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The role of circular economy in handling global environmental and economic challenges

Abstract

The concept of Circular Economy (CE) is a crucial element in handling the most important global environmental and economic challenges of the 21st century. Circular economy can be considered as an alternative to traditional linear economic systems at global level. This research is performed along the following baseline question: is the model of circular economy an appropriate tool for rethinking economic growth, and enhancing sustainability by changing attitudes towards production and consumption patterns? The investigations are also about exploring the cases where the contemporary best practices of CE can be identified in a global context. The paper focuses on the the implementation of circularity in the industrial sector. The methodology is based on literature review, examination of case studies and qualitative research (interviews with stakeholders, NGOs and companies). The results of the research can be expected to be relevant at regional, national and global level too, as CE may play a significant role in creating new jobs, supporting social inclusion, and contribute to the catching-up processes of local communities, regions and less developed countries as well.

Keywords: *Circular economy, sustainability, economic growth, industrial production, industrial symbiosis*

I. Introduction

The concept of circular economy (CE) is a very important new paradigm of sustainable development, aiming at closing the loop of material and resource flows. The key elements of the model are resource-efficiency, low-carbon economy, sustainable waste management systems, production and consumption (TUKKER, 2015).

The model is aiming at supporting not only the environmental, but the economic and social dimensions of sustainability as well. Regarding environmental sustainability, CE may contribute to a higher level of resource efficiency, a lower amount of waste production and using more renewables. In terms of economic benefits, saving energy costs and creating new jobs are the most important aspects to mention. Circular economy might have a lot of social added value too, since it can enhance networking between many different actors involved, such as stakeholders, NGOs, companies, civil society etc. (KORHONEN et al., 2018).

Circular economy can be considered as an alternative to traditional linear economic systems at global level. There are a lot of examples from all over the world where the concept of CE appears not only in theory, but in policy-making processes and in practice as well. The European Union is moving very intensively towards CE, and so do many other countries, such

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as China, where circularity plays a crucial role in national (governmental) economic and environmental strategies (ELLEN MACARTHUR FOUNDATION, 2013).

II. Research questions

The research is performed along the following baseline question: is the model of circular economy an appropriate tool for rethinking economic growth and enhancing sustainability by changing attitudes towards production and consumption patterns? The investigations are primarily about exploring and analysing the cases where the contemporary best practices of CE can be identified in a global context. The research focuses on industrial production as one of the most relevant aspects of CE. Consequently, there are two further specific research questions to examine: How can industrial sustainability be interpreted in the light of the circular economic model? How can CE be applied in the practice of industrial production?

III. Methodology

The methodology is based on literature review, examination of case studies and qualitative research (interviews with stakeholders, NGOs and companies). The literature review focuses on the most recent and relevant sources which give a complex, multidisciplinary, general overview of the research topic. Some of the reviewed literature presents case studies from different parts of the world which are especially important to analyse international best practices and policies. The empirical part of the research includes qualtitative interviews with stakeholders, NGOs and industrial companies which are potentially interested in and effected by the concept of CE. These interviews contribute both to a deep case study analysis and to the better understanding of the policy context of the examined topic.

This research is linked to a research and development project dealing with the smart specialization opportunities of a Hungarian region, Central Transdanubia[2]. Within the framework of this project, Székesfehérvár, one of the biggest industrial centres of Hungary has been examined and evaluated through qualitative interviews conducted with local companies from different industrial parks.

[2] EFOP 3.6.1 Research Into Networks Providing Public Services and Producing Policies: The role of industrial parks and circular economy in sustainable municipal development – The case study of Székesfehérvár (HU).

IV. CE and industrial sustainability

The connections between the concept of circular economy and the practice of sustainable industrial production can be examined through the operation of industrial parks in different parts of the world. Industrial parks have gone through a rapid evolution since their first appearance a few decades ago. This evolution does not only include the development of technology, but a very conscious economic, environmental and spatial planning as well. Since the 1990s, the number of the so-called eco-industrial parks is increasing worldwide. These institutions are based on new, innovative solutions, and contribute to the renewal of traditional industrial sectors. The eco-parks are appropriate tools for creating high value added in environmental, economic and social terms as well, paying special attention to the protection of natural resources and ecosystems. That is why it can be stated that eco-industrial parks include the key elements and aims of the model of circular economy (CONTICELLI et al., 2014).

When examining eco-industrial parks, the concept of industrial symbiosis (IS) must necessarily be taken into consideration. The essence of IS is a sustainable, resource-and cost-efficient industrial production through creating synergies between economic, governmental and civil actors, in order to support sustainability (CHERTOW, 2000).

V. Case studies and best practices

As mentioned in the *Abstract* and the *Methodology* part of this paper, numerous case studies and policies have been analysed during the research. Best practices e.g. from the Scandinavian countries, the UK, the United States and China have totally different characteristics, but all of these show a kind of progressive and innovative point of view: making the production 'smarter', more efficient, more environmentally friendly, and utilizing the potential synergies and positive externalities of CE and IS. The main difference between the examined case studies is whether the projects are based on a top-down or rather a bottom-up principle. The Chinese practice is a typical example for the top-down approach, since CE is a focal point of the country's national (governmental) economic and environmental strategies and industrial development programs (QI et al., 2016).

Such initiatives are not unknown in Hungary either, since the country managed the National Industrial Symbiosis Program between 2010 and 2012. The Hungarian NISP completely adopted the model which was born in the UK in 2005 (LAYBURN, 2016). The project connected and created synergies between Hungarian industrial companies, contributed

to new partnerships, supported industrial symbiosis and sustainable resource and waste management (BRÁNYI, 2012).

In order to get familiar with the future opportunities of circular economic models in the Hungarian industry, and to see its position in a global context, Székesfehérvár, one of the country's most prosperous industrial centres has been examined as a very detailed case study.

V.1. The case study of Székesfehérvár (HU)

The aim of the qualitative research in Székesfehérvár was to examine whether there are some already existing progressive and sustainable production patterns or best practices in the city, and what are the possible scenarios of developing an eco-conscious industrial center to enhance the competitiveness of Székesfehérvár. The interviews concentrated on the management of the companies in Székesfehérvár's industrial parks. The questions were aimed at measuring the interest and involvement in CE and sustainable industrial production, examining attitudes towards the development of industrial ecosystems and the possible cooperation networks with other companies and the local government. The research studied the concept of sustainability from the point of view of Székesfehérvár's industrial companies. Environmental sustainability was considered to be important: all of the examined companies found circularity and 'closing the loop' relevant, but in very different ways – a high variegation of practices could be detected. The firms were primarily concentrating on resource and waste management: recycling and reusing material and waste; finding optimal solutions and closing the loop of material flows – but only within the company's own production structure and supply chain.

Cooperation and common future planning between the companies already exist, but mainly in an ad-hoc form. Informal sharing of knowledge and experience is very important in the field of environment protection and sustainability as well. The institutionalization of platforms of joint actions is in a very early (immature) phase, but the need and intention appears at many enterprises. Industrial symbiosis and eco-projects are absolutely marginal for now, but there is a theoretical willingness of moving towards such a development – mainly depending on cost-benefit analysis and financial rationality. The interviews did not identify explicit rejection of the concept of CE and industrial symbiosis. It turned out from the answers that the attitude most of all depends on two factors: the ownership (100 % Hungarian or foreign) and the size of the company. The bigger the company is, the more attention is paid to making the production sustainable. Another important research output is that the environmental

responsibility is much more stressed in the case of multinational companies, because they can get the know-how from the parent company – mainly from Western Europe.

VI. Conclusions

The research results so far confirm that the model of CE and its industrial dimension might be a determining trend of the future's development policy. Initiatives to achieve a more sustainable industrial production could create a dense cooperation network between the public and the private sector, and open up new perspectives of resource-efficiency and environment protection. It seems to be even more obvious that making the economy circular and adopting symbiotic models will play a decisive role in which regions or countries will be able to rise and catch up to the most developed ones in the following years. The crucial point is to have favorable regulation, financial resources, technology and institutionalized cooperation which can support the spread of CE. This will definitely influence the global competition between the three 'great players' (the EU, China and the USA), and the sustainability and competitiveness of the Hungarian economy as well.

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