

Opportunities and business models of circular economy - the hierarchy of waste management methods

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Abstract

A circular economy at the enterprise level requires a structural transformation of the business model and the appropriate adaptation of various management functions. The aim of the article is to show the economic possibilities of circular economy, selected areas and tools that can be the key to radical improvement of sustainable results, creating environmental, social and financial value. The attention was paid to the benefits and challenges of circular economy, to the hierarchy of ways to deal with waste. It was emphasized that the opportunity for new business models of the circular economy, especially the Zero Waste concept, is to ensure the further economic growth of enterprises when designing and managing products and processes in such a way as to avoid and eliminate waste as much as possible and promote the saving and recovery of all resources.

Keywords: circular economy, sustainable results, waste hierarchy, Zero Waste concept.

1 Introduction

The evolution of the world economy is dominated by a linear model of production and consumption. It assumes the extensive use of natural and artificial raw materials, processing them into products and goods, and then throwing them away. In this way, the linear economy model contributes greatly to the deterioration of our planet and the pollution of the environment with non-recyclable waste. It is the more disadvantageous, the more single-use goods are produced and the more mass production, characteristic of modern times, develops. While great strides have been made in resource efficiency, any system that relies on consumption rather than regenerative use of raw materials involves significant losses along the value chain. The rapid acceleration in consumption and extraction since the mid-twentieth century has significantly intensified the negative externalities and, in the opinion of both scientists and practitioners, there is a high probability of further deterioration of these trends, which may also result from the global growth of the middle class and its growing needs, which by 2030 it will have 5 billion people [ESPAS, EU 2017, p. 20].

Developing a solution consisting in reducing the consumption of resources and energy from fossil sources per unit of economic production will not change the limited nature of material stocks, but only delay the inevitable, which only confirms the fact that a deeper change of the economic system is necessary [Ellen MacArthur Foundation].

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A circular economy model (circular economy), referred to a repair and regeneration economy, is the answer to contemporary threats that make the environment more and more a barrier rather than a development factor.

The aim of the article is to show the economic possibilities of circular economy of selected models and tools that can be the key to radically improving sustainable results, creating environmental, social and financial value. Attention was paid to the assumptions, benefits and challenges of circular economy, the hierarchy of ways to deal with waste and ways to encourage its implementation. The activities included in the ReSOLVE scheme are presented - a tool that serves resource efficiency and extends the life cycle of resources, and contributes to the shift from the use of non-renewable resources to renewable resources.

It was emphasized that the opportunity for new business models of the circular economy, especially the Zero Waste concept, is to ensure the further economic growth of enterprises when designing and managing products and processes in such a way as to avoid and eliminate waste as much as possible and promote the saving and recovery of all resources.

2 Circular economy assumptions

The idea of circular economy did not appear as an independent concept in the scientific literature until the beginning of the 20th century. Descriptions of industrial ecology, economic symbiosis of cleaner technologies, green economy, eco-efficiency, 3R principles, sustainable consumption and production, and above all, sustainable development dominated [Kulczycka, Pędziwiatr, 2019, p. 11]. The implementation and improvement of the circular economy rules took place at the beginning of the 21st century, initially in the countries of Asia, and now, following the recommendations presented in the documents of the European Commission, in many EU Member States.

In Polish policy, the culmination of long-term work on both *the Roadmap for transformation towards a circular economy and the National Environmental Policy - 2030* took place in the second half of 2019. Despite clearly defined assumptions defining circular economy as maximizing the added value of raw materials / resources, materials and products and / or minimizing the amount of waste generated, commonly understood circular economy is often treated as the introduction of new legislative and administrative requirements or new restrictions on waste management. This is inappropriate because circular economy is mainly an efficient resource management, and above all a new global economic model in which economically and ecologically effective solutions are sought [Kulczycka, 2019, p. 5].

In world literature and publications of many international organizations, the term circular economy describes, in simplified terms, such a model of production and consumption, which consists in sharing, borrowing, reusing, repairing, renewing and recycling existing materials and products for as long as possible. In this way, the life cycle of the products is extended. A similar view is held by the European Commission, which defines circular economy as the value of products, materials and resources kept in the economy for as long as possible, and the production of waste is limited to a minimum [Commission communication ... 2015, p. 2].

Deloitte [2016, s. 8] recognizes that circular economy represents a development strategy that enables economic growth while optimizing resource consumption, profoundly transforms patterns of production and consumption chains, and redesigns industrial systems.

According to the Institute of Innovative Economy, circular economy is a modern concept of creating value through the rational use of resources. It allows you to minimize the negative impact on the environment of the manufactured products thanks to such changes at all stages of the product life cycle that enable the reuse of the materials used. In the Roadmap for transformation towards a circular economy, circular economy is defined as a concept in which the value of products, materials and raw materials should remain in circulation for as long as possible, and waste generation should be minimized as much as possible [Mapa drogowa.,2019].

According to the Ellen MacArthur Foundation, circular economy means incorporating the possibility of its repair and regeneration into the product design and maintaining the highest utility and value of products, components and materials at all times, distinguishing between technical cycles (regarding non-renewable resources) and biological (renewable resources) [Ellen MacArthur Foundation, 2012]. The circular economy is defined in a similar way by the World Business Council for Sustainable Development (WBCSD), which emphasizes that the goal of circular

economy is to preserve the greatest possible value of resources, products, components and materials and to create a system that ensures a long service life, optimal reuse, maintenance, regeneration and recycling. extends the rules of circular economy and indicates: durability, renewable, re-use, repair, replacement, modernization, renovation, reduced consumption of raw materials [WBCSD 2017, pp. 6, 8].

The presented circular economy approach contrasts with the traditional, linear economic model, which is based on the "produce - use - throw away" scheme. Although, as can be seen from the above-mentioned definitions, this new development model is related to the already functioning in practice approaches such as: reusing, repairing, refurbishing and recycling products in accordance with the well-known 3R principle (reduce, reuse, recycle), extended to 4R (reuse, repair, renew, recycle) [Szyja 2016, p. 134] or managing a sustainable supply chain, ie managing the economic, social and environmental impact of the supply chain throughout the product life cycle in order to create value for all stakeholders involved in this process. However, circular economy goes further. It includes activities not only on the production side, but also on the consumption side. It is a systemic approach in line with the new sharing economy, which is part of the new, intensively developing phenomenon of the collaborative economy. Its essence is scattered networks of interconnected individuals and communities, cooperation stimulated and supported by the Internet, mobile devices, social media and big data. Thanks to the cooperation economy, it has become possible to innovatively and effectively use the hidden wealth of resources not (fully) used so far (eg product circulation through sharing or borrowing) [Botsman 2013].

The concept of circular economy eliminates both the concepts of end-of-life of a product and waste categories that gain value by becoming a resource again. The resource efficiency of circular economy results not only from the departure from wasting resources discarded as waste, but also from their more efficient use (also in connection with extending the life of products and their cycles), switching to renewable resources and conscious consumption. All the pre-waste activities at an earlier stage in the life of a product or service are intended to turn the waste into a secondary raw material (if it has to be generated). The essence of circular economy is a new way of looking at relations between markets, customers and resources [Jastrzębska, 2017, p. 225].

Circular economy in the presented concepts can undoubtedly bring great economic benefits, contributing to the development of innovation, growth and creation of new jobs [Kirchherr, L. Piscicell et al. 2018] as well as increasing competitiveness, protecting enterprises from resource scarcity and price volatility, providing more efficient ways of producing and consuming, and providing new business opportunities.

3 Circular economy business models

The Business and Sustainable Development Commission (BSDC) identifies 4 breakthrough business models of the future. They include the social model (which also creates non-economic value by exerting a positive social impact), the lean model (consisting in optimizing the use of all forms of capital) and the integrated model (meaning managing the economic and non-economic impact of the process of creating value in the company). The fourth model with the lowest negative impact (e.g. on resources, ecosystems or well-being) is the circular model. Within it, BSDC indicates such activities as: industrial symbiosis (sharing resources and services among related industries), closed-loop production, closed-loop supply (use of renewable or fully recyclable raw materials), waste collection services, dematerialization, rematerialization (obtaining materials from recovered raw materials to create completely new products), trash to cash (used products are collected and either sold or transformed into new products) or peer-to-peer platforms (enabling users to communicate on an equal basis) [Volans, BSDC 2016, pp. 14, 27-28, 32-33]. Wayne Visser [2017, p. 6] calls this new syndical approach because it is related to designing towards industrial synergy. They are characterized by 4 steps reflecting the idea of circular economy: borrow, create, benefit, return (table 2). Visser's approach is reflected in the research conducted by Accenture among over 120 companies from different parts of the world and various industries, within which 5 effective and scalable business models were identified, distinguishing from the point of view of circular economy [Lacy, Rutqvist 2016, pp. 6-8].

The business models identified by Accenture are included in the ReSOLVE tool of the Ellen MacArthur Foundation, consisting of 6 business paths that can help companies switch to circular economy, they are: regenerate, share, optimize, loop (loop), virtualise, exchange [Ellen MacArthur Foundation 2015a, pp. 25-26]. Table 1 presents

an approach to the essence of circular economy according to Visser, Accenture models and the Ellen MacArthur Foundation's paths to facilitate the comparison and recognition of the similarities of these approaches.

Table 1. Circular economy business models according to Wayne Visser, Accenture and the Ellen MacArthur Foundation

The 4 Steps of Wayne Visser	The 5 Accenture Models	The 6 activities of the Ellen MacArthur Foundation
<p>LEND by limiting and renewing (reducing the consumption of non-renewable resources in favor of renewable resources)</p> <p>CREATE by improving and restoring (by designing and manufacturing non-negative products and making positive product innovations)</p> <p>BENEFIT through reuse and redistribution (extending product life cycle by repairing, reusing, renting and sharing)</p> <p>RETURN by recycling and reinventing (using recycled materials to re-create the same as well as new products)</p>	<p>CIRCULAR SUPPLY CHAIN - use of renewable energy and recyclable or biodegradable materials</p> <p>RECOVERY AND RECYCLING - creating production and consumption systems in which everything that was previously waste is used for new applications</p> <p>EXTENDING THE LIFE OF THE PRODUCT - by repairing, improving, processing (secondary manufacturing, factory regeneration) or remarketing (reselling) to generate income from their life cycle, instead of selling the products themselves</p> <p>SHARING PLATFORM - enables consumers to rent, share, exchange or borrow goods they rarely use, thanks to which they both save and earn</p> <p>PRODUCT AS A SERVICE - consists in renting or paying for the use of the product (thanks to which for the company efficiency becomes more important than quantity, and durability than one-off)</p>	<p>REGENERATE - switching to renewable materials and energy sources to enable the preservation and regeneration of ecosystems</p> <p>SHARE - sharing goods (owned and new - buying services), exchanging and reusing used goods, renting also rarely used goods, extending the life of the product through design that increases durability, but also maintenance, repair, modernization</p> <p>OPTIMISE - increasing the effectiveness and efficiency of the product, eliminating waste throughout the supply chain</p> <p>LOOP - the use of materials facilitating the re-use of the product, recycling them, reducing the loss of materials, energy and waste</p> <p>VIRTUALISE - dematerialization, provision of products and services in a virtual way (functionalities in a direct and indirect way)</p> <p>EXCHANGE - replacing non-renewable or old materials - with new and advanced ones, using modern technologies, products and services</p>

Source: Own elaboration based on Visser 2017, p. 6, Lacy, Rutqvist 2016, pp. 6-9; Ellen MacArthur Foundation 2015a, pp. 25-26.

The Circle Economy organization proposes a list of 9 models, divided into models of selling products and services. The models for selling products include 6 strategies:

- 1) sale of long-lasting products,
- 2) sale of refillable products,
- 3) sale of spare parts,
- 4) P2P sharing,
- 5) renting, leasing and payment for use,

6) products sold in a subscription model.

For services, three sales models have been distinguished: subscription, payment for use, crowd-based [<https://gozwpraktyce.pl/modele-biznesowe/>].

The evolutionary nature of the venture, which is the transition to a circular model in the economy, requires a more thoughtful approach, although theoretically all enterprises can be applied to the full set of business models. When analyzing the possibilities of transformation towards a circular model of individual entities, it is important to know which of the implemented types of business models would bring the most benefits in relation to the costs incurred. It is necessary to take into account not only the short-term cost-benefit calculation, but its long-term perspective [Bukowski, Szynek, 2019, p. 61].

4 Zero Waste Concept

Zero Waste is a dynamically growing philosophy that encourages the redesign of products and their packaging in such a way that raw materials can be used repeatedly during the product life cycle. A very important assumption is that, according to this idea, waste is neither sent to landfills nor is it incinerated. In the way of treating waste, we try to be neutral towards the environment, thus striving to imitate the natural processes taking place in it [https://en.wikipedia.org/wiki/Zero_waste].

International Alliance defines Zero Waste as an ethical, economic, effective and forward-looking concept whereby people can change their lifestyles and habits to mimic natural cycles, where all materials discarded are designed to become resources they can use others. Zero Waste means designing and managing products and processes to systematically reduce the amount and toxicity of waste and materials, conserve and recover all resources, and avoid their incineration or disposal. The implementation of Zero Waste will lead to the complete elimination of harmful substances that threaten the health, the Earth, humanity, animals and plants into the soil, water and air.

Zero Waste means moving from a waste disposal approach to resource management. If a product cannot be reused, repaired, rebuilt, modernized, refurbished, resold, recycled or composted, its availability must be restricted, redesigned or withdrawn from production [http://www.otzo.most.org.pl/Zero_Waste_ZWIA.pdf]. Zero Waste means moving from a waste disposal approach to resource management. If a product cannot be reused, repaired, rebuilt, upgraded, refurbished, resold, recycled or composted, it must be restricted in its availability, redesigned or decommissioned. Zero Waste is an essential precondition for the rest of the work to be done in the field of health, increasing social equity and achieving sustainable development. Zero Waste can be linked to the sustainable development of agriculture, construction, energy, industrial, economic and social sectors. Every resident produces waste and as such is part of a wasteful society.

The Zero Waste concept has been around for so long that it has developed its own hierarchy of behavior. The Zero Waste hierarchy is a set of processes designed to protect the environment from a broader perspective than the commonly known waste management hierarchy. The Zero Waste Principles indicate that the emphasis should be on resource efficiency and the avoidance of waste, which will lead to the elimination of the need for waste management itself. Hence, in the Zero Waste hierarchy, recycling (which is a much more environmentally friendly form of waste management than the still very common landfilling) is paradoxically located at the lowest point and is assumed to be used only for the processing of product residues, which unfortunately could not be avoided [K. Michniewska, 2018 , 162-164] The Zero Waste Raw Material Hierarchy: Avoiding Waste Generation and Conserving Raw Materials, Supporting the Cyclical Use of Raw Materials and Creating Encouragements to Eliminate Waste, Industrial Product Design for Recycle and Recycle, Reuse - Maintaining Function and Value of products in the longest possible time, recycling of residues in an environmentally safe manner and close to the point of origin.

Among the advantages of the concepts emphasized by supporters of Zero Waste should be mentioned [https://en.wikipedia.org/wiki/Zero_waste]: saving financial resources. Waste is the result of a lack of economy and reducing it can both reduce costs and make faster progress. The Zero Waste concept streamlines production and improves preventive processes in environmental protection, all this enables the implementation of large, more innovative projects in these areas. This movement is a significant support for the idea of sustainable development. It

coincides with the three basic goals of eco-development: economic growth, environmental protection and social welfare of the inhabitants.

The Zero Waste concept is a much broader approach to the problem of waste generation than just recovery and recycling. It is an innovative idea because in its assumptions it eliminates the problem of the necessity to manage waste. Table 2 shows the waste management hierarchy according to the Zero Waste concept [Ellen MacArthur Foundation 2015] and the classic waste management hierarchy in line with the assumptions of the European Commission [<http://ec.europa.eu/environment/waste/framework/index.htm>].

Table 2. Hierarchy of waste management according to the Zero Waste concept and assumptions of the European Commission

Zero Waste	Assumptions of the European Commission
Prevention of waste formation	Preparation for re-use
Preparation for re-use	Preparation for re-use
Eco-designing	
Upcycling	
Recycling	Recycling
	Recovery
	Disposal / Depositing

Source: Own study based on Ellen MacArthur Foundation 2015 and data from the European Commission - <http://ec.europa.eu/environment/waste/framework/index.htm>.

Waste recovery is any process the main result of which is that the waste serves a useful application by replacing other materials that would otherwise be used for a given function or as a result of which the waste is prepared to fulfill that function in a given facility or in general. in the economy. Recycling is recovery where waste is reprocessed into products, materials or substances used for their original purpose or for other purposes. This includes the reprocessing of organic material (organic recycling) but does not include energy recovery and reprocessing into materials to be used as fuels or for backfilling purposes. Waste disposal is a non-recovery process, even where the process has as a secondary consequence the recovery of substances or energy. The neutralization processes include, among others: storage, processing in soil and earth, surface retention (e.g. placing waste in sediment plots or lagoons), thermal treatment. Thermal waste transformation is understood as waste incineration processes by oxidation and other processes, including pyrolysis, gasification, and plasma processes. These processes are carried out in incineration plants or in waste co-incineration plants. Landfilled waste should be understood as waste removed to landfills and mining waste disposal facilities (heaps, tailings ponds) of own plants or other plants [GUS, Statistical analysis, Environmental protection 2021, p. 151]. Upcycling, like recycling, is a form of recovery consisting in restoring the utility value to waste, and even more - making waste more valuable than the raw materials it consists of. The authors of this term are William McDonough and Michael Braungart, authors of the book *Cradle to Cradle: Remaking the Way We Make Things*. Upcycling - according to their definition - is a form of waste recycling, which results in a product with a value greater than the basic value of raw materials used in production [McDonough, Braungart, 2002]. Ecodesign is about identifying the environmental aspects of a product and integrating them into the design process at an early stage of product development. Ecodesign introduces an additional criterion, which is the assessment of a given product in terms of its impact on the environment [Burchart – Korol D., 2009].

Proper waste management is an essential element for the efficient use of natural resources and sustainable economic growth. Therefore, the Waste Act, implementing the waste framework directive, introduced a waste hierarchy, in which at the top - waste prevention was recognized as the best procedure, followed by reuse, recycling, other forms of recovery, and ultimately the disposal of waste (e.g. through storage) and economic instruments and other incentives for its use. Selected economic instruments and other measures to encourage Polish entrepreneurs to apply the waste management hierarchy are presented in Table 2.

Table 2. Selected economic instruments and other measures to encourage the use of the waste hierarchy

1.	Charges for landfilling and incineration of waste and restrictions on the use of these processes to encourage waste prevention and recycling, while keeping landfilling as the least desirable waste management option.
2.	Payment systems that are proportionate to the amount of waste collected from waste producers, based on the actual amount of waste generated, and encourage source separation of recyclable waste and the reduction of mixed waste.
3.	Tax incentives to donate products free of charge, especially food.
4.	Extended producer responsibility schemes for different types of waste and measures to improve their efficiency, profitability and management.
5.	Deposit refund systems and other measures to encourage the efficient collection of used products and materials.
6.	Proper planning of investments in waste management infrastructure, including the use of EU funds.
7.	Sustainable public procurement to encourage better waste management and the use of recycled products and materials.
8.	Gradual abolition of subsidies inconsistent with the waste hierarchy.
9.	Applying fiscal measures or other measures that support the use of re-used or recycled products and materials.
10.	Supporting research and innovation in advanced technologies for recycling and remanufacturing products.
11.	Use of the best available waste treatment techniques.
12.	Economic incentives for local government units and government administration in the voivodship, especially supporting the prevention of waste generation and the development of separate collection systems, without supporting landfilling and incineration.
13.	Public awareness-raising campaigns, especially on separate collection, prevention and reduction of waste, and mainstreaming it into education and training.
14.	Systems for coordinating the activities of all public authorities involved in waste management, including the use of electronic means.
15.	Promote ongoing dialogue and cooperation between all waste management stakeholders and encourage voluntary agreements and company reporting on waste.

Source: Annex 4a to the Waste Act.

It is not possible to fully implement the waste hierarchy. Therefore, it is worth considering increasing the quantity and quality of information on waste, which may help to identify previously unnoticed opportunities. In such cases, it is necessary to properly plan gradual changes in the activity, waste management and production process, so that the benefits of introducing the considered modifications do not result in the waste of other resources. Improvements in the use of the hierarchy should take into account the current technological and system changes on the market. Plans to increase the efficiency of waste handling should also take into account the possibility of own innovative activity in this area and modification of the company's business model.

5 Effective waste management activities

Avoiding the creation of waste is the best solution for the environment. However, most of the items we use will sooner or later become waste that needs to be recycled. Hence, rational design for recycling is essential for the circular economy. The decisions made during the development of the products determine the extent to which the materials used can be reused in the future. The goal of designing for recycling is to reduce the use of natural resources in production in favor of those that are recycled, and to achieve the highest possible recycling rate at the end of the product life cycle. Designing is essential, as it makes it

possible to return waste with certain properties back to the production process or to use it by another entity. The quality of waste management is also influenced by planning production purchases in such a way that none of the substrates is wasted.

Waste management also has a significant impact on the continuity of production, so it should be organized to support it. In order to properly manage waste, it is necessary to analyze the generated waste fractions and their quantity. On its basis, it is possible to optimize the segregation processes by applying solutions that meet the needs of a specific enterprise. In waste management, it is important to properly select the number and size of devices and collective containers for collecting waste in order to optimize the exports and maintain the cleanliness of the fractions. At the stage of post-production waste management, it is necessary to properly select solutions for their use in relation to their physical and chemical properties. Such waste - raw materials - such as paper, plastics, glass, ferrous and non-ferrous metals can be recycled many times. Paper can be processed 6-7 times, plastics up to 10 times and used, for example, in plastic pallets and baskets, sound screens, flower pots or garden furniture [Mąkowska, 2016, 22-23).

According to the data of the Central Statistical Office, it is estimated that in Poland about 30% is construction waste, another 30% is waste from mining and energy, and only 7-8% is municipal waste. In 2020, 109 466 thous. tonnes of waste (excluding municipal waste) from various branches of economic activity. Economic development and the level and patterns of individual consumption are the main factors determining the amount of waste generated. This is confirmed by the latest data published by the Central Statistical Office (GUS, Environmental protection 2021, p. 152). In Poland, 13.7 million tonnes of municipal waste was collected in 2021. Compared to 2020, this means an increase by 4.2%. Per one inhabitant of the country, there was an average of 358 kg of collected municipal waste - 16 kg more than in 2020. According to Eurostat data, the mass of waste generated by one inhabitant of Poland is still significantly below the European average. In 2020, approximately 505 kg of municipal waste per inhabitant was generated in the EU. The amount of municipal waste generated varies significantly across the EU, ranging from 282 kg per capita in Romania to 845 kg per capita in Denmark. This is due to differences in consumption patterns and the economic wealth of a country. These values also depend on the method of collection and management of municipal waste.

The key to optimizing waste management is monitoring and control of the entire process. For this purpose, waste audits are carried out, which are an analysis of production processes, waste management logistics and the legal situation, which is to contribute to the improvement of the management system. A company that wants to improve its waste management system should monitor the amount and type of waste generated, as well as the methods of its management on a monthly basis [<https://www.biznes.gov.pl/pl/opisy-procedur/-/proc/1624>]. Reports and reports can improve the implementation of changes to make the waste management process more effective.

Effective waste management activities contribute to reducing the amount of waste, saving employees' time, improving the business functioning of the company, increasing work safety, contributing to the achievement of environmental goals. Changes in each link of the chain provide an opportunity for an effective and conscious change of the waste management system, which allows materials to gain a new life in new products. Consequently, this translates into a positive financial result. Therefore, the application of the waste management hierarchy should be a natural approach for all enterprises, and when thinking about the future of business, an action plan should be established on how to recover the products that will be produced for the market. Inspirations on how to do this, e.g. in the construction industry, can be found during Circular Week - an international series of events and initiatives devoted to the circular economy and sustainable development that take place all over Europe. The goal of Circular Week is to promote the idea of a circular economy, support sustainable business models and establish cooperation between stakeholders [<https://circularweek.org/popzednie-edycje/>].

6 Economic possibilities of the circular economy

Circular economy maximizes resource efficiency and minimizes waste production in the context of sustainable economic and social development. As a result, many countries began to treat circular economy not as a concept, but as a model, strategy and even economic system, adjusting legislation and economic instruments to facilitate its implementation. In 2013, the Dutch drew attention to the economic value of circular economy as an economic system, the starting point of which is the possibility of reusing products and materials in order to conserve natural resources, creating value for people, the environment and the economy. The economic accent distinguishes circular economy, emphasizing its importance for economic development, laying the foundations for the search for business models that facilitate its implementation.

We are currently dealing with the need for a great change in the global entrepreneurial market in terms of resource use. This, of course, is not just a business challenge, as it is largely about creating a market for a new, collaborative, low-carbon circular economy, and initiating a transformation towards *sustainable economy and sustainable lifestyle*. Solutions concern products, services and processes, but a significant part of them begins with structural innovations, usually requiring new business models, which, by reducing financial risk, allow to increase the possibility of achieving important goals. Synergy in terms of values and resources enables the achievement of better social, ecological and economic results. Taking up civilization challenges is no longer treated as a necessity to give up profits in order to solve social problems. In many companies, it is starting to look for specific solutions so that economic activity contributes directly to, for example, counteracting climate change, promoting responsible consumption, combating social inequalities and poverty, or inclusion of users. It is about looking for ethically and economically viable, financially effective ways to meet social needs that have a positive impact on quality of life, creating and using opportunities that were usually overlooked by more traditionally oriented companies. This leads to the creation of economic and social value at the same time, sustainable and lasting, a radical reduction of the environmental burden or the ecological footprint. It is also an important factor in building the motivation of entrepreneurs looking for appropriate solutions. It is clearly visible that solutions in the area of circular economy will allow to minimize the negative environmental impact of manufactured products. These changes at all stages of the product life cycle enable the creation of more value by reusing the materials used [K. Rok, 2017, pp. 18-19].

Poland, like many countries in the world, perceives the circular economy as a way to achieve the emission targets, improve living conditions and increase the competitiveness of the economy. The circular economy is also responding to difficult geopolitical times as business innovation and material reuse make supply lines and value chains more resilient and flexible.

Understanding how Poland is circular today is essential to identifying opportunities for the future. The backbone of the circular economy is 'business innovation', which creates new jobs, services and industries, enabling higher living standards and tax revenues.

The circular economy is gaining more and more attention from the business and political world, which recognize its significant potential. If we switch to this model, its impact will be felt throughout society. The Ellen MacArthur Foundation, SUN and McKinsey have jointly estimated that implementing the principles of the circular economy will allow Europe to take advantage of the impending technological revolution to achieve net benefits of € 1.8 trillion by 2030. This is EUR 0.9 trillion more than under the current linear development model. The circular economy offers enormous opportunities for the refurbishment, remanufacturing and innovation sectors of industry. In some cases, take advantage of entirely new profit channels. The Ellen MacArthur Foundation's analysis of complex mid-life products and fast moving consumer goods has shown that using the principles of the circular economy will benefit the following:

The cost of reworking a mobile phone could be reduced by 50% per item [Towards the circular economy report, volume 1, Ellen MacArthur Foundation (2012)], provided that manufacturers would make it easier to disassemble phones, improve the recovery cycle and encourage customers to return devices.

Most households could afford high-end washing machines if they could be rented instead of bought. Both customer savings and manufacturers' profits could increase by a third for each wash cycle.

The UK could gain \$ 1.5 billion a year from treating mixed food waste from the household and hospitality sectors.

for each hectolitre of beer produced, \$ 1.90 can be recovered through the sale of used brewing malt.

In the UK, each tonne of garments collected and sorted can generate a revenue of \$ 1,97538 or a gross profit of \$ 1,295 when reused.

The costs of packaging, processing and distributing beer could be reduced by 20% by using reusable glass bottles.

The shift to a circular economy implies less use of virgin materials in favor of recycled materials, with a higher proportion of labor costs. This arrangement protects companies against the effects of volatile resource prices and builds their flexibility. It reduces greenhouse gas emissions by 2-4% per year, 600 billion euros in savings for European businesses, a reduction in waste and 2 million more jobs in the European Union. The risk of disrupting supply chains as a result of natural disasters or geopolitical destabilization is also reduced as the decentralized nature of operations will be able to provide alternative sources of materials. The circular economy will create demand for new business services, such as: collection and recovery logistics that allows the re-introduction of used products into the economy, sales and remarketing platforms that promote longer life or greater use of products, regeneration of parts and components and refreshing products using specialized knowledge and skills. The new solutions will allow more creative ways to encourage customers to participate. New business models such as rental and leasing create long-lasting relationships with consumers because they have more points of contact throughout the product life cycle. These models provide entrepreneurs with the opportunity to examine customer habits, which can translate into improving products and services and increasing the level of satisfaction.

The result of such activities should be a competitive advantage resulting from higher productivity, better perception of the company with increasing customer awareness and early preparation for the growing legal requirements in the field of environmental protection. Profit maximization through the use of the waste management hierarchy is achieved by maintaining the highest possible economic value of the product, calculated in monetary units. Thus, by preventing a good from becoming waste, its highest value is preserved.

7 Conclusion

Waste generation is an inherent feature of human activity. An important problem for societies is their proper management. Actions are taken at the regional, national and global levels to reduce the impact (nuisance) of waste on the environment and human health, and to manage resources in the most efficient way possible. The main challenge in waste management is the transition to a circular economy.

The circular economy offers a great opportunity to improve business processes and even create enterprises with a completely new way of operating. Various business models were created that fit into this economic concept, including: 4 Visser steps, 5 Accenture models, Ellen MacArthur Foundation paths, a set of 9 Circle Economy models divided into models for the sale of products and services. These models are

complementary and often a business process uses several models simultaneously, at different stages of the value chain.

The hierarchy of ways of dealing with waste is a kind of signpost for entrepreneurs. It shows what changes they should make in order for their companies to act in accordance with the idea of sustainable development. The order of preferred priorities in legislation and policies relating to waste prevention, as well as economic instruments and other incentives to apply it, are primarily aimed at the need to take preventive measures in waste management.

The pillar of sustainable development is the concept of Zero Waste, which aims to protect the environment from a much broader perspective than the commonly known hierarchy of waste management methods. The Zero Waste Principles communicate that the emphasis should be on resource efficiency and avoiding waste.

Using the hierarchy of waste management methods, waste prevention can bring many benefits to enterprises, such as: reducing the pressure on the environment, increasing the security of supply of raw materials, increasing competitiveness, stimulating innovation, economic growth and employment, thus increasing the financial result. They will bring consumers more durable and innovative products that provide savings and a better quality of life.

New consumer requirements in terms of ecological aspects lead to the creation of business models for the provision of services and products according to the assumptions of the Zero Waste concept - with minimal or complete avoidance of waste generation. This will change the way waste management is carried out today, undermining the need for it. There will therefore be a paradigm shift in waste management.

Due to its comprehensive and systemic dimension, circular economy can be a remedy for many contemporary global problems. In Poland, it is necessary to define circular economy as an economic development strategy with appropriate legal and economic instruments and monitoring indicators, both the progress of its implementation and the use of the latest IT solutions.

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