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CIRCULAR ECONOMY AS A DRIVER OF SUSTAINABLE DEVELOPMENT OF UKRAINE

Abstract. The article considers the model of circular economy and the possibility of its implementation in Ukraine. The authors explore the main aspects of the circular economy and the relationship with the goals of sustainable development. It is noted that the use of innovations and innovation systems is the basis of the circular economy, which will ensure the interdependence between the reduction of non-returnable waste and increase the use of reusable resources, will not improve the ecological and economic condition of the country. The article analyzes the economic content of methods and models of implementation of the circular economy by identifying their impact on the sustainability of economic and government systems. The generalization of world experience in the implemented concepts of the circular economy allowed us to identify 5 main circular business models: circular deliveries, resource recovery, platforms for exchange and sharing, product as a service. The article gives examples of implementation of the principles of circular economy in the production of world brands. Prerequisites and recommendations for the introduction of a circular economy in Ukraine are summarized. It is determined that the introduction of a circular economy is beneficial for the enterprise or company, for consumers, communities and the state as a whole. The advantages in the long run on optimization of material flows, opportunities to enter new markets, expand the scope of services, obtaining additional profits in the field of services are highlighted. The interrelation of business models of circular economy recommended for use in Ukraine is established. The article identifies further steps of the study, which will be aimed at building a model of circular economy, based on the experience of leading European countries, taking into account Ukrainian characteristics, as well as detailed performance criteria for companies implementing circular economy depending on the scope and size.

Key words: circular economy; sustainable development; business model; ecological and economic environment; energy efficiency; innovation.

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INTRODUCTION

Formulation of the problem. The critical ecological situation in the world, which is getting worse every year, requires the introduction of mechanisms to encourage the population to rational consumption and production in conditions of sustainable development. Today, the

market not only meets the needs of the population in goods and services, but also forms such needs by offering new or modified products, the consumer value of which is not always high.

Ukraine has also joined the global process of sustainable development, given that the Sustainable Development Goals (SDGs) must ensure the national integration of efforts for economic growth, social equality and justice, the need for "smart" environmental management. SDGs recognize that results in one area will affect results in others, and that sustainable development must balance the social, economic and environmental components of the state. They envisage the implementation of such priority programs as sustainable living and education, circular public procurement, consumer information, development of sustainable tourism, ensuring sustainability in the field of construction, etc. Regarding the introduction of the system of circular economy in the state economic policy, the goal № 12 "Responsible consumption and production" [1; 2].

Analysis of recent research and publications. Research on this topic is just beginning to gain momentum, but such contributions to the problems and prospects of the circular economy have been made by such foreign and Ukrainian scientists as Chen Demin, W. Stachel, N. Boken and E. Olivetti, P. J. Matthews, K. Fletcher, O. Ulanova, S. Miroshnichenko, M. Ruda, J. Mirka, N. Vergunova.

The purpose of the article is to define the principles and mechanisms of the circular economy in order to ensure sustainable development of Ukrainian economic system.

RESULTS OF THE RESEARCH

The circular economy is a new model aimed at reusing materials, creating added value through services and intelligent solutions. The circular economy assumes that the value chain is organized so that the outputs of one chain become inputs to another, reducing dependence on new raw materials. In a global sense, the circular economy is very relevant, because, according to international organizations, the global importance of the circular economy market is more than a trillion US dollars.

Many countries around the world have already begun to move towards a circular economy. The European Union has adopted a Circular Economy Action Plan, and within the framework of the Association Agreement between Ukraine and the EU, our country has committed itself to harmonizing national legislation with European legislation. This contributed to the adoption in 2017 of the National Waste Management Strategy, which provides, in particular, the introduction of the principles of the circular economy.

According to KPMG research [3], the main 9 global trends that affect the development of the country's economy are identified: "increasing opportunities for the individual", the use of effective technologies in the process, public debt, population demographics, urbanization, environmental change, lack of natural resources, the relationship of the economy, economic change of centers of influence. Nowadays, there is a need to ensure efficiency and minimize the activities of enterprises and the economy as a whole. In particular, the activities of the production nature of the enterprise are unstable models in terms of environmental safety. Instead of the classical economy used in some countries, the circular economy, which is gradually beginning to be the leading key to economic development in developed countries in Europe and the United States.

In Ukraine, the gradual transition to a circular economy, the pace of which varies each year. Just as the circular economy involves rethinking and changing the management of waste, raw materials and using a recycling scheme to make more efficient innovations, as well as taking into account the environmental situation and changing the behavior of the population. The circular economy began to be used in industrial activities, and especially in the environmental industry, the activities of different enterprises, which can be fundamentally

different. The circular economy is based on the tools and principles of economic development, using more innovative technologies, which include green tools, tools for reuse of materials (ie returnable waste), but also environmental development tools with an emphasis on environmental protection and emission reduction.

Note the interpretation of the concept of circular economy, interpreted by Chen Demin, which states: "Circular economy is a pattern of economic exploitation, according to which material resources can be used in a circle, in re-included in production. The purpose of the circular economy is to ensure the endless use of material resources. " In other words, the circular economy is an economic and environmental restructuring of a linear economy, in accordance with the conditions dictated by the modern market, but also in accordance with the innovative conditions and conditions for improving the environmental situation [4].

Many scholars associate the circular economy with the use of resources in a circle, resulting in an interdependence between reducing irreversible waste that affects the environment and increasing the use of reusable resources that improve the ecological and economic condition of a circular economy (Fig.1). Thus, the circular economy (closed-cycle economy) should be understood as a model of using materials that are recycled or released into the biosphere without harmful effects, and accordingly perceive waste not as garbage but as useful resources in the face of depletion of many natural resources.

Fig. 1. Principles of circular economy

Source: formed by the authors based on [1; 2; 3]

According to the principles, the goal is to reduce waste through reuse, i.e recycling, which will reduce environmental pollution, full use of resources and energy efficiency, reduce landfills and create environmental awareness in the population to prevent negative impact on the environment.

The mechanism of the circular economy is subject to a number of concepts, specific approaches and rules:

1) Biomimicry - the search for environmentally sustainable solutions that stimulate time-tested biological models [5].

2) the concept of Cradle-to-Cradle - the concept of waste-free production [6].

3) Industrial Ecology - the development of industrial products and processes, which involves a double assessment in terms of product competitiveness and environmental friendliness [7; 8].

4) Blue Economy - the sustainable use of ocean resources for economic growth, improved livelihoods and jobs while maintaining the health of the ocean ecosystem [9].

5) Biosphere Rules - the application of principles that facilitate the circular processes in nature, their interpretation and implementation in industrial production systems [10].

The transition to a circular economy will cause a systemic transformation of economic relations, provided the willingness of business, government, society as a whole to change their habits, rules and form new schemes of interaction in various spheres of life. The introduction of new resource-efficient technologies, innovative business models and tools for attracting resources to the industrial production system will lead not only to modernization of production, but also to the formation of new supply chains and significant changes in the paradigm of commercial relations.

In particular, the introduction of circular approaches may make structural changes in the economy, which will have a potential impact on trade flows. Demand for imports and exports of primary materials may decrease, and secondary materials and waste may increase, and new opportunities for trade in services may emerge.

Thus, the circular economy involves the formation and predominant development of markets that provide incentives for reuse rather than extraction of new resources, and therefore all forms of waste (used clothing, scrap metal and obsolete electronics) can be brought back to life through recycling, reconstruction and recovery. With better supply-demand linkages, shared manufacturing and trading business models can help fill gaps in companies' economic chains and help minimize "virtual waste."

In this sense, circular business models are not only an opportunity to protect the environment, but also a way to save resources, develop new industries and industry markets, create jobs and generate income from production and trade.

Generalization of world experience in the implemented concept of circular economy makes it possible to identify 5 main circular business models [11]:

1. Circular suppliers - a model in which renewables replace limited resources - providing fully recyclable resources or those that are subject to biodegradation.

2. Resources recovery - a model in which, thanks to innovation, resources are restored and reused, which helps to avoid loss of resources and increases the profitability of production through reverse flows.

3. Sharing platforms - a model in which the exchange or sharing of goods or assets, provides interaction between users of the product.

4. Product life extension - a model in which due to modernization, reconstruction, restoration, companies continue the life cycle of their products.

5. Product as a service - a model that offers an alternative to the purchase of products - its use by "rent" with payment on the spot (through a lease agreement, leasing, etc.).

The use of these models will lead to increased trade flows and the formation of innovative approaches to the organization of trade at different levels of the value chain: "green" public procurement, trade in materials and waste for energy processing and recovery, trade in secondary raw materials, scrap and secondary goods. handicrafts, trade in goods for reconstruction and repair; trade in goods as services (Table 1).

Both developed and developing countries have benefit from the circular economy. At the same time, the size of the "premium" that countries could receive by implementing circular economy strategies is still a relevant subject of study. The potential economic benefits are estimated at 13 to more than \$ 1 trillion a year in material cost savings. For India, Laos and the EU, savings can be as high as € 320 billion, respectively [12].

Table 1

The relationship between trade and the circular economy

Business models	Life cycle	Trade flows
Circular deliveries	Ecodesign	"Green" public procurement
	Procurement	
Resource recovery	Production	Trade in goods for refurbished / remanufactured
	Logistics	
Goods as a service	Sales and marketing	Trade in goods as services
Sharing economy	Using	Trade in repair and restoration services
Continuation of the product life cycle	Disposal	Second-hand trade. Trade in waste and scrap

Source: formed by the authors based on [4; 7; 14; 15]

The relationship between trade and the circular economy makes it possible to identify 7 key instruments of the circular economy [13]:

1. The design of the future is the production of goods in which traditional materials can be replaced by renewable or recycled ones. This strategic direction provides an opportunity to optimize the use of resources and reduces the amount of waste in the production process. Thanks to this tool, Adidas has developed running shoes from 100% recycled materials, one type of material is used in the production and no glue is used, so after using the shoes you can recycle them to produce a new pair.

2. Sharing and virtualization - already familiar to many business models Uber, BlaBlaCar, Airbnb, music streaming services use this approach. In Ukraine, the brand Oh My Look!, which is transformed from a dress rental service to an offer of a virtual wardrobe by subscription.

3. The strategy "goods as a service" seeks to replace traditional models of selling goods by selling services. Rolls Royce offered a similar approach to the market almost 60 years ago. With the Power-by-the-Hour service, the company offers customers in the aviation industry instead of buying aircraft engines - to pay for their use on a fixed rate for 1 hour of work.

4. Reuse in production, when used products or components become part of new products. Canon takes products back at the end of their life cycle and uses components in new devices without compromising the functionality of the materials. Dell uses used products to make parts. The Michelin Group annually returns 17 million tons of used car tires to the production process, and thanks to R&D developments, they are once again becoming a valuable material.

5. Reuse in consumption, when by optimizing service companies can increase the life cycle of the product. EBay Marketplace offers restored after damage or defect, but fully functional devices, on a special site at reduced prices. In Sweden, there is a whole Retuna supermarket, the range of which, from furniture to books, consists of second-hand things. In Ukraine, there is a project "Courage Bazaar", which promotes reuse.

6. Industrial symbiosis and recycling of production waste can significantly increase business efficiency. The first example of symbiosis in the concept of circular economy is considered to be the project in Kalundborg, Denmark. The participating companies are united by the principle of interaction, when the waste of production of one business becomes a resource for another and at the same time reduces economic costs and CO2 emissions. The consortium includes Denmark's largest oil refining company, owned by energy giant Equinor, the pharmaceutical company Novo Nordisk, a municipal water and heat company, a waste management operator and others. In Ukraine, an example of efficient use of resources in the production process was Myronivsky Khliboproduct, which builds biogas plants for processing poultry waste and energy. Concern "Obolon" sells to agricultural companies by-products of beer production, which become animal feed. The Silpo supermarket chain is installing special heat recovery tanks from refrigeration equipment to meet the need for hot water supply.

7. The usual term "recycling" is also a strategy of the circular economy. At the end of the product life cycle, the materials are recycled in a safe manner. Nike sports shoe maker launched the Nike Grind initiative almost 30 years ago. Old sneakers, collected around the world, were used as a material for making coatings for sports grounds. In Ukraine, the topic of recycling is on the agenda of many producers in the context of the adoption in the first reading of the law 2207-1d "On Waste Management". The law is an important step towards the functioning of extended producer responsibility (RVV) systems. In Ukraine, the current problem of plastic processing and private business is included in its solution. The Morshinskaya brand has updated the packaging design, reducing the amount of plastic used by 15%.

In the context of the implementation of circular business models in Ukraine, it should be understood that it all depends on whether the company intends to reconfigure its business model, which is relevant for existing companies, whether the entrepreneur or startup company is looking for ways to develop a completely new business model. In this case it is necessary to create an appropriate system with the coordination of its elements. The main recommendations for designing a management system for circular business models in Ukraine are that their introduction becomes a source of innovation: providing as a tool the ability to implement the results of various innovations in products and services, processes or in various organizational settings and helping to market existing products. and services in a new way (Fig. 2)

Fig. 2. The relationship of business models of the circular economy recommended for use in Ukraine

Source: formed by the authors based on [11; 13; 14; 15]

The possibility of using and creating new business models in the structure of the circular economy is available only with the support of the state, consumers and the market environment, which is urbanized and environmentally responsible and aimed at reducing dependence on material resources, energy efficiency and profit.

CONCLUSIONS AND PROSPECTS OF FURTHER RESEARCH

Thus, the introduction of a circular economy is beneficial not only for the enterprise or company, but also for consumers and communities, there are also long-term benefits for optimizing material flows, opportunities to enter new markets, expand services, generate additional profits in the field of services. But to implement the basic principles of the circular economy requires a restructuring of the legal framework, the introduction of technology, financing and forms of doing business, the willingness of society to change their habits and rules, creating new platforms and schemes of interaction between producers and consumers of circular goods.

Summarizing the directions of formation of the circular economy, we can identify initiatives that should be a priority:

- 1) analysis of product features in the context of what customers really value. Often materials can be replaced with renewable ones without loss of quality.
- 2) logistics must work bilaterally. Valuable materials can be returned to production after customers use the product.
- 3) mutually beneficial joint work with other companies on innovations.
- 4) search for secondary markets. New markets outside the traditional sector of activity can significantly increase the company's customer base and provide profit growth.
- 5) constant communication with customers about the product and changing needs. The circular economy is built on continuous communication with the consumer and the search for new opportunities.

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ЦИРКУЛЯРНА ЕКОНОМІКА ЯК ДРАЙВЕР СТІЙКОГО РОЗВИТКУ УКРАЇНИ

Анотація. У статті розглянуто модель циркулярної економіки та можливість її впровадження в Україні. Авторами досліджено основні аспекти циркулярної економіки та взаємозв'язок із цілями сталого розвитку. Зазначено, використання інновацій та інноваційних систем є основою циркулярної економіки, що забезпечить взаємозалежність між зменшенням безповоротних відходів та збільшить використання повторних ресурсів, на створить покращення еколого-економічного стану країни. Узагальнення світового досвіду у впровадженні концепції циркулярної економіки дозволило виділити 5 основних кругових бізнес-моделей: циркулярні поставки, відновлення ресурсів, платформи для обміну та сумісного використання, продукт як послуга. У статті зазначено приклади впровадження принципів циркулярної економіки у виробництві світових брендів. Узагальнено передумови та рекомендації впровадженні циркулярної економіки в Україні, для впровадження основних засад циркулярної економіки необхідна перебудова законодавчої бази, впровадження технологій, фінансування та форм ведення бізнесу, готовність суспільства змінювати власні звички та правила, створення нових платформ та схем взаємодії виробників та споживачів циркулярних товарів. Визначено, що впровадження циркулярної економіки є вигідним для підприємства чи компанії, для споживачів, громад та держави в цілому. Виокремлено переваги в довгостроковій перспективі з оптимізації матеріальних потоків, можливості виходу на нові ринки збуту, розширити сфери обслуговування, отримання додаткового прибутку в сфері надання послуг. Встановлено взаємозв'язок бізнес-моделей циркулярної економіки рекомендованих для використання в Україні. У статі визначені подальші кроки дослідження, які будуть направлені на побудову моделі циркулярної економіки, зпираючись на досвід провідних Європейських країн, з урахуванням українських особливостей, а також детально розроблені критерії ефективності для компаній, які впроваджують циркулярну економіку в залежності від сфери діяльності та розміру.

Ключові слова: циркулярна економіка; сталий розвиток; бізнес-модель; еколого-економічне середовище; енергоефективності; інновації.

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ЦИРКУЛЯРНАЯ ЭКОНОМИКА КАК ДРАЙВЕР УСТОЙЧИВОГО РАЗВИТИЯ УКРАИНЫ

Аннотация. В статье рассмотрена модель циркулярной экономики и возможность ее внедрения в Украине. Авторами исследованы основные аспекты циркулярной экономики и взаимосвязь с целями устойчивого развития. Отмечено, что использование инноваций и инновационных систем является основой циркулярной экономики, обеспечит взаимозависимость между уменьшением безвозвратных отходов и увеличит использование повторных ресурсов, что повлияет на улучшение эколого-экономического состояния страны. Обобщение мирового опыта во внедрении концепции циркулярной экономики позволило выделить 5 основных круговых бизнес-моделей: циркулярные поставки, восстановление ресурсов, платформы для обмена и совместного использования, продукт как услуга. В статье указаны примеры внедрения принципов циркулярной экономики в производстве мировых брендов. Обзор предпосылки и рекомендации внедрения циркулярной экономики в Украине, для внедрения основных принципов циркулярной экономики необходима модернизация законодательной базы, внедрение технологий, финансирования и форм ведения бизнеса, готовность общества изменять собственные привычки и правила, создания новых платформ и моделей взаимодействия производителей и потребителей циркулярных товаров. Определено, что внедрение циркулярной экономики выгодно для предприятия или компании, для потребителей, громад и государства в целом. Выделены преимущества в долгосрочной перспективе по оптимизации материальных потоков, возможности выхода на новые рынки сбыта, расширения сферы обслуживания, получения дополнительной прибыли в сфере оказания услуг. Установлена взаимосвязь бизнес-моделей циркулярной экономики, рекомендованных для использования в Украине. В статье определены дальнейшие шаги исследования, которые будут направлены на построение модели циркулярной экономики, опираясь на опыт ведущих Европейских стран, с учетом украинских особенностей, а также детально разработаны критерии эффективности для компаний, внедряющих циркулярную экономику в зависимости от сферы деятельности и размера.

Ключевые слова: циркулярная экономика; устойчивое развитие; бизнес-модель; эколого-экономическая среда; энергоэффективность; инновации.

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