

APPLICATION OF CIRCULAR ECONOMY MODELS ALONG THE BLACK SEA COAST

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Abstract: *The circular economy model seeks to address precisely the two main defects of the linear model. The idea of the circular economy draws its inspiration from the way nature works and, more specifically, individual biosystems.*

Keywords: *linear economy, circular economy*

Introduction

An interesting regular phenomenon has been observed over the past hundred years. On the one hand, the consumption of resources on a global scale is increasing, on the other - the way in which these resources are consumed is clearly proving its inefficiency. The inefficiency can be seen in two ways, leading to two main defects of the linear model. First, uneven consumption of resources - the main part of them is consumed in highly developed countries at the expense of developing ones, and secondly, the accumulation of huge amounts of waste that is not used after being thrown away. The economic model currently followed is linear, i.e. implies the following sequence - extracting natural resources, processing them into final products and consuming the products, which ends with their disposal. In addition, according to a number of studies, the current model of a linear economy cannot ensure the achievement of high economic development by all countries in the world, because the available natural resources are not sufficient for this.¹

The circular economy model seeks to address precisely the two main defects of the linear model. The idea of the circular economy draws its inspiration from the way nature works and, more specifically, individual biosystems. Just as each of them has its own cycle - (re)birth, development, decline, death and rebirth, so individual systems within the economy have such cycles. Therefore, the life of a product should not end with its disposal in the form of waste that can no longer be used, but on the contrary, each product should be seen as an eternally existing collection of materials, each of which after the conditional end of the given product's life should be included in the creation of a new product. Thus, at some point in the future, society should reach a state where virtually no waste is thrown away, and all products are recycled or used in some way.

The circular economy is a model aimed at extending the life cycle of products. In practice, this means sharing, borrowing, reusing, repairing and recycling existing materials and products as long as possible. When a product reaches the end of its life,

¹ Haas, W. et al. How Circular is the Global Economy? An Assessment of Material Flows, Waste Production, and Recycling in the European Union and the World in 2005. Journal of Industrial Ecology. Volume 19, N 5, www.wileyonlinelibrary.com/journal/jie, p. 765



the materials from which it is composed continue to be used in another way. Thus, the generation of waste is reduced to a minimum².

Demand for raw materials and energy resources is growing, but many are limited in quantity. Often, they do not reach within the EU and European countries become dependent on imports from other countries. The effect on the environment should not be underestimated - the extraction and consumption of raw materials increases energy consumption and greenhouse gas emissions. A more reasonable use of raw materials is also a measure against climate change.

The circular economy is an economic approach that seeks to prevent waste by maximizing the use of raw materials or energy. The circular economy is designed as an alternative to the linear model of "take, use/consume, throw away" and sees it as a wasteful model based on the use of large quantities of materials, ignoring their (future) availability and the effects of their consumption and disposal. The assumption underlying the circular economy is that due to the finiteness of the planet's resources, the linear model is not sustainable³.

The current linear model of economic development generates a significant amount of waste on the "take, make, waste" principle. In the conditions of limited resources, a change to a new economic model is required, following the model of nature without waste with a closed cycle, reducing environmental pollution, with significant amounts of waste and gases affecting the average temperature of the planet, as well as the congestion of water spaces with plastics and their particles endangering biological diversity. Climate changes are deepening and require a rethinking of the prerogatives in the development of modern economic models around the world. Sustainable consumption and production ensuring minimal waste and closing the cycle of the principle of extraction, production, recycling "take, make, reuse" is known as circular economy. Production with minimal amounts of waste is a guideline for the development of current economies⁴.

I. Model of the circular economy

We are facing great uncertainty in the world economy and increasingly scarce resources, so the call for a new economic model is growing. In search of a significant improvement in resource efficiency throughout the economy, businesses have begun to look for ways to reuse products or their components and recover more and more of their valuable material, energy value and natural resources.

The growing consumption of resources and the environmental consequences it causes require a change in the economic model. The concept of circular economy is part of this change. It is an economic system of production and exchange, where at every stage of the product's life cycle we strive to increase efficiency in the use of resources and reduce the harmful impact on the environment.

One of the big challenges at the moment is how to break away from the growth-dominated model in order to meet the social needs of society and how to replace the current predatory exploitation of natural resources with a new, more efficient, resource-saving and ecologically responsible model.

The circular economy provides basic guidelines for what needs to be done to significantly and permanently reduce the resource dependence of the economy and

² Стратегия и план за действие за преход към кръгова икономика на Република България за периода 2021-2027 г.

³ <https://bg.wikipedia.org/wiki>

⁴ Балинов, Б., Технически университет-София, Управление и устойчиво развитие 04/2018

move towards overcoming the scarcity of non-renewable natural resources. It offers important solutions, especially for manufacturing skills and design, new business models, building cycle skills, as well as cross-industry collaboration.

The circular economy is a closed loop covering each of the three areas: supply and responsible choice of producers, demand and consumer behavior and waste management (Europesworld, 2014).

The term circular economy envisages a system of production and consumption that generates as little loss as possible. Ideally, almost everything is reused, recycled or recovered to produce other output goods and services. Product recycling and manufacturing processes can help minimize waste and turn the unused part into a resource. The effect is a triple dividend – economic, ecological and social.

Contrary to the linear economy model (extraction, production, consumption, waste), the circular economy functions as a kind of closed system. Its purpose is to produce goods and services, limiting the use of raw materials and energy on the one hand and reducing the generation of waste on the other. The end result is increasing the efficiency of the use of resources, reducing the harmful impact on the environment and at the same time - increasing the well-being of users.

The aim is to increase the efficiency of the use of resources, reduce the harmful impact on the environment and at the same time increase the well-being of the users. The greening of the activities of companies, with the aim of greater competitiveness and sustainability of production, becomes an inevitable necessity (Bansal, P. and Roth, K., 2000). The main emphasis here is resource efficiency, which leads to a reduction in production costs and an increase in productivity. In this direction, the actions related to the utilization of waste, reuse and its actual limitation, carry significant potential (Fricker, A., 2003).

The transition to a circular economy shifts the emphasis to the reuse, repair, recycling of existing materials and products. This requires, on the one hand, a reduction in the share of waste and, on the other hand, a change in the behavior pattern of producers related to the offering of a new type of product with re-usability possibilities (McDonough and Braungard, 2002). Advances in eco-innovation provide new products, processes, technologies and organizational structures that enable a transition to business models based on the repair, reuse or recycling of products or their components. This is undoubtedly a new opportunity for small and medium enterprises.

Most of the business practices applied so far boil down to achieving more with less. In contrast, the circular economy model relies on reuse. Its essence goes far beyond the limits of only waste management or recycling. At the heart of this concept is the effort to maximize the benefit of an already created product throughout its life cycle. Therefore, a key place is occupied by eco-design and the possibility of individual components of an end-of-life product being reused (Sherwin and Evans).

The development and popularization of the concept of a "circular economy", in which resources are used to the maximum, can become a generator of a new type of economic growth and additional jobs, while at the same time solving serious societal challenges related to the exhaustion of natural resources and their ever-increasing prices on international markets as well as their environmental footprint.

This will help ensure a cleaner and healthier environment for European citizens, as well as more durable products. At the same time, the expenses of the enterprises are expected to decrease by 8% of the annual turnover⁵.

⁵ <http://ec.europa.eu/environment/newprg/index.htm>



For this reason, recycling is becoming an increasingly relevant topic. However, the concept of a circular economy is far from exhausted there. The idea here is to produce products in a way that allows them to be easily repaired or converted into other products afterwards (so-called product transformation), with companies being responsible for them even after they are sold. To close the circle, each industry works with the others and uses their waste material to achieve the so-called industrial symbiosis.

The development of the so-called blue economy is a new trend that is gaining more and more popularity as a way of sustainable development of the marine ecosystem. The blue economy is also known as blue growth and aims to develop businesses and initiatives that are of societal importance, contributing to the preservation of natural flora and fauna around oceans, seas and coastal areas.

This type of economy is based on creating sustainable business models that protect and restore marine resources while stimulating economic growth and employment. Projects related to the development of the blue economy emphasize knowledge of the marine environment, methods for intelligent marine planning and integrated monitoring. The blue economy has several fields of action related to innovative ideas and projects. Among them are aquaculture, blue biotechnologies, use of sea and ocean energy, coastal tourism and the seabed⁶.

The coast offers employment opportunities and has traditionally well-established blue economy sectors, including the following:

- coastal and marine tourism, including sub-sectors or diverse forms of tourism such as beach, cultural and underwater cultural heritage (UCH)/adventure tourism, historical, wellness and spa tourism, ecological and nature tourism, cruise and yacht tourism, recreational boating;
- extraction and commercialization of marine living resources (fishing, aquaculture and processing and distribution);
- maritime transport, ports, shipbuilding and ship repair, including smart/environmentally clean shipping and maritime industry;
- extraction of minerals, oil and gas (marine non-living resources).

II. Examples of successful introduction of circular economy models applicable to and for the specific environment of the Black Sea coast:

1. An example of innovation from "Nasekomo" AD⁷

With the ever-increasing population of the planet, humanity is facing one of the main global problems - the lack of protein to feed itself.

By 2050, the Earth's population will increase by 2 billion people. This population will need an additional 100 million tons of protein per year. Current methods of procuring them are unsustainable.

The solution is provided by the innovative Bulgarian startup "Nasekomo" AD. Valuable animal proteins are produced here, transforming organic by-products. And what's more, they do it without using up arable land, water or depleting wild fish stocks. For this purpose "Insect" uses Black Soldier Fly or black fly "Soldier". It is extremely efficient for protein production: 1 fly can lay up to 900 eggs, and its larvae increase their weight 10,000 times in just 12 days.

⁶ <https://move.bg/ustoichivo-razvitiie>

⁷ <https://nasekomo.life/>

In practice, the larvae of the fly feed on organic by-waste such as beer mash from breweries for example. After that, the larvae turn the by-products into body mass, from which protein meal and oil are subsequently obtained. They are used as an ingredient in animal feed. In addition, the company also produces high-quality animal manure as a by-product of their production. And all this is done with zero waste, thus Nasekomo applies the principles of the circular economy.

2. Innovation of the French company Veolia in Bulgaria ⁸

Business from sludge - when you supply drinking water to 100 million people, produce 53 million megawatt hours of energy and convert 42.9 million tons of waste into new materials and energy, you have a good idea of the cost of resources. The French company Veolia is one of the pioneers in the circular economy concept. It operates in dozens of countries and over the years has introduced various innovations in the sphere of the circular economy.

One of the main solutions it introduces is the standard production of energy from waste and sludge. This is the practice used at the Kubratovo wastewater treatment plant, which is located near Sofia and is operated by the group. In Bulgaria, Veolia is known for being the concessionaire of Sofia Water, that is, the capital's water supply operator. What is not known is that, according to the company's data, the station is the most energy efficient among all 10,000 stations of the group worldwide. The valuable thing about it is that it reuses a number of raw materials. For example, sludge collected from wastewater is treated anaerobically, producing biogas that powers the plant. Separately, sediments are used for soil enrichment, and sand - for use in construction.

The Struvia technology, developed by Veolia Water Technologies, reuses phosphorus from wastewater, a substance that is becoming increasingly scarce in Europe. Phosphorus sludge is removed in water treatment plants and can be packaged and sold later to be reused in agriculture as fertilizer.

In partnership with French DIY retailer Castorama, Veolia is creating a completely recycled kitchen countertop. It is created from leftover wood and plastic, and the product is recyclable even after it is no longer in use.

3. An example of innovation from "Fishland"

Fish processing plants generate large amounts of waste, which reaches up to 40%. To get rid of this waste, businesses pay fees, which represent serious costs. The company has decided to process this waste by entering it into an installation for the production of fish meal and fish oil. In this way, the costs of dealing with waste can be invested in the production of new products that bring additional profit.

The fish waste processing plant contains serious potential for solving problems in several directions - dealing with the generated waste, opening up new jobs, occupying a serious market niche and meeting the needs of the local fishmeal and oil market.

The installation itself is a production line that consists of several components: a grinder - which reduces the volume of the incoming raw material; vessel for "cooking" - the raw material is "cooked" for a certain time at a temperature of up to 80 degrees; press - under pressure, the dry mass, which represents the fish meal, is pressed out of the liquid, which is a mixture of fish oil and water; the dry mass - the fishmeal is ground to a powdery mixture and filled in suitable containers (sacks made of wheat or other material); the liquid is taken to a separate container that separates the "oil" from the water - the fish oil is mechanically filtered to present a final product, and the

⁸ Forbesbulgaria.com/2021/02/04/компания-на-бъдещето/



water, which is also mechanically filtered, can be stored and reused for the company's needs.

The introduction of the plant in fish processing and aquaculture enterprises can be cited as a positive example of the transition to a blue economy in terms of dealing with waste products and adding value to the input product. In this way, the production cycle is closed and the problem of production waste generation is eliminated.

4. Activity of the Bulgarian company BLOIL⁹

BLOIL processes waste oil and turns it into biodiesel, thus keeping nature clean of harmful fats, while at the same time enabling hundreds of cars to reduce exhaust gases and substances using the biodiesel that the company produces.

Biodiesel is a biofuel made from vegetable oils or animal fats. It has characteristics close to those of petroleum diesel and is considered particularly suitable as a fuel for standard diesel engines without the need for further modifications.

Biodiesel improves the performance of the engine, increases its power, contains no sulphur, reduces fuel consumption and last but not least, biodiesel is cheaper than conventional diesel as it is not subject to excise duty.

This is the most promising and environmentally friendly fuel.

Biodiesel can be used in its pure form and as an additive to regular diesel.

Vegetable oil is mainly composed of triglycerides, which contain three fatty acid esters linked to a single glycerol molecule.

In the process of trans esterification, triglycerides are reacted with a mixture of methyl alcohol and sodium hydroxide so that the fatty acid esters are broken off from the glycerol molecule and attached to the methyl group of the methyl alcohol. Potassium hydroxide, which is preferred by many biodiesel producers, can also be used.

Conclusion

Waste reduction, eco-design, reuse and similar measures can save EU businesses a lot of money and reduce overall annual greenhouse gas emissions. Currently, the production of materials we use in everyday life generates around 45% of emissions in the EU.

The transition to a circular economy will reduce environmental pollution, ease problems with the procurement of raw materials, and strengthen innovation and competitiveness. The change has the potential to add another 0.5% to the EU's gross domestic product and create 700,000 jobs in Europe by 2030. Consumers will also gain access to more sustainable and economical products.

Although in the initial stage of introducing elements of a circular economy in Bulgaria and the EU with the adoption of adequate legislative measures and a number of practical design tools, the eco-design of the product is aimed at reducing the pressure of the generated waste, increasingly oriented towards turning it into a resource for subsequent productions and reduction to a minimum of their disposal, as well as to create prerequisites for the deterioration of the environment.

Regarding the development of the blue economy, it can be concluded that the Bulgarian Black Sea coast has been subject to serious development and urbanization in the last 30 years. Its coastal economy and maritime sectors remain vital segments of the national economy. As part of the blue space of Europe, the coastal and maritime areas of Bulgaria are the object of considerable interest beyond the national borders.

⁹ <http://bloil.bg/>

The above highlights some lesser-known ways in which established and emerging sectors in Bulgaria's blue economy can optimally use the blue economy platform and tools for strategic, integrated and engaged development and protection of coastal and marine natural capital to support and development of blue industries, services and activities. The benefits generated through blue economy tools can not only make a significant contribution to the national economy, but also help Bulgaria lead the current heterogeneous development practices in the Black Sea region and promote technological development and innovation, which are closely related to marine protection and effective maritime spatial planning.

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