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Review Paper

The Circular Economy Model and the Imperatives of its Implementation in Ukraine

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ABSTRACT

In Ukrainian realities, the issue of implementing a circular economy is the most significant task for a country that is mainly focused on the extraction and processing of raw materials. The issue of applying the circular economy model and the possible imperatives of its implementation are formed on the basis of the realities of military operations and an unfavorable economic situation. The purpose of the research is to analyze the feasibility of implementing the circular economy, as well as the possible partial provision of its circulation based on using basic principles of functioning. The principal goal of the research is to evaluate theoretical and practical models of using the circular economy, as well as the relevance of developing such a model in Ukraine. The potential opportunities for developing the circular economy in the state are investigated with the help of forming and using information technologies, as well as specialized equipment. The represented results can be used in the public administration of the country for establishing a qualitative stabilization policy of the country's economy both in the conditions of war and in the post-war period. The academic paper investigates the basic principles of creating and developing the circular economy based on European experience. The research results can be useful for the corporate sector, as well as for the institutions of regulation of economic activity in private-state relations.

HIGHLIGHTS

- The purpose of the research is to analyze the feasibility of implementing the circular economy, as well as the possible partial provision of its circulation based on using basic principles of functioning.
- The research results can be useful for the corporate sector, as well as for the institutions of regulation of economic activity in private-state relations.
- The object of the research in the academic paper is the process of establishing the circular economy as an adjacent qualitative alternative to the traditional economy.

Keywords: Corporate sector, circular economy, cyclicality, turnover, processing technologies, ecology, alternative economy

The development of the economic environment and the circulation of processes is mainly cyclical. Therefore, the issue of effective use and distribution of resources for production is a priority task for industrial production. Global environmental problems, as well as increased industrialization in the world, stimulate the search for effective solutions to overcome the consequences of social-

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economic problems resulting from such activities. A qualitative mechanism for implementing the corporate management policy of enterprises and ensuring corporate social responsibility as a factor in preserving the environment is the introduction of a circular economy. The essence of the circular economy's concept implies the existence of an economic system in which the principles of reproducing products and services through their reorganization or processing the material used for their production are dominant. The quantitative advantages of the circular economy, the principles of which are used in the European Union's countries, are the restraint of the industrial sector in the industrial extraction of minerals, as well as the stimulation of waste disposal for the purpose of its further processing. The primary sources of the circular economy have their roots precisely in the environmental sphere, for as much as the issue of using recycled waste in production can provide a number of advantages for the enterprise. However, the circular economy can be used not only in the means of processing natural resources but also in forming the functioning mechanism of the corporate sector as the main factor in optimizing consumption policy, limiting manufactured products to ensure current demand, as well as preserving the natural environment. Through using such resources, the circular economy model is primarily significant for countries focusing on industrial production, as well as large businesses using industrialization products. The application of modern information technologies is a key component of developing and establishing the circular economy. After all, it is impossible to implement the uninterrupted operation of an industrial enterprise without automation processes and its control in production (Girko, V.L. 2022). Ukraine has a powerful internal resource potential, which is evidenced by the state of affairs in the corporate sector. The issue of implementing the circular economy in Ukraine under such conditions, as well as the prospects for its development, is significant and expedient. This can contribute to stabilizing the country's social-economic situation and ensure overcoming the negative consequences of military aggression (Kachula, S., Zhytar, M., Sidelnykova, L., Perchuk, O., Novosolova, O. 2022).

The purpose of the research is to determine the features of implementing the circular economy and reveal the theoretical and practical fundamentals of its introduction and functioning. The primary objective of the research is to analyze the potential opportunities for implementing the circular economy in Ukraine and outline the prerequisites for its introduction. The transition from a traditional to a circular economy involves using several principles on the basis of which a circular economy is established (Nitsenko, V., Kotenko, S., Hanzhurenko, I., Mardani, A., Stashkevych, I., & Karakai, M. 2020). A significant direction of the research is the possibility of implementing a circular economy in accordance with the economic climate in Ukraine, as well as the possibility of applying investments in the sphere of the corporate sector. The academic paper pays particular attention to using available recycling opportunities and assessing the social-economic effect and identifying the consequences of such a policy in the conditions of military operations and global economic instability (Shvets, V.Y., Rozdobudko, E.V. & Solomina, G.V. 2013). A promising direction of the research is using international cooperation for exchanging technologies, as well as attracting investments to strengthen the technological infrastructure, which can be used to ensure a circular economy as an alternative to the traditional one. In Ukraine, as a country with a dominant medium and large business, the practical results are useful from the perspective of reforming the economy in the post-war period.

Literature Review

Using a rational consumption approach is a crucial practice of highly developed countries. The issue of optimizing the industrial sector, which is a key producer of goods, as well as the provision of services for the state economy, creates the need to consider a modern alternative to the traditional economy – a circular one. The enterprises functioning of the circular economy, noted that the key principles of its implementation are using the principles according to which it functions. The scientist (Bassi, 2021) notes that the key principles of building a circular economy are reusing natural resources or raw materials, which are used to manufacture products for the purpose of their further sale in the corresponding segment of the enterprise's economic activity. With which he agrees

(Sergienko, 2017), claims that the circular economy consists not only of the reproduction of products based on recycled resources but in the optimization of consumption - the reduction of production and the rational distribution of production technologies that can reproduce the product with fewer resources.

The scientist (Hofmann, 2019) considers the circular economy as a means to improve the ecological situation, forasmuch as the key basis of its development is using natural resources in smaller volumes, and waste disposal should be used to support the production of enterprises. Also, the Ukrainian team of authors, led by Ishchenko (Ishchenko, 2021) studied the issue of chemical safety and considered it in the context of the environmental goals of sustainable development. According to (Kalmykova, 2018), the circular economy is an alternative to the linear and the modern traditional economies. Its implementation is possible only with the available innovative technologies, as processing raw materials requires additional infrastructure, provision and financing.

According to Testa, 2020, a significant factor in developing the circular economy is the constant optimization of production processes, which will improve the technological process, and also contribute to improving equipment, advancing personnel qualifications, and the participation of the state in regulating the industrial sector. Prokudin G. and his colleagues 2020 considered and studied in detail the logistic approach to the organization of unbalanced freight transport, which optimized the connection between production processes (Prokudin, G., Chupaylenko, O., Lebid, I., Luzhanska, N., 2020). A year earlier, vehicle speed prediction methods were developed for the highway transport system (Prokudin, G., Chupaylenko, O., Dudnik, O., Oliskevych, M., 2019). According to this approach, the level of monopolization of commodity markets, as noted by (Mohan, 2021), will be minimal, forasmuch as introducing a circular economy from the state's perspective requires a regulatory and legal framework that enables auditing activities regarding using enterprises' internal resources, as well as ways of improving rational distribution (Pogodayev, S.E. 2013; Savelyuk, N., Kalmykov, O., Riznyk, V. 2021).

He believes that the key issue of the circular economy is the difficulty of involving the industrial sector in domestic investment activities in "green" technologies. The high cost of the previous ones stimulates the search for shady means of overcoming state restrictions. The practice of the European Union regarding using the principles of the circular economy reached its peak at the beginning of 2018. As noted by (Anggraeni, 2019), the new ten principles of the circular economy stimulate the search for effective solutions for its implementation at the private-state level, and also improve the sphere technological developments and modeling to support its functioning (Kalina, I., Novykov, D., Leszczynski, V., Lavrukhina, K., Kukhta, P., Nitsenko, V. 2022). Thus, in the modern scientific environment, the circular economy is an important direction of developing the traditional economy, which can improve the social-economic environment, contributing to ensuring the ecological state.

MATERIALS AND METHODS

During writing the academic paper, methods of scientific research, sources of open data on prices for the processing of natural resources, as well as information resources of the current macroeconomic state of Ukraine were used. The search method was applied to investigate the circular economy's theoretical concept and the features of developing its principles and implementing in European countries. The synthesis method was applied to outline the key advantages and features of using the circular economy. Along with this, the advantages of the circular economy over the traditional one and the basic principles of its functioning in the modern environment, were studied. The issues of circular economy implementation are characterized using the method of deduction and induction. The economic effect of its use in the industrial corporate sector was predicted based on the cost of processing. Attention is paid to disclosing the key principles of the functioning of the circular economy, the main stages of its evolution, as well as the use of digital technologies to ensure its vital activities. According to Ukrainian realities, in the war conditions, the academic paper analyzes the potential use of the circular economy and alternative options adjacent to the traditional one. The applied methods make it possible to characterize the circular economy model and the subsequent imperatives of its

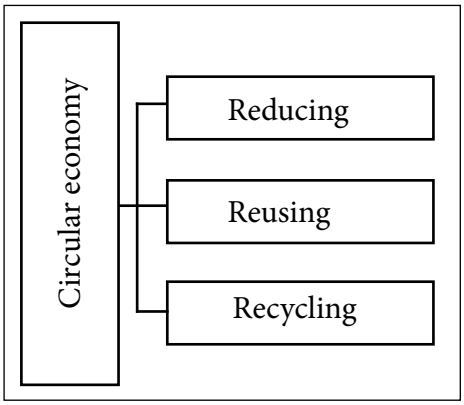
establishment based on implementing the foreign experience of developed countries. The defined research methodology makes it possible to describe the circular economy's properties as an effective tool for stabilizing the Ukrainian space. It also helps consider the corporate sector's orientation on producing raw materials, as well as the high level of production, the prospect of its implementation. The prospects of studying the circular economy in Ukraine are determined by the uncertainty of the geopolitical situation, as well as the problems of the functioning of the energy market, which is a key factor necessary for developing the circular economy. The research is based on analyzing modern strategic problems in the Ukrainian corporate sector and the environmental condition inherent in implementing the circular economy.

RESULTS

The modern traditional economy in its form is ineffective for Ukrainian realities due to the threat of military actions and the uncertainty of the future economic situation. Therefore, the circular economy is an important alternative for being implemented and used in the domestic environment, as a source to recover and stabilize the economic situation and ensure sustainable development. The range of problems concerning the circular economy lies in the uncertainty of approaches to this concept and the constant improvement of theoretical and methodological viewpoints on its definition. The functioning of the circular economy consists in using manufactured products, as well as their partial modernization to the modern level for the purpose of further application. After all, using such approach is possible not only to ensure uninterrupted production, but also to optimize the internal use of resources. A key feature of modern standpoints on the issues of the circular economy is the ambiguity of views regarding its direction, for as much as the vast majority of theoretical approaches relate to optimizing raw materials and materials for manufacturing products. However, the circular economy, if possible, can be used not only in the industrial sector, but also have characteristic features for the provision of services. It can be applied based on principles that primarily involve optimizing available resources.

The advantages of using the circular economy, as opposed to a traditional or linear one, are the optimization of the industrial sector and large and medium-sized businesses. They use natural resources, raw materials or services that can be reproduced through recycling and implemented in the future with commercial benefit. The key principle of using the circular economy is reducing production costs, creating a repeated cycle of producing products and introducing cyclical production of materials and technologies for its further implementation in the selected market's segment. In addition, the circular economy is characterized by strengthening the role of corporate social responsibility, as well as using automated technologies that can improve the production of a particular product or service. The circular economy is able to function in the modern digital environment precisely because of innovative technologies. Therefore, a significant factor in determining the circular economy should be paying attention not only to processing, but also to the issue of effective using such technologies, the amount of investment in them, as well as the formation of a socially beneficial effect for society and the enterprise as a whole.

The basic principles of the functioning of the circular economy model are the principle of commodity circulation, where the commodity is processed raw materials or any resources that can be reused in production for the purpose of their further commercial or domestic sale. Based on the principles outlined, it is possible to single out the crucial fundamentals of the circular economy, which are commonly applied when using the term "circular economy". They are reflected in more detail in Fig. 1.



Source: *Compiled by the author.*

Fig. 1: 3R (3RRR) principles of the circular economy

The circular economy functions in the developed world countries based on the principles reflected in Fig. 1. After all, the very definition of the circular economy is not based on the model of its implementation, but on the principles used for its implementation. The primary fundamentals of its development in the modern world are the formation of effective approaches contributing to the improvement of its activities in conditions of sustainable development, as well as economic reform in countries where industrial production is most involved. In addition, the environmental sphere suffers the most because of the powerful industrial sector in developed countries. Moreover, the issue of optimal use of natural resources is also of particular importance. The circular economy is mainly related to using natural resources and not to services, for as much as its principles should be applied in industrial turnover, according to which the manufacture of products is possible with the repeated use of particular models. There are significantly fewer services that could be implemented using the same approach.

The circular economy's approach to using natural resources was formed due to the presence of numerous industrial enterprises, as well as large businesses participating in the production of the gross domestic product. For instance, in the European Union's countries, the average level of small enterprises participating in GDP production is about 30%, while in Ukraine, it is only 16%. The share of medium and large businesses in Ukraine is crucial, for as much as the share of GDP production reaches more than 73% as of the end of 2021, in the pre-war period. Based on the data specified, it can be predicted that the economic sector of Ukraine is currently focused on the production of industrial goods, producing and processing raw materials. In view of such an economic situation, the circular economy will be used in terms of optimizing natural resources, as well as possible waste processing for its further application. Moreover, there are significant problems with waste disposal in Ukraine, as well as the search for really effective solutions for using recycled raw materials.

Ukraine's economy has almost halved due to the war in the country, indicating the incapacity of mainly medium and large businesses to conduct their economic activities. Moreover, those enterprises that are currently operating provide critical infrastructure. In order to establish a favorable climate in Ukraine, the corporate sector should apply the method of optimizing resources used for producing and processing raw materials and the subsequent production of products. The process of establishing the circular economy consists primarily in using innovative technologies that can bring real benefits to the economy. After all, this will increase the production capacity of those enterprises that are currently functioning, as well as ensure a reduction in the costs of processing and producing raw materials. In order to establish information cooperation, it is worth using the experience of Switzerland and Germany, which are actively implementing several investment projects and reforms in the direction of developing the green economy into state practice as part of a circular one. The issue of the green economy is using only raw materials that will not harm people and the environment. However, one of the principles is common to the circular economy – using raw materials and their constant processing to reduce the production of natural resources.

Taking into account the current tendencies towards digitalization, as well as the emergence of innovative technologies, which mainly function in the circular economy, the formation of its essence was expanded. It is expedient to use not only the 3RRR model in implementing the circular economy, which involved a rational distribution of resources, but also a broader technological approach. Innovative principles in the circular economy based on developing technologies, as well as their characteristics, are shown in Table 1.

Table 1: Innovative principles of the circular economy

Principle	**Content**
Refusing	Search for alternative technologies for product processing
Rethinking	Optimization of existing waste processing and utilization solutions, rethinking of this process
Reducing	Reducing the circulation of natural resources by reusing raw materials
Reusing	Reusing raw products, materials, etc.
Repairing	Improvement of technical equipment operation

Refurbishing	Modernization of an outdated product to a modern one
Remanufacturing	Using components of an old product to produce a new one
Repurposing	Implementation of technological equipment and functionality of the old product to a new one
Recycling	Recycling to obtain products of previous quality
Recovering	Return to the start of the cycle

Source: *Compiled based on [3].*

More than 80% of the expenditures of Ukraine's budget are directed to the defense sector as of 2022 and the beginning of 2023, while the rest is mainly distributed to the social sphere. Such state of affairs in the war conditions significantly limits state resources for promoting the establishment of the circular economy. After all, it should be invested significantly – through creating special infrastructure, as well as using innovative technologies that can improve product processing and promote the production of goods in a rational use. Reduction of resources on the part of medium and large enterprises will be able to ensure the corporate sector's activity without additional financing or lending. It will also be able to support stable circulation of goods both on the domestic market and on export products.

One of the key directions of the functioning of the corporate sector is using the agro-industrial sector, and producing grain and food products. Currently, using technologies that can improve the processing of products in the agricultural sector is crucial for Ukraine. In addition, optimizing the metallurgical industry's activity, and using this segment's capacity to work on internal infrastructure according to European technologies provides support for the military sector. It contributes to the functioning of exporters within the country. In order to implement the measures outlined, primarily, it is necessary to focus on the policy of using means of processing, as well as assessing their real effectiveness in implementing such activities in the modern global environment. Table 2 reflects in more detail the features of using waste processing and their possible reusing.

According to data of Table 2, most recyclable products can make up about 15% of finished raw materials for manufacturing products, as well as ensuring subsequent turnover, which is a very high indicator even with minimal levels of recycling. A significant shortage of electricity in Ukraine is observed as of 2022, as well as the problem of providing key cities with light, heating, etc. Under such conditions, it is significant to introduce a state program for using alternative energy sources and apply the circular economy principles. They involve optimizing available resources and their wider implementation in the Ukrainian space. It is possible to improve the activity of the corporate sector only through using such means, as well as increase the corporate social responsibility of enterprises applying such technologies. After all, the advantages lie in optimizing and a rational approach to using natural resources and significantly reducing the harmful impact on Ukraine's ecological state.

During the war, environmental issues became much more acute. The environmental disaster taking place in Ukraine is an acute issue for international cooperation due to the damage to Ukrainian soil,

Table 2: The cost of waste processing tools and the share of their return to the turnover

Waste processing methods	**Possible level of processing,%**	**Specific investments depending on capacity, EUR per ton, for 2022**
Collection and processing of mixed waste flow	15%	200–350
Recycling with separate waste collection (separation of organic waste)	20%	300–350
Recycling with separate collection of waste (four or more fractions)	35%	250–450
Production of biogas from organic biomass	25%	250–450
Composting (aerobic fermentation)	35%	450–550
Incineration of waste with energy production	80%	1000–1 350

Source: *Compiled based on data of the Ministry of Environmental Protection and Natural Resources of Ukraine.*

as well as the conduct of hostilities. In the future, all the issues outlined will require real measures to optimize the activities of the corporate sector based on using circular and green economy principles. Overcoming the ecological catastrophe in the country is a priority goal of the state, forasmuch as the need to create safe working conditions, conduct business and promote population's standard of living is one of the overriding objectives. Eliminating the war's negative environmental consequences is possible only through improving the regulatory and legal framework, transparent and effective monitoring of the quality of using natural resources and open reporting of the corporate industrial sector to an independent audit.

Currently, a quick orientation towards the circular economy is impossible, as the process of its implementation in Ukraine involves spreading 3RRR principles among the corporate sector. Such a measure requires a significant initial investment, which is a dubious decision for any business in wartime conditions. This is precisely why the most effective model will be a smooth transition to a circular economy by attracting investors to the Ukrainian industrial and technological markets under favorable conditions, using state investment projects that could improve the corporate sector's activities. In addition, a high-quality method of public management in the country can be using the local self-government bodies' activities, as well as strengthening their monitoring function regarding using natural resources and the quality of the ecological state.

Only at the final stage, in the case of favorable scenarios in hostilities, it is necessary to implement a legal framework that would strengthen the circular economy's position. Such a plan of measures should be developed now to implement and stabilize Ukraine's economic situation operationally. Moreover, conducting educational activities on environmental issues in Ukraine and establishing cooperation with international organizations will be a priority task of the country to improve the principles of approval of the circular economy.

An important factor in developing the circular economy in Ukraine is the implementation of an effective state management mechanism for promoting the processing of raw materials, as well as its use at the level of local self-government. It is envisaged to establish special bodies possessing control and monitoring duties regarding using natural resources, as well as an open audit for large business enterprises regarding the optimality of such technologies. Considering the issue of running a transparent business, improving the legal framework in the post-war period requires significant attention. This can ensure the efficiency of using raw materials by enterprises that are of strategic importance for the country, in particular: the defense sector, energy, water supply, metallurgical production and agro-industrial complex. The importance of the state's partial participation in the process of implementing the circular economy lies in monitoring the high-quality use of technologies, reducing the risk of corruption, as well as the planned implementation of foreign European experience in the corporate sector.

Under such conditions, taking into account the current state of Ukraine's economic development, as well as the functioning of the corporate sector, the imperatives of implementing a circular economy are significant and priority goals for the country in the post-war period. After all, to ensure the circular economy's functioning, significant investments are needed to create a technological infrastructure that could provide the processing of natural resources and reusing raw materials. An important direction in implementing such a model may be the partial integration of the largest industrial metallurgical and agro-industrial enterprises according to the circular economy's principles, implementing special normative and legal amendments to the legislation regarding the possibility of state intervention in the corporate sector's activities in order to monitor the quality of using such resources. Ukraine is one of the leading countries in the production of industrial products and raw materials. Therefore, the implementation of the circular economy model is vital to overcome the unstable situation and improve the social-economic situation.

DISCUSSION

The conducted research indicates the necessity to transform Ukraine's economic model from a traditional to a circular one. The significance of using such an economy's basic principles provides competitive advantages in the corporate sector, as well as improves the ecological state's quality, raises

the population's living standard and contributes to the sustainable development of the economy. The modern concept of understanding the circular economy is mainly applied to the industrial sector in order to optimize the use of resources through their processing and reusing. It is expedient to investigate the practical application of the circular economy's principles to the service sector, as well as technologies supporting the functionality of this process.

The issue of using alternative sources of energy, as well as the possibility of ensuring their functioning based on the circular economy model remains a significant aspect for discussion in subsequent scientific studies. Diplomatic cooperation, promotion of investments in the energy market and the search for tools for using raw materials to re-produce petroleum products and fuel are the key principles of creating the sustainable economy. After all, the European Union's countries have suffered the most in the energy issue due to the military aggression of the Russian Federation. Under such conditions, studying the possible use of processing technologies in the direction of reproducing the energy sector, and supporting the stabilization operation of power plants, etc. is a significant issue.

In order to strengthen the economy's corporate sector by optimizing the use of resources for the industrial production of goods and services, the necessary task is implementing the principles of a circular economy according to the German model. It provides quality control over compliance with the procedure, stages and means of processing technologies. In Ukrainian realities, the key issue is using relevant investment in this direction, as well as conducting an independent audit regarding using processed products in further production. This is precisely why, calculating the production of products from the most industrial enterprises of Ukraine, as well as the share of raw materials that can be processed using innovative technologies and the number of products ready for sale, which were manufactured using processing technologies, can be a promising direction of the research.

Ensuring a circular economy in the conditions of hostilities is a difficult task due to the need to invest in processing technologies and developing specialized infrastructure, which can be used for further reorientation of the industrial sector to reduce the extraction of natural resources and raw materials. The critical aspect of this issue is the solution of this approach's effectiveness and forecasting enterprises' real commercial income, as well as consideration of the positive social-economic and environmental effects. Based on the positions outlined, the prospects for further investigations on implementing the circular economy in Ukraine should be studying foreign experience in using resources for the production of goods and products, as well as the legal framework and public management policy used to ensure the circular economy as an innovative alternative to the traditional one.

CONCLUSION

The obtained results of the research make it possible to form a relevant definition of the circular economy as an alternative to the traditional and linear economy. The circular economy implies producing goods and services implemented through processing raw materials for the purpose of their further sale on commodity markets. Using digital and innovative technologies is a key factor in the functioning of the circular economy. They make it possible to reduce the company's costs for extracting raw materials and conduct automated processing with further integration into the production process, which will not have significant time constraints and additional operating costs of the company.

The state's crucial direction is to ensure the vital activity of business because of armed hostilities in Ukraine. Therefore, implementing a circular economy is impossible in such conditions due to the need to attract internal investment funds for developing special infrastructure, which is under the threat of shelling and damage. In this regard, it is worth giving particular attention to the program of developing and using possible resource processing. Moreover, the energy market should be the key segment, which is strategically important for the country's economy. It also requires alternative sources of attracting oil products and effective energy management.

Modern approaches to processing raw materials and natural resources can have a positive effect on the country's economy. After all, with the minimal use of such raw materials, at least 15% of the

recycled material can be used for further production of products or services. Taking into account the potential possibilities of stabilizing Ukraine's economy, attracting investors for developing the circular economy is one of the primary directions of strengthening the Ukrainian economy's position in the post-war period. The development of the legal framework should be oriented towards a transparent audit of medium and large businesses, which will implement the use of technology for processing raw materials at the state level.

Therefore, it is possible to draw a conclusion based on the research conducted. Seeing that Ukraine's corporate sector consists mainly of medium and large businesses, which account for a key share of the country's GDP, planning for the implementation of the circular economy, or the principles of the 3RRR model, is critically necessary. Strengthening the industrial sector's positions due to introducing such technologies can contribute to overcoming the economic crisis, solving unemployment issues, as well as strengthening stabilization processes in Ukraine.

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