

# THE CIRCULAR ECONOMY BETWEEN LIMITS AND OPPORTUNITIES

**Ph.D., Olga TIMOFEI**

National Institute for Economic Research, Republic of Moldova  
E-mail: o\_timofei@yahoo.com

**Abstract:** From the perspective of increasing the world's population, the pressures on the environment and most natural resources that serve as raw materials (fuels, minerals and metals), food, sun, water and biomass are increasing. Given that natural resources are indispensable for the functioning of the economy and contribute significantly to the quality of our lives, it would be appropriate to reduce our consumption of materials from the design stage of products. In this context, the circular economy, which aims in particular at a goal of zero waste and the rehabilitation of all problems, is a solution. The development of this type of economy is already a clear political will in several countries. It is also possible to make the least use of non-renewable resources by opting for the use of renewable resources, depending on their renewal rate and the disposal of waste through recycling, repair and reuse. In this paper we aim to present the limits of the linear economy and the concept of circular economy, in the context of the situation of the circular economy in the world.

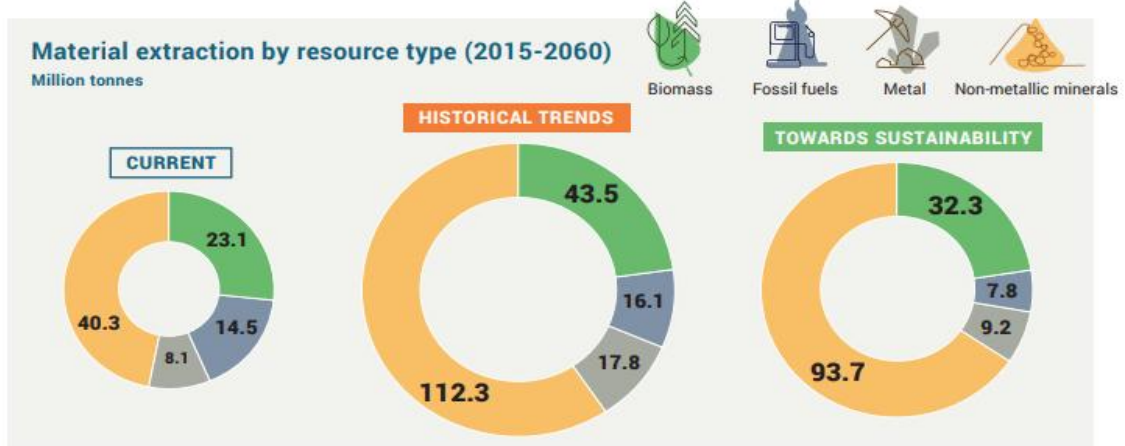
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## 1. Introduction

During its evolution and diversification, our economic system has never managed to escape a fundamental feature present since the beginning of industrialization: a linear way of consuming resources that is equivalent to extraction-manufacture-disposal. Companies extract raw materials, use them in the factory of their products, which they sell to the consumer. The latter throws them away as soon as they no longer perform their functions or are no longer fashionable. This fact would have grown considerably today if it had not initiated some measures to move to a sustainable economy. The results of implementing the principles of a sustainable economy, although still quite modest, as we see in Figure 1, are quite promising.



**Figure 1. Trends in material extraction by resource type.**

Source: Global Resources Outlook 2019: Natural Resources for the Future We Want, <https://www.resourcepanel.org/reports/global-resources-outlook>

In the report of the Committee on the Environment, Public Health and Food Safety "Global Resources Outlook 2019", the International Committee on Sustainable Resource

Management estimated that the global economy uses resources equivalent to the resources of 1.5 planets and we would need more from now on three planets if all people consumed at the level of an average EU inhabitant”, significantly reducing the use of natural resources and waste generation should be the primary goal of the circular economy (UN Environment Programme, 2019). Maintaining the pace of resource use remains dangerous not only for the environment but also for companies exposing them to several risks including rising raw material prices, disruption of supply, etc. An increasing number of them are caught between sudden increases or uncertainties related to commodity prices, on the one hand, and stagnant demand on the other.

At the same time, the volatility of prices for metals, food and non-food products increased during the first decade of the 21st century to levels not seen in the 20th century. The upward trend in commodity prices and their volatility continues today.

## 2. The practices of the circular economy

The circular business model is based on the reuse, repair, reprocessing and recycling of materials and products. The objectives of such an economic model are: to increase resource productivity and to separate economic growth from resource consumption and environmental impact. A circular economy is an industrial model that is by definition based on the repair or regeneration of resources, by replacing the concept of "end of life" with that of "repair" and "reuse", using renewable energy and even proposing to eliminate toxic substances by promoting a new design of products and materials. What is means preserving the economic value and limiting the harmful effects on the environment.



**Figure 2. The practices underpinning the Circular economy**

*Source: Phd2050, 2014 according to ADEME, 2013*

The foundation, created in 2010 by British sailor Ellen MacArthur, an international landmark in the circular economy, specifically states that “the circular economy is a generic term for an economy that is restored by its nature. Material flows are of two types, biological, which are destined to return to the biosphere, and technical, which are destined to flow with as little loss of quality as possible, leading to the shift to a food economy eventually renewable energy” (Ellen Macarthur Foundation, 2012). The transition of circulating economic models promises a much better future for the global economy. In this

way, the world can meet current and future challenges caused by the limit of global resources and the insecurity caused by the lack of supply.

Supported by a new model of economic development, the circular economy needs both theoretical and empirical assistance. After studying the relevant literature, we consider that in order for the circular economy to realize its full potential, it is important to follow the implementation of its principles, which can be achieved by following seven practices that are essential.

The first practice is related to ecological design, it assumes that at the design stage of any product or service, it is essential to consider all its impacts on environment throughout its life cycle. About the importance of the concept of organic production wrote (Nilsson et al., 2007) noting that this involves issues such as: the correct use of resources and the replacement of resources that are short-lived or dangerous (Lévy and Aurez, 2013). Eco-design can be done by using materials that have a low impact on the environment (from renewables, recycled and recyclable materials), reducing the mass or volume of materials, minimizing greenhouse gas emissions, choosing production technologies that generate less or even zero waste and emissions, or low energy consumption, by increasing the durability of the product which would minimize service and repair needs, designing the product considering how to use them after the end of its life cycle (reuse, reconditioning, modernization, recycling). For example, plastics can be melted a limited number of times after which molecular integrity will be lost. This means that it is crucial to achieve new and innovative plastics, designed in an environmentally friendly way, because plastics today are a very important category of waste.

The second is related to industrial ecology, is a method of industrial organization applied by several companies in the same territory and characterized by an optimized management of resources (water, materials, energy). Responds to a collective logic of sharing and exchange (waste, raw materials, energy, services, etc.). The principles of industrial ecology were defined by Tibbs in 1992, referring to the necessity of creation of industrial ecosystems, balancing natural inputs and outputs, dematerialization of industrial production, efficient improvement of the industrial process, using energy and political alignment to the concept of industrial ecology (Tibbs, 1992). Waste from various animal factories could be used, for example, as fertilizer for plant breeders.

The functional economy is the third practice and it is about favoring using instead of possession and tends to sell product-related services rather than products themselves. For example, renting various products with a guaranteed life cycle and not selling them. The indicators that can characterize the functionality of the circular economy are based on six basic principles that should be known and respected: the infinity of the circuit of matter and materials, using renewable energy, supporting ecosystem services and natural capital, supporting health and activity supporting society and culture, generating added value in any form, not just financially (Circle Economy, 2015).

Reuse, the fourth practice, involves the introduction of products that no longer meet the needs of the first consumer repeatedly in the economic circuit. As was mentioned by the J. Kirchherr and others at conceptualizing the definition of circular economy 74-75% of the definitions of different specialists emphasize the reuse (Kirchherr, Reike and Hekkert, 2017). And Stahel in his paper calls reuse as key of the circular economy (Stahel, 2014). This involves selling products that we no longer need instead of turning them into waste.

The fifth practice is repair. Damaged goods can receive a second life by repairing with new or used parts from the reuse process. Some waste can be repaired or dismantled, and the working parts sorted and then resold. The repair prolongs the life of the products, attracting many other benefits for the economy and the environment.

Finally, the last practice, well known, is about recycling. It aims to reuse raw materials from waste either in a closed loop (to produce similar products) or in an open loop (used in the production of other types of goods).

The implementation of all these behaviors or practice, as we have named them above, are important and aim to minimize: the amount of natural resources consumed in production, the amount of pollutants discharged into the environment and the global ecological damage caused by the economic activity.

### **3. The circular economy in the European Union**

The European Union has a key role to play in supporting the circular economy. The European Commission officially announced its interest in the circular economy on 17 December 2012, through a flagship initiative "Resource Efficient Europe", which states that "in a world where pressure on resources and on the growing environment, the EU has no choice but to decide "How to take a step towards a profitable economy and finally achieve a circular economic recovery". In connection with the European Commission's adoption of the "Circular Economy Package", there is a real interest in the authorities in Europe in implementing circular economy programs and legislation.

The EU Action Plan includes a number of measures aimed at covering the entire production cycle, from production and consumption to waste management and the secondary raw materials market. The description and measures included in the action plan reflect a shift in the focus of EU waste policy, which has traditionally focused on efficient management of materials and resources.

According to the initiators of the European Commission (Circular economy Strategy, 2016), stimulating the transition to the circular economy, aims to increase the global competitiveness of the European Union, support sustainable economic growth and create new jobs. In early December 2015, the European Commission adopted the Circular Economy Package. In the opinion of the Vice President of the European Commission (Katainen, 2016), the adoption of the Circular Economy Package created the conditions for the transition to the circular economy, which encourages investment in this direction, provides the necessary incentives for business and consumers to adopt new business models, products, services and techniques" (Katainen, 2016).

In the meantime, the European Commission has also been actively involved in promoting the circular economy, by supporting various research projects in the field of the circular economy in the EU's research and innovation program (Horizon 2020); establishing a strengthened partnership to support research and innovation for the circular economy; facilitating the development of more circular models of products and services, and supporting the principle of cascading in the sustainable use of biomass, taking into account all sectors exploiting biomass, so that this resource can be used as efficiently as possible (European Commission, 2014).

Recent studies show that the circular economy has the potential to increase EU GDP by an additional 0.5% and create more than 700,000 new jobs by 2030, and that between 2012 and 2018 the number of jobs linked to of the circular economy in the EU increased by 5%, reaching about 4 million, the implementation of the principles of the circular economy also allow to improve the quality of jobs (Ellen Macarthur Foundation, 2015).

At EU level, concern about implementing the transition to a circular economy as soon as possible remains very pressing. This is dictated both by the publication of the report of the Intergovernmental Panel on Climate Change (IPCC, 2018) on global warming and many other issues that still persist, such as the rapid growth of e-commerce, the significant increase in packaging waste, such as waste disposable plastic and cardboard,

maintaining a high level of food waste generated in the EU (food waste having a considerable impact on the environment, approximately 6% of total EU greenhouse gas emissions), etc.

Europeans are currently in the process of adopting a new European Commission action plan on the circular economy. Among the basic pillars of these actions are the importance of improving access to funding for research and innovation projects in the circular economy; that calls on the Commission to focus its activities in Horizon Europe on supporting research and innovation in: recycling processes and technologies; efficiency of industrial process resources; innovative and sustainable materials, products, processes, technologies and services, as well as their industrial expansion; bioeconomy, through bio-based innovation, including the development of bio-based materials and products; Earth observation satellites, as they can play an important role in monitoring the development of a circular economy by assessing the pressure on virgin raw materials and emission levels.

The transition to a circular economy has the potential to promote sustainable business practices, its policies and measures aim to put European companies and economies at the forefront of a global race for circularity, thanks to well-developed EU business models, increasing knowledge in circularity and strong experts in recycling, sustainable and responsible supply of primary raw materials.

#### **4. The limits of the circular economy**

The implementation of the principles of the circular economy regardless of the selected direction implies the confrontation of certain limits, both technical and economic and political.

The circular economy faces not only the complexity of the flow of products to be recycled, but also the degradation of the material (Lévy and Auzan, 2013). In fact, the raw materials in the warehouses lose their purity from the first stages of manufacture: they are mixed and treated with various additives, so that they have the desired properties. The resulting materials are then assembled into components and then into the final product. Each of these steps significantly increases the complexity of the flow of products to be recycled. And, after recycling, the material degrades. So recycled steel for the first time is worse than new steel and so on. Therefore, recycling is limited and the material used does not necessarily have the possibility to be reintroduced into a production/consumption circuit (World Bank, 2009).

Another technical limitation is the diversity of the composition of municipal solid waste, which prevents the realization of circular economy projects in a generalized form. For example, the composition of waste in different regions of the same country depends on the level of urbanization and living conditions of the population, as well as the industry present.

The transition from a linear to a circular economy could slow short-term economic growth and limit the possibilities for developing certain activities (Lévy and Auzan, 2013). It should be noted that many studies, including the StiglitzSen report, question the relevance of GDP as an indicator of economic growth, as it limits alternative approaches in too limited a framework. GDP only takes into account monetary criteria and therefore does not take into account, inter alia, short-, medium- and long-term environmental damage (Stiglitz, Sen and Fitoussi, 2009).

In addition, recycling is economically viable only when the demand for materials is high. However, during crises, the demand for new materials decreases, leading to an even greater decrease in the demand for recycled materials. In addition, despite the progress of recycling and waste recovery, resource depletion is not sufficiently slowed down. For

example, steel recycling is said to save only 12 years until the world's iron ore is depleted, with a 70% level of global steel recycling (UN Environment Programme, 2019).

Also, should be adopted a lot of stimulus policies for the development of the circular economy. An effective tax system for promoting this economy would be the direct taxation of raw materials and not products derived from them (Stahel, 2014). This taxation would affect the entire system of producer and consumer prices. It would also be necessary for the cost of exploiting natural resources to be higher than that of renewable and circular resources, and for the consumption of the latter to be more profitable than that of natural resources. In short, it is necessary to reorganize the system of prices, markets and taxes.

## 5. Conclusion

The circular economy is now a model of more viable development, more environmentally neutral and with real local coverage. It can develop provided that many factors are united and taken into account in a systemic approach.

This concept has the great advantage of connecting all economic actors. Indeed, large companies may be seduced by the many opportunities to create value and reduce the costs of the circular economy. Public administrations may be interested in the zero waste target. Finally, alternative actors may be interested in breaking with the productivity embodied in the functional economy, as well as the values of sustainability promoted by the circular economy.

However, the transition to a circular economy requires the development of knowledge, facilitation of the dissemination of knowledge and acceleration of innovation. If they are insufficient, this can impede the transition to a circular economy.

Generally, in the field of a circular economy, there is a fragmented organization of knowledge development and a reduced cross-sectoral knowledge development. Because the circular economy has relationships with several sectors, such an organization of knowledge is not effective. It is necessary to ensure a flow of information containing reliable information, accessible to all concerned. The development of knowledge in this field remains necessary for a transition to a circular economy. However, to date, linear technologies seem to be deeply rooted.

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