THE ROAD TO THE CIRCULAR ECONOMY: SOME EXPERIENCES FROM CHINA AND THE EUROPEAN UNION

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ABSTRACT

In this article, we review the circular economy as a global economic model for reducing the consumption of limited resources, providing an approach to deal with it and moving towards a more economically, socially and environmentally sustainable world. Europe is considered through the "Roadmap to a Resource-Efficient Europe", framed in the European Commission's Europe 2020 the only region in the world that has a roadmap on its table to start applying specific standards and rules to the circular economy. China has successfully applied a "top-down" approach to the development of the circular economy. Among China's future plans for the development of the circular economy, we find "Project Lead CE" for the period 2016-2020 under the 13th Five-Year plan (2016–2020) :National Economic and Social Development", which seeks to achieve quantitative and compulsory targets related to resource conservation and pollution control.

KEY WORDS : Circular Economy, China, European Union.

JEL CLASSIFICATION: Q01 ; Q5.

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LA ROUTE VERS L'ÉCONOMIE CIRCULAIRE: QUELQUES EXPÉRIENCES DE LA CHINE ET DE L'UNION EUROPÉENNE

RÉSUMÉ

Dans cet article, nous examinons l'économie circulaire en tant que modèle économique mondial visant à réduire la consommation de ressources limitées, en fournissant une approche permettant de les gérer et en évoluant vers une économie plus durable sur le plan économique, social et environnemental. à travers la "feuille de route pour une Europe préservant les ressources», élaborée dans le cadre de la stratégie européenne 2020 de la commission européenne, l'Europe est considérée comme étant la seule région au monde qui dispose déjà d'une feuille de route pour appliquer les critères et règles spécifiques de l'économie circulaire. La Chine a appliqué avec succès une approche "top-down" au développement de l'économie circulaire. Parmi les projets futurs de la Chine pour le développement de l'économie circulaire, nous avons le "Project Lead CE" pour la période 2016-2020 du treizième plan quinquennal "Plan national de Développement Economique et Social", qui cherche à atteindre des objectifs quantitatifs obligatoires liés à la conservation des ressources et au contrôle de la pollution.

MOTS CLÉS : Economie Circulaire, Chine, Union européenne.

CLASSIFICATION JEL : Q01 ; Q5.

الطريق إلى الاقتصاد الدائري:
بعض التجارب المستفادة من الصين والاتحاد الأوروبي

ملخص

في هذا المقال استعرضنا الاقتصاد الدائري كنموذج اقتصادي عالمي لتقليل استهلاك الموارد المحدودة، حيث يوفر نهجاً للتعامل معها، والتحرك نحو عالم أكثر استدامة اقتصاديا، اجتماعيا وبيئيا. تعتبر أوروبا من خلال "خارطة الطريق إلى أوروبا الموفرة للموارد" ، والتي وضعت في إطار إستراتيجية أوروبا 2020 للمفوضية الأوروبية، المنطقة الوحيدة في العالم التي لديها بالفعل خريطة طريق على طاولتها للبدء في تطبيق معايير وقواعد محددة للاقتصاد الدائري. نجحت الصين في تطبيق نهج "من أعلى إلى أسفل" في تطوير الاقتصاد الدائري، ومن بين خطط الصين المستقبلية في تطوير الاقتصاد الدائري، نجد "Project Lead CE" للفترة 2016-2020 المندرج ضمن الخطة الخمسية الثالثة عشرة "الخطة الوطنية للتنمية الاقتصادية والاجتماعية"، والذي يسعى إلى تحقيق أهداف كمية إجبارية، تتعلق بالحفاظ على الموارد ومكافحة التلوث.

كلمات مفتاحية :الاقتصاد الدائري، الصين، الإتحاد الأوربي.

تصنيف جال:Q5 ; Q01.

INTRODUCTION

Companies must take into account both their own growth and environmental protection; Chen, Wang & Tan (2019) pointed out that sustainable production can be achieved by the enhancement of product quality, which has the added benefit of increasing product value and industry competitiveness. Increasing process quality lowers scrap and rework rates, lengthens product life span, and reduces product maintenance, which can in turn reduce environmental pollution. (Lin and all, 2019)

In the 1970s, the topic of the finite available natural resources came high to become an important issue or gained an increasing importance. This was mainly under the influence of the reports and models of the Club of Rome published under the alarming title "Limits to Growth" and the 1973 oil crisis. A movement started that advocated reduced energy consumption and the use of less and cleaner materials. More recently, the idea that in sustainable production products are recycled has become particularly known through the book by Braungart & McDonough (2002) "remaking the way we make things". One may observe that even previous studies published by Stahel (1982) and Kristinsson & all, (2001) followed this line of reasoning, nowadays known as the cradle-to-cradle (C2C) approach. (Ploeger & all, 2019)

In recent years, the traditional economic model of "make-use-dispose", which had proven to be an effective and widely acceptable approach of doing business , has been put in question for various reasons . Whether that is becoming aware of the environmental impact of a firm's activities, having to adhere to the environmental legislation or having to adjust to issues regarding the scarcity of resources, a need for a different economic model has been presented since the early 2000s. One approach that appears to effectively provide solutions for these issues is the circular economy. (Liakos & all, 2019)

Ripanti & Tjahjono (2019) noted that the idea of CE was coined by Boulding (1966) who expressed it as a "cyclical ecological system

which is capable of continuous reproduction of material form even though it cannot escape having inputs of energy". The circular economy (CE) is defined as a global economic model to minimise the consumption of finite resources, which focuses on the intelligent design of materials, product and systems . It also supports separating treatment between technical and biological materials to maximise the design for reuse, to return to the biosphere and retain value through innovations across fields. Transitioning from the linear to a CE not only requires a fine-tuning that reduces the negative impacts of the linear economy, but also a whole system approach that builds upon a number of guiding principles. These principles allow resilience to be built into the CE system, ensuring the long-term generation of economic opportunities and at the same time offering societal and environmental benefits.

The concept of circular economy has emerged in recent years in response to the need to decouple economic growth from the consumption of environmental resources and impacts. Since the end of the industrial revolution, it has become clear that linear production processes can deplete reserves of finite resources in addition to overloading landfills and incinerators. This has led to strategic commitments to sustainability for many organizations. To maximize the efficiency of resources, circular economy represents an alternative to current economic models focused on extraction and use. (Pinheiro & all, 2019)

As stated by Liakos & all (2019) The Circular Economy is a term that first appeared in the last decade of the twentieth century, as an alternative to the traditional economic model and it is based on the basic principles of the laws of thermodynamics. However, the term remained in obscurity until it was first implemented by the Chinese Government in the wake of the twenty-first century, through an initiative called the "Circular Economy Promotion Law of the People's Republic of China". The positive results of that implementation piqued the interest of manufacturing firms worldwide as well as governing bodies in the European continent. Having seen the vast improvements that were achieved in the Chinese landscape and

realizing the opportunity behind the concept of Circular Economy, European officials decided to adopt the circular as an approach that needed to be promoted, as an alternative to the unsustainable current economic model. Since then, a significant number of firms have started to look into Circular Economy and have attempted (and succeeded) to take advantage of the opportunities that it offers.

Within the view of EMF (2019a), in a circular economy, economic activity builds and rebuilds overall system health. The concept recognizes the importance of the economy needing to work effectively at all scales – for large and small businesses, for organizations and individuals, globally and locally. Transitioning to a circular economy is not only confined to adjustments aimed at reducing the negative impacts of the linear economy. It would rather represent a systemic shift that builds long-term resilience, generates business and economic opportunities, and provides environmental and societal benefits.

Through this article we will try to identify the concept of the circular economy and its most important principles, and we will try to highlight the most important opportunities offered by, and as well as the barriers what are the barriers that can limit the adoption of its endeavor.

Also, by tracking the experiences of some countries in the transition towards a circular economy, we tried to answer the following question:

What are the most important guidelines outlined by (China) and (European Union and within some of its countries) in their path towards the circular economy?

In order to demystify concepts related to the circular economy, we will work thorough *extensive review* of the literature from original research and studies, focusing on what is published in authentic, discreet and specialized journals. We will use the *case study approach* to show and review an important aspect of experiences from China and the European Union.

1. CIRCULAR ECONOMICS: DEFINITION, PRINCIPLES AND PILLARS

1.1- Definition of the Circular Economy

McCarthy & all (2018) said that there is no single accepted definition of a circular economy. The precise meaning of a "transition to a circular economy" varies across the current literature, but tends to involve reduced demand for certain natural resources, and the materials that are derived from them. The resources usually emphasized are minerals (both metallic and nonmetallic), fossil fuels, and various biotic resources such as forestry, fish, or other biomass. Relatively little attention tends to be given to other resources: land and water are the most obvious examples.

Several definitions have appeared over the last ten years concerning the concept of circular economy. Among these definitions, the concept of circular economy as an economic system, based on business models, which seeks to replace the "end-of-life" idea through a change of paradigm in the way that society lives and interrelates with nature is common sense. (Machado & all, 2019)

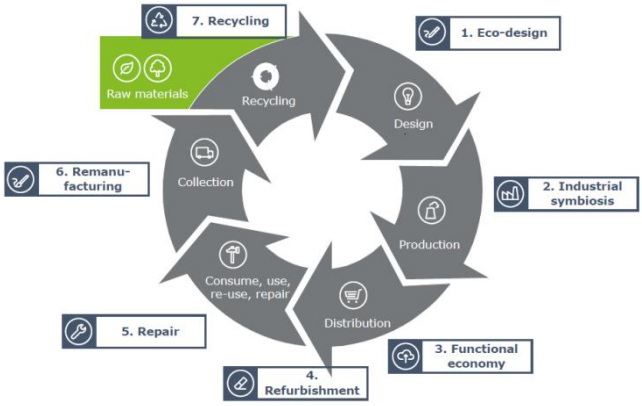
Through what was referred to by Guiu Segur & all (2019) the concept of circular economy offers a way to move towards an economy in which what is regarded as waste today can re-enter the economic cycle as a resource. Circular economy acknowledges the constraints on natural resources, and offers an approach to cope with them and move towards a more economically, socially and environmentally sustainable world.

There is no single shared definition of circular economy. See Kirchherr & all (2017) for a recent review of 114 circular economy definitions. Based on their review, they recommend the definition by van Buren & all (2016): "Reducing the consumption of raw materials, designing products in such a manner that they can easily be taken apart and reused after use (eco-design), prolonging the lifespan of products through maintenance and repair, and the use of recyclables in products and recovering raw materials from waste flows. A circular economy aims at creating an economic value (the economic value of materials or products increases), the creation of social value

(minimization of social value destruction throughout the entire system, such as the prevention of unhealthy working conditions in the extraction of raw materials and reuse) as well as value creation in terms of the environment (resilience of natural resources)". (Ziegler, 2019)

Ivanova & Slavova (2019) emphasized that the essence of circular economy lies in the aggregation of different production methods and practices, hierarchically arranged depending on their impact and aiming to optimize consumption of raw materials and energy .According to the UN definition "circular economy is a system of production, exchange and sharing enabling social progress, the preservation of natural capital and sustainable economic development" According to the definition provided by the Environment and Energy Management Agency "circular economy is an economic system for exchange and production which, at all stages of the product life cycle (goods and services), aims to increase the efficiency of resource use and reduce the impact on the environment, while enabling people to live well" .

Figure 1. The concept of circular economy



Source: (NCEB, 2018)

However, the three thematic categories normally used to organize the literature of circular economy review include:

- policy instruments and approaches;
- value chains, material flows and product-specific applications;
- technological, organizational and social innovation .

1.2- Pillars of The circular economy

Gorini & all (2019), indicated that the circular economy model is based on five essential pillars:

1.2.1. Design out waste:

Within a circular economy perspective, waste does not exist; it is intentionally 'designed out'. Indeed, biological and technical nutrients are designed to fit within cycles. Biological nutrients are non-toxic and can be given back to the soil by anaerobic digestion or composting; technical nutrients, including polymers and alloys, can be recovered and reused by maximizing the preservation of value and reducing to a minimum the energy input.

1.2.2. Build strength through diversity:

Diversity is considered to be the driving force for creating resilience, versatility and strength. It means that different scales of business are essential to let economies be successful in the medium and long run. If a crisis occurs, the larger firms offer efficiency and volume, whereas the smaller ones provide alternative models.

1.2.3. Rely on energy from renewable sources:

In order to raise systems resilience and minimize dependence on resources, the circular economy has to be fuelled by renewable energy.

1.2.4. Wholistic systems:

On the waves of the globalization dynamics, this principle refers to the ability to understand both the importance of the relationship between a whole and the parts, and the mutual influence of parts

within a whole. An effective transition towards circular economy has to consider these influences and connections.

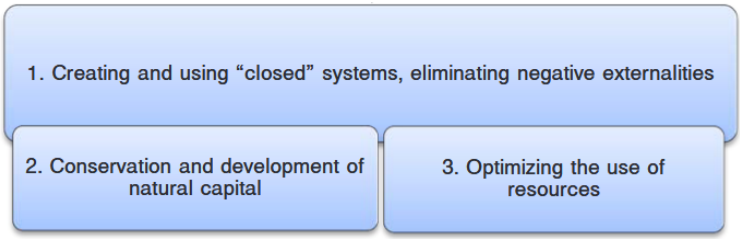
1.2.5. Waste is food:

Waste no longer exist since it can be turned into food, both on the biological and technical nutrient side. At the biological nutrient level, the core of the concept is that materials and products can be reintroduced back to the biosphere by means of restorative and non-toxic loops. In technical nutrient terms, this so-called upcycling allows enhancements in quality.

1.3- Circular economy principles

In order to meet modern economic challenges related, on the one hand, to scarce, finite and increasingly expensive resources, and to environmental needs, on the other, circular economy is based on three fundamental principles. They are summarized in following Figure:

Figure 2. Principles of Circular Economy



Source: (Ivanova & Slavova, 2019)

Implementing each of these principles leads to economical, responsible and efficient resource use. Preservation and development of natural capital is carried out by controlling finite stocks and balancing renewable resource flows. The focus is on dematerializing utility whenever possible and careful selection and promotion of technological processes enabling renewability of resources with the highest possible efficiency. In the circular economy model of natural capital, suitable conditions are created for regeneration and recovery of ecosystems. (Ivanova & Slavova, 2019)

2. CIRCULAR ECONOMICS BETWEEN OPPORTUNITIES AND BARRIERS

2.1. Opportunities of circular economy

Circular economy offers a variety of societal opportunities. It strengthens the connection between the society and industry companies can understand the needs and expectations of the public in a better way and manufacture products accordingly. In turn, they can satisfy their customers and attract many others. (Kumar, 2019)

For Kumar V., & all. (2019), the implementation of circular economy has the potential to create many employment opportunities to local communities. The development of recovery firms also bring investments and create many job opportunities to local people. circular economy also paves the way for the improvement of public health and environmental awareness.

Politically, circular economy enables companies to operate in accordance with regulations , it helps to create an organizational legitimacy and improve companies' environmental consciousness. Therefore, they are able to obey the requirements of laws and decrease the social pressure. circular economy helps also companies to save money and enhance their profitability. It enables to reduce the costs through sustainable supply chain and end-of-life managements, lower input prices and minimize environmental penalties and waste generation. (Kumar & all, 2019)

By the developments in environmental sciences and technologies, new concepts that aim at protecting nature have emerged, namely eco-design, eco-label, cleaner production and life cycle assessment. As a result, the amounts of environmentally friendly and green products, which have minimum negative effects on environment, have become more common and preferred. Those products save energy and natural resources and reduce pollution generation. (Kumar& all, 2019)

2.2. Barriers for circular economy

Agyemang & all, (2019) notes that over the past few years, research on the circular economy has gained considerable attention among practitioners, and academia. Literature has identified and discussed barriers to circular economy:

- lack of design tools for circular business models and for circular products
- current infrastructure does not support circular offerings, i.e., locked-in infrastructure:
- barriers related to value chain covering: existing supply chain dependencies and relationships prevent circularity ;
- OEMs may risk damaging relationships with their retailers and dealers by offering repair or refurbishment ;
- component producers and other non-OEMs may have limited or unclear opportunities to adopt circular business models because of their position in the value chain ;
- barriers related to finance, coercive, customer related, organizational strategies and capabilities, and technical issues
- in terms of lever are categorized barriers "general framework," "design and production," "consumption," "recycling and recovery," and "logistics."

Conceptualizing earth as a 'spaceship' that enables us to survive in a hostile universe was a powerful image that reframed the debate about resource use and the urgency of sustainable, rather than just maximum, development. Like few other images, this view reminded us of the scarcity of our inhabitable environment, and the need to make sensible and long-term choices within that constraint. The transition to a circular economy will require many changes and economic ideas and instruments are important components that can be used to assist in that process of change. Exactly how disruptive that change may prove to be is still unclear. Humans have a great capacity for change and adaptation. The race to create a circular economy and

so improve our ability to create an environment in which we can sustain both ourselves and our planet is still being run. (Shanahan, 2018)

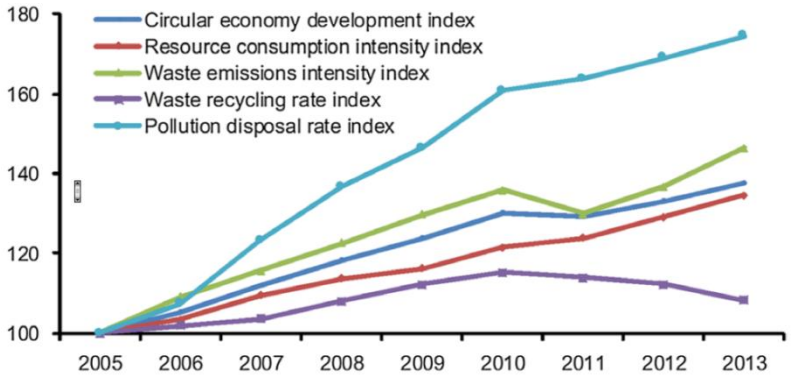
30 SOME GLOBAL EXPERIENCES OF CIRCULAR ECONOMY ADOPTION

3.1. China

Circular Economy is a relatively new development paradigm for China, potentially allowing China to "leapfrog" into a more sustainable economic development model. Positioned as a sustainability strategy, Circular Economy is being promoted by governments at all levels in China. Some initiatives of China's Circular Economy practice have been investigated by researchers. These initiatives encompass the implementation of Circular Economy at the individual firm level, industrial park level and city, province or state level. These initiatives have been supported by demonstration projects, formulation and promulgation of laws, and establishment of relevant organizations. The Circular Economy Promotion Law of China was issued by the Chinese government and went into effect in January 2009. 20. The central government also launched a large number of demonstration projects nationwide. Interestingly some symbiosis projects had already been in place and successfully demonstrating Circular Economy concepts, such as the Guitang Group and the Hai Hua Group . In January 2013, the State Council issued "the Development Strategy and Recent Action Plan for the Circular Economy". This is the first national Circular Economy development strategy and plan. Issuing this plan suggests that the Chinese government is keen to promote the expansion of Circular Economy development to more sectors and a larger geographic area. The government also strongly supports the establishment of organizations related to Circular Economy. In 2013, the China Association of Circular Economy (CACE) was established. As a non-profit organization, it is positioned as a platform for implementing Circular Economy across country. Its purpose is to provide services for government and business sector in the development of Circular Economy. (Liu& all, 2017)

From 2011 to 2015, energy consumptions reducing rates per ten thousand yuan GDP increased from 2.0 to 5.6%, and the clean energy consumption rates to the total energy consumption rose from 13.0 to 17.9%. National Bureau of Statistics of the People's Republic of China firstly released the circular economy development index of China. This index took 2005 as the base year (the index in 2005 equals to 100), and reached 137.6 in 2013 with an average annual increase of 4%, which indicated a reasonable implementation of circular economy development in China. (Liu& all, 2017)

Figure N° 3. Circular economy development index in China from 2005 to 2013



Source: (Liu, Liang, Song, & Li, 2017)

In its 11th and 12th Five-Year plans, China, facing increasingly serious resource challenges and environmental threats, has adopted CE as a new development model that helps China leapfrog into a more sustainable economic structure. China has successfully deployed a 'top-down' approach in developing CE, leveraging an array of financial, legal, administrative and institutional measures to do so. With China moving into the 'new normal' of economic growth and building ecological civilization, CE continues to act as a major strategy for the development of China's economy and society. While setting a prospective target for GDP growth (averagely 6.5% per year), the 13th Five-Year plan (2016–2020) National Economic and Social

Development Plan set quantitative and compulsory targets in resource conservation and pollution control. among China's future plans in CE development, we find 'Project Lead CE' for 2016–2020, which is aimed at fulfilling the above compulsory targets.(Zhao, 2018)

Zhao (2018) points out that the project defines the details of the following tasks:

- constructing a circular industrial system;
- improving circular urban development models;
- strengthening the resource recycling industry;
- enhancing institutional supply;
- stimulating new momentum in circular development;
- implementing major special operations.

By 2020, the project aims to fulfil a 15% increase in the output of resources compared to 2015, a 73% comprehensive utilisation rate for industrial solid waste, an 85% comprehensive utilisation rate for crop straw, CNY 3 trillion in output value from the resource recycling industry, 75% of national industry parks, and 50% of provincial industry parks carrying out recycling transformation and 100 resource recycling demonstration bases in cities of prefecture level and above..(Zhao, 2018)

3.2. European Union

Europe is now the only region in the world that already has a roadmap on its table to start applying specific criteria and rules of the circular economy. The European Commission stresses that the circular economy will boost the European Union's (EU) competitiveness by protecting businesses against resource scarcity and price volatility. In this case, environmental protection, human health, innovation, and improved competitiveness are embraced to define what the European economy is expected to look like in the coming decades. The EU also points out that this new way of consuming and producing creates new business opportunities and locally appropriate jobs with different

skills levels and, thus, generates opportunities for integration and social cohesion. (Garcia-Muiña & all. 2019)

To promote this new paradigm, the EU has launched various initiatives to address, in an integrated manner, some of the major challenges arising from the environmental and competitiveness problems of European industry. The "Roadmap to a Resource-Efficient Europe", framed in the European Commission's Europe 2020 Strategy, establishes actions to stimulate the market for secondary materials and the demand for recycled materials by offering economic incentives and developing criteria to determine when waste ceases to be wasted . On the other hand, the Union's Seventh General Action Program for the Environment 2013–2020 sets as its second priority the objective to turn the Union into a low-carbon , resource-efficient, ecological, and competitive economy, capable of mitigating climate change . The other major European initiative is called "An Integrated Industrial Policy for the Globalization Era". It establishes six priority lines of action, among which is a sustainable industrial, construction, and raw materials policy that promotes, among others, the development of stable recycling markets and systems for extended producer responsibility, as a means of moving towards a circular economy. (Garcia-Muiña & all. 2019)

Tableau N° 1 (Circular use leaders, Circular outsiders & Emerging circular) Countries in 2016

Circular use leaders	Circular outsiders	Emerging circular countries, 2016
Netherlands	Greece	Ireland
Italy	Romania	Czech Republic
France		Croatia
Belgium		Latvia
United Kingdom	Estonia	Malta
Spain		Poland
Luxembourg		Portugal
Germany		Slovenia

Source: (Krysovatyy, & all. 2018)

The highest level of household waste recycling was recorded in Germany, followed by Belgium, Denmark, France, Italy, Slovenia, Sweden, and Montenegro . In 2016, the largest gap of increasing levels of recirculation was typical for Lithuania, Bulgaria, Czech Republic, Luxembourg, and Poland. It's important to note that Germany has the best recycling standards in the world. Austria ranks second, followed by South Korea and Wales. All four countries managed to recycle from 52 to 56% of their total municipal waste. Switzerland, in the fifth place, processes almost half of their municipal waste. (Krysovatyy & all. 2018)

3.2.1. Poland

The Polish Ministry of Development started to work on the implementation of circular economy principles within the national economy in 2016. An Interdepartmental Circular Economy Group has been established to propose actions aimed at introducing a circular economy under the Polish roadmap 'Transformation towards a circular economy'. The group was divided into four thematic sub-groups focused on waste, bio-economy, business models and soft actions (education and promotion), which consist of industrial and socio-economic partners from all parts of the Quadruple Helix, i.e. government, academia and research units, industry, NGOs and citizens. The objective of the group is to identify opportunities, threats, strengths and weaknesses in the context of the transition towards a circular economy, develop a position with regard to the EU initiatives related to the transition towards a circular economy and develop the Polish roadmap for the implementation of a circular economy. As a result of the reconstruction of the Polish government, from 1st January 2018, the tasks related to the circular economy were taken over by the newly established Ministry of Entrepreneurship and Technology, which currently is working on a national action plan for a circular economy. (Smol, 2018).

It should also be noted that the management of raw materials (RMs) is one of the main tasks of the Ministry of Environment. Currently, one of the most important projects related to RMs in

Poland is the State Raw Materials Policy, which is the result of the work of the Ministry of Environment with the support of the representatives of all other ministries, business entities, etc., in particular those that form part of the Interdepartmental Group for the State Raw Materials Policy, scientific institutions and citizens. The development of the State Raw Materials Policy is based on nine pillars: (Smol, 2018).

- the demand of the domestic economy for mineral raw materials;
- obtaining RMs from mineral deposits and the terrestrial heat ;
- the acquisition of RMs from waste, their substitutes and reclamation and remediation;
- obtaining scarce mineral resources by import and international cooperation;
- the legal conditions of the State's Raw Materials Policy;
- dissemination of knowledge about geology, mining an mineral resources;
- the institutional framework for the development an implementation of the State's Raw Materials Policy;
- risk and investment planning;

improving the tax system and taxes.

3.2.2. Netherlands

The government has selected 5 economic sectors and value chains to be the first to switch to a circular economy. These 5 priorities are important to the Dutch economy and have a big impact on the environment. Much is already being done in these sectors to move towards a circular economy, both in the Netherlands and in Europe. The 5 economic sectors are: (Government of the Netherlands , 2015)

- biomass and food;
- plastics;

- manufacturing industry;
- construction sector;
- consumer goods.

When it comes to the circular economy, the future began some time ago. There is already a solid foundation for it in the Netherlands. The Government-wide programme is working on a programme called From Waste to Raw Material (Van Afval Naar Grondstof - VANG) and the Biomass Vision 2030 (Visie Biomassa 20306).Netherlands have a Value Chain Agreement for Plastic Recycling (Ketenakkoord Kunststof Kringloop7), the Green Deal Sustainable Concrete Chain (Green Deal Verduurzaming Betonketen) has been completed, and substantially less non-recyclable residual waste is taken to the waste incineration plants. Through the Green Deal approach, thousands of homes and companies have become more energy- efficient, and transport has become cleaner. The recycling of plastic packaging has nearly doubled in six years. The Dutch clothing brand G-Star Raw has been using recycled materials to make denim since 2008. In 2014, 82% of paper and cardboard was recycled and 94% of metal was recycled, well above the European and national targets. Furthermore, many municipalities are actively engaged in the "100-100-100"[1] project, which has achieved a spectacular reduction in waste. (A circular economy in the Netherlands by 2050, 2015)

[1] The 100-100-100 project is an idea from the waste processing company ROVA. Will 100 households manage to live 100 days, 100% without waste? In this successful project, residents show that it is possible to produce much less waste. This is achieved by separating good waste and considering the purchase of products. 100-100-100 offers an online platform where participants do a weekly assignment that helps them in the challenge of a waste-free life. They fill in the residual waste that they still have on the waste meter on the website. Previous results show that participants from 100-100-100 remain well below the national average. Sometimes up to almost 90% less kg of residual waste per person per year. (www.100-100-100.nl)

3.2.3. Germany

The new German Closed Cycle Management Act (Verpack) in 1991 is aimed to turn the waste management into a resource management. The responsibility for packaging materials was already enforced in this Act. (Nelles M & all 2016)

A step in Germany's policy towards the transition to the circular economic model is the declaration in 2002 in the sustainable development strategy of the need to differentiate the efforts to realize economic growth from the increase in the use of resources. The German government has set the ambitious goal of doubling the productivity of the raw materials used in the various industries between 1994 and 2020. The goal set forced Germany to initiate detailed work on identifying the specific parameters to help it materialize. First of all, serious analytical work is underway on identifying the potential of resource efficiency in the various industries. The analysis carried out on what measures should be taken to actually use this potential. Thirdly, the possible micro- and macroeconomic effects of these measures are explored in detail. To this end, a comprehensive program for the study of these issues was set up in 2007, with 31 organizations under the leadership of the Wuppertal Institute (Zhelyazkova, 2018) . There are four guiding principles in the program: (Zhelyazkova, 2018)

- Reconciliation of environmental imperatives with economic opportunities, support for innovation and social responsibility;
- Integrating the global dimension into resource-efficient policy, taking into account the influence that this policy of Germany will have on the rest of the world (a feature that is also observed in Dutch policies);
- Accelerating efforts in Germany to increasingly use less raw material dependence at the expense of developing closed-loop management in different production areas;

- Ensuring the sustainable use of natural resources in the long run and the orientation of the whole society towards the quality of growth.

Since June 2005, it is no longer permitted to landfill organic waste without prior treatment. Around 70 waste incineration facilities with a capacity of 20 million tons are available in Germany for the treatment of residual waste. Moreover, 4.6 million tonnes in incineration capacities are available in 30 refuse-derived fuel power plants. For the mechanic biological treatment of waste, 44 facilities with a capacity of around 5.5 million tonnes are available. Today, 14 per cent of the raw materials used by the German industry are recovered waste. Modern closed cycle management contributes, with a share of approximately 20 per cent, to achieve the German Kyoto targets on the reduction of greenhouse gas emission. (Nelles & all, 2016)

Many German companies are already taking measures to minimize their resource consumption. In addition, material consumption constitutes a considerable cost factor. In order to safeguard the future supply of raw materials, the German economy faces the challenge of dealing sparingly with available resources. To counter the overconsumption of valuable resources, there are two significant approaches available to businesses: (Neligan, 2018)

- Using less material: increasing resource efficiency and preventing waste through the better eco-design of products;
- Using resources more than once: increasing the use of secondary raw materials via improved re-use and recyclability (circular economy).

The increasing digital networking in complex industrial production and processes also raises high expectations in terms of more resource-efficient productions methods. The growing intertwining of modern information and communications technologies with traditional industrial processes offers new potential for both the thriftier and more efficient use and re-use (i.e. recycling)

of resources. In addition, new business fields can be opened, for example the sale of a service instead of a product. (Neligan, 2018)

Germany is among the EU among the first to adopt the circular economy at the earliest. What is special is that this country is highly export-oriented, its industry consumes huge quantities of raw materials and produces output for markets around the world. In order to compete on the world market, Germangoods must be produced with the most efficient use of resources. This, to a certain extent, naturally requires the need to work hard to study resource efficiency, search for funds to be continually upgraded, to stimulate various innovations to support this process, and last but not least – the cultivation of the corresponding awareness in society that supports these efforts.(Zhelyazkova, 2018)

CONCLUSION

The transition to a circular economy requires changes in many aspects of the economy and society, such as value chains, product design, new business models and new ways to transform waste into a resource, into new patterns of consumer behavior, financing methods and legislation.

The Europe 2020 Strategy emphasizes the objectives of the Sustainable Development Policy and focuses on the efficiency of resources and the competitiveness of the European Union. In the end of 2015, the European Commission adopted a circular economy package, which appears to be a crucial turning point for the subsequent implementation of the concept of ecodesign in various sectors of the economy and would contribute to the "closing cycle" of the cycles of product life cycles through recycling and re-use. The European Union Circular Economy Action Plan sets out concrete objectives and actions for waste management and resource efficiency by 2030.

In general, the countries with the highest levels of circular economy - Germany, the United Kingdom and France, respectively - have strong recycling systems and high levels of innovation in the

manufacturing sectors and the circular economy. Bigger countries also tend to have higher circular economic degrees, due in part to the fact that they have larger economies with more private investment and patents.

China has changed the form of economic development to minimize its negative impact on resources and the environment. Successful circular economy practices in China are diverse in sectors such as agriculture, iron and steel, cement, coal-fired power generation, chemistry, and paper manufacturing through how to recycle environmental waste and optimize its economic benefits.

In the industrial sector, China will seek to promote the economical use of resources including energy, water and land as well as waste exchange. It is building a circular farming system aimed at enhancing resource conservation, clean production and waste re-use in order to improve the rural environment and raise farm efficiency. It will also improve the system of recycling renewable energy resources and waste, and will seek to advance green concepts in architecture and transportation.

As some of the core recommendations , we suggest the following:

- To make the circular economy a priority;
- To create a national circular economic roadmap with specific objectives;
- Supporting SMEs and companies in the implementation of circular models at local, regional and national levels is a major step in the transition to a circular economy
- The launch of a green agreement on circular purchases makes it possible to quickly follow the development of the circular economy.

Bibliographical references

A Circular Economy in the Netherlands by 2050, (2016), Ministry of infrastructure and the environment and the Ministry of Economic Affairs, also on behalf of the Ministry of Foreign Aff airs and the Ministry of the Interior and Kingdom Relations, Netherlands 2016, Retrieved from:

https://www.government.nl/documents/policy-notes/2016/09/14/a-circular-economy-in-the-netherlands-by-2050

Agyemang M., Kusi-Sarpong S., Khan S., Mani V., Rehman S. and **Kusi-Sarpong H., (2019)**, "Drivers and barriers to circular economy implementation", *Management Decision*, 57 (4), 971-994.

EMF (2019a), "Circular economy overview", Ellen MacArthur Foundation, available at: *www.ellenmacarthurfoundation.org* or *www.ellenmacarthurfoundation.org/circular-economy/overview/principles (accessed 9-10-2019).*

EMF (2019b), "Circular economy Schools of Thought", *Ellen MacArthur Foundation*, available at: www.ellenmacarthurfoundation.org or www.ellenmacarthurfoundation.org/circular-economy/overview/principles (accessed 9-10-2019).

Garcia-Muiña F.E., González-Sánchez R., Ferrari A. M., Volpi L., Pini M., Siligardi C., and **Settembre-Blundo D., (2019)**. Identifying the equilibrium point between sustainability goals and circular economy practices in *an industry 4.0 manufacturing context using eco-design. Social Sciences*, 8(8).

Gorini G., Imbriani C., *and* **Morone P., (2019),** "*Circular Economy and Legal Waste Management*" , (1), 19–38

Government of the Netherlands, (2015). " Transition to a circular economy", Retrieved From: *https://www.government.nl/topics/circular-economy/transition-to-a-circular-economy*

Guiu Segura, J. M., Antoni, G. P., Vivian, S. C., & Paula, H. C., (2019), "Introducing concepts of circular economy into the public procurement of medicines in europe". European Journal of Hospital Pharmacy.Science and Practice, 26(4), 240.

Ivanova, V., & Slavova I., (2019), "Corporate Environmental Responsibility within the Circular Economy Context: Opportunities for Development and Sustainability: (the example of Dundee Precious Metals Chelopech EAD)" , *Economic Alternatives*, (2), 184–204.

Krysovatyy, A., Zvarych I., and **Zvarych R., (2018),** "Circular economy in the context of alterglobalization" , Journal of International Studies,11(4), 185–200

Kumar, V., Sezersan, I., Garza-Reyes, J., Gonzalez, E. and AL-Shboul, M. (2019), "Circular economy in the manufacturing sector: benefits, opportunities and barriers", Management Decision, 57 (4), 1067-1086.

Liakos, N., Kumar, V., Pongsakornrungsilp, S., Garza-Reyes, J., Gupta, B. and Pongsakornrungsilp P., (2019), "Understanding circular economy awareness and practices in manufacturing firms", *Journal of Enterprise Information Management*, 32 (4), 563-584.

Lin K., Yu C., and **Chen K., (2019),** "Production data analysis system using novel process capability indices-based circular economy", *Industrial Management & Data Systems*, 119 (8), 1655-1668.

Liu C., and **Côte R., (2017),** "A framework for integrating ecosystem services into China's circular economy: The case of eco-industrial parks". Sustainability, 9(9), 1510

Liu L., Liang Y., Song Q., and **Li J., (2017)**. "A review of waste prevention through 3R under the concept of circular economy in china" . *The Journal of Material Cycles and Waste Management*, 19(4), 1314-1323.

Machado M., Almeida, S., Bollick L., and **Bragagnolo G., (2019)**, "Second-hand fashion market: consumer role in circular economy", Journal of Fashion Marketing and Management, 23 (3), 382-395.

McCarthy A., Dellink R., and **Bibas R., (2018)**, "The Macroeconomics of the Circular Economy Transition: A Critical Review of Modelling Approaches", OECD *Environment Working Papers*, N°. 130, OECDPublishing, Paris.

Neligan A., (2018). "Digitalisation as enabler towards a sustainable circular economy in germany". *Intereconomics*, 53(2), 101-106.

Nelles M., Grünes J., Morscheck G., (2016). "Waste management in Germany—development to a sustainable circular economy? " *Procedia Environ Sci*, 35,6–14.

Norwegian Circular Economy Benchmark 2017. (2018). "Deloitte AS and Circular Norway", Retrieved from: *https://www2.deloitte.com/no/no.html*

Pinheiro, M., Seles B., De Camargo Fiorini, P., Jugend D., Lopes de Sousa Jabbour A., da Silva H., and Latan H., (2019), "The role of new product development in underpinning the circular economy", *Management Decision*, 57 (4), 840-862.

Ploeger H., Prins M., Straub A., and **Van den Brink R., (2019)**, "*Circular economy and real estate: the legal (im)possibilities of operational lease*", Facilities, 37 (9/10), 653-668.

Ripanti E., and **Tjahjono B., (2019)**, "Unveiling the potentials of circular economy values in logistics and supply chain management", *International Journal of Logistics Management*, 30 (3), 723-742.

Shanahan M., (2018), "Can Economics Assist the Transition to a Circular Economy?", Crocker, R., Saint, C., Chen, G. and Tong, Y. (Ed.) Unmaking Waste in P*roduction and Consumption: Towards the Circular Economy*, Emerald Publishing Limited. 35-48.

Smol M., (2018). "The Importance of Sustainable Phosphorus Management In the Circular Economy (Ce) Model: the Polish Case Study". *Journal of Material Cycles and Waste Management*, 21(2), 227-238.

Zhao X., (2018), "China's Policies for Promoting the Circular Economy: Past-Decade Experiences, Future Plans and Success Stories", Crocker, R., Saint, C., Chen, G. and Tong, Y. (Ed.) Unmaking Waste in *Production and Consumption: Towards the Circular Economy*, Emerald Publishing Limited. 49-66.

Zhelyazkova V., (2018). "The Road to Circular Economy: What Can Europe Learn from the Experience of Germany and Japan?" , *Economic Studies* (Ikonomicheski Izsledvania), 27(6), 167–177.

Ziegler R., (2019). "Viewpoint − water innovation for a circular economy: The contribution of grassroots actors". *Water Alternatives*, 12(2), 774-787.