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PRACTICAL APPROACH TO CIRCULAR ECONOMY IMPLEMENTATION

ПРАКТИЧНИЙ ПІДХІД ДО РЕАЛІЗАЦІЇ ЦИРКУЛЯРНОЇ ЕКОНОМІКИ

The paper is an attempt to presents a practical approach to implementation of circular economy requirements. The article consists of two parts. In the first part the issue of circularity, as well as, circular economy definitions are presented. In this part the Author conduct the cluster analysis of circularity for all European Union's countries. In the analysis the Eurostat data concern circularity were used. The result of the analysis allowed to present differences between the countries in the field of circularity. In the second part of the article a circular public procurement idea was present, as well as, the criteria using during that tenders and an example of conducted procedure in one of the EU country.

European Commission recommend a set of indicators for assess the different aspects of circularity in Europe. The indicators are divided into four groups: (1) Production and consumption, (2) Waste management, (3) Secondary raw materials and (4) Competitiveness and Innovation. Observing the changing approach to the issue of ecology and care for our planet, one can also notice the changing awareness of users. They have a real impact on what is happening in the environment, but the strength of their impact depends primarily on the scale of efforts, i.e. the number of people who undertake such activities or become involved in their implementation.

Circularity seems to be one of the most important practical approach to implementation the concept of sustainable development. However it is quite new and not clearly defined, this topic affects increasing actions taken by the countries which want to protect limited natural resources. The process of reusing them is one of the obvious solution for the problem of global waste and pollution.

Key words: *circular economy, sustainable development, taxonomic methods, cluster analysis, circular public procurement.*

Наукова стаття є спробою представити практичний підхід до виконання вимог циркулярної економіки. Ця публікація складається з двох частин. У першій частині публікації проаналізовано поняття та зміст циркулярності, а також досліджено визначення циркулярної економіки. У цій частині автор проводить кластерний аналіз циркулярності для всіх країн Європейського Союзу. В аналізі були використані дані Євростату щодо циркулярності. Отриманий результат аналізу дозволив представити відмінності між країнами у сфері циркулярності. У другій частині наукової статті було представлено циркулярну ідею державних закупівель, а також критерії, що використовуються під час проведення тендерів, та приклад проведеної процедури в одній із країн ЄС.

Встановлено, що Європейська комісія рекомендує набір показників для оцінки різних аспектів циркулярності в Європі. Показники поділяються на чотири групи: (1) Виробництво та споживання, (2) Поводження з відходами, (3) Вторинна сировина та (4) Конкурентоспроможність та інновації. Спостерігаючи мінливий підхід до питання екології та догляду за нашою планетою, можна також помітити мінливість обізнаності користувачів. Вони мають реальний вплив на те, що відбувається в навколишньому середовищі, але сила їх впливу залежить насамперед від масштабів зусиль, тобто кількості людей, які здійснюють таку діяльність або беруть участь у їх здійсненні.

Обґрунтовано, що циркулярність є одним з найважливіших практичних підходів до реалізації концепції сталого розвитку. Однак вона є досить новою і не чітко визначеною, ця тема стосується посилення дій, які вживають країни, які хочуть захистити обмежені природні ресурси. Процес їх повторного використання є одним із очевидних рішень проблеми глобальних відходів та забруднення.

Ключові слова: *циркулярна економіка, сталий розвиток, таксономічні методи, кластерний аналіз, циркулярні державні закупівлі.*

Introduction. Nowadays, circular economy is one of the most important practical approach used to apply in sustainable development concept implementation. For the first time the term *circular economy* was used by David Pearce and R. Kerry Turner in 1990 in their book entitled "Economics of Natural Resources and the Environment" (Pearce & Turner, 1990). They explained this concept as a integral part of economic system,

where production, consumption of goods, capital goods and resources are the inputs and ignore of environment affects its linearity. Instead of this, circularity is an effect of taking into consideration such dimensions as: wastes, the Laws of Thermodynamics, entropy phenomenon and possibility of recycling. In effect the whole economic system could be closed and many of our resources are safe and use once again.

For last three decades many scientists have taken an effort to create one common definition of circular economy which could be applied not only as a theoretical consideration but used in practice, especially in measurement process. Till 2017, in subject literature approximately 214 definitions have been existed. They were analysed and described by Julian Kirchherr, Denise Reike and Marko Hekkerts (2017). The most common definition of circular economy assumes that, it is a *closed loop economy that does not generate excessive waste and whereby any waste becomes a resource* (Geisendorf & Pietrulla, 2018). The more deepened and more complex definition of circular economy is the following: *circular economy is the manifestation of a paradigm shift, and it will require changes in the way that society legislates, produces and consumes innovations, while also using nature as inspiration for responding to societal and environmental needs* (Prieto-Sandoval *et al.*, 2017). The last one based on sustainable development concept and its three dimensions (pillars): society, environment and economy (Diaz-Sarachaga, *et al.* 2018). Back to the definition proposed by Prieto-Sandoval, *et al.* (2017) in their paper they elaborated their own coherent concept which consists also the definition adopted in the present paper. *The circular economy is an economic system that represents a change of paradigm in the way that human society is interrelated with nature and aims to prevent the depletion of resources, close energy and materials loops, and facilitate sustainable development through its implementation at the micro (enterprises and consumers), meso (economic agents integrated in symbiosis) and macro (city, regions and governments) levels. Attaining this circular model requires cyclical*

and regenerative environmental innovations in the way society legislates, produces and consumes.

1. Circularity of economy

Circularity of economy is related with closing the loops. Intuitive approach to this topic is related to the economy in the shape of a circle. That is why *circular economy* is named also as: *cradle-to-cradle*, *closed supply chains* or *closed-loop supply chains*. It is worth to underline, that other words related with this topic are: *blue economy*, *reverse logistics*, *industrial ecology*, *performance economy*, *natural capitalism*, *biomimicry*, and *regenerative design* (Geisendorf & Pietrulla, 2018).

Circularity is also an effect of “thinking change”, which requires using the resources as effectively as we can. It is focused not only on waste management or limit, but firstly – on reduce, reuse or recycle of used materials or natural resources. This 3R’s approach (Reduce, Reuse and Recycle) which is typical for circular economy and which is opposite to traditional approach related with linear economy (*take, make, and waste* or *take, make, use and dispose*). The 3R’s approach has been developed into “more R’s”, e.g. 9R (starting from *Refuse* as *R0*; then *R1 – Rethink*, *R2 – Reduce*, *R3 – Reuse*, *R4 – Repair*, *R5 – Refurbish*, *R6 – Remanufacture*, *R7 – Repurpose*, *R8 – Recycle*, *R9 – Recover*) (Kirchner *et al.*, 2017; Manickam & Duraisamy, 2019).

In subject literature, the Authors noticed, that circular economy is not precisely defined, because of many aspects and dimension of this concept. As was mentioned above, circular economy is related with both the waste management and natural resource protection. But those perspectives are not the only ones. G.D.A. Galvão *et al.* in their article (2018), mention the other topics, i.a.: sustainability, industrial ecology

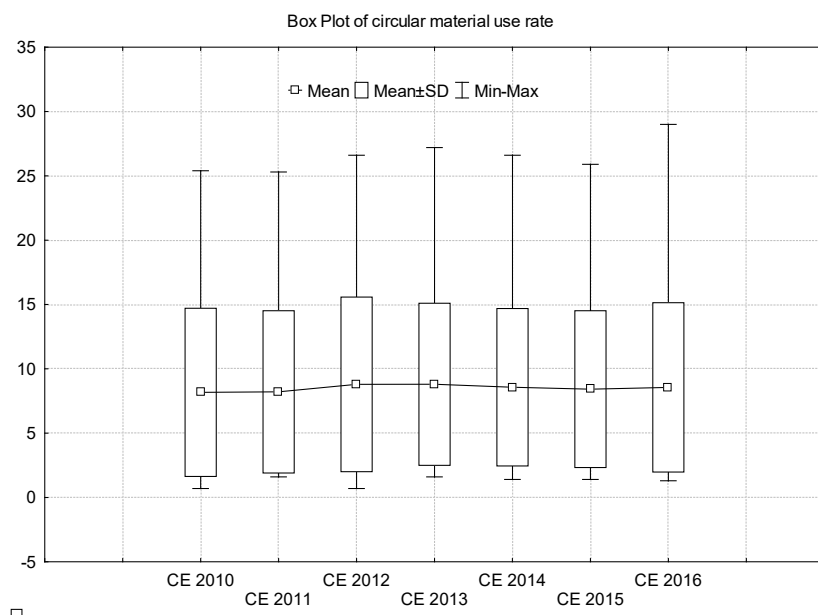


Fig. 1. Mean, standard deviation and minimum & maximum value of circular material use rate in 28 European Union's countries

Source: Eurostat

or eco-design, cleaner production or product service systems, eco-innovations, etc. Due to this fact, the direct measurement of circularity of the economy is difficult. European Commission recommend a set of indicators for assess the different aspects of circularity in Europe. The indicators are divided into four groups: (1) Production and consumption, (2) Waste management, (3) Secondary raw materials and (4) Competitiveness and Innovation. Among that indicators, the most appropriate one to assess circularity of the economy is: Circular material use rate. The Figure 1 shows the mean of circular material use rate (which could be recognized as circularity indication) for all EU countries since 2010 (the first available data).

It is observed, that the range between countries (also considered as standard deviation value and as minimum-maximum range) is increasing in the last year of analysis (2016). The differences between the countries are the results of different approach to the circular economy matters, different stage of economical development, as well as different implemented approach to practical action in this fields. Based on Eurostat data, the cluster analysis could be conduct. A multivariate

comparative analysis method with using Ward's method (an agglomerative hierarchical clustering procedure) allowed to assess the clusters of countries similar in circularity (Grabiński, 1992). In effect a connection tree (which is also called the dendrogram) illustrated subsequent connections of higher and higher order groups was prepared (Figure 2).

The cut-off point was marked for the value 30. It allows to group the countries into 5 clusters depends of the level of circularity (from the highest to the lowest). The first cluster (the highest value of circularity) consists on by only one country – the Netherlands. To the second cluster (the higher value of circularity) belongs the following countries: Belgium, Italy, France and United Kingdom. In the third one (the moderate value of circularity) there are: Czechia, Hungary, Malta, Denmark, Austria Slovenia, Sweden and Spain. To the fourth cluster (lower value of circularity) belongs: Germany, Estonia, Finland, Poland, Luxembourg. The fifth cluster (the lowest value of circularity) consists on: Bulgaria, Latvia, Ireland, Greece, Romania, Cyprus, Portugal, Croatia, Lithuania, Slovakia. Table 1 presents

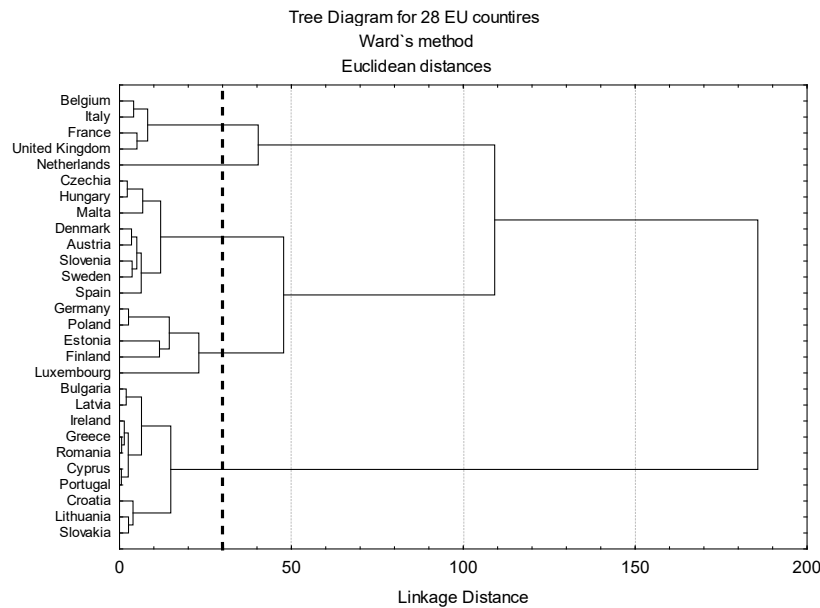


Fig. 2. Tree Diagram for circularity in 28 European Union's countries

Source: own elaboration on Eurostat data

Table 1

Descriptive statistics for the clusters

Cluster	Mean value for the cluster	Standard deviation of mean value for the cluster
The highest value	26,57	0
The high value	16,29	1,17
The moderate value	12,05	2,01
The lower value	7,42	1,09
The lowest value	2,68	1,02

Source: own elaboration on Eurostat data

the distance between the mean value of circularity between these countries during the analysed period.

To the first group belongs the country with the highest value of circularity. The Netherlands is a promoter of circular behaviour among society. To the second group belongs the countries with the value of circularity higher than mean value for EU. The third cluster consists on the countries which value of circularity is approximately the same as the mean for the whole EU. The fourth cluster consists on the countries reached the value of circularity lower than mean for EU, and to the last one – the fifth – the countries which reached the lowest value of circularity.

2. Practical implementation of circular economy

Thinking about implementing the circularity into practice, it is needed to understand the specificity of taken effort. Observing the changing approach to the issue of ecology and care for our planet, one can also notice the changing awareness of users. They have a real impact on what is happening in the environment, but the strength of their impact depends primarily on the scale of efforts, i.e. the number of people who undertake such activities or become involved in their implementation. Mentioned definition prepared by Prieto-Sandoval *et al.* (2017) can therefore be concluded that if we want to change something, we must do it on a large scale. A single action, though noble, will have no effect. The question may be asked: So how do we approach the topic of implementing the idea of a circular economy? It can be conducted through information campaigns and raising awareness, but in my opinion, specific actions at various administrative levels can bring positive effects. An example of this can be public procurement carried out using circular economy criteria. In this place it is needed to be underline that in the subject literature and in the practice we differentiate three kinds of “environmental” procurements: (1) Sustainable Public Procurements – SPP; (2) Green Public Procurements – GPP; and (3) Circular Public Procurements – CPP. The first group (SPP) is *the process by which the purchasing party seeks to achieve the appropriate balance between the three pillars of sustainable development* (European Commission, 2019). This procuring process is referred to both goods, services and works. The second one – GPP – are related with a broader approach to sustainability in the operations conducted by public authorities. In this procurement process public procurers tries to order those goods, services or works which have a reduced environmental impact, not only a the stage of their production but during the whole lifespan of their using. The last one group – CPP – consists on these tenders procedures allows to ensure that, *at the end of their service life or useful life, products or materials will be re-used effectively in a new cycle* (European Commission, 2017).

According to the Circular public procurement, it seems that there are no such provisions in the law. In example, in Poland the Public Procurement Law applies the rule, that during the preparation of the description of the subject of the contract, it should include performance or functionality

requirements, including environmental ones. It allows these aspects to be taken into account in tender procedure. It is worth to mention, that there are more references to environmental aspects in the abovementioned Act. In some publications there are a proposition of the set of criteria for circular public procurement. I.e.: durability (criteria: *requiring quality and durability standards or demanding a minimum guarantee and availability of spare parts*), resource efficiency (criteria: *setting criteria for use of electricity in the use phase or setting criteria for fuel consumption*), reuse (criteria: *demanding delivery of products in reusable transport packaging*), refurbish/retrofitting (criteria: *retrofitting of building appliances through energy service contracts or refurbishment of furniture*), recycling (criteria: *demanding the use of low or no harmful materials and products to improve the recyclability of the products themselves and their packaging or demanding that products can be dismantled for recycling*), buy recycled (criteria: *purchase of textiles with recycled fibres, recycled paper etc. or require a minimum of recycled material in packaging*) (Jones *et al.*, 2017).

Good example of practical approach to the public procurement conduction is the procedure conducted by the city of Pļaviņas (Latvia) which concerned the tender for catering services at the gymnasium (European Commission, 2018). In this tender, in addition to the price, the selection criteria also referred to: (1) nutritional quality, (2) follow a healthy diet, (3) the number of certified products on the menu (especially organic), (4) environmentally friendly transport (below 50 km), (5) participation in the “School fruit” program. As a result of this order, students received appropriate meals consisting of, among others, seasonal fruit and vegetables and organic milk (at least 50%). Meals were served without the use of disposable plastic containers, and services were evaluated twice a year by students. One of the requirements was for waste management. In this order, the service provider was responsible for sorting waste (biological, packaging and other) according to the instructions of the waste collection manager. The supplier also had to draw up a list of waste generated in the kitchen and catering every six months, analyze and agree an action plan on reducing waste with the contracting party.

Conclusions. Circularity seems to be one of the most important practical approach to implementation the concept of sustainable development. However it is quite new and not clearly defined, this topic affects increasing actions taken by the countries which want to protect limited natural resources. The process of reusing them is one of the obvious solution for the problem of global waste and pollution. Effective approach to implement circularity as a normal standard requires adopt coherent procedures, obligatory for all actors of the economy, especially – public ones. In this field popularisation of circular public procurement, as well as other types of green procurement allows to ensure that public actions will be environmental friendly and build the new attitude to doing the business.

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