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Circular Economy as a Management Model in the Paradigm of Sustainable Development

1. Introduction

The idea of *sustainable development* (SD), understood as a process enabling meeting the needs of the present societies while respecting the needs of the future generations, can be seen as a main narrative in the current socio-economic debate. Thus, it has been incorporated into of numerous international political organizations, non-governmental bodies, governments and the European Union into strategies and policies. On the other hand, the concept of sustainable development is a relatively new paradigm in Management and the model is still being developed and précised in this area of science. Particularly the change of the core values, aims and methods it requires on every level of the economy proves to be a challenge.

The changes on the macro level aim mostly at counteracting the growing socio-economic and ecological imbalances, associated with the hitherto dominant linear model of economic development. This model, founded on the prerequisite of the continuous economic growth and an increased use of resources, essentially applied the following production strategy: Obtaining resources and materials,

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transforming them into goods and after their utilization by the consumer, disposing of the rests (the so called "*take-make-dispose*" approach) (fig. 1).

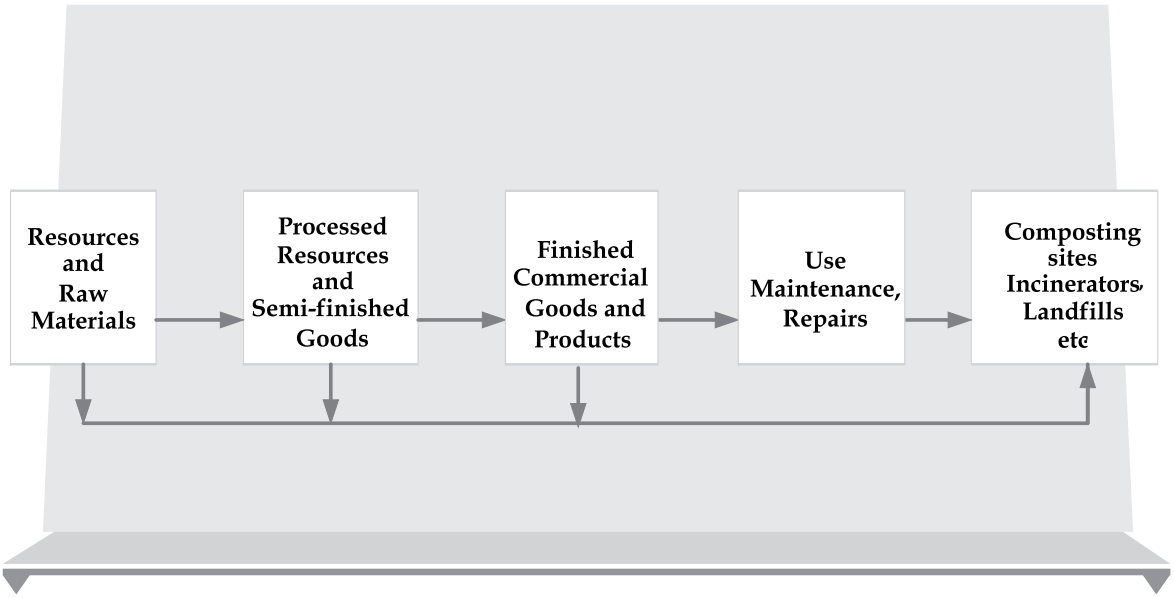

Figure 1. The process of production in the linear economy model

Source: own compilation

The main problems that have been arising from the linear economy over the past decades are: the greenhouse effect caused by the increase of the CO^2 concentration in the atmosphere, the depletion of resources accompanied by the growing prices, fluctuating on the markets, as well as the rising pollution of the atmosphere and soil, shortage and pollution of water, increasing amounts of communal and industrial waste, growing demand for energy, destabilization of ecosystems etc. (Lee B. et.al. 2012). For a long time now the subjects of the linear model of economy have been struggling to resolve the issues resulting from the economic growth, with little to no effect. Consumerism, globalization, many societies becoming wealthier and the increase of world population from 6.8 billion people today to more than 9.8 billion over the next 30 years (ONZ 2017) cause the fast rate of depletion of basic resources, which are to large extent exhaustible and non-renewable, thus forming a **natural barrier to economic growth**. The use of many resources doubled in the past 40 years and will continue to increase rapidly, if not met by a swift adaptation of business models (Ellen MacArthur Foundation 2012,

p. 14ff). Even the advance of resource-efficient technologies and the dramatic rise in prices for some materials will not be able to solve the dilemma of the constant increase of demand in an adequate way (Jackson 2011, pp. 155-164). Additionally, far-reaching results of the economic growth, such as its impact on the climate change and the deregulation of the cycle of basic elements in the biosphere, have to be taken into consideration as well. Hence, gradually the attention turned towards the necessity to reduce the pace of growth and consumption, the inclusion of external costs and mechanisms of environmental protection into the economic process and towards technological solutions such as material recycling and new technologies, based on the closed loop of production (so called 'circular technologies'). The concept of sustainability has been augmented with the model of circular economy. However this leads to the following questions: a) Will circular economy gain general acceptance in the management processes of the 21st century? b) Will better understanding and deeper interest in the idea behind this type of economy be sufficient for its popularization? c) And what are the conditions necessary for circular economy to be able to develop at each stage of the management process? The authors propose the following hypothesis: Among different management models used in the 21st century, the model (concept) of circular economy is the one meeting the prerequisites of sustainable development in the most accurate way.

The objective of this paper is to present the knowledge of circular economy in the context of other models in the paradigm of sustainable development applied in the 21st century. The analysis is based on the review of secondary sources, methods of deduction, model presentation and visualization as well as the statistic data from Eurostat.

2. The concept of sustainable development

Proponents of sustainable development were promoting the idea of sustainability on various fora of international organizations (e.g. UN, OECD) already in 1960s (Skawińska et al. 2016 p.59). In 1975 the management board of UNEP (United Nation Environment Programme) used the first formally denoted definition of sustainable development on their program. In the late 1980s the concept was extended by the element of durability to describe **"development that meets the needs of the present without compromising the ability of future generations to meet their own needs"** (WCED 1987) and attributed with 3 interdependent dimensions (economic, social and environmental) - a definition that has remained valid in its core until today.

Due to the economic crises in 21 century, the intellectual effort around the concept of sustainability has shifted towards its pragmatic aspects. The necessity to implement the principles of sustainability in the practice became more and more pressing in the light of the durability challenged by increasing economic polarity, population growth, changing age structure and the extent of environmental deterioration. Economists and other academics in Poland, such as sociologists and psychologists, but also politicians and intellectuals, while attempting to provide viable solutions to these pressing problems, engage more and more in a multifaceted debate (see e.g. Forum Myśli Strategicznej PTE; Kołodko 2017; Filek 2017). The approach has to be interdisciplinary as it needs to take into consideration the above mentioned natural barriers of growth and the dysfunction of the current economy, as well as aspects of ethics, justice, morality, culture, norms and values. The comprehensiveness of the sustainable development concept demonstrates the UN Agenda for Sustainable Development (so called ***Agenda 2030***) adopted by the UN in 2015, defining 17 intersectional Sustainable Development Goals (SDGs) and 169 targets in order to implement SD (ONZ 2015b).

In Europe the paradigm of sustainable development can be formally traced to the international documents of the European Economic Community (EEC), followed by normative regulations in the member states in the 1980s. The ***Single European Act***, adopted in 1986, defined the principles of sustainable development in the European Communities. Next, the ***Lisbon Strategy***, an action and development plan launched by the European Council in 2000, designated the prerequisites for promoting SD in the European Union. The Strategy was ratified and implemented with a set of suggestions by the Council of Europe in Goteborg. Both the *Constitution Treaty* in 2004 and the ***Lisbon Treaty*** in 2007, making amendments to the *Treaty on European Union* and to the treaty constituting the European Community, declared **social market economy to be the foundation for sustainable development in the EU**. The theoretical presumptions of this model include the adaptation of methods and measures of economic policy to the competitive economic order.

Currently, the main guiding document in this area is „**Europe 2020 – A strategy for smart, sustainable and inclusive growth**" (see Europe 2020), adopted by the European Commission in 2010. It describes the new paradigm for development of *sustainable enterprises* and *sustainable innovations*. In order to foster the implementation of its goals, the strategy contains 7 flagship initiatives, including the "Innovation Union" (EC 2018) and "Resource efficient Europe"(EEA 2018), which are of direct interest from the circular economy point of view. The **7th**

Environment Action Programme (EAP), introduced in 2013, refers directly to the principles of circular economy. Its leading vision reads: "In 2050, we live well, within the planet's ecological limits. Our prosperity and healthy environment stem from an innovative, **circular economy where nothing is wasted and where natural resources are managed sustainably, and biodiversity is protected, valued and restored** in ways that enhance our society's resilience. Our **low-carbon growth has long been decoupled from resource use**, setting the pace for a safe and sustainable global society." (EC 2014a). Whereas the UN under the Goal 12 *Ensure sustainable consumption and production patterns* of their **Agenda 2030**, which was signed by all UN member states in 2015, including Poland, aims to achieve among others:

- sustainable management and efficient use of natural resources, including t**he entire material life cycle**,
- substantial reduction of waste generation through **prevention, reduction, recycling and reuse,**
- fostering implementation of innovation and efficiency strategies and
- creating strong national **frameworks for sustainable production and consumption**, integrated in plans on national and intersectional levels (see OECD 2017, p. 22).

In Poland the concept of sustainable development, interlinked with the model of social market economy as the foundation of the Polish economic system, was included in the Constitution Act from 1997 as well as in the National Development Strategy valid until 2025 (Strategia 2000) and the Environmental Protection Act (Ustawa 2001). In 2012 the above mentioned UE strategy *Europe 2020* was translated into the national vision for economic development, the document by the Ministry of Economy called "Strategy for Innovation and Efficiency of the Economy – Dynamic Poland 2020" (see Strategia 2012). The strategy is based on 4 operational goals. Worth mentioning from the perspective of circular economy is goal 3, called "Increasing the efficiency of use of natural resources and materials". In 2017, in accordance with the UN Agenda 2030, Polish government adopted the national Strategy for Responsible Development (OECD 2017). This comprehensive policy instrument includes more than 700 measures to foster sustainability in Poland.

3. Models in sustainable development in the hitherto management practice

The sustainability policy measures address all economic agents (actors) operating on the micro, meso and macro scale of economy. On the **macro level** the following models and methods are being used:

- economics of moderation and low-carbon economy (Kołodko 2014, pp. 30-34; 2017, p. 67),
- economizing the use of natural and non-renewable resources (Meadows etal. 1973, Mesarovic, Pestel 1977; Poskrobko 2007; Wąsowicz 2014; Borys 2010),
- models of neutral (*zero growth*) and negative economic growth (*degrowth*), promoting a decrease of economic growth rates (Wordwatch Institute 2012, p. 22ff),
- social market economy (Pysz 2008; Mączyńska 2010, pp. 20-21),
- inclusive formal and informal economic and non-economic institutions (Kołodko 2014, p. 19; Filek 2017, p. 34),
- as well at the national ecological footprint, determining national natural resources and their depletion at the current rate of use (GFN 2018).

On the **meso level** there are sustainable strategies for regional development as well as various initiatives and instruments intended for specific sectors of production and services (e.g. organic agriculture, renewable energy, green building or sustainable tourism etc.).

Whereas from the **micro level** point of view, the following models and methods are frequently used:

- *Corporate Social Responsibility* (CSR) (Adamczyk 2009; Fiedor 2016; Kozłowska 2007; Filek 2017),
- *sustainable enterprises* (Grudzewski i inni 2010; Hejduk 2014),
- comprehensive quality management methods such as *Total Quality Management* (TQM) (Zalewski, 2008, pp.117-137) and *ISO 26000 : 2010* (ISO 2014, pp.14-15),
- reducing environmental impact – e.g. of a spacial project (Environmental Impact Assessment (EIA)), of a technological process or product (various life-cycle-analyses (LCA)) and organization (e.g. Eco-Management and Audit Scheme (EMAS) and the ISO 14001 norm),
- various certificates for the production processes (eg. *Oeko-Tex*, *RedCERT*, *RSPO*) and for goods (e.g. *Ecolabel* 1980/2000/EU, *FSC*, *FairTrade*, *Utz*),
- extending the principles of sustainability to the entire chain of supply, *sustainable supply chains* (ONZ 2015a),
- sustainable accounting, such as *sustainability reporting* and *non-financial reporting* (e.g. according to the standards of the *Global Reporting Initiative* or the EU Directive 2014/95/EU),
- comprehensive sustainability ratings and rankings for companies or value papers on the financial markets (e.g. the *Dow Jones Sustainability Index* (DJSI), *CDP*, *FTSE4Good*, *Global Compact 100*).

On the **consumer level** the concept of **sustainable consumption** applies, i.e. procurement and utilization of goods and services according to the principles of sustainable development, including decrease of consumption, buying mostly eco-friendly or organic products, collaborative consumption as well as reuse, maintenance and repairs. The term has been coined after it appeared in the 4th chapter of the Agenda 21 in 1992 (WEF 2013). One of the methods of establishing if the consumption level of an individual is sustainable, is calculating the so called individual environmental footprint.

The sheer variety and number of methods and models of sustainable management suggest that sustainable development is a concept, in which model solutions play a vital role. However, none of the above mentioned models and methods covers all aspects of sustainability and they are mostly aimed at reducing the negative impact of economic activities rather than at solving their root causes in a holistic way (Bonciu 2014, p. 78).

4. Circular economy as a model of sustainable development

The progress of natural sciences, which gained momentum in the 18th and 19th century, resulted in the observation, research and partial understanding of the cyclic mechanisms in numerous processes occurring not only in the abiotic but also in the biotic environment, mainly the biosphere. It has been observed that over time development follows a sigmoid curve until it reaches its maximum (Osenton, 2004). According to the quality loss principle (Oakland, Followell, 1992) unless new growth incentives appear, every process is prone to gradual decline. However, new stimuli are able to induce another phase of growth, thus increasing the efficiency of the process. It can be assumed that it is a general mechanism, an axiom, which applies to the majority of processes, including economic phenomena. Another conclusion suggests that biotic systems and forms are "ideal solutions", perfected by means of evolution with an objective to maximize on benefits and minimize on efforts. They can be thus attributed innovativeness, effectiveness and efficiency. According to Bernd Hill (2012, p. 148), their perfection stems also from being self-organized systems, capable of self-reproduction, self-optimization, self-regulation and self-maintenance. Additionally, they strive to keep a dynamic balance with their environment. These characteristics qualify them as optimal models for the development of holistic sustainable solutions.

Although natural and applied sciences made a quick theoretical and technological progress, the practical application of their achievements in the production processes had not occurred until the turn of the 1960s and 70s. Only in 1976 did Stahel and Reday describe some characteristics of the circular economy (CE), however not yet defining them as such. Their concept was based on reducing the waste, creating new jobs in the regions, effective use of resources and de-materialization of economic processes (activities), especially in the industrial economy. Sometime later, Stahel suggested that shared use and rental of some goods are a superior and a more sustainable approach than classic ownership (so called functional service, performance economy, sharing economy).

The first explicit use of the term „circular economy" goes back to 1990 and the publication by D.W. Pearce and R.K. Turner called „Economics of Natural Resources and the Environment". The authors observed that in the traditional economies and the previous production systems the incentives for recycling were missing at large. On the contrary, until recently the manufacturers have been viewing the environment mainly as a place to dump waste and the postproduction pollutants. In contrast, the notion of the circular economy is based on the following principles (ibidem):

1. Waste is a resource.
2. Diversity is an advantage.
3. The energy used should stem from renewable sources.
4. Management should be based on systemic thinking.
5. Prices and feedback mechanisms should reflect real costs.

According to Ellen MacArthur Foundation (2012) investigations their applicability has been proven by time.

The concept of circular economy is still evolving. In order to assess the use of the term in literature, Geissdoerfer and team (2017) analyzed recent scientific publications according to the title of the journal, authors' country of origin and the keywords associated with the concept of CE. Furthermore, J. Kirchherr etal. (2017) conducted a systematic analysis of 114 definitions of circular economy, taking into consideration the occurrence of the pre-defined 16 characteristics (dimensions) of the phenomenon. We present the results of their study in Table 1. Their research showed that the most common descriptors of CE were the activities **reducing**, **reusing** and **recycling**, traditionally denoted as **3R,** as well as the aspect of **economic prosperity**. At the same time, the authors stress that the necessity of systematic change in these areas has not always been mentioned. The activity noted most seldom was **recovering**. Amongst the goals of CE the least popular connotations were **social equality** and all three dimensions

of **sustainability** used simultaneously, whereas the dimension of **future generations** has been mentioned only once.

Table 1. Occurrence of the 17 aspects of CE in scientific publications and practitioners' opinions

Hits in 114 publications (in %)					
	Publications	Practitioners		Publications	Practitioners
Activity	-	-	**Goals of CE**	-	-
Reduce	54-55	44	Sustainability	11	11
Reuse	74-75	68	in which: Environment	37	28
Recycle	79	68	Economic prosperity	49	53
Recover	7-8	3	Social equality	19	16
Waste	30	11	All three	13	8
System	-	-	Future generations	1	0
Micro	19	22	**CE as Enabler**	-	-
Meso	21	22	Business model	11	14
Macro	24	22	Consumers	19	22

Source: own compilation based on Kirchherr etal. (2017)

According to the authors mentioned above, such a large number of various definitions and connotations may impair the whole concept. Based on the reviewed literature they propose a new, more advanced definition of CE as "an economic system, in which the concept of the finite 'product life-cycle' is replaced by the concept (philosophy) of **4R (reducing, reusing, recycling** and **recovering)** of materials in all processes of production, distribution and consumption" (ibidem). In order to ensure sustainable development, this system should be implemented at all levels of economy, i.e. on the micro (manufacturer, product, consumer), meso (e.g. city, region, industry) and the macro (state and higher) level. At the same time, sustainability needs to provide a holistic framework for safeguarding the quality of the environment, securing the economic prosperity and facilitating social equality, today and in future. Fig. 2 shows a holistic version of circular economy.

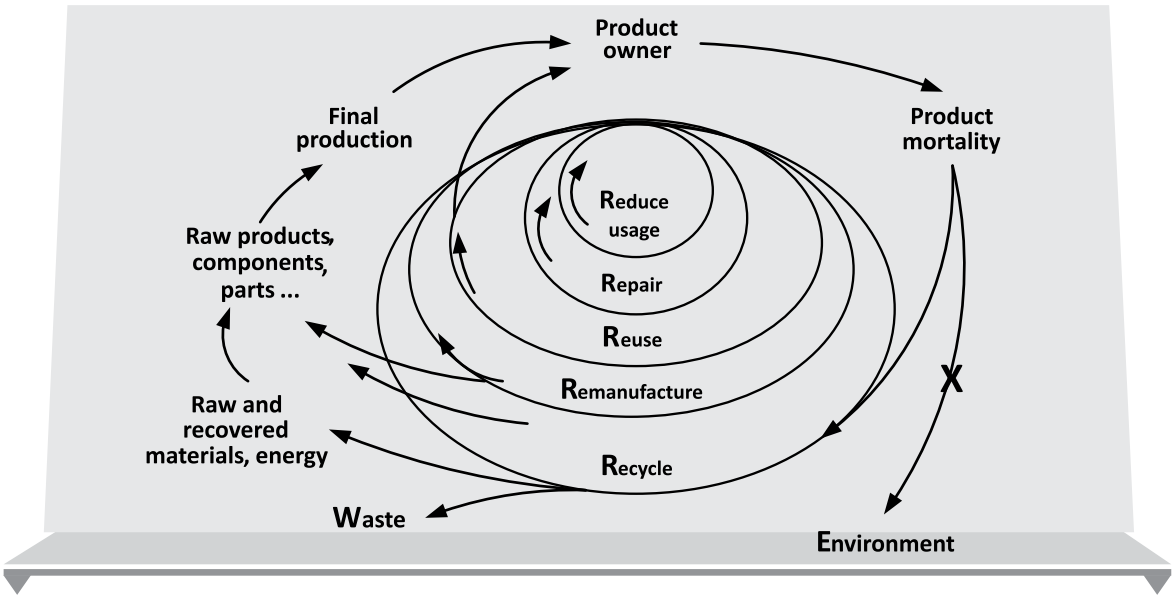

Figure 2. The flow model of matter in the circular economy in the holistic perspective

Source: own composition based on Mihelcic etal. 2003

According to Geissdoerfer et al. (2017, p. 759) and Schut et al. (2015, p. 15) the most comprehensive definition of circular economy has been developed by the Ellen MacArthur Fundation (2012, p. 22). In this understanding, the term circular economy both in theory and practice refers to a production system characterized by restoration and regeneration of the applied resources. CE offers to replace the traditional concept of the finite product life-cycle ('end-of-life' cycle) by an industrial economy, which is restorative, relies on renewable energy, reduces the use of toxic chemicals impairing reuse, and eradicates waste through advanced design of materials, products, systems and business models (ibidem). It is necessary to put a light on Korhonen et al. (2018, p. 37) opinion, that circular economy has been developed and led by practitioners (policy-makers, businesses, consultants, foundations etc.) and is weakly explored by scientists.

5. Impact of EU on circular economy development

Development of circular economy in EU countries is influenced by rules and law as well as directives and other proposals. The European Commission states in their "Manifesto for a Resource-Efficient Europe" issued in 2012 that "In a world

with growing pressures on resources and the environment, the EU has no choice but to go for the transition to a resource-efficient and ultimately regenerative circular economy"(EC 2012). In 2015 this proclamation was followed by the Circular Economy Package, including revised legislative proposals regarding waste and a wide-ranging **Circular Economy Action Plan** with measures covering the whole product cycle (i.e. from production and consumption to waste management and the market for secondary raw materials). The Plan is based on actions in 6 key areas (EC 2015):

- **resources –** for a more efficient use of resources,
- **eco-innovations –** enabling the transformation towards the circular economy,
- **materials –** making sure the use of materials will not deplete natural resources,
- **production –** promoting ecological products and supporting sustainable enterprises and organizations,
- **consumption –** delivering thorough information to consumers to facilitate the choice of „green" alternatives,
- **reducing and managing waste –** decreasing waste production and improving waste management.

The Plan also addresses barriers of circular economy development in specific sectors and material flows (such as plastics, food waste, scarce resources, constructions, biomass production and products based on bio-materials) and horizontal activities in the key economic areas, such as innovations and investments. The Plan has been reinforced financially by the means from the European Structural and Investment Funds (ESIF), including EUR 5.5 billion for waste management only. In addition, EUR 650 million has been provided under Horizon 2020 (the EU funding program for research and innovation) and with investments in the circular economy at the national level in order to facilitate practical applications.

In 2018, the EU published data showing the progress made in the application of the circular economy objectives (Measuring 2018). In many areas the progress has been noted mainly in recycling of industrial and organic waste. However, the latest data is available for 2016 only and there are substantial differences between the contributing countries. In order to measure performance, a number of quantifiable targets have been set. These include e.g. recycling of up to 65% of municipal waste by 2035 and 70% of packaging waste by 2030, as well as reducing landfilling to 10% by 2035. In 2019 a new directive will ban the production of single use plastic products. More goals has been presented in the paper „A long-term strategy for a European circular economy – setting the course for success" (Think 2030.eu).

6. Conclusions

Results of our work allow to accept the hypothesis. The idea of sustainable development is dequately reflected by the model proposal of circular economy. The latter has been in focus of scientists, practitioners and decision makers for over a decade now and has been increasingly often included in formal institutions. The unique aspect of CE is its holistic approach, as it addresses all processes in a society (see Bonciu 2014, p. 85), at the same time offering practical solutions to the problems of the contemporary civilization caused by the natural barriers of economic growth. The critics of the concept argue however that circular economy is still not well defined and thus so far an ambiguous concept. Many of them point out that the term is mostly understood as an improved waste management. In our opinion such a narrow understanding can impair the concepts' advance because recycling, reuse or recovering may be possible only under some circumstances and not in other instances, such as green chemistry and biotechnology (due to the very high costs). Nevertheless, circular economy undeniably offers a huge potential to facilitate sustainability and to foster economic prosperity, at the same time reducing inputs of matter, materials and energy and minimizing environmental impacts.

However, it is important to remember that the conditions and the framework of a sustainable economy, including CE, are based on innovations, therefore need creative and innovative employees with high intellectual capital, new business models and green consumers. The complexity of the vision offered by both sustainable development and the circular economy makes their application dependent on pioneer scientific research and open collaboration with business environment in order to deliver radical innovations. Such endeavors will only be possible with a strong intellectual and financial support from the governments and industries. The idea will also require promotion in the society in order to induce and facilitate sustainable attitudes and green consumer preferences (Kirchherr 2017, pp. 221-232). Last but not least, by its very design the concept cannot be successfully realized within the framework of one economic actor, nor can it be fully implemented within one industry, region or economy (see Bonciu 2014, p. 86). Thus the success of circular economy will largely depend on the radical changes in the industrial practice, in politics and in the system of decision-making, and require a harmonious cooperation of all economic actors. Based on the above mentioned conclusions, we propose the following suggestions for the policy-makers. Circular economy as a management model in the paradigm of sustainable development can be successfully implemented via:

1. Strengthening social capital, a derivative of several assets (such as trust, customs and values, solidarity, cooperation etc.) that require investment in order to improve. This process needs to be driven mainly by the state and regional authorities but also by schools, corporate managers and NGOs. A more comprehensive description of the role these actors play in social capital development has been given by the authors in the publication Kapitał społeczny 2012 (see pp. 164-193).
2. Establishing a system of preferences for managing resources in a circular way, in order to weaken the competitive advantage of the linear management models.
3. Promoting cooperation between suppliers and receivers and manufacturers and consumers towards a collaborative sharing economy.
4. Establishing and executing regulations to protect the natural environment (e.g. water, air), recycling rates of various waste and product quality standards.

Summary

Circular Economy as a Management Model in the Paradigm of Sustainable Development

The following paper explores circular economy as a model of management within the framework of sustainable development. Its structure comprises 4 parts. The first part illustrates the role of sustainable development as an emerging paradigm in the theory of modern economics and in the recent policy of the European Union. In the second part, the authors demonstrate the applicability of sustainable development based on the relevant management models on the micro, meso and macro levels of economy. The third part discusses the concept of circular economy, in particular the various definitions of the phenomenon, its advantages over the linear economy, the role of innovations in its development and how to overcome barriers to its application. The fourth part outlines the current state of implementation of the circular economy in the EU in regard to its normative implications for the member countries. The conclusions close the exploration. The paper is theoretical, based on the review of the international literature on the subject. The unique contribution of the authors consists of the systematic analysis of the term circular economy as a holistic model of sustainable development and of illustrating the benefits of its promotion in the management practice.

Keywords: *Sustainable development, management models, circular economy.*

Streszczenie

Gospodarka cyrkularna jako model zarządzania w paradygmacie zrównoważonego rozwoju

Celem pracy jest zbadanie stanu wiedzy ~~przedstawienie modelu~~ o gospodarce cyrkularnej jako modelu zarządzania w ramach zrównoważonego rozwoju. Strukturę artykułu stanowią cztery jego części. W pierwszej opisano koncepcję zrównoważonego rozwoju jako wiodącego paradygmatu w teorii nauk ekonomicznych i polityce Unii Europejskiej. Stosowanie zasad takiego rozwoju w praktyce autorzy prezentują na różnych modelach na poziomie makro, mezo i mikro (cz.2). W części trzeciej ukazano koncepcje gospodarki cyrkularnej, ze szczególną uwagą na jej definicje, zalety w stosunku do gospodarki linearnej, rolę innowacji w jej rozwoju i sposoby pokonywania występujących ograniczeń w aplikacji tego modelu. W czwartej części krótko omówiono implementacje gospodarki cyrkularnej w Unii Europejskiej w związku z jej wpływem normatywnym na kraje członkowskie. W zakończeniu zawarto wnioski poznawcze. Praca ma charakter teoretyczny. Podstawą jej opracowania była literatura światowa. Nowatorski wkład autorów do istniejącej wiedzy wyraża się w podjętej próbie usystematyzowania pojęcia gospodarka cyrkularna jako holistyczny model zrównoważonego rozwoju i określeniu korzyści z jego upowszechnienia.

Słowa kluczowe: *Zrównoważony rozwój, modele, gospodarka cyrkularna.*

JEL Classification: Q 44, Q 56, Q 53

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