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TRANSPORT IN THE CIRCULAR ECONOMY

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Abstract: *Considering the global environmental and economic problems that the humanity faces in the XXI century, the issue of limited resources with increasing needs is one of the most important issues that needs to be addressed. Using the methods of observation, modeling, analysis and synthesis, historical, logical, and others, the article defines global economic trends in the world, explores the concept and content of the circular economy, and points out the advantages of the circular economy (closed-cycle economy) over the traditional economy. The article separately points to the wide spread of the ideas of circular economy in many countries of the world and the transition of these countries ' economies to a circular model based on the postulates: "reduce, reuse and remake". The article also explores effective business models of the circular economy and describes their successful practical implementation using examples from the transport sector. The author also pays attention to the legal basis for the development of a circular economy. The purpose of the article is to determine the place and prospects for the development of transport in a circular economy. As a result, the article concludes that the business model of the circular economy in the transport sector is highly effective and promising, and that there are excellent prospects for the development of the circular economy as a whole.*

Keywords*: circular economy, closed economy, sustainable development, transport, logistics, business, circular economy law.*

INTRODUCTION

The future of our planet at the current level of consumption and production and with the constant increase in the number of people on Earth is a big concern to the whole world. According to the 2015 UN (United Nations) report on the global demographic situation, the population of the planet Earth today equals to 7.4 billion, but by 2030 this number will reach 8.3 billion, by 2050 - 9.7 billion (United nations of Ukraine, 2020).

According to published data, some non-renewable energy resources-metals, minerals, and fossil fuels-will not be able to meet demand in the future, even if consumption and production remain at the same level, let alone grow. Scientists note that some resources will be completely exhausted within 50-100 years (Ellen MacArthur Foundation, 2016).

Considering this, on September 25, 2015, the UN member states adopted 17 sustainable development goals until 2030 and 169 targets to be met by the world's countries by 2030. Responsible consumption and production are one of these goals (goal 12). This goal is aimed at rational use of natural resources and reducing environmental pollution (International center for trade and sustainable development, 2019). The adopted sustainable development goals indicate the need to change the traditional economic model that operates on the principle of "get, use, throw away" to a fundamentally new model -the circular economy (closed - cycle economy), which operates on the principle of "3R" - Reduce, Reuse and Recycle.

LITERATURE REVIEW

The scientific research on various aspects of the circular economy was carried out by: Artemenko L. P, Ove Jacobsen, Fonz Dekker, G. Krotova, Kramer J., Dajain J., L. Hongyan, L. A. Musina, T. K. Kvasha, D. Pujari, Peng, Zhang and Huang, S. Morkh, I. Zvarych, A. Zelinskaya, Krueger A., May G., Taish M., C. Bouldering, Zhao Fu, John Sutherland, Joseph Sarkis, Campan Mukherjee, Elif Congar, R. Frosh, N. Gallopoulos, Didenko N.I., Klochkov Yu.S., and others. Today, people have many scientific papers directly on the topic of the circular economy.

The ideas of a closed-loop economy originated in the scientific field of environmental management. Authors: Geghamyan M.A., Gorbunova O.N., Chuikova L.Yu., Chuikov Yu.S., Maslennikova, I.S., Grossman G. Krueger A. describe the relationship between household income and the level of environmental damage. May G., Taish M. evaluate the environmental effect of using alternative energy sources. Didenko N.I., Klochkov Yu.S., Skripnyuk D.F. describe the environmental criteria of the circular and linear economies using the systems of econometric equations which are ADL models.

I want to note the activities of the Helen MacArthur non-governmental fund, which deals with the development of a closed economy in the European Union, conducts active research and educational activities. Closed deliveries and return logistics reviewed in the works of Imre Dobosch, Cherenkov V.I., Chris Dekker, Elif Kongar. However, the issue of transport in the circular economy has not been paid enough attention, so this article will make a significant contribution to the research of the circular economy.

METHODOLOGICAL APPROACH

The analysis is primarily based on initial sources of the international economics and on research by other scientists and practitioners in the field of international economics and international business. The article uses general scientific methods such as: observations, simulations, analysis and synthesis, system structural, formal logical, historical methods, and etc. The information base for the study was international normative legal acts, acts of international organizations and acts of the EU, reports of experts in the transport industry, analysis of Google Scholar, Semantic scholar, SciVerse, Scopus, E-library databases.

CONDUCTING RESEARCH AND RESULTS

The concept of a circular economy

Circular economy mode provides support for sustainable economic development without compromising the environment. In 1966, C. Boulding from the USA described in his work the theory of the cyclical economic model. He presented the Earth as a spaceship, where there are no reservoirs for storing waste and people must learn to recycle and reuse everything. In 1972, D. Meadows published the study "The Limits of Growth," where he called for the design and manufacture of products in such a way as to engage them repeatedly and provide a closed cycle of the cycle of materials. In the eighties of the last century, Michael Braungart, Ulyam Stakhil again drew attention to the transition to a closed cycle and conducted their research. The most widespread idea of the model of the circular economy was in the 90s of the XX century and is still actively developing now.

Circular economy is understood as economic activity aimed at energy saving, environmentally friendly production and rational consumption (Loiko, 2019). Circular economy is a more rational waste management, responsible attitude to raw materials, innovative solutions for production, the use of environmentally friendly raw materials, changing consumer behavior, and so on. This type of economy is characterized by "3R" - Reduce, Reuse and Recycle: optimization of the production process, reuse or sharing of the product, recycling of waste (International center for trade and sustainable development, 2019). An example of a circular economy business model in Table 1.

Table 1. A common example of a business model of the circular economy

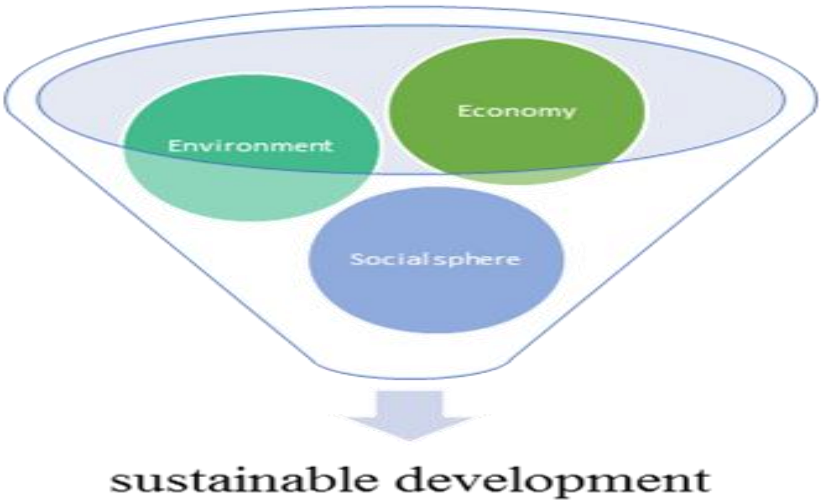
Stages of Use	**Characteristic**
Cycle start	Product design, selection of materials and production technologies
Exploitation	New consumption patterns (concepts based on the principle "From ownership to use" or "Product as a service" (TCU))
Cycle end	Processing and reverse cycles of goods, components and materials

Source: own compilation

The transition of states to a circular economy requires modernization and introduction of innovations in production based on the long life cycle of the goods and resources from which the product is made, restoration, reconstruction, opportunities for joint consumption, processing, and, if possible, modularization. Circular economies are restorative, regenerative, and holistic. According to the researcher Zvarych I.Ya., the whole circular economy in the context of the implementation of sustainable development goals becomes inclusive and provides everyone with access to the benefits of such development.

The basic idea of an inclusive circular economy is the respectful use of both material and human resources. In a comprehensive circular economy, growth should be based on human capital instead of increasing the extraction of natural resources. The global inclusive circular economy is low-carbon, efficient and clean in production, and also includes consumption and results based on exchange, circularity, cooperation, solidarity, sustainability, opportunities and interdependence, diversifying choices for national economies, using targeted and appropriate fiscal and social policies, supporting

strong institutions specifically aimed at protecting social and environmental foundations, which expands the path of sustainable environmental development in the context of the concept of circularity and inclusivity (Zvarich, 2018).



Source: own compilation

Figure 1. Correlation elements of sustainable development.

The priority goal of sustainable development is to meet the needs of the modern generation without compromising the needs of future generations. The principles of sustainable development determine the need to satisfy the vital needs of all people and provide everyone with the opportunity to satisfy their own aspirations for a better life. (Figure 1). The circular economy attracts increasing attention around the world. The European Union, the United States, China, Germany, Canada, Japan, and Finland are implementing appropriate state incentive policies for the development of the circular economy. The European Union has adopted the Europe 2020 Program within the framework of the EU development strategy. It provides for about 50 provisions governing the entire cycle of product movement: design, production, consumption and processing of waste, designing another product that includes materials received because of processing the previous product. For example, Royal DSM has developed cellulosic bioethanol, in which agricultural waste, such as corncobs, husks, leaves and stems, is converted into renewable fuel.

Philips, for example, sells lighting as a service. The organization reserves the right to own the equipment, so customers do not pay for installation and equipment breakdowns - all this is a service component of the contract (United nations of Ukraine, 2020). The company Nespresso uses the refund program. Consumers can leave their used coffee capsules in prepaid recycling bags anywhere on the UPS rack. Aluminum capsules are separated from the coffee grounds before melting the metal for use in new products. Used coffee cake is sold as a high-quality fertilizer for gardeners, garden centers, municipalities and homeowners (Asstra, 2018). An assessment of the level of compliance of a product with the principles of a circular economy (level of product circularity) is made using the indices: The Material Circularity Indicator (MCI); The Regional Circular Economy Index System; The Circular Economy Performance Index; A Circular Economy Index for the Consumer Goods Sector. It is worth noting that the circular economy (closed

cycle) opens up new opportunities for logistics and transport companies. It helps accelerate innovation and attract new customers for whom sustainable development is a priority. The waste-free circular economy is expected to provide 3.66 trillion euros by 2030, and logistics will be a key success factor in new business models (Asstra, 2018).

Transport and logistics in the circular economy

Logistics plays a central role in a global economy. The strategy for the success of the transport sector in a circular economy (closed-loop economy) is to accelerate the exchange of information, introduce new transport services, integrate and manage transport infrastructure, and switch to clean fuels from renewable energy sources. In a circular economy, goods do not end up in waste and are continuously involved in transport, since they can always be reused elsewhere. The most difficult logistics issues in the circular economy are the predictability of cargo flows, low cost and heterogeneity of cargo. For example, companies that produce inexpensive materials pay great attention to transport costs and usually develop their own logistics schemes. In addition, an important issue of the circular economy is the specifics of building transport infrastructure, ways and means of using transport, its environmental friendliness and efficiency.

Companies and consumers in the circular economy are increasingly choosing "temporary use" services rather than "ownership", which increases the use of transport. Efficient use of transport and building high-tech supply chains is one of the foundations for the success of circular economy entities. In the digital world, careful monitoring, tracking, and modern logistics solutions can solve a large number of problems of the circular economy and give it additional appeal. For example, returning previously purchased and used items to the manufacturer after they are used for recycling. For example, according to the latest UPS (United Parcel Service) survey, 56% of respondents said that a refund discount will help ensure that consumer products, their components, and related materials are returned and reused at the end of their initial use period. 47% believe that the possibility of returning the product is a very convenient solution. And 42% indicated the possibility of returning the product using pre-paid delivery (Asstra, 2018).

A striking example of compliance with and promotion of the circular economy is the activity of H & M (Hennes & Mauritz). According to the corporate strategy for sustainable development in 2016, this company has announced a circular policy on the active use of recycled materials in the product chain and the use of exclusively renewable energy sources, carried out through the actions: "give up unnecessary clothes for reuse or recycling", which are regularly held in all states where the company sells its products. A good example of the application of the principles of circular economy on transport sector is "circular trips" are increasingly used both in the transport of passengers and goods. Their essence is to transport passengers and cargo with a full load in both directions. For example, AsstrA makes extensive use of circular transport when developing new routes and planning further expansion. Efficient use of transport in the circular economy is a common goal of both: the transport company and meets the requirements of the service economy.

Business models of the circular economy and transport

There are many doctrinal views on the business model of the circular economy. Experts offer the following options for business models that meet the principles of a circular economy: a) circular (cyclical) value chains; b) recovery and processing; c) increasing the product life cycle; d) exchange and joint consumption; e) product as a service (Lacy, Rutqvist, 2015). Adapting these economic business models in the transport sector, we will give relevant examples in the transport sector.

a) Cyclical value chains – this is a model in which limited resources are replaced with fully renewable sources. This model is relevant for the transport sector, as evidenced by the examples. For example, the Italian company Greenrail Group Srl in 2019 offers excellent technical, environmental and economic characteristics for the railway sector, namely, environmental and innovative railway sleepers (Geenrail, 2018). The technology developed by Greenrail makes it possible to produce railway sleepers from recycled materials, using a mixture of rubber collected from ELT (End of Life Tyres) and plastic from urban waste. Greenrail sleepers consist of an outer covering made of a mixture of ELT and recycled plastic, and an inner core made of reinforced concrete. The company is engaged in the entire process of designing, prototyping and testing products, working with primary research centers and industrial partners.

b) Recovery and recycling - it is a model that uses technological innovations and opportunities to recover and reuse resources. Examples include a closed recycling cycle that involves recycling waste into new resources, which is also used in the transport sector. For example, according to an EU (European Union) study, electric vehicles are key factors to decarbonizing the road transport sector, and their use is expected to increase, leading to increased demand for lithium-ion batteries. This makes the development of the value chain for batteries a priority in Europe, in particular, the recycling of lithium-ion batteries in which Europe is the market leader. The broader CIRCULAR IMPACTS project (Drabik, Rizos, 2018), which examines the economic, human and social consequences of the transition to a circular economy, also examines the end-of-life effects of using lithium-ion batteries for electric vehicles, and concludes that improving the efficiency of collecting and recycling batteries for electric vehicles in the EU (European Union) can reduce dependence on imported materials and help preserve the value of recovered materials in the EU economy. Additional potential benefits include creating jobs in the lithium-ion battery recycling sector, while recycling certain materials, as opposed to mining raw materials, can reduce CO2 emissions.

c) Increasing the life cycle of a product / service – it is a model that allows you to maintain economic benefits for as long as possible by restoring, repairing, upgrading, or remarketing a product. An example in the transport sector is the company Distretto Tecnologico Aerospaziale della Campania (Italy-2020), which in its report evaluates the value chain in the aviation sector in the context of the principles of the circularity economy (European Aerospace Cluster Partnership, 2020). It offers an overview of the aircraft's life cycle, new supplier-consumer programs that have already been initiated by the industry, and suggestions for a reconversion towards a more circular business model. The value chain was evaluated in accordance with the circular economy (Redesign, Reduction, Reuse, and recycling). In this report, companies participating in the EACP-EUROSME project are offered as tools for doing business in the circular economy.

d) Sharing economy – it is a model that is based on the exchange of goods or assets that have a small utilization rate. Examples of public platforms include "Blablacar".

Another example is the French company Magic Pallet, which in 2019 offered to exchange pallets in Europe (Magic pallet, 2019) [11]. This platform allows anyone to trade, buy and sell their European pallets in the right place at the right time. Pallets are flat platform structures that are used for stable support of goods during transportation. They create efficiency when it comes to handling and storing goods. We can also mention the above-mentioned "circular trips" with the transportation of passengers or cargo in both directions, which allows to increase the efficiency of transport while minimizing costs and harmful effects on the environment.

e) Servisation as model in which customers use the products through "rent" on pay-as-you-go basis. This model is widely used in the transport sector. For example, using a car rental service instead of buying them (car sharing), chartering ships and planes, and so on. Car2go is the largest car sharing company in the world and one of the largest in the field of electric car sharing. It is represented in nine countries and thirty cities (15 in Europe, 14 in North America and 1 in China) in 2016, has a registered user base of almost 2 million users around the world, more than 14,000 cars in its fleet. The Boston Consulting Group indicates in a 2016 report that potential annual revenue for car sharing is 4.7 billion euros worldwide by 2021, and Europe will become the largest region in terms of income.

Legal bases of circular economy

In the context of considering the circular economy, the main issues that need to be addressed and legal regulation are issues of environmental safety of vehicles, the introduction of new technologies in the production of various modes of transport, control over the technical condition of vehicles and more. These problems are solved by domestic norms and international law through mostly international agreements and conventions. The initiators of the creation of sources of transport law are often international organizations such as UNCITRAL (United Nations Commission On International Trade Law), UNIDROIT (International Institute for the Unification of Private Law), the Hague Conference on Private International Law, the Domestic Transport Committee of the United Nations Economic Commission for Europe, the IRU (The International Road Transport Union), ICAO (International Civil Aviation Organization), and the IMO (International Maritime Organization). Recently, they have been paying much attention to environmental issues, which are recognized at the UN (United Nation) level as global problems of today that need to be addressed. Their solution is fixed among the goals of sustainable development in 2015 for the period up to 2030 as the pursuit of responsible consumption and production (UN The goals of sustainable development, 2015).

Today, among the sources of international transport law, only some points of certain agreements and conventions are devoted to topical issues of the circular economy, which, in our opinion, is insufficient due to the lack of a comprehensive legal framework to address such issues. In the sources regulating the transportation of dangerous goods, environmental safety issues are considered more broadly: for example, the European Agreement concerning the International Carriage of Dangerous Goods by Road applies to road transport; a special International Code for the Carriage of Dangerous Goods by Sea has been adopted in maritime transport. It has been developed on the basis of Chapter VII "Transport of Dangerous Goods" of the International Convention for the Safety of Life at Sea (International Convention for the Safety of Life at Sea); on air transport – IATA

(International Air Transport Association) adopted special rules for the transport of dangerous goods.

At the national legal level, countries around the world are also actively developing the concept of a circular economy, its transport sector, creating an appropriate legal framework. Thus, in China in 2009 the Law on Encouragement of the Circular Economy was adopted. In 2012 in Germany, an act on the circular economy was concluded. In 2015, The EU (European Union) has adopted a package of measures on the circular economy. In 2016, Finland has a roadmap for the circular economy until 2025 and in the Netherlands in the same year the program of the circular economy until 2050 (Lobanov, 2018). The first event dedicated to the world's best solutions in the field of circular economy took place in Finland - the World Forum of Circular Economy in 2017. More than 1600 private sector representatives, managers and experts from more than 90 countries, attended it. The forum gave impetus to international cooperation in transforming the world economy.

In 2017, the United Kingdom also adopted standards for the circular economy. A total of 9 EU (European Union) countries from 2016 to date have adopted similar regulations in the field of circular economy. In 2018, the European Union adopted the European Plastics Strategy, which restricts and prohibits the use of certain plastic products. European Commission in 2019 adopted the European Green Agreement for the period until 2021, which provides for European environmental neutrality and climate law, standards for CO2 emissions, proposals for energy taxation, industrial strategy of the circular economy, proposals for waste disposal and sustainable development in a circular economy, etc (European Comission, 2019). Thus, despite the slow pace of implementation of the circular economy and the consolidation of relevant norms at the universal level, at the regional level in Europe and in the national legal systems of European countries, more and more regulations on the circular economy and its prospects.

CONCLUSIONS

The adopted United Nations sustainable development goals of 2015 indicate the need to change the traditional economic model, which operates on the principle of "get, use, throw away", to a fundamentally new model-the circular economy, which can be defined as economic activities aimed at energy conservation, environmentally friendly production and rational consumption. The circular economy is being paid increasing attention around the world. Developed countries are increasingly declaring their commitment to the principles of the circular economy at the international level and encouraging its implementation in the business models of their subjects at the national level. The legal basis for the development of a circular economy is reflected in national and international legal acts. At the regional level, the European Union adopted the European Green Agreement for the period up to 2021 in 2019 and proclaimed a course for a circular economy.

The transition to a circular economy is extremely important for the transport sector. It opens up new opportunities for logistics and transport companies - helping to accelerate innovation and attract new customers for whom sustainable development is a priority. The main business models of the circular economy, worth noting, include: cyclical value chains, recovery and processing, increasing the product life cycle, exchange and joint consumption, and service delivery. Circular economies are restorative, regenerative, holistic and fully responsive to modern global challenges and are a worthy alternative to traditional economies. The transport sector of the traditional economy has

all the prerequisites to be successfully transformed into a circulating economic system in accordance with its principles and fits into all existing business models within its framework.

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