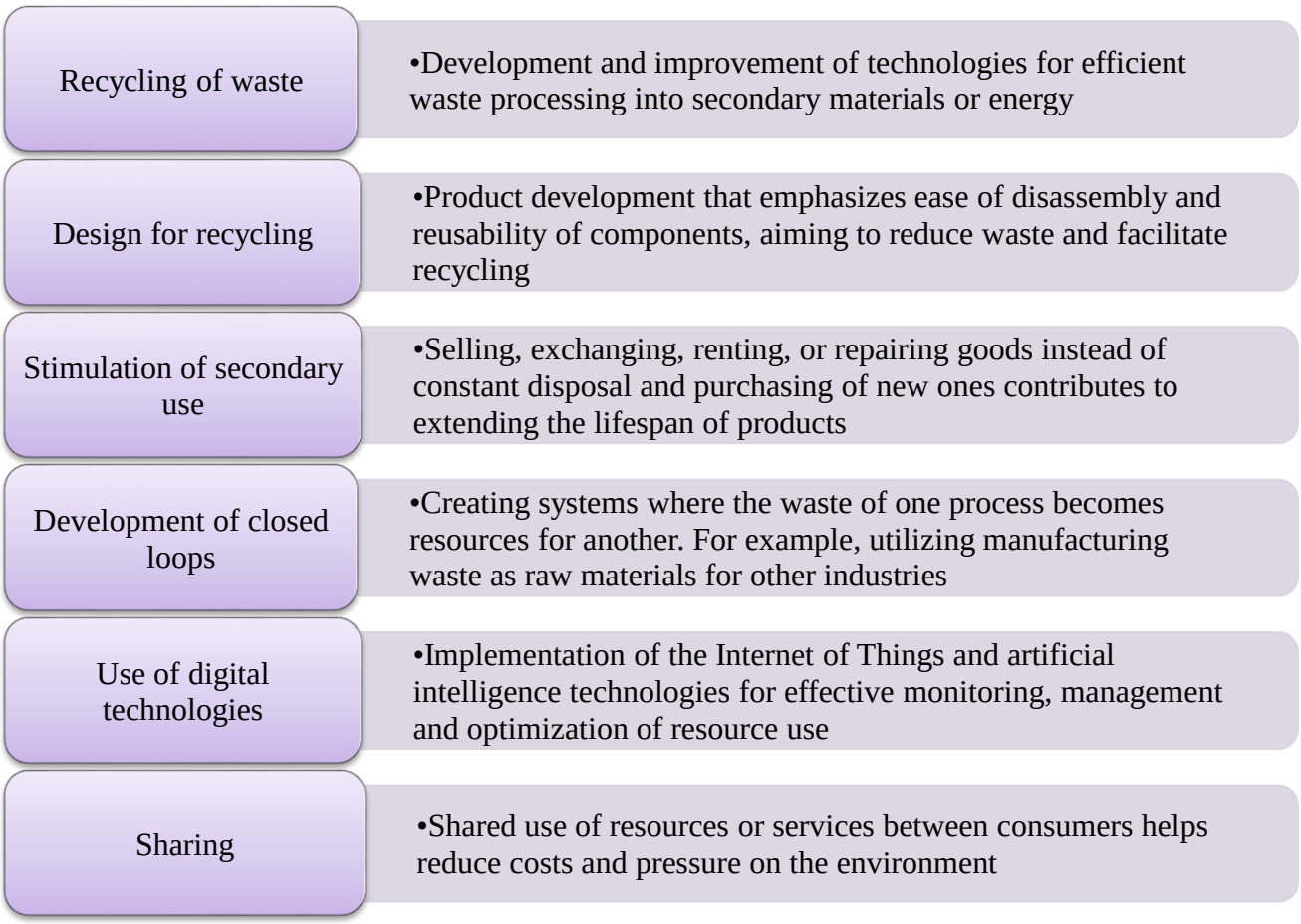

Fig. 1.1. Approaches of the circular economy in the context of resource conservation*
*Compiled by the author according to [39; 47]

Reducing resource and energy costs, reducing emissions and pollution, increasing the competitiveness of enterprises and stimulating innovation are just some of the benefits that the implementation of such technologies can bring. The transition to resource-saving approaches is an important step in creating a more sustainable and efficient economy that will ensure not only economic development, but also preserve the environment for future generations. In this context, consideration of aspects of the introduction of resource-saving technologies is critical for understanding the advantages of such an approach and its importance for sustainable development [40]. Figure 1.2 shows the advantages of implementing resource-saving technology implementation projects.

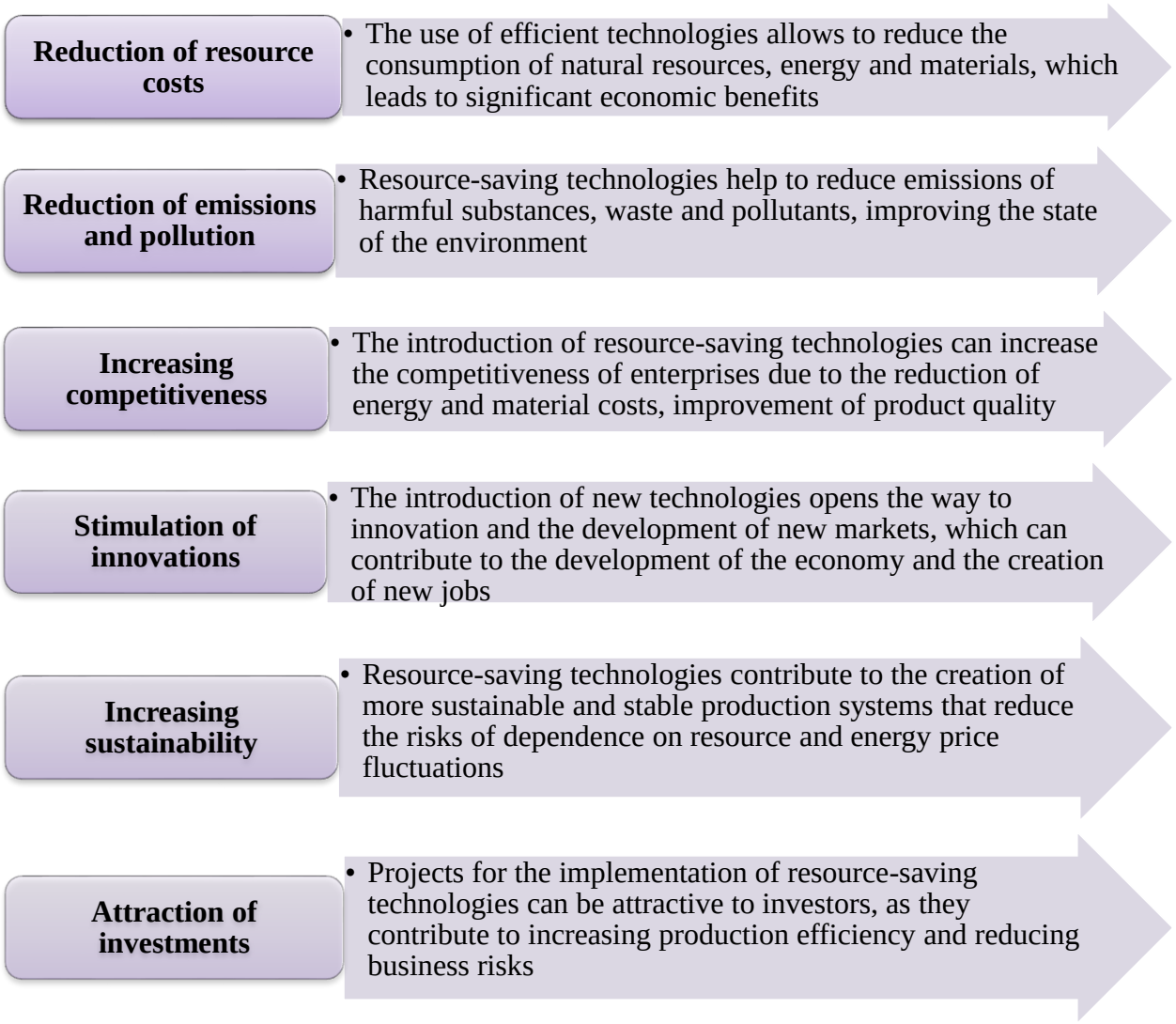

Fig. 1.2. Advantages of implementing projects of resource-saving technologies * * Compiled by the author

Projects for the introduction of resource-saving technologies differ in their features compared to other types of projects. They include not only technical and engineering aspects, but also take into account environmental, economic and social requirements. The main features of such projects [50]:

1. Integrated approach. Projects of resource-saving technologies require an integrated approach covering various aspects such as technical feasibility, environmental consequences, economic feasibility and social impacts.

2. Long-term impact. The implementation of resource-saving technologies often has a long-term impact, as it is aimed at creating a sustainable basis for future

development, ensuring sustainability and reducing the negative impact on the environment.

3. Innovativeness. These projects often include the use of the latest technologies and innovative approaches to ensure maximum resource and energy efficiency.

4. Cooperation and partnership. Implementation of resource-saving technology projects often requires collaboration and partnership between various sectors, including government agencies, the private sector, community organizations, and academic institutions.

5. Comprehensive risk assessment. Implementation of projects of resource-saving technologies requires a comprehensive assessment of risks related to technical, environmental, economic and social aspects, as well as the adoption of appropriate strategies for managing these risks.

These features make projects of implementation of resource-saving technologies an important element for achieving sustainable development and ensuring efficient use of resources in the modern world.

Projects for the introduction of resource-saving technologies can be attractive from different perspectives. First, they can provide significant economic benefits, including reducing energy and material costs, optimizing production processes, and increasing the competitiveness of enterprises. In addition, the implementation of such projects can lead to a reduction in business risks associated with resource price fluctuations and changes in environmental safety requirements. From an environmental perspective, these projects help reduce emissions and pollution, improve air and water quality, and conserve natural resources. In addition, they can have a significant social impact, creating new jobs, improving the quality of life in communities and promoting innovation and education in sustainable production. In general, the attractiveness of projects for the introduction of resource-saving technologies lies in their potential to provide a balance between economic, environmental and social benefits for society.

1.2. Analysis of Experience in Implementing Projects for the Introduction of Resource-Saving Technologies

The analysis of the experience of implementation of projects of introduction of resource-saving technologies indicates a wide range of important conclusions and lessons that can be used for future initiatives in this area. First of all, successful projects often require an integrated approach that takes into account technical, economic, environmental and social aspects. It is important to take into account the specifics of each specific case and the relationship between various factors. The experience also highlights the importance of collaboration and partnership between various stakeholders, such as government agencies, the private sector, community organizations and academic institutions. This promotes the exchange of knowledge, resources and skills, which can significantly improve the results of projects [16].

Successful resource-saving technology projects often have an open and flexible approach to change. The ability to adapt to new conditions and take into account changes in the economic, political and technological environment is a key element of success.

The experience of implementing resource-saving technologies demonstrates a wide range of initiatives and successful practices aimed at creating a more sustainable and resource-saving environment.

Energy efficiency

The "Energy Star" program in the USA, which is aimed at stimulating the use of energy-efficient technologies in construction and industry. This program awards energy efficiency certificates to products and premises that meet high standards for reducing energy consumption. This helps save energy, reduce costs, and reduce greenhouse gas emissions [54].

The “Energiesprong” project in the Netherlands is an innovative initiative aimed at transforming residential buildings into energy-efficient and environmentally friendly objects. This project was developed with the aim of significantly reducing

the energy consumption of the residential sector and correspondingly reducing greenhouse gas emissions.

The main components of the “Energiesprong” project are insulated facades, solar panels and energy-efficient equipment. The project involves the installation of insulated facades on buildings. This makes it possible to significantly reduce heat loss through the walls of buildings, which ensures more effective retention of heat inside the premises. As part of the project, solar panels are installed on the roofs of buildings. This allows you to generate your own electricity, which can be used for the needs of lighting and electrical appliances in the house. The project also includes the installation of energy-efficient equipment, such as high-efficiency heating systems, variable-performance ventilation systems, etc. This makes it possible to use energy more efficiently and reduce electricity consumption.

The “Energiesprong” project is an important step towards the sustainable development of the housing sector, providing a significant reduction in energy consumption and greenhouse gas emissions. This initiative reflects the desire of the Netherlands to create an energy-efficient and ecologically clean living environment for its citizens [14].

The Blue Sky Project in Shenzhen, China is an ambitious initiative to build energy-efficient buildings that meet today's requirements for sustainable development and environmental safety. This project includes a number of innovative solutions and technologies aimed at significantly reducing energy consumption and greenhouse gas emissions.

The main features of the “Blue Sky” project: 1) Use of solar panels: the buildings are equipped with solar panels that will ensure the production of clean electricity without emissions of harmful substances. This will reduce dependence on traditional energy sources and impact on the environment. 2) Energy-efficient heating and air-conditioning systems: the project involves the use of advanced heating and air-conditioning systems, which are characterized by high energy efficiency and minimal energy consumption. This will allow to optimize the use of energy and provide comfortable conditions for the residents of the building. 3) Use of

environmentally friendly materials: during the construction of “Blue Sky”, great attention is paid to the use of environmentally friendly materials and technologies, which reduces the negative impact on the environment and the health of residents. 4) Energy management systems: buildings will be equipped with energy management systems that automate the processes of regulating energy consumption and optimize its use, which contributes to the efficient functioning of the building and the reduction of energy consumption. The “Blue Sky” project reflects the high level of technological development and China's rapid desire to create energy-efficient and environmentally friendly facilities that meet the modern requirements of sustainable development and energy efficiency [7; 49].

Use of renewable energy sources

The use of renewable energy sources in China is one of the key directions in the country's efforts to improve energy security, reduce dependence on coal and other traditional energy sources, and reduce greenhouse gas emissions.

One example is large-scale investment in the production and use of solar panels. China is the world leader in the production of solar cells and panels, as well as in the use of solar power plants. its ambitious goal is to make solar energy the country's main source of electricity by 2030. Public policy promotes the development of solar energy by providing financial support and incentives for the installation of solar panels on building roofs and large solar power plants. This allows reducing the consumption of traditional energy sources and greenhouse gas emissions, contributing to the transition to cleaner energy sources [37].

Another important direction is the development of the production and use of electric vehicles. China has already become the largest market for electric vehicles in the world, and the government is actively supporting the development of the sector by providing subsidies and building charging infrastructure.

BYD is a Chinese manufacturer of electric vehicles and batteries. They are also interested in the production and development of renewable energy, including solar panels and energy storage systems. BYD started production of its first plug-in hybrid electric vehicle in 2009. With the increasing market share of electric vehicles in

China, BYD has seen significant sales growth since 2020. As of November 2023, BYD Auto has become the largest manufacturer of plug-in electric vehicles, overtaking Tesla. BYD is also the best-selling car brand in China as of the first quarter of 2023. American company Rivian specializes in electric pickup trucks and SUVs. They focus on sustainable production and the use of secondary materials. These companies show interest in manufacturing vehicles based on circular principles and using renewable energy sources to improve the sustainability of the automotive industry.

China is also actively developing the production of wind power plants and hydroelectric power plants. It is also worth noting that China is actively investing in the research and development of other renewable energy sources, such as geothermal energy, marine energy and biofuels. In general, the use of renewable energy sources in China is an important element of the country's strategy to combat climate change and ensure sustainable development [10].

Water resources management

The examples demonstrate the diversity of water management projects and their important contribution to the conservation and efficient use of water resources. Project “Water supply and water treatment system in the city of Copenhagen, Denmark”: Innovative technologies for wastewater treatment and the use of renewable energy sources for the operation of treatment facilities have been introduced in Copenhagen. This makes it possible to significantly reduce energy consumption and impact on the environment [17].

The “Water Management in the Agro-Industrial Sector” project in Israel, which implements advanced irrigation and irrigation technologies in agriculture, such as drip irrigation and aeroponics systems. These technologies allow efficient use of water resources and water conservation in arid regions. The project “Effective use of water resources in the city of Singapore”: water recovery and purification technologies have been introduced in Singapore, allowing the use of wastewater for irrigation, cooling and other needs of the city. This reduces the need for fresh water and helps save water resources. Coca-Cola Water Resources Management Project:

The Coca-Cola Company is actively implementing programs for the efficient use of water resources in its production activities. This includes the use of advanced water treatment technologies, implementation of rainwater recovery and use systems, and reduction of water consumption in production processes [2].

Use of secondary materials and recycling of waste

One of the examples of the successful implementation of the project of introducing resource-saving technologies is the initiative of the Coca-Cola company to create a program for recycling plastic bottles. As part of this project, the company introduced innovative technologies for processing used bottles into secondary raw materials, which are then used for the production of new packaging. This allows the company to reduce raw material costs, minimize waste and reduce environmental impact by reducing waste.

Tesla actively uses secondary aluminum in the production of its electric cars. Secondary aluminum is obtained from the processing of used aluminum scrap. The use of secondary material allows to reduce energy costs and environmental impact compared to the production of primary aluminum. Tesla electric cars are designed with ease of disassembly and reuse of their components. This helps in simplifying recycling processes and the possibility of using some parts in the production of new cars. Tesla is studying the possibilities of collecting and using waste during production. This may include the processing of waste secondary materials or their use in other aspects of production. The company takes into account not only material aspects, but also uses renewable energy sources in production processes. For example, solar panels and energy storage batteries are installed in many manufacturing facilities. These practices allow Tesla to reduce its own carbon footprint, contributing to the development of circular principles in the automotive industry and changing approaches to sustainability and environmental responsibility [3].

The Chinese company NIO manufactures electric vehicles and develops battery production technologies. They are also exploring the possibility of using battery waste for secondary use in the energy sector. The BMW company has been

producing the BMW i3 model since 2013, the first serial electric car of the German company BMW, the model is produced using secondary materials and is easily recyclable. In addition, the company is actively studying the possibilities of using waste during production.

Companies are implementing technologies that allow processing waste from secondary raw materials for the production of new products. For example, businesses in big cities can use waste to generate energy.

Let's consider the methods of waste on the example of the company *TerraCycle*, whose business Inc. magazine. Called “the best small startup in the USA.” TerraCycle currently works with more than 35 million people in twenty countries to collect waste and turn it into useful products.

TerraCycle is a company that specializes in recycling hard-to-digest waste that is not traditionally recyclable. They cooperate with various brands and organizations, including large international companies. TerraCycle has created a reusable Loop platform that allows any brand to create reusable versions of their product packaging. As a freshman at Princeton University, Tom Saki founded TerraCycle in 2001 to help eliminate the idea of waste by making plant-based worm food from cafeteria leftovers. TerraCycle Worm Poop Plant Food was soon sold by major retailers including The Home Depot, Target, and Walmart, and the company established its headquarters in Trenton, New Jersey.

By 2010, the Recycling Program had collected and recycled more than 50 million beverage bags and raised more than $1 million. through the TerraCycle Points Program. In 2014, TerraCycle launched Zero Waste Box, offering recycling solutions for an even wider variety of waste. In 2016, the first industrial recycling program was implemented in the United States, recycling adhesive packaging together with Henkel.

In 2020, TerraCycle launched the TerraCycle Global Foundation, which works to remove plastic from rivers and canals before it reaches the ocean. 2021 saw the launch of SalonCycle in the US, a simple way to recycle all waste. TerraCycle made all the podiums for the Tokyo Olympics out of recycled waste.

All TerraCycle recycling models have a lower environmental impact compared to traditional solutions (landfill, incineration) in eight main impact categories, including global warming. This means that TerraCycle is on average 45% better than traditional recycling models. Their free recycling programs are sponsored by stakeholders, so you can recycle for free. It is a way for stakeholders to voluntarily take responsibility for harmful impacts [36].

Establishment of local waste management systems

Covanta Holding Corporation is a company that specializes in generating electricity from waste. They use energy recovery technology to convert waste into electricity. This technology is particularly effective in outsourced waste management systems of large cities. Recyclebank creates a platform to encourage environmentally responsible consumer behavior through rewards and bonus programs. They collaborate with various companies and municipalities to implement circular approaches in the field of waste. The Canadian company Loop Industries develops technologies for processing plastic into higher quality and highly recyclable materials. This contributes to the creation of closed production cycles and supports the secondary use of plastic materials. Veolia is a company specializing in resource management and waste disposal services. They collaborate with various industries to implement circular solutions. These companies are just a few examples of business entities implementing circular economy technologies to convert waste into secondary resources or energy [55].

Ecological mobility

Projects for the introduction of resource-saving technologies in the field of ecological mobility are initiatives aimed at the implementation of innovative technologies and practices with the aim of reducing resource consumption, reducing energy consumption and emissions of harmful substances in mobile technologies, such as vehicles and infrastructure. These projects may include the development and implementation of electric vehicles, the installation of networks of charging stations for electric vehicles, the development of public transport, the promotion of the use of bicycles and walking routes, and the promotion of the use of open public transport.

A public transport electrification program is being actively implemented in Shanghai. The city authorities purchase and use electric buses, which allows to reduce air pollution and emissions of harmful substances. In Amsterdam, the city authorities continue to actively develop infrastructure for cyclists. A large network of bicycle paths and special parking lots for bicycles contribute to the reduction of traffic and air pollution. The project “Expansion of the network of charging stations for electric cars in France” stimulates the use of electric cars and reduces dependence on traditional cars with internal combustion engines. In San Francisco, electric scooters are widely used as an alternative means of transportation. They help reduce traffic flow and air pollution in the city. These projects aim to improve air quality, reduce road congestion, reduce dependence on hydrocarbons and promote sustainable development in cities and territories in general.

Environmental educational and informational initiatives

Environmental education and information initiatives are important for projects to introduce resource-saving technologies, as they contribute to public awareness of the need to conserve natural resources and reduce the impact on the environment. These initiatives consist of conducting various activities such as training seminars, lectures, courses, exhibitions, conferences, waste collection campaigns, creating educational materials and disseminating information through the media. Their goal is to increase public awareness of environmental issues, understanding the need for rational use of resources, and spreading knowledge about environmentally friendly technologies and practices. These initiatives support the promotion and adoption of green initiatives, thereby contributing to the reduction of society's ecological footprint and the transition to a more sustainable lifestyle.

The Ellen MacArthur Foundation is a non-profit organization that actively works to popularize and develop a resource-efficient economy. The organization works with companies and governments to implement circular approaches. They also run educational campaigns and provide resources to understand circular principles. The Cradle to Cradle Products Innovation Institute works to stimulate the market for

products created using circular principles; Cradle to Cradle certification guarantees a high degree of sustainability and the use of safe materials in production [12].

The experience of implementing projects of resource-saving technologies shows that it is important to have a clear system of monitoring and evaluating results. This makes it possible to identify problems in time, determine the effectiveness of measures and make the necessary adjustments to achieve the set goals.

1.3. Methodological Aspects of Project Management for the Implementation of Resource-Saving Technologies

Methodological aspects of project management for the introduction of resource-saving technologies include a systematic approach to the planning, implementation and control of such projects in order to achieve their goals effectively and efficiently. Methodological aspects of project management for the introduction of resource-saving technologies are key to the successful implementation of such projects and ensuring their efficiency and stability.

In the context of resource conservation and resource efficiency, where the main emphasis is on optimizing the use of resources and creating efficient production cycles, projects play a key role. They introduce new technologies, create innovations and attract new partners to implement resource-saving ideas. Although projects can cause unpredictable changes, they stimulate internal restructuring of companies and organizations, encouraging flexibility and willingness to learn. Flexibility in project management allows you to monitor changes, adapt strategies and ensure the support of all participants. This approach contributes not only to the successful implementation of projects, but also to the creation of a sustainable and competitive business under the conditions of a resource-saving approach [46].

Project management standards in the field of resource-saving technologies play a key role in ensuring the success and efficiency of the implementation of such projects. Some of the main project management standards used in this area include:

ISO 14001. This standard defines the requirements for the environmental management system, including aspects of planning, implementation, control and continuous improvement of processes aimed at reducing the negative impact on the environment. The implementation of this standard helps organizations to effectively manage resources and reduce waste as a result of the implementation of resource-saving technologies. ISO 14001 is an international standard that defines requirements for an environmental management system. The main goal of ISO 14001 is to reduce the company's negative impact on the environment and ensure sustainable resource management [22].

In the context of resource-saving technologies, the implementation of the ISO 14001 standard helps organizations effectively manage their resources, identify opportunities to reduce waste and optimize the use of material and energy resources. This may include improving production processes, using renewable energy sources, implementing efficient waste management and recycling systems, and implementing low-waste technologies. In general, ISO 14001 is an important tool for supporting sustainable development and ensuring the effective implementation of resource-saving technologies in various areas of business and industry [23].

A project management methodology is a systematized set of principles, approaches, tools, and practices that determine how to effectively plan, execute, and control projects. It provides a structured approach to project work and defines milestones, tasks, and responsibilities, helping to successfully complete projects within time, budget, and scope constraints. The project management methodology can be based on recognized standards that establish norms and recommendations for the implementation of project tasks [34].

We will analyze the main characteristics of project management methods that can be used to manage projects for the introduction of resource-saving technologies.

Waterfall. Waterfall is a linear and sequential approach to project management, where the entire project is broken down into phases, and each phase begins after the previous one is completed. From requirements definition and planning, the project moves through the stages of development, testing, implementation and support.

Changes in requirements during development can be difficult to implement. Waterfall is suitable for projects with well-defined requirements, but may not be effective for flexible and complex tasks where adaptation to change is required.

Agile. The Agile project management method is a flexible approach to project execution aimed at rapid response to changes, interaction with the customer, and continuous delivery of a functional product. The main principles of Agile include an iterative approach to development, an emphasis on communication and collaboration in a team, as well as a readiness for change at any stage of a project. Flexibility and openness to change are the main features of Agile, and this approach allows you to effectively solve tasks in conditions of uncertainty and ensures greater satisfaction of the customer with the result of the project.

Scrum. Scrum is a flexible project management method for software development. The project is divided into short iterations, or sprints, lasting 2-4 weeks. Each sprint begins with planning, includes a constant exchange of information between the development team, the product owner and the scrum master. The Product Owner prioritizes tasks, and the Scrum Master supports the team and resolves potential issues. Iterations end with a demonstration of the results, which allows the product to be evaluated and allows for adaptation and improvement throughout the development process.

Project Management Body of Knowledge (PMBOK). Project Management Institute's PMBOK (Project Management Body of Knowledge) methodology is recognized and widely used. It defines the basic principles and processes of project management, focusing on five key stages: initiation, planning, execution, monitoring and control, project closure. Each phase includes key steps and requires the use of specific knowledge and skills, such as project plan development, risk assessment, task and resource definition, budget analysis, and quality control. The PMBOK serves as an important tool for standardizing and improving the effectiveness of project management in various industries and organizations.

Critical Path Method (CPM). The critical path method (CPM) is key to project management, aimed at optimizing the sequence of tasks that determine the duration

of the project. The main idea is to identify the "critical path" where delays affect the duration of the entire project. The method determines task durations, their dependencies, and possible delays using network analysis. The critical path is a sequence of tasks that determines the duration of the project. CPM helps identify key tasks for timely completion and develop resource management strategies.

Critical Chain Project Management (CCPM). Critical Chain Project Management (CCPM) is a strategy aimed at avoiding delays and maximizing the use of resources in a project. It uses the concept of a "critical chain" to identify the tasks with the greatest impact on the duration of the project. The basic idea is to focus attention and resources on these critical elements, reducing the risk of delays and using spare time for non-critical tasks. CCPM also incorporates the concept of "buffers" to compensate for uncertainties and provide additional time at critical stages. This methodology improves resource management, planning and communication within the project team, ensuring that tasks are completed efficiently and projects are completed on time and within budget.

Kanban originated in Japan as a production system in the automotive industry, and is now widely used in project management. This method is based on visualizing the workflow and limiting the number of tasks that are performed simultaneously. In Kanban, tasks are displayed on a board (Kanban Board) and moved between columns, representing stages of the workflow, such as “To Do”, “In Progress”, and “Done”. The key principle is to limit the number of simultaneous tasks at each stage, aimed at improving productivity and completing tasks before new ones. In addition, Kanban emphasizes continuous improvement, using feedback to optimize the work process[56].

Lean is a strategic approach aimed at streamlining processes and maximizing customer value by minimizing costs and eliminating non-value-added costs. The main principles of Lean include simplifying processes, reducing inventory and cycle time, improving quality and efficiency. An important part of Lean is the continuous learning and implementation of changes at all levels of the organization to achieve the highest productivity and value for the end user. Lean also emphasizes the

importance of collaboration, communication and interaction between project participants for continuous improvement.

PRINCE2 is a project management methodology developed in the UK with a focus on a structured and controlled approach. She views the project as an external initiative that requires a clear focus on business goals and efficient use of resources. Principles include a focus on the business case, stage management, roles and responsibilities, change and risk management, product orientation and an adaptive approach. The methodology defines principles, themes, processes and roles, creating a framework for effective project management. PRINCE2 standardizes approaches and improves communication between participants, which makes it widely used in various industries and for managing various projects in a changing business environment [56; 57].

The choice of project management methodology depends on various factors that are taken into account when making a decision. Here is a short *list of conditions that need to be taken into account when deciding on the choice of methodology*: project cost and budget, team size, ability to take risks, flexibility, timeline, cooperation with clients and stakeholders [48].

Project cost and budget are key factors determining the choice of project management methodology. In the case of a limited budget or strict financial constraints, it can be important to choose a methodology that allows you to effectively manage costs and minimize the risks of financial overruns. Some methodologies, such as Agile, can be useful in situations where flexibility and the ability to adapt to change are required, which also contributes to the efficient use of limited resources. On the other hand, for large budgets and complex projects, more formalized methodologies may be chosen that provide a high level of control and structure in project management. Taking financial aspects into account is key to choosing the optimal methodology that meets the specific budget conditions and financial requirements of the project.

Team size is an important factor in choosing a project management methodology. In large teams where many members are involved in the project, it can

be effective to use more structured and formalized methodologies such as Waterfall or PRINCE2. This allows project managers to clearly allocate responsibilities, define roles and stages of work. Conversely, smaller teams with fewer members may use more flexible methods such as Agile. Flexibility and interoperability become more important as communication is more direct and the need for rigid management is less. Therefore, the size of the team determines the degree of necessary structure and flexibility in the project management methodology.

The ability to take risks has a significant impact on the choice of project management methodology. In large and impactful projects, where huge risks can have significant consequences, the use of more traditional and tightly controlled methodologies, such as Waterfall, may be justified. This allows you to avoid big risks and unforeseen changes, ensuring stability and clarity in the execution of the project. Conversely, in industries and companies where innovation and rapid change are considered key success factors, agile methodologies may be chosen. They allow you to respond effectively to changes, quickly implement new ideas and risky strategies to achieve better results in a more competitive environment. Thus, the ability to take risks determines how flexible the methodology should be and ready to take on a high level of uncertainty during the execution of the project.

Project flexibility determines how easily changes can be made to the scope of the project or the product during its implementation. If the project requires flexibility and can evolve over time, then flexible or iterative methodologies such as Scrum or Agile may be more appropriate. These methodologies allow you to effectively adapt to changes in requirements and adjust the project strategy according to the development of the situation. The ability to flexibly respond to new insights or client requirements without significantly impacting the rest of the process makes these methodologies popular in modern project management.

Chronology. The duration of the project significantly affects the choice of management methodology. If the allotted time is limited and the project needs to be completed quickly, it may be appropriate to use methodologies that accelerate the schedule and allow for faster implementation of changes. On the other hand, if it is

more important to achieve high quality and better results, regardless of how long it takes, then the chosen methodology may be less accelerated, but more detailed and focused on achieving high efficiency and compliance with the project goals.

Cooperation with customers and stakeholders is determined by the level of their participation and influence on the project management process. This is an important factor in choosing a methodology. When interaction with customers and stakeholders is active and required throughout the project, flexible and iterative methodologies such as Scrum or Agile may be chosen. They allow you to provide constant feedback, make changes during work and quickly respond to customer requirements. In the case when cooperation is limited to the initial and final phases of the project, and requires tighter control and preliminary planning, it is better to give preference to the Waterfall methodology. They provide a more detailed work plan and define a fixed set of stages that can meet the requirements of the parties. Therefore, the choice of methodology depends significantly on the importance of interactivity and cooperation with clients and stakeholders throughout the project [42].

Various methods can be used to manage projects of introducing resource-saving technologies.

Yes, the *Waterfall* method can be used for the following projects for the introduction of resource-saving technologies:

- Development and implementation of software for energy-efficient management of lighting systems in buildings. In this project, the team has to create software to automate lighting control in buildings in order to reduce electricity consumption. The Waterfall method can be effective in such a project because it requires a clear sequence of steps: requirements analysis, system design, development, testing, and implementation.
- Implementation of a system of monitoring and control of water consumption in industrial enterprises. This project envisages the creation of a system for monitoring water consumption in industrial processes with the aim of efficient use of this resource. The Waterfall method can be useful in this case, because

you need to define clear phases of system development, including requirements analysis, architecture design, programming, testing, and implementation.

- Creation of a waste management system at the enterprise in order to reduce emissions and optimize the utilization of materials. This project involves the development and implementation of a system for waste management at the enterprise in order to reduce the impact on the environment and optimize the processes of material use. The Waterfall method can be useful in this project because it will clearly define the stages of system development, including requirements analysis, development, testing and implementation.

Agile can be applied in the following cases of implementation of resource-saving technology implementation projects, when flexibility, speed of response to changes and constant interaction with interested parties are required:

- Development and implementation of energy-efficient solutions for buildings. In projects aimed at implementing energy-efficient technologies in residential buildings, Agile can be useful for quickly responding to customer needs and changes in requirements for energy-saving systems.
- Development and implementation of software for monitoring and managing energy consumption. In this case, Agile can help the team quickly adapt to new technologies and market demands to ensure efficient management of energy costs and ensure customer needs are met.
- Implementation of new methods of using renewable energy sources. In projects aimed at implementing new technologies for the use of renewable energy sources, Agile allows for the rapid implementation and testing of new ideas, taking into account the requirements of environmental sustainability and efficiency.

The *Scrum* method can be successfully used to implement resource-saving technology implementation projects, especially when constant communication, flexibility and speed of change implementation are important. Scrum can be useful in such projects due to the following advantages:

- allows the team to quickly respond to changes in market conditions, new technologies and customer requirements, which allows effective implementation of resource-saving technologies.
- allows you to regularly test, review and adapt strategies, which helps to ensure high quality of implemented technologies and efficient use of resources.
- supports constant interaction with interested parties, such as clients and users, which allows taking into account their needs and requirements in the process of developing and implementing resource-saving technologies.

Scrum can become an effective tool for managing such projects for the implementation of resource-saving technologies:

- Development and implementation of a mobile application for monitoring and managing electricity consumption. A team can use Scrum to quickly respond to changes in user and technology requirements. This application can provide users with convenient tools to track and reduce household electricity consumption.
- Creation of a water supply monitoring system and optimization of water consumption. In this project, Scrum can help ensure the rapid implementation of a monitoring system that will allow consumers to use water efficiently and reduce wastage.
- Development and implementation of an innovative waste management system. The team can use Scrum to quickly implement and test new ideas for waste management in the enterprise. This system can help reduce emissions and optimize the use of resources.

In all of these projects, Scrum allows the team to quickly adapt to changes, effectively collaborate with stakeholders, and provides constant quality control and effectiveness of implemented resource-saving technologies.

Critical Path Method (CPM) is best suited for projects where several tasks need to be performed simultaneously; or when the previous one must be completed before doing the following:

- Implementation of the production energy efficiency program: implementation of measures to increase energy efficiency and reduce emissions in the production process. CPM can help identify the steps to focus on to maximize performance improvements and ensure that each activity is implemented on time.
- The project to create a waste management system in an urban environment: the goal is to develop and implement a system that combines IoT elements and smart technologies for sorting and recycling waste in urban areas. CPM helps identify critical paths, ensures thorough project planning, including managing sensor implementation, system deployment, and infrastructure preparation.
- A project for the production of clothing: creation of a business model where the entire life cycle of clothing is taken into account, in particular, recycling, production of new clothing using secondary raw materials. CPM helps plan the stages from design development and material selection to production and implementation of a recycling system in the production process.

The CPM method is especially effective where it is necessary to accurately define and control the time frame and sequence of works, which is important in projects of implementing resource-saving technologies to achieve effective management of resources and maximize the positive impact on the environment.

PRINCE2 (Projects in Controlled Environments). The methodology is best suited to large and complex projects with clear requirements. PRINCE2 is a structured approach to project management and used in various industries. This method can be successfully adapted in the following projects:

- Food packaging design project: creation of ecological and recyclable packaging for products, promoting the principles of sustainable development and reducing waste. PRINCE2 will provide a clear hierarchy of tasks in the packaging development process, define quality criteria and testing stages. It will also help in managing customer and stakeholder requirements.

- A project on the introduction of resource-saving technologies in textile production: changing traditional models of textile production to those that involve the recycling and use of secondary materials. This method will allow you to effectively manage the processes of transition to a new business model, identify key stages of implementation and effectively interact with key stakeholders.
- Product development in the field of electronics: creation of an electronic device, where the main emphasis is on the ease of repair, upgrade and secondary use of components. The project requires strict phase management, defined resources and the establishment of precise success criteria, in line with PRINCE2 principles.
- Creation of a business model for maintenance and upgrading of household appliances: development and implementation of a project that contributes to the extension of the service life and the use of appliances, not their ownership. This project involves many phases, requires clear change management and may benefit from being managed using the PRINCE2 methodology.

These examples reflect situations where PRINCE2 can be effectively used for project management, particularly for large and complex initiatives. PRINCE2 allows you to clearly define the stages of the project, the relationships between them and ensure effective management of processes in projects in the field of resource conservation.

Kanban. The Kanban method is a work visualization and management system that focuses on work flow and is limited by workload. It is widely used to manage software development processes.

- Food industry waste utilization project: implementation of a system for creating products from food industry waste. Kanban is used to track inventory and optimize manufacturing processes from recycled products.
- Project on optimization of energy use in urban systems: development and implementation of a system that allows the use of renewable energy sources and

optimization of electricity consumption. Key stages of the project: study of the district's energy needs, development and installation of the necessary infrastructure, monitoring and management of energy consumption. The method helps to visualize and manage tasks at each stage of the project, in particular in the field of technical infrastructure installation.

- Green automotive project: In projects aimed at creating environmentally friendly cars, the Kanban method can coordinate the production and installation of components such as batteries and power systems to maximize workflow control.

The Kanban project management system originated in Japan from the field of software development and production. The term “Kanban” means “board” in Japanese. This method originated at Toyota in the 1950s and 1960s as part of the Just-in-Time system to optimize production and inventory management. The basic ideas of Kanban arose under the influence of the “supermarket” system and the “only what is needed, when it is needed” approach. Production processes were presented in the form of cards (Kanban), which moved across the board from stage to stage, indicating the need to manufacture new parts or products. In today's context, Kanban is used as a project and task management method. Kanban has become popular in many industries, covering not only software development, but also project management in general [56].

The critical chain method (CCPM) demonstrates its effectiveness in cases where the team has limited resources and all resources are involved in the execution of a single project.

- Implementation of the waste battery recycling program for batteries: creation of an infrastructure for the safe and efficient disposal of waste batteries and the use of their components. The method allows you to identify and manage the key stages of the disposal process, ensuring its successful implementation.
- Project on creating a circular system of water resources management: implementation of a system for efficient use and reuse of water resources in industrial and commercial conditions. Critical chains may include stages of

water treatment, storage and redistribution. Using the critical chain method helps control water quality, maintain environmental sustainability, and respond to potential problems in a timely manner.

When choosing project management methods in the field of resource conservation, it is important to pay attention to the specific features of the business and its needs. Each management method has its advantages and limitations, and the choice should be based on the company’s unique requirements, goals and structure. Considering the variety of projects for the introduction of resource-saving technologies, an effective approach may include the use of several methodologies at the same time to optimally solve tasks and achieve successful results.

CHAPTER 2. ANALYSIS OF THE IMPLEMENTATION SUPPORT FOR RESOURCE-SAVING TECHNOLOGY PROJECT

2.1. Problem Analysis and Project Idea Development for the Implementation of Resource-Saving Technologies Project

In today's world, the problem of efficient use of resources is gaining more and more importance in the context of growing demands for sustainable development and environmental protection. Improving resource efficiency is a critical task for business, civil society and government, as it helps reduce emissions, optimize costs and ensure the stability of economic development. Resource conservation strategies include the implementation of technologies aimed at optimizing the use of energy, water, materials and other resources in the production process and everyday life.

Before starting the development of a project on the introduction of resource-saving technologies, it is necessary to conduct an analysis of current problems in areas that require optimization of the use of resources. This analysis involves examining the current state of resource use, identifying the main sources of costs and emissions, and assessing existing technological and organizational constraints.

When analyzing a problem, attention should be paid to various aspects, such as the economic, environmental and social consequences of resource use. It is important to take into account the specifics of a specific industry or sector, as well as the context of socio-economic development of the country or region. Based on the collected data, it will be possible to identify key problems that require attention and solutions through the introduction of new technologies [43].

The development of the project idea includes the search and analysis of innovative solutions aimed at reducing the cost of resources and ensuring their more efficient use. This may include the application of advanced manufacturing technologies, the implementation of resource management systems and energy efficiency, as well as the development of new materials and production processes.

Table 2.1

Algorithm of actions for problem analysis and preparation of a project on the implementation of resource-saving technologies *

Step	Description
1. Information collection and analysis	Start by gathering all available information about the use of resources in your area of activity.
2. Defining problem areas	Identify the main problems or aspects that need improvement or optimization of the use of resources.
3. Analysis of influencing factors	Consider the various factors that influence the problem, such as economic, technological, environmental, and social factors.
4. Determining the cause of the problem	Try to find out why these problems occur. Is it because of outdated technology, inefficient resource management, or other reasons?
5. Assessment of consequences	Analyze the potential consequences of underutilizing resources.
6. Identification of opportunities	Look for opportunities to implement resource-saving technologies and methods that can solve identified problems.
7. Assessment of risks and benefits	Analyze the risks and benefits of implementing different solutions in order to ensure the optimal result.
8. Development of an implementation strategy	Based on the results of the analysis, develop a strategy for the implementation of resource-saving technologies that will meet the needs of your project and have the greatest potential for success.

* Compiled by the author

When analyzing the problem, it is worth paying attention to potential obstacles and challenges that may arise during the implementation of resource-saving technologies. Among them can be high costs for the introduction of new technologies, insufficient resources for the necessary research and development, as well as resistance from old systems and production methods [11].

In addition, it is important to consider the possible benefits that the implementation of resource-saving technologies will bring. Such benefits may include reducing energy and raw material costs, reducing emissions of pollutants, increasing the company’s competitiveness on the market, and improving the company’s image in the eyes of consumers and investors.

On the basis of the conducted analysis, it is possible to formulate the main goals and objectives of the project on the implementation of resource-saving technologies. Among them may be improving the efficiency of the use of resources, reducing the negative impact on the environment, increasing the competitiveness of the enterprise and ensuring sustainable development.

In general, the analysis of the problem and development of the project idea is an important stage in the implementation of resource-saving technologies. This process helps to identify key aspects of the problem, identify potential obstacles and advantages, and formulate the main goals and objectives of the project. On the basis of this data, it is possible to develop a technology implementation strategy that will effectively meet the needs of the organization and contribute to the achievement of the set goals.

Now, when the implementation of resource-saving technologies is becoming an urgent task in many industries and spheres of activity, it is also important to consider the prospects for the future development of this sphere. Technology is changing rapidly, there are new opportunities and challenges that may arise in the future.

One of the main prospects is constant technological progress in the field of resource conservation. The development of new materials, processes and management systems will make it possible to use available resources more efficiently and reduce the negative impact on the environment. In addition, innovative approaches to solving resource disruption problems, such as the development of recycling technologies and the use of alternative energy sources, should be taken into account. Implementation of such approaches can ensure a sustainable supply of resources and reduce dependence on limited sources. Finally, it is necessary to take into account the social aspect of the introduction of resource-saving technologies. It is important to ensure access to these technologies for different segments of the population and countries, reduce social inequalities and promote sustainable development of all population groups.

Therefore, the analysis of the problem and the development of the project idea for the implementation of resource-saving technologies are an important stage for the

development of efficient and sustainable use of resources. A properly designed and implemented project can contribute to the achievement of important goals of reducing resource consumption, reducing emissions of pollutants, and increasing the competitiveness of enterprises and countries as a whole.

Analyzing problems and defining the project idea begins with defining the context, understanding the field of activity in which the problem is observed, and determining the factors affecting it. The social, economic, environmental and technological factors that affect the industry in which the project is planned or the problem to be solved should be studied. It is important to study trends, regulatory changes and other factors that can create opportunities for a circular transition. This includes examining market trends, legislative constraints, technological capabilities, and other factors.

Projects aimed at the collection and use of secondary raw materials are an important component in the field of resource conservation. Firstly, the use of secondary raw materials allows us to significantly reduce the load on natural resources, since instead of extracting new materials, we use already existing ones. This not only reduces the costs of extraction and transportation of raw materials, but also has a positive effect on the environment, reducing the amount of waste that ends up in landfills or in nature. Second, recycling projects help create a more holistic production cycle where waste is turned into useful resources instead of just being thrown away. This contributes to increasing the efficiency of resource use and reducing the environmental impact of industry. Thus, projects aimed at the collection and use of secondary raw materials help to use resources more efficiently and reduce the negative impact on the environment, and therefore they can be considered projects in the field of resource conservation [6].

In addition, projects on the collection and use of secondary raw materials contribute to reducing the need for the production of new materials, which is usually associated with high energy and water costs, as well as emissions of greenhouse gases and toxic substances into the air and water. The use of secondary raw materials

allows to reduce such negative effects on the environment and contributes to the maintenance of ecologically clean production.

Recycling projects can have a significant economic impact. They contribute to the development of the secondary resources market and create new opportunities for enterprises in the field of waste processing. This can lead to the creation of new jobs, increased competitiveness of companies and increased profitability of activities in this sector.

Therefore, projects on the collection and use of secondary raw materials are an important element of the resource conservation strategy, as they contribute to more efficient use of resources, reduce environmental impact and stimulate economic development.

Reducing waste is an important strategy for several reasons. The increase in the volume of waste leads to environmental pollution and harmful effects on ecosystems. Large amounts of waste, especially plastic, end up in oceans, forests, rivers and soil, which can lead to water pollution, animal and bird deaths, as well as soil pollution and reduced fertility. Processing and disposal of waste requires significant expenditure of money, resources and energy. Reducing the volume of waste can help save money, especially in the context of the costs of its collection, transportation and disposal. Many wastes can be used as secondary raw materials for the production of new goods. Conserving natural resources by recycling and using waste helps reduce the need to extract new materials and resources. Waste treatment and disposal processes often require significant energy costs and can lead to greenhouse gas emissions. Reducing the amount of waste contributes to reducing these emissions and reducing energy costs.

It is most important to solve the problems of waste reduction in areas where the amount of waste is the largest and the impact on the environment and human health is the most critical. This includes consumption, manufacturing, food waste, packaging, construction and other industries where large volumes of waste are generated and where they can have the greatest negative impact.

The problem of plastic waste has become global, requiring complex and innovative solutions. In the context of resource conservation, solving this problem involves not only reducing the use of plastic, but also implementing strategies aimed at creating a closed cycle of the use of plastic materials. The need to solve the problem of plastic waste is determined by the variety of challenges associated with plastic pollution and its negative impact on the environment. Plastic waste, especially single-use products and packaging, has become a serious problem for ecosystems, water resources and human health.

Plastic consumption continues to grow. Global plastic production has doubled since the turn of the century to nearly 400 million tonnes per year in 2021. While plastic products have an average lifespan of about 10 years, plastic can take up to 500 years to decompose, depending on its composition and disposal. Global plastic waste generation is projected to triple to one billion tons by 2060 without changes to current policies. If new measures are introduced, this figure may drop to less than 700 million tons. Currently, less than 10% of plastic waste is recycled per year [51].

Due to misuse, plastic waste is disposed of in illegal landfills or incinerated in open pits, while significant amounts end up in rivers and oceans. From 1970 to 2019, approximately 30 million tons accumulated in the ocean, more than 100 million tons in rivers and lakes. Such large amounts of plastic pollution in waterways can have devastating effects on marine life and ecosystems. Asia accounts for more than 80% of global plastic waste that ends up in the ocean. However, while wealthier regions account for approximately five percent of the ocean's plastic waste, they often export vast amounts of plastic waste to developing regions for processing. Many of these countries lack the capacity to deal with such volumes of waste.

The problem of textile waste is a serious environmental and social challenge all over the world. Each year, large volumes of textiles are thrown into landfills and into the environment, with only a small fraction being recycled or reused. According to the European Commission, about 92 million tons of textile waste are thrown out annually in the world. This constitutes a significant part of waste in general and is a serious problem for the environment.

The fast fashion industry is a major source of textile waste. For example, H&M claims to collect and recycle around 20,000 tonnes of used clothing annually, but this is only 0.1% of its total textile waste. The fast fashion industry is notorious for accelerating the cycle of clothing production and consumption, resulting in large volumes of textile waste. Companies such as Zara, H&M, and Forever 21 release new collections several times a season, creating a demand for fast fashion and fast-discarding clothing [15].

Textile production also results in significant waste at every stage of the production process. For example, according to the World Resources Institute, up to 40% of waste is generated during the production phase in the weaving and manufacturing phase. More than 11 million tons of textile waste, including used clothing, footwear and household textiles, are thrown away every year. These wastes often end up in landfills or open access, creating disposal and environmental pollution problems. The cost of textile waste losses is estimated at billions of dollars annually. This includes disposal costs, losses due to inefficient use of resources and energy, and losses due to environmental pollution.

Industrial textile production methods often use chemicals that can be toxic to the environment. In addition, improperly disposed textile waste can be thrown into landfills or enter water bodies, leading to water and soil pollution. Textile production requires significant amounts of water, energy and other resources. The more textile waste accumulates, the more costs are required for its disposal or recovery. In many countries, textile production is carried out under conditions of low wages and poor working conditions. Many textile factories do not follow safety and employment standards, resulting in the exploitation of workers. These facts point to the need to find solutions to reduce textile waste worldwide through recycling, secondary use and innovative approaches to textile production and consumption.

Problem Analysis. This step involves an in-depth study of the problem to be solved. It is necessary to identify the causes, consequences and key challenges and consider the problem from the point of view of environmental, social and economic dimensions. A useful tool in the development of a circular project is the Problem tree,

because it helps to identify problems and opportunities in the system that need attention.

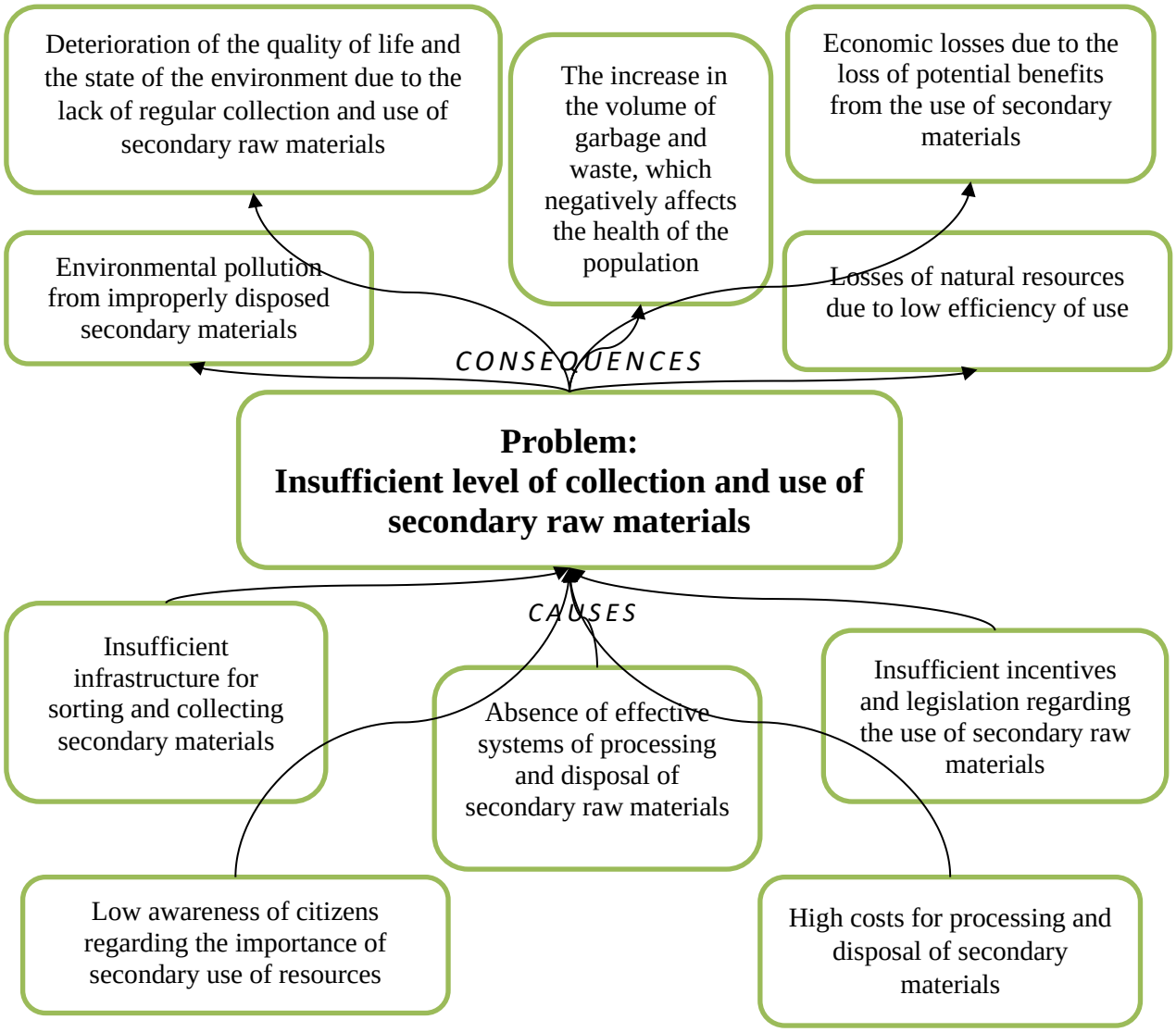

Fig. 2.1. “Problem tree” for the project of collection and use of secondary raw materials*

*Compiled according to [26; 38]

The causes combine to create a system in which resources are rapidly used and waste accumulates. Problem tree analysis is best done in a small focus group of six to eight people. The first step is to discuss and agree on the problem or issue to be analyzed. The problem or question is recorded in the center and becomes the “trunk” of the tree. This becomes a “focal issue”. The wording does not have to be exact, as

roots and branches will further define it, but it should describe the problem at hand. Next, the group identifies the causes of the core problem – these become the roots – and then identifies the consequences, which become the branches. What is important is the discussion, debate and dialogue that occurs when factors are ordered and regrouped, often forming roots and branches that are divided into subdivisions (like a mind map) [31].

A problem tree, also known as a "cause tree", is a graphical tool for analyzing a problem and its root causes. Problem tree analysis helps you find solutions by mapping the anatomy of cause-and-effect relationships around a problem, similar to a mind map, but with more structure. This gives several advantages [32]:

- The problem can be broken down into manageable and defined parts.
- A deeper understanding of the problem and its causes appears.
- The problem tree identifies the constituent problems and helps identify actors and processes at each stage.
- Helps determine if additional information or resources are needed for persuasive arguments and decision making.
- Actual problems are identified, not obvious, future or past ones.
- The process of analysis often helps to understand the purpose and necessary actions.

Applying a problem tree in a project in the field of resource conservation can help identify key problems, understand their root causes, and find opportunities to implement resource-efficient solutions. This can contribute to better project development.

Search for opportunities for resource saving. At this stage, the problem tree should be analyzed to identify opportunities for implementing resource-efficient solutions; pay attention to problems that can be solved by changing the system of resource use, implementing waste recycling or creating new circular supply chains [35].

Increasing the use of secondary raw materials is an important strategy for several reasons in the context of resource depletion, the need for resource conservation and resource efficiency:

- The use of secondary raw materials helps to reduce the pressure on natural resources and prevent their depletion. Since many natural resources are limited and irreversible, the use of secondary raw materials allows more efficient use of existing materials, reducing the need to extract new resources.
- Increasing the use of secondary raw materials contributes to resource conservation, as waste that would otherwise be thrown away becomes valuable resources for the production of new goods. This allows you to reduce the amount of waste that ends up in landfills or in nature, and reduce the negative impact on the environment.
- The use of secondary raw materials contributes to resource efficiency, as it allows to obtain more product from a smaller amount of used resources. This can be especially important in manufacturing, where efficient use of resources can have a positive impact on the economic efficiency and competitiveness of enterprises.

Therefore, increasing the use of secondary raw materials is an important step in the direction of creating a more sustainable and efficient use of resources. This helps preserve natural resources, reduce the amount of waste and improve resource use in general.

Strategy development. Based on the analysis of the problem tree, a strategy is developed to solve the main problems and implement resource-efficient solutions. You should choose the most promising opportunities and develop an action plan for their implementation.

Research and innovation. It is necessary to carry out research to find innovative solutions and ideas for the project, to analyze examples of successful projects in the relevant field or similar fields, to study technological possibilities, to identify circular strategies and approaches that can be applied. By analyzing

examples of success, you can understand what strategies and approaches can be applied to solve the problem.

Examples of the use of secondary raw materials can include various areas: paper recycling, secondary processing of materials, secondary use of plastic, textiles, building materials, etc. [35]:

- Yes, old newspapers, books, boxes and other paper products can be recycled into secondary raw materials for the production of new paper. This allows to reduce the cutting down of trees for the production of new paper and reduces the impact on nature.

- Metal waste, such as aluminum, steel, copper, etc., can be collected and processed into secondary raw materials. This secondary raw material is used to produce new metal products, which helps reduce the need to mine new metals.
- Plastic waste, such as bottles, containers, film, etc., can be recycled into secondary raw materials for the production of new plastic products. This helps reduce environmental pollution and reduce the need for new plastic production.
- Old clothes, bedding and other textiles can be recycled to produce new textiles or used to create new products such as carpets, bags, etc.
- Many construction materials, such as concrete, glass, metal, can be made from recycled materials. For example, recycled concrete can be used to build new roads or infrastructure facilities.

Some countries are known for high standards in plastic recycling and waste management. Germany is known for its efficient waste management system, the country is implementing advanced technologies for recycling and using plastic waste in production. Switzerland is also defined by a high level of waste recycling. The country is actively developing and implementing innovative approaches to plastic processing. Sweden is an example of a country that effectively uses waste to produce energy. Waste incineration technologies help not only to solve the waste problem, but also to generate electricity. Norway is known for its initiatives in the field of plastic recycling and the development of environmentally friendly technologies.

An example of increasing the use of secondary raw materials is the processing of plastic bottles into new products. In particular, a program for recycling plastic bottles to produce polyester fiber, which is then used in the textile industry to produce clothing, carpets, furniture and other goods.

Another example is the use of secondary steel in production. Secondary steel is obtained from the recycling of metal waste, such as car frames, building structures, machine parts, etc. This process allows you to use material that has already been mined and processed instead of mining new ores.

Another example is the use of secondary glass in production. Old glass bottles and containers can be recycled to produce new glass products such as bottles, windows, tableware and other products.

Many EU countries have a waste sorting system that allows for the collection of secondary materials such as paper, glass, plastic and metal. For example, in Germany, many companies use recycled plastic to produce packaging and other plastic products. In the Netherlands, great emphasis is placed on textile recycling. Recycling companies use old clothes to create new textiles or generate energy.

There are many recycling programs in the US, such as Recycle Across America, that promote the collection and recycling of recyclables. For example, TerraCycle has partnered with many American brands to recycle plastic waste into new products. In the city of San Francisco, there is a “Zero Waste” program, which aims to achieve zero waste processing through maximum recycling and the use of secondary raw materials [4].

In Japan, there are highly organized waste sorting and recycling systems. For example, in the city of Kamakura, an innovative waste sorting system is used, which allows for the separate collection of plastic, paper, glass and other materials for further processing. Plastic recycling technologies are also actively developing in Japan. For example, Toyota uses recycled plastic to manufacture parts for its cars [9].

The Nike company actively uses recycled plastic bottles in the production of its shoe line. They created a line of shoes made from fiber obtained from recycled plastic bottles. This allows the company to reduce its impact on the environment and use

waste in production. The Adidas company uses secondary raw materials in the production of its sports shoes and clothes. They use recycled plastic bottles to make tops and textile materials for their products. For example, the Adidas Parley shoe line is made from recycled plastic from the ocean [53].

Toyota uses secondary steel in the production of its cars. It recycles scrap metal, such as car frames, into new parts and components. This allows to reduce the costs of metal mining and processing, and also contributes to the efficient use of resources.

The Coca-Cola company uses secondary raw materials in the production of its bottles. They recycle used bottles into new beverage bottles, which reduces the use of new plastic and helps save resources.

IKEA uses secondary wood in the production of furniture and interior solutions. They recycle used wood, such as wooden pallets, to produce new furniture and other products. This allows to reduce the felling of trees and contributes to the creation of a more sustainable forestry.

The company Unilever uses secondary raw materials in the production of its products for body care and household chemicals. For example, they use recycled plastic bottles to package their products, and they also use recycled materials in their products.

These examples demonstrate how large companies in different countries actively use secondary raw materials in their production activities. This not only helps to reduce the impact on the environment, but also supports the principles of resource conservation and resource efficiency.

Generation of ideas. On the basis of the received data, project ideas are developed, aimed at solving specific problems and introducing resource-saving approaches in production and consumption, using creative thinking techniques, such as brainstorming, prototyping, etc.

Involvement of stakeholders in the idea generation process. Identifying and involving different stakeholders who are interested in solving the problem. These can be government representatives, public organizations, potential customers, suppliers,

experts, etc. It is important to take into account the different views and interests of stakeholders in order to effectively solve the problem.

Evaluation of ideas. Ideas should be evaluated to determine their potential and viability. At the same time, it is necessary to take into account environmental, social and economic aspects, as well as the risks and opportunities of implementing these ideas. Then, several promising ideas are selected, which can be developed in more detail.

First of all, you should analyze which options provide the highest added value for the company and start implementing projects. Project ideas should be selected to see if they support the strategy, if changes are needed, or if they should be discarded because they are based on linear thinking. Preference should be given to measures that bring better results for resource conservation [19].

This can include various aspects such as:

- measures aimed at reducing resource costs in the production, consumption and disposal of goods;
- initiatives that promote the secondary use of materials or products, reducing waste;
- effective waste processing, processes and technologies aimed at improving waste processing and their transformation into new resources;
- development of closed production cycles, where materials and resources are used in production with minimal losses and creation of waste that can be reused;
- improvement of resource management, use of technologies and strategies aimed at optimizing the use of resources and reducing losses.

The assessment of circular results often requires an integrated approach, taking into account economic, environmental and social indicators, as well as involving standards and methodologies, such as the Circularity Indicators or the Circularity Gap Initiative Index.

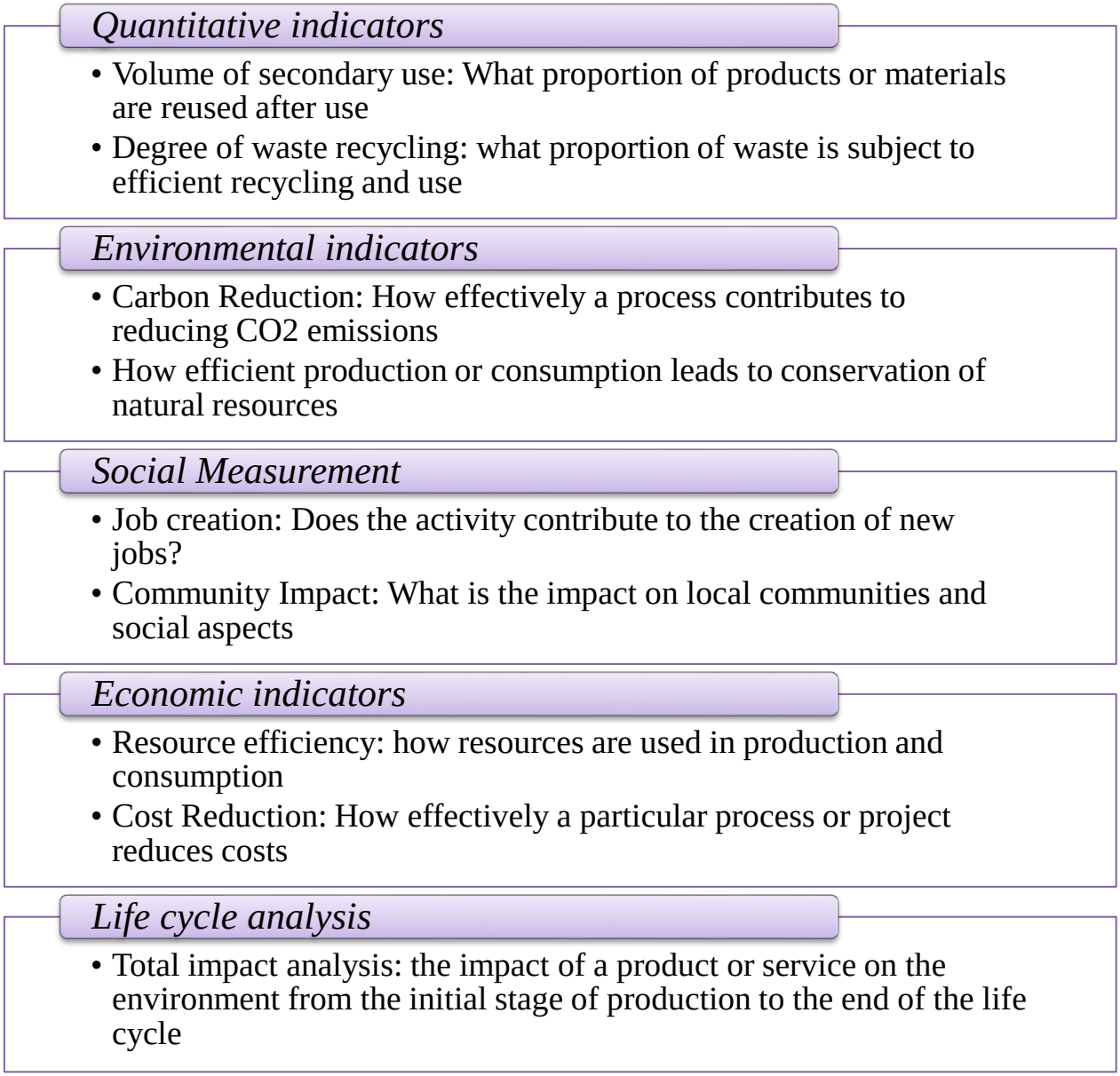

Fig. 2.2. Measuring the results of projects for the introduction of resource-saving technologies*

*Compiled according to [21]

Measuring the results of projects for the introduction of resource-saving technologies is an important component of the successful implementation of such projects. Various methods and approaches can be used to effectively measure results, including [20]:

1. Measurement of quantitative indicators. It is a measurement of specific quantitative parameters, such as the amount of energy, water or other resources that have been saved or efficiently used by new technologies.

2. Assessment of economic benefits. This may include reducing energy or resource costs, increasing profitability, or improving other economic indicators.

3. Environmental impact assessment. This could be measuring CO2 or other pollutants, reducing waste, improving air or water quality, etc.

4. Assessment of social impact. This could be measuring employee satisfaction, increasing the accessibility of technology to consumers, or other social benefits.

5. Assessment of innovative potential. e may include an assessment of opportunities for project scaling, introduction of new technologies or opening of new markets.

In order to effectively measure the results of projects of resource-saving technologies, it is important to determine key indicators and metrics in advance, develop a data collection and analysis system, as well as regularly evaluate the achieved results in order to constantly improve and optimize projects. Measuring the results allows not only to evaluate the effectiveness of a specific project, but also provides an opportunity to learn the experience and implement it in future projects, which contributes to continuous improvement and development.

Development of the project concept. Based on the selected ideas, the project concept is developed. The target audience is defined, a description of the circular cycle is created, the needs of the stakeholders are determined, the values and profits that can be obtained are determined, the profitability model is developed and the key elements of the project are determined.

Validation and refinement. By involving stakeholders, experts or clients, you can get feedback on the concept, consider suggestions and make adjustments to the project. Testing the project by conducting pilot projects or experiments allows you to check its effectiveness, as well as make adjustments in the early stages. After successful testing, the project can be scaled up and put into widespread use. It is

important to remember that each problem and each project is unique, so the stages of analysis and development may change depending on the specific situation. These stages may vary depending on the specific context and situation, but they provide a general idea of the challenges of process analysis and project development.

2.2. Relationship between the Goal, Objectives, and Tasks of the Project

In the project of collection and use of secondary raw materials, the purpose, goals and tasks are interconnected and aimed at achieving the overall goal of the project.

The project goal defines the general direction and target result of the project. In this case, the goal of the project can be formulated as “Improving the management of secondary raw materials and reducing the impact on the environment through the effective collection and use of secondary materials”.

Project objectives define specific achievements that lead to the achievement of the goal. In this case, project goals may include:

- Increase in the volume of collection of secondary raw materials by 20% during the first 12 months of the project.
- Development of an effective infrastructure for sorting and disposal of secondary materials.
- Implementation of a program of education and informing the public about the importance of recycling and the use of secondary resources.
- The goal tree is a tool for defining and organizing the main goals and subgoals in a specific project. It helps establish a hierarchy between goals and connections between them [30]. Here are the steps you can take to develop a goal tree for a circular economy project:
- definition of the general goal: to establish the general goal of the project.;
- breaking down the overall goal into specific goals and sub-goals that will help achieve the overall goal;

- establishing dependencies and connections between goals and sub-goals, determining how the achievement of one goal affects the achievement of other goals and how they are interconnected;
- verification of connections and completeness: it should be ensured that the tree of goals reflects all key aspects of the project and includes all necessary goals and sub-goals;
- visualization of the goal tree in graphic form, which shows the hierarchy between goals and subgoals; you can use diagrams or other visual aids to understand the structure of the goal tree.

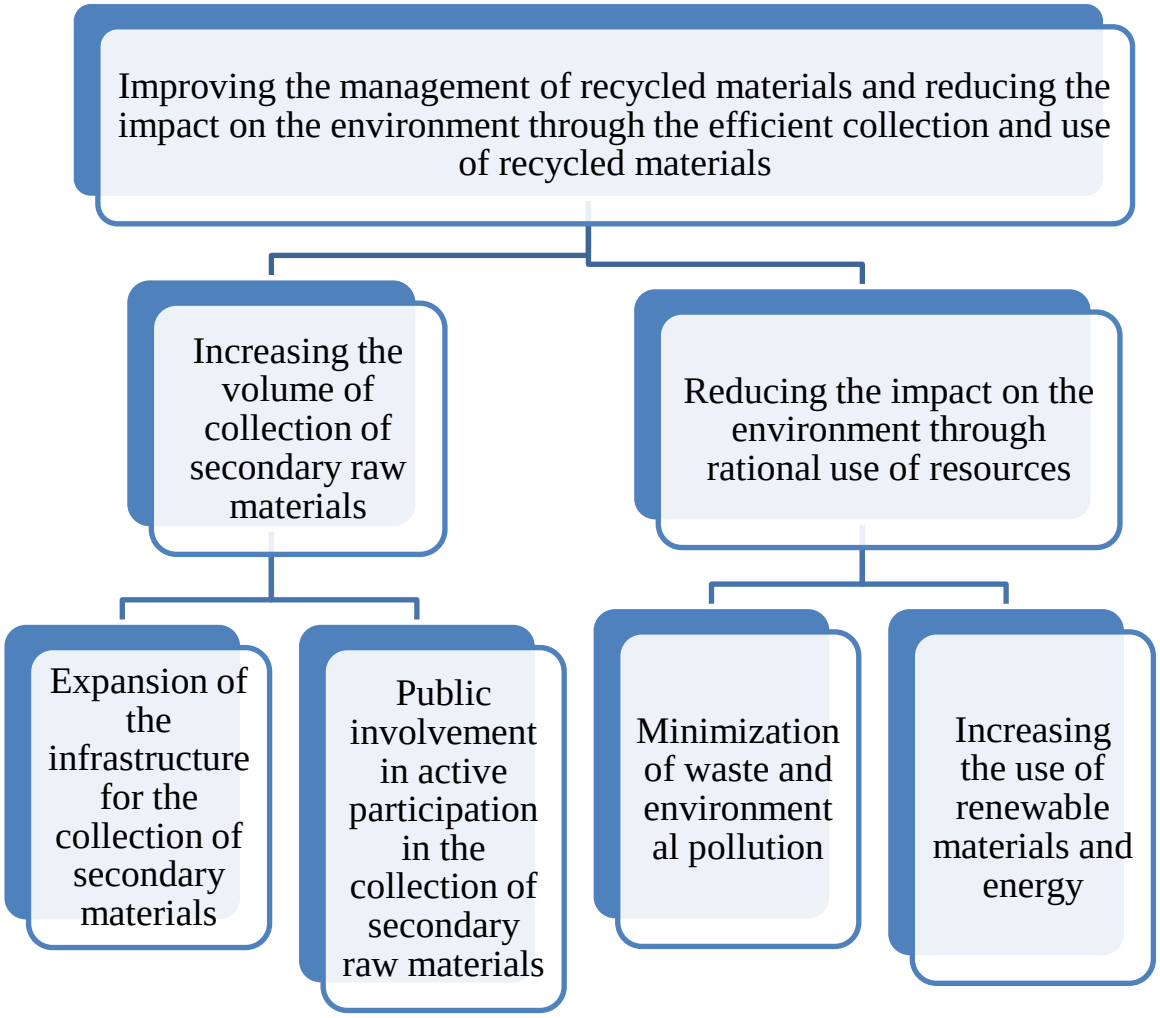

Fig. 2.3. The goal tree for the project of collecting and using secondary raw materials *

*Compiled by the author

Development of a tree of goals will help to understand the structure and hierarchy of project goals and create a clear action plan for their achievement. The goal tree is not a static tool and requires periodic analysis and updating, assessment of goal achievement and corrections if necessary.

A common approach to goal setting is the SMART methodology, which allows you to set specific, measurable, achievable, relevant, and time-bound goals. The defined goals should be:

1. Specific: the purpose, goals and objectives must be clearly defined and specific.
2. Measurable: goals and objectives must be measurable so that their achievement can be assessed. For example, for a circular business model, you can set indicators that allow you to measure the efficiency of material processing, waste reduction or increased use of secondary raw materials.
3. Achievable: the goal, goals and objectives must be realistic and achievable. They must take into account available resources, technological capabilities and constraints. For example, achieving zero waste may be unrealistic, but reducing waste by a certain percentage may be achievable.
4. Relevant: goals and objectives must be related to the main problems or challenges that are planned to be solved with the help of a circular business model. They should be relevant to the business context and stakeholder needs
5. Time-bound: goals and tasks must be time-bound in order to plan work according to deadlines. For example, a final date is set for achieving a specific goal or completing certain tasks [44].

Examples of goals for the project of collection and use of secondary raw materials, formulated according to the SMART methodology:

1) Increase the volume of collection of secondary raw materials by 20% during the next 12 months:

- Specific: The goal is clearly defined – to increase the volume of collection of secondary raw materials.

- Measurable: The amount of collected secondary raw materials can be measured by the number of tons or volume.
- Achievable: A 20% increase is a realistically achievable goal with appropriate effort.
- Relevant: This goal is directly related to the goal of the project - to improve the management of secondary raw materials and reduce the impact on the environment.
- Time-bound: The time limit is set for 12 months.

2) Implement an education and awareness program on the importance of recycling and the use of secondary resources within the next 6 months:

- Specific: The goal is clearly defined – to implement an education and information program.
- Measurable: It is possible to measure the number of events and their impact on the consciousness of the target audience.
- Achievable: Implementation of the program within 6 months is a realistic goal if appropriate resources are available.
- Relevant: This objective is directly aimed at raising awareness of the importance of recycling and the use of secondary resources, which corresponds to the purpose of the project.
- Time-bound: The time limit is set for 6 months.

3) Implement a program of using secondary raw materials in production with waste minimization within the next 12 months:

- Specific: The goal is clearly defined – to introduce a program for the use of secondary raw materials in production.
- Measurable: It is possible to measure the amount of recycled materials used and the amount of reduced waste.
- Achievable: Implementation of the program within 12 months is possible if appropriate resources and support are available.

- Relevant: This goal is directly aimed at achieving the goal of the project – improving the management of secondary raw materials and reducing the impact on the environment.
- Time-bound: The time limit is set for 12 months.

Project tasks are specific actions and activities that must be performed to achieve the project's goals. Tasks may include:

Conducting an analysis of the potential for the collection of secondary raw materials and determining the optimal places for placement of containers for sorting.

Development and implementation of a training and education program on recycling for the local population.

Conclusion of contracts with processing enterprises for effective use of secondary materials in production.

The goals and objectives of the project are aimed at achieving the goal of collecting and using recyclable materials, and they interact to create a positive impact on the environment and society.

Resource planning: determining the resources needed to complete tasks. This may include financial resources, human resources, technical resources, materials, etc.

Monitoring and evaluation: establishing a system for monitoring and evaluating progress in achieving goals. This allows you to track results, make adjustments, and ensure alignment with the project strategy.

This approach can be adapted and customized according to the needs and specifics of the project. It is also important to involve stakeholders, consider economic, social and environmental aspects and strive for innovative and sustainable approaches in defining the purpose, goals and objectives.

A SWOT analysis plays an important role in a recycling project because it helps to understand the strengths and weaknesses of the project, as well as the opportunities and threats that can affect its success. Identifying the strengths of the project allows you to use its advantages to achieve the goals and use resources effectively. On the other hand, identification of weaknesses allows to develop strategies to overcome problems and improve the project [41].

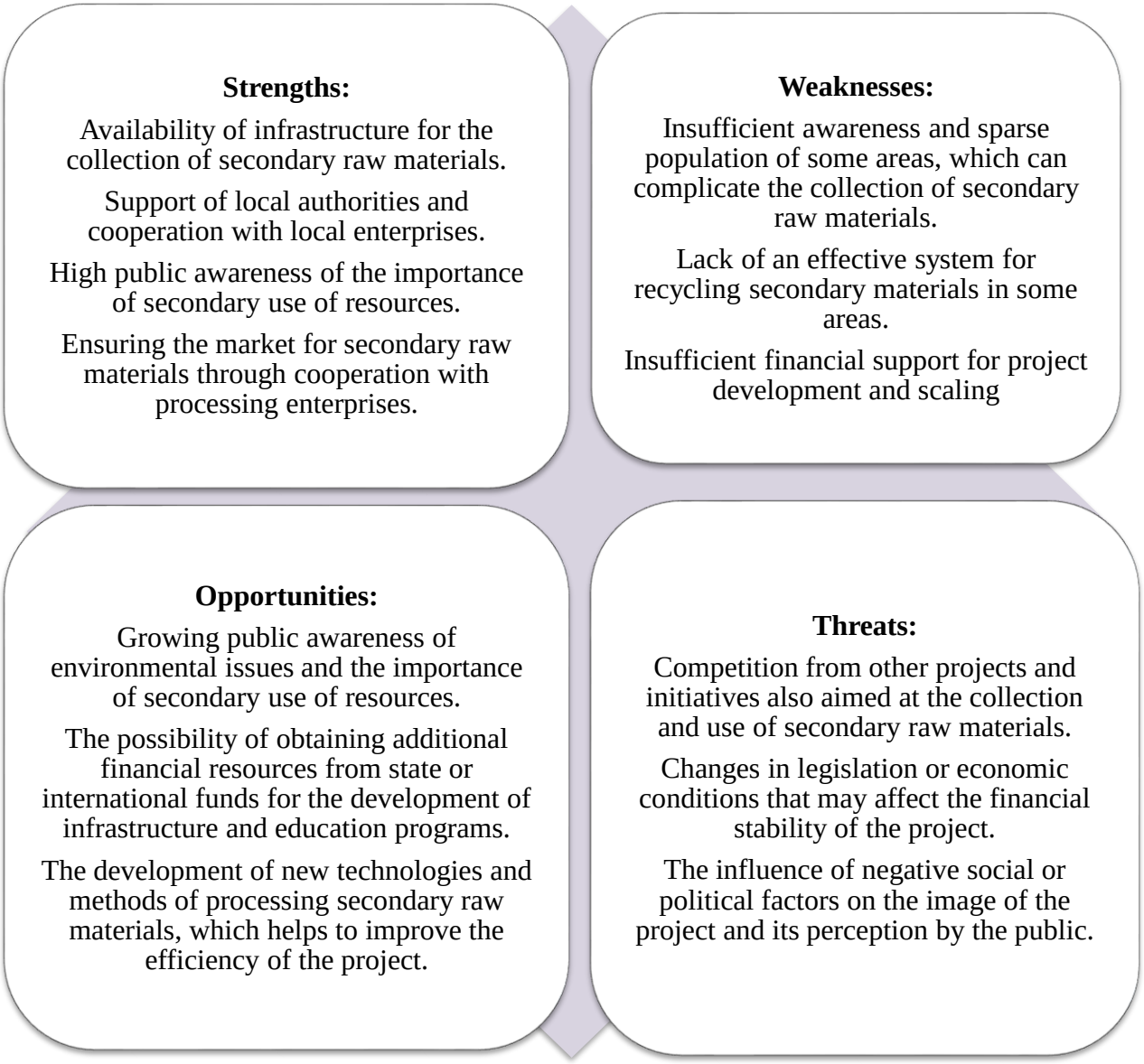

Fig. 2.4. SWOT analysis for the project of collection and use of secondary raw materials *

* Compiled according to [41]

Analysis of opportunities helps to find new ways of developing the project and using existing opportunities to improve it. Threats identified with the help of SWOT analysis allow you to predict in advance possible problems and risks that may arise and develop strategies to avoid them or reduce their impact on the project. Overall, a SWOT analysis helps to understand the context of the project, its strengths and weaknesses, and to create strategies to optimize its success and sustainability.

2.3. Technical Project Analysis

The technical analysis of the project of collection and use of secondary raw materials includes a detailed justification of the technical aspects of the implementation of the project, the determination of the necessary technologies, infrastructure and resources for its successful implementation.

The main aspects of the technical analysis include the assessment of the existing infrastructure for the collection and transportation of secondary raw materials, the analysis of available processing and disposal technologies, ensuring safety and compliance with environmental standards, the development of monitoring and process management systems, as well as the assessment of the financial aspects of the project, including costs and revenues. Technical analysis plays a key role in planning and managing the project implementation process, helping to ensure its successful and effective implementation [28].

At *the stage of assessment of existing infrastructure* (table 2.2), a detailed study and analysis of existing systems and means used for collection, sorting and processing of secondary raw materials is carried out. This includes an inspection and assessment of existing waste containers, their location, volume and condition. It is also important to study the sorting lines and their technical capabilities, which are used for the classification of secondary raw materials by type.

Analysis of transport routes and means of delivery helps to understand the optimal ways and methods of transporting the collected raw materials to processing sites. In addition, it is important to take into account any existing problems or deficiencies in the infrastructure that may affect the efficiency of the collection and processing of recyclable materials.

As a result of this stage, a complete picture of the existing infrastructure and its possibilities for optimization and improvement in the context of the project of collection and use of secondary raw materials should be obtained [1].

Table 2.2

Stages of technical analysis of the project of collection and use of secondary raw materials *

Stages of technical analysis	*Description*
1. Evaluation of the existing infrastructure	Study of the existing infrastructure for collecting, sorting and processing secondary raw materials. Analysis of waste containers, sorting lines, transportation routes, etc.
2. Technological analysis	Study of available technologies for recycling of secondary raw materials. Research of waste sorting, cleaning and processing methods.
3. Determination of the required equipment	Determination of the necessary equipment for the implementation of the project, such as sorting machines, presses for packaging of secondary raw materials, etc.
4. Analysis of safety and ecological aspects	Assessment of the safety of work processes and the impact of the project on the environment. Determination of measures to ensure occupational safety and minimize negative impact on the environment.
5. Development of an implementation plan	Development of a detailed plan for the implementation of the project of collecting and using secondary raw materials. Determination of steps, deadlines, responsible persons and necessary resources for the successful implementation of the project.

* Compiled by the author

The technological process of the project of collecting and using secondary raw materials consists of several key stages that ensure efficient and environmentally safe use of resources:

- Collection of secondary raw materials. This stage includes the organization and implementation of the process of collecting secondary raw materials from the places of their generation. This can be done through the placement of special containers for waste, separate sorting of waste by type and other methods.
- Transportation and delivery. After collection, secondary raw materials are transported to the place of processing. This may include the use of

vehicles to transport raw materials to processing plants or other places of their use.

- Sorting and cleaning. At this stage, secondary raw materials are sorted by type and subjected to purification from pollution and other impurities. This is necessary to improve the quality and suitability of raw materials for further processing.
- Processing and use. After sorting and cleaning, secondary raw materials are subjected to processing processes, which may include various methods and technologies depending on their type and purpose. For example, it can be the processing of plastic into raw materials for the manufacture of new products, the use of secondary metals in production, or the processing of organic waste into fertilizer.
- Waste disposal. The last stage of the technological process is the disposal of residual waste that cannot be used in production. This may include energy recovery from waste through incineration or other disposal methods that minimize the negative impact on the environment.

This technological process makes it possible to use secondary raw materials as much as possible and reduce the negative impact on the environment through their effective processing and use.

When *determining the necessary equipment for the project* of collection and use of secondary raw materials, a thorough analysis of various technologies and equipment that can be applied for the optimal implementation of the process is carried out. First of all, different types of sorting machines, their technical characteristics and capabilities are studied in order to determine the most suitable ones for sorting secondary raw materials. Available equipment for pressing and packaging of raw materials is also considered, which helps to reduce the volume of waste and facilitate their transportation. In addition, it is important to consider various recycling technologies, such as plastic recycling machines, presses for processing metal waste, composters for recycling organic materials, etc. This analysis helps to determine the most efficient and cost-effective equipment that will ensure the

optimal process of collection, sorting and processing of secondary raw materials within the project.

During *the safety and environmental analysis phase*, the potential hazards and risks that may arise when working with recycled materials, as well as the impact of the project on the environment, are studied in detail. This includes assessing the potential and risks of injury to workers during the collection, sorting and processing of recyclables. Compliance of equipment and work processes with safety and occupational health standards is studied in detail.

In particular, an analysis of possible risks from traumatic situations, such as cuts, blows, as well as risks of fires and emissions of harmful substances during raw material processing, is carried out. To prevent such negative scenarios, contingency plans are developed and staff training is conducted. In addition, an important aspect of the analysis is the assessment of the project's impact on the environment. Potential negative consequences for the natural environment, such as air, water and soil pollution, as well as increased greenhouse gas emissions, are being investigated. Strategies and measures are being developed to minimize the impact of the project on the environment, including the implementation of effective emission cleaning systems, the implementation of energy-efficient technologies and the reduction of the use of harmful substances. Such a detailed analysis allows not only to ensure the safety of workers and minimize the impact on the environment, but also to fulfill all legal requirements and standards related to labor protection and environmental safety [52].

At *the stage of development of the implementation plan* for the collection and use of secondary raw materials, a detailed design of all aspects and actions necessary for the successful implementation of the idea is carried out. First, the specific steps to be taken are identified, including gathering information, preparing resources, implementing technical solutions, organizing processes, and quality control. Each step is set with due dates, which may depend on various factors such as resource availability, technical constraints, and internal and external environmental conditions. During the development of the plan, the persons responsible for the implementation

of each stage of the project are also determined. This includes the appointment of project managers who are responsible for overall management, as well as specialists from specific areas who ensure that certain tasks are carried out. Each responsible person receives a clear task and performance requirements, and must collaborate with other team members to ensure common direction and cooperation.

For the successful implementation of the project, it is also important to determine the necessary resources that will be involved. This includes financial, material, technical and human resources. A comprehensive assessment of resource needs helps ensure that the project will have sufficient resources for its implementation and avoid possible obstacles on the way to success. The development of the implementation plan allows systematizing all stages and tasks of the project, ensuring control over their implementation, as well as mobilizing all necessary resources to achieve the goals of the project of collection and use of secondary raw materials.

CHAPTER 3. PLANNING SYSTEM OF THE PROJECT FOR THE IMPLEMENTATION OF RESOURCE-SAVING TECHNOLOGIES

3.1. Summary and Project Strategy Development

The summary of the project for the introduction of resource-saving technologies is a brief overview of the main aspects and goals of the project, which makes it possible to understand the essence and meaning of the project at a glance. It contains information about the purpose of the project, its goals and expected results. The executive summary helps stakeholders such as investors, government agencies, potential partners, and other interested parties quickly familiarize themselves with the project and understand its goals and potential benefits. It is an important element of project communication and can be used for presentations, appeals to investors, requests for funding and other project promotion activities [24].

The summary of the project for the introduction of resource-saving technologies contains several key components that help to briefly but clearly convey the essence and meaning of the project. The main components of the project summary include:

- Project name. This is a short name that reflects the main goal or direction of the project.
- The purpose of the project. A description of the main goal or purpose of the project. An indication of what problem it aims to solve or what result is planned to be achieved.
- Target audience. A description of the groups or stakeholders that the project will use. These can be clients, consumers, government bodies, industrial enterprises, etc.
- Implementation strategy. A brief description of the planned actions and strategies that will be used to achieve the project goal. This may include different project phases, key activities and methods.

- Expected results. A list of expected results or achievements that are planned to be obtained as a result of the implementation of the project.
- Budget and resources. Information about the approximate amount of financial and other resources required for the implementation of the project.
- Terms of implementation. Indication of the expected time frame for project implementation.
- Key responsible persons. Information about the main responsible persons or the team that will be responsible for the implementation of the project.

These elements allow you to create a clear, focused and informative summary of the project, which will help stakeholders to quickly familiarize themselves with the main aspects and benefits of the project.

Summary of the project of collection and use of secondary raw materials

1. Project name: Collection and use of secondary raw materials to stimulate sustainable development in the community

2. The purpose of the project: Creation of an effective system of collection, sorting and processing of secondary raw materials in order to reduce the negative impact on the environment, promote economic growth and ensure sustainable development.

3. Project goals:

- Reducing the volume of waste by organizing a system of collection and processing of secondary raw materials at the places of their generation.
- Stimulation of public awareness of the importance of recycling and the use of secondary materials through educational and informational events.
- Ensuring the effective use of secondary raw materials in production and consumption through the development of partnership relations with enterprises and organizations.

- Development and implementation of a system for collecting secondary raw materials in the places of their generation.
- Organization of information and educational campaigns for the public regarding the importance of recycling and the use of secondary materials.
- Conducting negotiations and concluding partnership agreements with enterprises regarding the use of secondary raw materials in production.
- Improvement of technological processes of processing secondary raw materials to maximize their use and reduce the impact on the environment.
- Monitoring and evaluation of project performance for the purpose of improvement and continuous improvement.

4. Implementation strategies:

- Partnership with local authorities to create recycling programs.
- Use of innovative technologies for processing secondary materials.
- Advertising and educational campaigns to raise public awareness of the importance of recycling [5].

5. Expected results:

- Reduction of waste volume by 30% during the first year of project implementation.
- Increase in the use of secondary raw materials by 50% by the community's production enterprises.
- Improvement of the environment and reduction of CO2 emissions by 20%.

6. Stakeholders: These are the main partners, sponsors or stakeholders who will be involved in the project. For example, local authorities, industrial enterprises, public organizations, etc.

The project involves cooperation with various stakeholders, such as local authorities, businesses, public organizations and residents of the city or region. It is

important to involve all stakeholders in a joint effort to efficiently collect, sort and use recyclable materials.

7. Budget: This is a general estimate of project implementation costs and sources of funding. For example, an estimate for 1 year of project implementation in the amount of USD 95,000. with funding from local and international organizations, grants and investors.

8. Development prospects. The project of collection and use of secondary raw materials is aimed at creating a sustainable and effective waste management system that will contribute to the conservation of resources, reduction of environmental pollution and creation of favorable conditions for the sustainable development of society. The project envisages large-scale activities aimed at solving the problem of insufficient use of secondary raw materials and excessive accumulation of waste. This problem is important from the ecological, economic and social point of view and requires an integrated approach to its solution.

The project will be aimed at creating innovative solutions in the field of waste management, including the introduction of the latest processing technologies and the use of secondary raw materials. In addition, programs and measures will be developed to raise awareness and educate the public about the importance of recycling and effective waste management. It is expected that the result of the project will be the creation of a sustainable and stable system of collection and use of secondary raw materials, which will contribute to the conservation of resources, reducing the negative impact on the environment and promoting the sustainable development of society.

The logical-structural scheme of the project is a graphic representation of the main components, stages and connections in the project, which helps to determine the logical sequence of tasks and achieving goals (Table 3.1.). This scheme allows to succinctly present the structure and organization of the project, define its key stages and the relationships between them, which facilitates the understanding and management of the project implementation process.

Table 3.1.

Logical and structural matrix*

	The logic of intervention	*Indicators that can be objectively verified*	*Inspection tools*	*Assumption*
General purpose	Reducing the negative impact of waste on the environment by creating an effective collection and sorting system	Collection and processing of a specific amount of waste, increasing the % of secondary use of materials and reducing the ecological footprint	Official reports, results of environmental impact monitoring, assessments of the use of secondary resources	
Project goal	Increasing public awareness in the system of responsible consumption	Increasing the volume of collected and processed waste	Collection and recycling efficiency monitoring data, public survey	Legislative changes in the field of waste and ecology, the level of public awareness of the problem of waste
Results	Implementation of effective waste collection and processing systems	The amount of collected and recycled waste, % of reuse	Monitoring data on waste quantity and treatment	Changes in market conditions for recycled materials and consumer trends
Actions	Environmental impact analysis, creation of effective collection infrastructure, support for secondary use, educational activities	Qualified personnel, necessary equipment for effective collection and processing, materials for infrastructure and educational activities, financial resources, and a monitoring system	Staff salaries, acquisition and maintenance of equipment, financing of educational activities, stimulation of innovation and interaction with business	Government support, active participation of business and the public, as well as taking into account changes in legislation and technological trends.

* Compiled according to [25]

Conditions for developing a strategy for the collection and use of secondary raw materials:

- Carrying out a detailed market analysis and researching potential opportunities for the collection and use of secondary raw materials.
- Evaluation of various technological solutions for the collection, sorting and processing of secondary raw materials in order to choose the most effective and environmentally safe ones.
- Establishing specific goals and objectives to be achieved through the strategy, such as reducing the amount of waste, improving the quality of the environment, etc.
- Determination of the structure of financing, income and expenses of the project, as well as development of a plan for monetization of secondary raw materials.

- Establishing key performance indicators and success criteria for evaluating strategy implementation.
- Development of a detailed action plan with a description of the steps, deadlines, responsible persons and resources necessary for the implementation of the strategy.
- Compliance with the requirements of legislation, quality standards and other regulatory norms related to waste management and processing of secondary raw materials.
- Engaging with all stakeholders such as local authorities, community organisations, businesses and residents to ensure support and joint implementation of the strategy.

These conditions help create an effective and feasible recycling project strategy that takes into account all aspects and potential problems of the project.

The implementation of the project for the collection and use of secondary raw materials involves a number of key measures: the introduction of the program for the collection of secondary raw materials, the development of infrastructure for processing, educational and informational activities.

Implementation of the program for the collection of secondary raw materials. This stage involves not only the installation of waste sorting containers on the streets of the city, but also the creation of a complete system for the collection and transportation of secondary raw materials to specialized processing facilities. This includes the development of a plan for the placement of containers, taking into account the population density and geographical features of the city. It is also planned to install special trash cans for various types of recyclable materials (plastic, paper, glass), which will facilitate separate collection and further processing.

Development of infrastructure for processing. Appropriate infrastructure is required for efficient processing of collected secondary raw materials. This includes the construction of modern sorting complexes equipped with advanced waste sorting

and processing technologies. It is also important to ensure appropriate conditions for the work of personnel and compliance with environmental standards.

Educational and information activities. Conducting educational seminars, trainings and campaigns for the promotion of recycling plays an important role in creating a culture of waste among the population and enterprises. These events aim to teach people how to properly sort waste, talk about the benefits of using recycled materials, and also popularize knowledge about how products can be created using recycled materials. It is also important to conduct information campaigns about the rational use of resources and the impact of recycling on environmental protection.

3.2. Project Budget Planning

The project budgeting methodology is a systematic approach to financial planning, which includes cost analysis, cost estimation and forecasting, determination of funding sources, allocation of the budget to project stages, consideration of risks and reserves, as well as establishment of a cost monitoring and control system. This approach is aimed at effective use of resources to realize project goals, ensure financial sustainability and optimize project implementation.

The main elements of the project budgeting methodology include:

Analysis of costs and revenues: study of all available costs and revenues related to the project. These may include research and development costs, equipment purchases, waste management, marketing and advertising, transportation, etc. It is important to obtain both direct and indirect costs. Accumulated sources of income, such as the sale of secondary materials, services, additional production services, etc., are also taken into account.

Setting budget goals: defining specific financial goals that are planned to be achieved with the help of the project. This may include ensuring profitability, reducing costs, optimizing the use of resources, increasing the share of secondary materials in production, etc. It is important that these goals are measurable and achievable [13].

Budget distribution: distribution of budget funds among all types of expenses and investments according to their priority. Priorities and strategic directions of the project are taken into account, which costs need more funding and which can be reduced or optimized are determined.

Control and monitoring: creation of a system of control and monitoring of financial indicators, determination of key performance indicators that reflect compliance with budget goals, regular assessment of actual costs and revenues in accordance with the planned.

Improvement and optimization: analysis of results and implementation of changes to improve the budget process, consideration of the results obtained and availability of feedback for further improvement of the budget process, application of innovative methods and strategies to ensure effective financial management of the project. This may include identifying effective practices, reducing unnecessary costs, improving control systems, and optimizing resource allocation.

The project budgeting methodology may vary depending on the specifics of the organization and circular strategy. It is important to adapt the methodology to specific needs and ensure transparency and efficiency of financial management in circular business.

To calculate costs for the implementation of the project of collecting and using secondary raw materials, we will divide the budget into key activities and determine the costs for each of them.

Implementation of the collection program. The cost of this measure may include costs for the purchase of waste sorting containers, installation of special waste containers, as well as costs for advertising and informational materials. We estimate that this will make up 36% of the total budget. Infrastructure development. Costs for the construction of sorting complexes and their maintenance can be significant. Since this is a complex and expensive process, we can allocate 50% of the budget for this event. The costs of conducting educational seminars, trainings and

campaigns to popularize recycling among the population can be relatively small compared to other measures. We can allocate 20% of the budget for this event.

Therefore, the total costs for the implementation of the project for the first year are:

35,000 dollars (collection of secondary raw materials) + USD 45,000. (infrastructure) + USD 15,000. (educational and information activities) = 95,000 dollars.

Thus, the estimate for 1 year of project implementation is USD 95,000.

Table 3.2

Cost calculations for the implementation of the project of collection and use of secondary raw materials

Key activities	*Costs (dollars)*	*A percentage of the total budget*
Implementation of the collection program		
Organization of collection distribution points	20 000	21.05%
Installation of special garbage containers	15 000	15.79%
Total costs for the collection program	35 000	36.84%
The development of infrastructure		
Construction of sorting facilities	20 000	21.05%
Servicing sorting complexes	25 000	26.32%
General costs for infrastructure	45 000	47.37%
Educational and information activities		
Holding training seminars	5 000	5.26%
Organization of trainings	7 000	7.37%
Promotion campaigns	3 000	3.16%
General expenditure on education and information	15 000	15.79%
General budget	95 000	100%

There are several methods of calculating the expected profit from project implementation.

Method of direct costs (Cost-Benefit Analysis, CBA). This method consists in comparing the total costs of the project with the expected benefits from it. Total costs include all project implementation costs, and expected benefits include all potential revenues that may be generated from the project. The result of the calculation is net profit or loss.

The method of calculating the internal rate of return (Internal Rate of Return, IRR). This method allows you to determine the level of profitability of the project at which the net cash flow is zero. IRR is expressed as a percentage and indicates the level of profitability of the project.

The method of calculating the net present value (Net Present Value, NPV). This method is used to determine the present value of the potential benefits of the project. It takes into account the time value of cash flows and allows you to understand whether the project is economically viable.

Return on Investment (ROI) method. This method measures the effectiveness of the project investment by comparing the total profits from the project with the costs of its implementation. ROI is expressed as a percentage and indicates the ratio of profit to costs.

To calculate the percentage change in profit from the implementation of the project, we need to know the current level of profit and the expected level after the implementation of the project. Let the current level of profit be equal to P1, and the expected level of profit after the implementation of the project - P2.

Then the formula for calculating the percentage change in profit (ΔP) will look like this:

$$\Delta P = \frac{\mathrm{P2} - \mathrm{P1}}{P1} \times 100\%$$

Where:

P1 - the current level of profit,

P2 - the expected level of profit after the implementation of the project.

Projects in the field of resource-saving technologies can receive funding from various sources.

Government grants and subsidies are an important source of funding for projects, as government programs and initiatives aim to support and stimulate initiatives that help solve waste problems and promote circular practices. This means that government bodies allocate financial resources to support projects aimed at reducing waste, implementing efficient recycling methods and promoting these processes in production and consumption. These programs can include various directions, such as stimulating innovation, supporting research in the field of waste management. Government involvement in financing such projects may also include setting standards and regulations, as well as actively working with the private sector and the public to jointly achieve sustainable development goals. This approach makes it possible to create a favorable ecosystem for the development and implementation of circular solutions, promoting environmental sustainability and optimizing the use of resources in the economy.

Investments from private companies. Corporations and foundations are actively considering the possibility of investing in projects that contribute to resource conservation, as this meets the modern requirements of sustainable development. These investors can provide financial support to both startups and large enterprises. This includes the development and implementation of the latest technologies for the collection, processing and use of secondary resources, as well as initiatives to improve production efficiency and reduce waste. Such investments can be strategic in nature, aimed at creating stable and sustainable business models that take into account not only the economic aspect, but also social and environmental benefits. Investors actively interact with companies, jointly developing and implementing strategies that contribute to balanced development and increased competitiveness in the market. An important aspect is that these investments help create a positive effect for consumers and the global environment, promoting the transition to a more sustainable and responsible way of production and consumption.

International financial organizations, such as the World Bank and the European Bank for Reconstruction and Development, are ready to support the implementation of projects aimed at sustainable resource management and the implementation of circular production models. The World Bank, as a global financial institution, provides financial and technical support to member countries for the development of a sustainable and responsible economy. It invests in projects aimed at reducing waste, optimizing the use of resources and stimulating environmentally friendly production. The European Bank for Reconstruction and Development acts as one of the largest financial institutions that supports projects in the European region and the Mediterranean countries. Funding from international financial organizations includes not only capital investment, but also expert support, technical advice and development of strategies to achieve sustainability goals.

Social investment funds are a source of financing aimed at socially responsible and environmental initiatives. These foundations are defined by their willingness to promote and support initiatives that promote sustainable development and have a positive impact on society and the environment. The main goal of social investment funds is to invest in projects that not only generate income, but also contribute to solving social and environmental challenges [33].

Sustainable development funds are financial institutions specialized in supporting projects aimed at achieving sustainable development and reducing waste. These funds act as key players in financing and supporting initiatives aimed at creating favorable conditions for ecologically sustainable development and balanced use of resources. Their investments are focused on projects that have a significant positive impact on the environment. Sustainable Development Funds actively seek out and finance projects that promote innovative approaches to waste management, increase the use of secondary resources, and create a more sustainable consumer environment.

Profit in the project of collection and use of secondary raw materials can be obtained from various sources. First, it can be the sale of secondary raw materials after their collection and processing, when they are used by manufacturers for further

use. In addition, participation in recycling and recycling promotion programs implemented in some countries or regions may generate additional revenue, for example through the provision of subsidies or incentives. It is also important to reduce the costs of environmental taxes and fines that some enterprises pay for non-compliance with standards regarding the use of resources and waste management. A recycling project can help reduce such costs by ensuring efficient waste management. In addition, cooperation with other enterprises that are also interested in the use of secondary raw materials can bring additional income through the joint production of goods or packaging. Thus, the profit from the project of collection and use of secondary raw materials can be provided in various ways, based on effective management of resources and waste and cooperation with other enterprises.

3.3. Risk management of the project of collection and use of secondary raw materials

Project risks are potential events or circumstances that can affect the success of the project, its goals and results. By defining risks, we identify possible negative consequences that may occur during the implementation of the project and look for ways to avoid, reduce or manage them. Risks can relate to financial aspects of the project, technical issues, management, external factors (eg changes in legislation or market conditions), environmental aspects, social or political factors.

Project risk management is a systematic approach to identification, analysis, assessment, management and monitoring of potential risks that may arise during project implementation. The main objective of risk management is to ensure the maximum probability of project success by managing hazards and threats and taking advantage of opportunities to improve outcomes. Project risk management includes such steps as identifying risks, assessing their impact and probability of occurrence, developing risk management strategies, implementing these strategies, and monitoring risks throughout the project's life cycle. Effective risk management helps

reduce the probability of negative events and minimizes their impact on project success [27].

During the implementation of the project of collection and use of secondary raw materials, various risks may arise that may threaten the successful implementation of the project and the achievement of its goals.

Financial risks. An increase in project costs, unexpected changes in the prices of raw materials or equipment, changes in legislation that may affect the financial terms of the project.

In order to effectively manage the financial risks of the project of collection and use of secondary raw materials, it is necessary to identify all possible financial risks that may affect the project. This may include increases in material or equipment costs, increases in labor costs, changes in exchange rates, financial constraints or changes in financial legislation. Once risks have been identified, they need to be assessed for their likelihood of occurrence and impact on the project. It is important to determine how serious these risks are and how they can affect the financial condition of the project. After assessing the risks, it is necessary to develop strategies for managing each of them. This may include risk mitigation measures, such as fixed-price contracts or increased contingency funding. Implementing risk management strategies will mean making changes to the project's financial plan, concluding risk insurance agreements, or regularly monitoring costs and financial indicators. It is important to constantly monitor financial risks and their impact on the project. This will make it possible to promptly respond to any changes in the situation and take appropriate measures to minimize negative consequences.

Technical risks. Problems with technical equipment, production process or processing technologies, which can lead to delays in the implementation of the project or a decrease in the quality of the products.

It is necessary to identify all possible technical risks that may arise during the implementation of the project, this may include problems with the equipment, unforeseen technical difficulties in the execution of the processing processes, technical errors or flaws in the design of the facilities. It is important to determine

which of these risks are the most serious and critical to the success of the project. The development of risk management strategies may include the introduction of technical security measures, the development of back-up action plans in case of problems, or the conclusion of additional agreements with equipment suppliers [18].

Project management risks. Insufficient management efficiency, insufficient experience of the project team, conflicts between project participants, insufficient resources or knowledge to solve problems.

It is important to create a complete list of potential risks. After identifying the risks, it is necessary to evaluate them from the point of view of their probability of occurrence and impact on the project. To do this, you can use rating scales or matrices to assign each risk a certain level of probability and importance. Based on the risk assessment, strategies are developed for each of them, which include plans to manage, prevent or minimize risks, transfer risks through insurance or contracts, and accept risks if their impact on the project turns out to be minimal.

Environmental risks. Potential negative environmental impacts that may arise from improper waste treatment or unintended environmental consequences of recycling.

Identification, assessment and management of environmental risks in a recycling project are critical to ensure its success and sustainability. It is necessary to carefully analyze all aspects of the project that may affect the environment. This may include the stages of collection, sorting, transportation and processing of recyclable materials. After identifying the risks, it is necessary to assess their probability of occurrence and potential impact on the environment, consider the possible consequences for water resources, air and soil, as well as for flora and fauna. Environmental risk management strategies may include implementing technologies and processes that minimize environmental impact, establishing standards and requirements for safe waste management, and emergency contingency plans.

Market risks. Changes in demand for secondary raw materials, competition in the market, changes in legislation or consumer requirements regarding product quality and standards. To manage risks of this type, all aspects of the market that may

affect the project should be analyzed. These can be changes in the demand for secondary raw materials, increased competition, changes in legislation or consumer demands regarding product quality and standards. It is important to take into account both general and specific factors that can affect the market [29].

Strategies for their management are developed based on the assessment of market risks. This may include developing action plans to respond to changes in market conditions, finding new market opportunities, developing marketing and advertising strategies to increase demand for products, and other measures to reduce exposure to market risks.

Social risks. Rejection of the project by the local population, conflicts with local communities, or negative public reaction to the project. The main step is to identify the potential social risks associated with the project. This may include rejection of the project by the local population, possible conflicts with local communities, negative public reaction to the project's activities, etc.

Social risk management strategies may include developing plans for interaction with the local population, conducting communication campaigns to support the project, including community representatives in decision-making, etc.

Political risks. Changes in the political environment, instability of government policy or legislative changes that may affect the conditions and development of the project.

The identification, assessment and management of political risks in a recycling project can be important to ensure the sustainability and success of the project. Conduct an analysis of the political environment to identify potential threats related to political instability, changes in government policy, or legislative changes. Carefully research the history of political events and trends in the country or region where the project is implemented. Based on risk assessment, develop strategies to manage them. This may include developing plans to respond to policy changes, establishing relationships with influential parties, lobbying and influencing decision-making processes.

Successful implementation of the project of collection and use of secondary raw materials involves the identification, assessment and management of risks, which will reduce their impact and ensure the successful completion of the project.

CONCLUSIONS

1. Resource-saving projects are a key component of modern society, as they solve the current problems of the environmental crisis and depletion of natural resources. In the context of growing awareness of sustainable development, resource conservation becomes an urgent need to ensure an ecologically stable future. Implementation of such projects helps to reduce the negative impact on the environment, preserve natural resources and improve people's quality of life. Resource-saving technologies help reduce emissions of harmful substances and environmental pollution, increase production efficiency and competitiveness of enterprises.

2. The experience of implementing resource-saving technologies demonstrates a wide range of initiatives and successful practices aimed at creating a more sustainable and resource-saving environment, such as the "Energy Star" program in the USA and the "Energiesprong" project in the Netherlands. The use of renewable energy sources in China is a strategic step to improve energy security and reduce dependence on traditional sources. Companies such as BYD and Tesla demonstrate the ability to innovate and develop renewable technologies in manufacturing and transportation. Water management projects indicate a variety of approaches to water conservation and energy conservation. The use of secondary materials and recycling help to reduce waste and promote a circular economy. Covanta Holding Corporation, Recyclebank, Loop Industries and Veolia are just a few examples of companies that are implementing circular approaches to the use of secondary resources and energy. At the same time, green mobility projects underway in Shanghai, Amsterdam, France and San Francisco signal a shift to green technologies in the transportation sector. These initiatives are of strategic importance for improving air quality, reducing congestion and reducing dependence on harmful carbon emissions, thus contributing to the sustainable development of cities and the natural environment in general.

3. The choice of project management methodology depends on the factors taken into account when making a decision. Here is a short list of conditions to

consider when deciding on a methodology: project cost and budget, team size, ability to take risks, flexibility, timeline, collaboration with clients and stakeholders. Each management method has its advantages and limitations, and the choice should be based on the company's unique requirements, goals and structure. Considering the variety of projects for the introduction of resource-efficient technologies, an effective approach may include the use of several methodologies at the same time to optimally solve tasks and achieve successful results.

4. Analysis of problems and definition of the project idea begins with definition of the context, understanding of the field of activity in which the problem is observed, and definition of the factors affecting it. It is important to study trends, regulatory changes and other factors that can create opportunities for resource conservation. This includes examining market trends, legislative constraints, technological capabilities, and other factors. Project ideas should be screened to see if they support the strategy, if they need to be changed, or if they need to be scrapped because they are based on linear thinking.

5. The study of the external environment and internal factors of the organization requires an understanding of the current state and identification of opportunities and threats, includes analysis of the market, competitors, technologies, legislation and other factors that affect the project. Development of a tree of goals will help to understand the structure and hierarchy of the goals of the circular project and will create a clear plan of action to achieve them. A common approach to goal setting is the SMART methodology, which allows you to set specific, measurable, achievable, relevant, and time-bound goals. SWOT analysis is a strategic tool for assessing the strengths and weaknesses, opportunities and threats of a project.

6. Technical analysis of the project of collection and use of secondary raw materials plays an important role in the planning and implementation of effective waste management systems. This analysis includes assessment of existing infrastructure, technology analysis, identification of required equipment, analysis of safety and environmental aspects, development of an implementation plan and other key steps. Based on the assessment of the existing infrastructure, the optimal ways of

collecting and transporting secondary raw materials are determined. Technological analysis helps to determine the most effective methods of processing and disposal of waste. An important stage is the analysis of safety and environmental aspects, which ensures the safety of processes and compliance with environmental standards. The development of the implementation plan allows you to clearly define the steps, deadlines and resources for the successful implementation of the project. In general, technical analysis is an important tool for ensuring the successful and efficient implementation of projects on the management of secondary raw materials, contributing to sustainable development and environmental protection.

7. The summary of the project for the introduction of resource-saving technologies serves as an important tool for quickly familiarizing interested parties with the main aspects and goals of the project. It provides information about the purpose, goals and expected results of the project, and also engages stakeholders in joint work. The summary includes the key components of the project, such as the title, objective, implementation strategy, expected results, budget and timeline. The project of collection and use of secondary raw materials is aimed at creating a sustainable and effective waste management system that will contribute to the conservation of resources, reduction of environmental pollution and creation of favorable conditions for the sustainable development of society. Successful implementation of the project is possible thanks to partnerships with local authorities, industrial enterprises and public organizations, as well as due to proper financing and compliance with strategic goals and objectives.

8. The main elements of the project budgeting methodology include: analysis of costs and revenues, setting budget goals, budget allocation. Priorities and strategic directions of the project are taken into account, which costs need more funding and which can be reduced or optimized are determined. It is envisaged to create a system of control and monitoring of financial indicators, determination of key performance indicators that reflect compliance with budget goals, regular assessment of actual costs and revenues in accordance with the planned ones.

9. Project risk management is a systematic approach aimed at maximizing the probability of successful project implementation by identifying, analyzing, evaluating and managing potential risks. The primary purpose of risk management is to manage hazards and opportunities to achieve successful outcomes. Project risk management includes the stages of identification, assessment, strategy development, implementation and monitoring of risks throughout the project. Effective risk management helps reduce the likelihood of negative consequences and minimize their impact on project success. During the implementation of the project of collection and use of secondary raw materials, various risks may arise, such as financial, technical, project management risks, environmental, market risks, social and political risks. Effective risk management involves identifying, evaluating, and developing strategies to manage each of these risks to ensure project success.

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