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Regions in Context III
-
Principles of circular economics in regional management leading to increased efficiency of systems

Editor Dagmar Škodová Parmová

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Content

Introduction

Modern challenges of economic science, reflecting the current needs of a changing society, provide stimuli for researchers and change the discourse of perception of economic development from linear to circular. Growth theories are being replaced by sustainability theories and the resulting incentives to approach innovative solutions both in the theoretical level and in practical applications. This scientific monograph, which falls into the hands of the reader, brings new perspectives on classical industries or changes in economic governance mechanisms that reflect the principles of circularity.

The authors of the individual chapters try to present in a readable form both the theory of circular economics in various industries and the current state of knowledge in the application of circular economics in practice or in case studies. The team of the Faculty of Economics of the University of South Bohemia in České Budějovice cooperates on the topic of circular economics with experts from different fields, but also from different generations, and it is this diversity of views on one topic that makes this book very attractive and I believe that further research and cooperation.

Editor

doc. Dr. Ing. Dagmar Škodová Parmová

1 SUBSIDIARITY AS A CONSTRUCTIVE PRINCIPLE FOR THE INTEGRATION TENDENCY OF THE CIRCULAR AND SOCIAL ECONOMY

Jaroslav Šetek, Ing., Ph.D. [1]

Abstract: The chapter deals with the constructive principle of subsidiarity in terms of conceptual content and reflection of integration tendencies of the circular and social economy. It also sets out the reasons for more consistent reflection and application of regional and social policy, especially in terms of taking into account the tradition of sustainable development with the onset of the Industry 4.0 era. Attention is also paid to the aspect of the development of civil society traditions, which can also, within the framework of subsidiarity, help the above-mentioned integration tendency of economies of interest.

Key words: decentralization, subsidiarity, regional policy, civil society, circular and social economy

1.1 INTRODUCTION

The concept of subsidiarity is one of the occasionally mentioned key concepts in the field of political and social philosophy, but also general legal theory, European Union legislation, social policy in the comprehensive care of appropriate standards of quality of life for members of society. Therefore, it is also justified within the integration tendencies of the circular and social economy. However, in addition to the key principles of social justice, solidarity and participation, it is often ranked among the basic principles of human-oriented political doctrines and disciplines,

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various interest groups and interpersonal relationships (Armstrong, 2006). Since the last third of the last century in developed market economies, this trend has accelerated considerably and at the same time theories of human and social capital are developing. As a result of the interdisciplinary approach of social sciences and humanities, cybernetics and management theories, border disciplines have emerged, on the basis of whose theoretical concepts completely new methods have been created and developed, through which integration tendencies of circular and social economy can be realized within the municipality, city, region. Each of these territorial self-governing units shows its specifics, such as the structure of human resources (age, educational, cultural, etc.), dislocation of production and conditions for deployment, networks of infrastructure and civic amenities, the state of the environment, local traditions, etc.

The starting point for the above-mentioned integration lies in the reality that the focused areas of the circular and social economy are a challenge to sustainable development, strengthening the security of the resource and social system. Therefore, they are the domain of specializations of experts for the daily content of activities required by quality of life standards. This is logical because, despite all the economic, reduction and financial problems, human needs are a priority. People manages and implements the whole process and the final result is intended for him, and economic growth as a part of national wealth results from its quality of life as a result of the synergetic effect. This is also evidenced by the theory of endogenous growth according to R. Lucas and P. Romer (Lucas, 1988; Romer, 1990), which is based on an empirical analysis based on the correlation of investment in human resources to support economic growth. In the context of this theory, subsidiarity represents a constructive principle for the integration tendency of the circular and social economy within the territorial unit of interest in the position of a municipality, city, region.

1.2 THE BASIC PHILOSOPHY OF THE APPLICATION OF SUBSIDIARITY TO THE INTEGRATION OF THE CIRCULAR AND SOCIAL ECONOMY

The principle of subsidiarity is understood in modern society as the integration of personal responsibility with solidarity. It is based on the approach to man as an individual with unique abilities, qualities, dispositions, which the individual in the moral sense of the word is obliged to use for the benefit and social security of himself and his neighbors (Druláková, 2010). This principle also respects the fact that people do not live in isolation. The principle of subsidiarity emphasizes the importance and necessity of the activities of certain communities for the provision of social security and the interest, the obligation of the state to support such activities. Subsidiarity is based on a society in which responsibilities are conditioned by relationships between people.

From a historical point of view, subsidiarity developed within the Christian churches, but at the same time in a secularized form among philosophers who sought in it an ideal organization of society (Druláková, 2010). Subsidiarity was named by the Church, which also developed the principles of this principle and the criteria for its application. Some principles of subsidiarity developed among political scientists and philosophers, which were then put into practice in the federal states. Although they did not directly indicate subsidiarity, they have shown that this principle facilitates and enriches the division of powers. Within the European continent, the principle of subsidiarity has been addressed by, for example, John Lock, John Stuart Mill, Alexis de Tocqueville, Jean Jacques Rousseau and Fridrich Hegel (Druláková, 2010).

Subsidiarity, conceived in the context of principles, always also means the right of the personality to help from the surrounding community and the right of a smaller community to help from a larger community, this help should go to self-help (Egorov & Harstad, 2017). This principle also respects the fact that people do not live in isolation. The principle of subsidiarity emphasizes the importance and necessity of the activities of certain communities for the provision of social security and the interest, the obligation of the state to support such activities. Fulfilling the principle of subsidiarity presupposes a certain education of the population to take their own responsibility, as well as the real social situation, ie. space for one's own social action. The emphasis placed on this principle is mainly due to the crisis of the welfare state and the way in which the principle of solidarity is applied in it. The reason is the fact that help and support goes to citizens primarily from the state. The principle of subsidiarity breaks this link and it is therefore not surprising that it is not generally accepted (Shapiro, 2007). Subsidiarity, interpreted in conjunction with principles, always also means the right of a person to help from the surrounding community and the right of a smaller community to help from a larger community; this help should go to self-help. The application of the principle of subsidiarity is linked to thinking and also to the values of the citizens of a given state. The principle of subsidiarity applies to the relationship between the state and the individual and state institutions on the basis that the individual should be as empowered as possible to address his or her own needs and make his or her own decisions.

From the very beginning of its existence, the gradually emerging European Communities had the prerequisites to be the main place for the implementation of the principle of subsidiarity, through the federalist and Christian traditions that stood at their creation (Druláková, 2010). However, it took over four decades for subsidiarity to become one of the fundamental principles on which the European Union was to be built. Many thanks to the development of the principle of subsidiarity, especially to Germany and the United Kingdom, because they have the largest share in the fact that the principle of subsidiarity appeared in the Treaty on European Union (Druláková, 2010). The other Member States did not influence the form of the principle of subsidiarity. In relation to it, it is possible to divide into three groups. The first group consisted of states with a centralist tradition of nation-state organization, which had a similar view of subsidiarity as the United Kingdom, ie

France, Denmark. The second group was the Benelux countries, which belong to the countries with a long tradition of decentralization and accepted subsidiarity as an inherent part of the democratic system. The last group consisted of southern states that traditionally support supranational structures.

In view of the above overview, it is therefore clear that the concept of subsidiarity is the subject of various controversies, debates and ambiguous acceptance by the social sciences as well as political-philosophically oriented debates. In part, this may be a mere misunderstanding in the use of concepts, because the theoretical dimensions of the circular and social economy are based on value principles that are close in nature to the content of the concept of subsidiarity.

1.3 APPLICATION OF SUBSIDIARITY ACCORDING TO THEORETICAL CONCEPTS OF SOCIAL SCIENCES

The accumulation of capital and the development of industrial technologies have become the "vanguard" of the accelerated movement of modern societies and have given it direction. Economics, with its knowledge, contributed most significantly to this "construction of the new world" of the social sciences (Druláková, 2010). The idea of decentralization movements in society leading to the realization of subsidiarity is the subject of interest of the social sciences, which as interested disciplines with different paradigms of implicit anthropological and value ideas are based on different contexts of social and worldview dimensions. Therefore, they will not be completely uniform in assessing the relevance of the principle of subsidiarity in its practical application. However, the principle of subsidiarity can help the social sciences, as an independent social science discipline striving for at least partial independence from specific historically, contextually and politically conditioned social policies, to better formulate relations of least dependence between the state and comprehensive care for the quality of life of all members of society. Creating a link of social interaction not to general philosophical and moral principles (freedom, equality, justice, solidarity, subsidiarity), but to specific doctrines of social justice or human rights formulated in political processes can create a loss of autonomy in favor of human service in quality of life care. and the growing dependence on specific historically, socially, and ideologically formulated doctrines and policies. Many of the newly defined human rights, in particular of a social and economic nature, contained in the documents to which human resources-oriented social sciences refer are essentially relative to consensus in society and its economic potential, and cannot therefore be strictly understood as temporally or regionally universal.

However, it is not clear from the above facts whether the subject of the application of well-being, justice and human rights is human freedom and autonomy associated with responsibility, or rather the realization of the ideals of a concrete idea of the material quality of human life. The reference to increasing "well-being" also points to the fact that ethics in the care of human resources is, in a sense, captive to utilitarian concepts, not ideals based on unquestionable ethical criteria. This pro-

blem opens up in the field of political philosophy the often debated problem concerning the nature of human freedom and autonomy. While the principle of subsidiarity is intended to protect, in particular, negatively defined freedom (elimination of oppression by other people and the state) and to leave as wide a space as possible for unmanipulated individual activity, factors in the application of a concretely conceived particular ideal of human life and the idea that the essence of freedom lies in its realization, not the preservation of the autonomy of the individual.

1.4 SUBSIDIARITY IN THE CONTEXT OF CIVIL SOCIETY DEVELOPMENT

Since the events of November 1989 and the subsequent transformation of society into a democratic political system with the mechanism of the functioning of a market economy, the Czech Republic has been talking about the development of civil society and models for inspiration are often sought. Nevertheless, the approach of popularizers, but also implementers of the concepts of its development, is mostly full of foreign inspirations, as if there were no traditions in the Czech lands. Taking examples from abroad often leads to disillusionment with the infinitely richer and more accommodating patronage environment, especially in the United States, and with a clear willingness of people to contribute to the development of civil society - whether through money or work. Our knowledge of the tradition of foundation activities and other charitable organizations as specific social institutions in the Czech lands is relatively limited.

The concept of subsidiarity is a key principle in the formation of civil society, ie the association and organization of social activities independent of the state. In the area of policy for the care of the quality of life of human resources, it is not only a concept that identifies the concept of welfare state exclusively with the activity of the state, but the concept of welfare mix or welfare society is increasingly used. The concepts suggest that the state should not be the sole subject of social policy and its implementation, but that civil society and market institutions are important actors. There is a relatively broad consensus on the involvement of civil society actors, but there are also many relevant stimuli and arguments from the "neoliberal" spectrum calling for a broader consideration of market principles and the involvement of commercial actors in social policy.). However, current currents of modern liberalism influencing social policy hold the exact opposite of subsidiarity, a kind of "anti-subsidiary principle" (Shapiro, 2007). The weakening of the state with regard to globalization processes, problematic economic and demographic sustainability of developed welfare states should therefore lead to a reassessment of the position of the state, the market and non-state actors in the field of social policy. The first is a more thorough analysis of the benefits and effects of individual traditions of the welfare state in terms of taking into account the strengths and weaknesses and their certain convergence.

The consequence of the application of the principle of subsidiarity leads, in terms of the typology of the welfare state, to the promotion of its "residual" character, ie strengthening the responsibility of citizens, civil society actors at the expense of a strong redistributive state (Shapiro, 2007). However, in the context of social policy crises, such a position appears to be a strong reference point for further debate on the prospects for the sustainability of citizens' quality of life achievements. Although the system of work with social interest groups must to a large extent respect the trends and approaches of specifically established social policies, the question remains to what extent and how to use the challenges of reformulation or change, ie "Facing unfair policies and practices" (Ockenfels & Selten, 2005), as opinions and approaches in a given matter are always ideologically shaped in some fundamental way. The emphasis on the principle of subsidiarity is largely based on the historical experience of concerns about the position of state power and, last but not least, the image of a person whose dignity is based mainly on freedom of responsibility, or a reflection of the Anglo-Saxon experience of active civil society resources and assumptions unnatural in the continental European context (Ockenfels & Selten, 2005).

1.5 RATIONALE AND EXPERIENCE WITH THE APPLICATION OF SUBSIDIARITY TO THE REGION'S ECONOMY

Economic theorists who have joined subsidiary concepts are trying to find concrete ways to make self-sufficient small communities run. In this context, they consider non-monetary exchanges (Cooper, 1994). This is evidenced, for example, by the project of the so-called local barter trade, which was designed in 1983 by M. Linton (then the phenomenon of Local Exchange Trading System took hold). The first attempts at the project were carried out mainly in Canada, the United Kingdom, Australia and New Zealand, when 200 small groups around the world operated in 1993 (Cooper, 1994). Referring to sociological and socio-psychological theories, ecological authors emphasize the importance of small communities in which everyone knows everyone, strengthening social responsibility and group cohesion (Newbert, 2018). There is more willingness to participate in life together. Deeper interpersonal relationships contribute to the deepening of the spiritual dimension of man. Such "spiritualization" can also be expected to compensate for the ecologically desirable reduction in material levels and consumer satisfaction (Bookchin, 1992). It should also be borne in mind that resource flows involve an interconnected combination of organic and inorganic materials, either due to their nature or due to their technical nature, which may represent significant limits on circularity (Velenturf, AP, Archer, SA, Gomes, HI, Christgen, B. , Lag-Brotons, AJ, & Purnell, P., 2019).

For the above reasons, in terms of economic, ecological and social effect, the development of integration tendencies of the circular and social economy appears. It

would be based mainly on the territorial factors of the region of interest, city, municipality. It is certain that some activities (such as collection and recycling of municipal and vegetable waste) are identical for all territorial units, some differ according to the dislocation of economic activities (industrial and agricultural production). The transfer of management of the circular and social economy to the scope of regional and economic policy also leads to an increased sense of citizenship. It is easier to fulfill the idea of direct participatory democracy, which guarantees the promotion of the interests of the inhabitants of the community, including interests of an ecological and social nature (Bookchin, 1992). Thus, a higher level of participation in the territorial unit can be expected, when it is not allowed for the municipality, city, region to be forced to externally make decisions that would damage the regional natural environment and social climate (Jonášová, 2018). This can also be demonstrated by the application of system dynamics methods. The mentioned application within interdisciplinary fields monitoring the behavior of stakeholders in the circular and social economy within the framework of scientific research brings with it a number of advantages. The most visible is the visualization of complex relationships within the system, which is an effective replacement (or rather a supplement) to a common verbal description. For very complex systems with a large number of elements, a mere text would not be able to capture and describe the whole situation. The system dynamics and graphical representation of its models thus help both the author (in the position of prognosis of future development) in his attempt to describe the structure and explain the behavior of the concept or phenomenon, and the reader (in the position of the recipient of information trying to absorb this information and knowledge, to acquire them and then take appropriate measures of strategic importance, system dynamics can not only illustrate the phenomenon or problem under study, but also shed light on hidden relationships and counterintuitive causality that might otherwise remain undetected (Blaga, & Jozsef, 2014).

Similar useful outputs and practical benefits can be expected from the use of system dynamics to model systems that cover a wide range of areas. The economic, ecological and social areas are the most popular. These areas can be applied, for example, in the context of transport systems, which from an "anatomical" point of view of the national economy represent the "vascular system" (Alina, J., McGrath, R., Faltová Leitmanová, I., & Petrách, F., 2020). This is due to the fact that system dynamics has long been established and its use here dates back at least to the 70s of the 20th century, ie before the development of circular economy in the context of transport policy, because from the point of view of theory there is virtually no economic or an issue that system dynamics would not be able to capture and that would not be possible to model and explore in this way.

1.6 FORECAST OF POPULATION DEVELOPMENT TO IDENTIFY THE REDUCTION OF POTENTIAL MACROECONOMIC RISKS THROUGH THE CIRCULAR AND SOCIAL ECONOMY

According to the forecasts of the population development of the Czech Republic, it is clear that in the coming decades it will face very significant demographic changes, caused mainly by low birth rates (after 1990 in connection with the transformation of the economy) and the associated aging population. Disproportions in the structure of the population will significantly affect the entire economy of the Czech Republic, as well as all systems based on the redistribution of funds from economically active to economically inactive - the entire system of public finances (Zubíková, Švejnová-Höesová & Chytil, 2021) and the inevitable consequence of the increasing old age dependency ratio.

From the above, it is almost certain that a major problem will arise after 2035. During this period, the strong years of the 1970s will retire. If we want to deal with the effects of the expected demographic development on the economy of the Czech Republic, it is necessary to take into account the long-term dynamics of the age structure of the population, including their relevant forecasts (Abraham & Laczo, 2018). These facts are evident from the following Table 1 with proven milestones from 2000 to 2065 at five-year intervals.

It is possible to add to the demographic development that the correctly described main trend can be corrected by migration from abroad, as is happening after all, when the population of the Czech Republic is constantly growing (except for the covid period), and the main source of this increase is immigration, namely the immigration of the predominantly younger population.

Table 1: Population structure of the Czech Republic by age group in years 2000 - 2065 (selected years in %)

Age	2000	2010	2015	2020	2025	2035	2045	2055	2065
0 – 14	16,4	14,2	15,1	15,6	14,9	13,0	13,3	13,9	13,2
15 – 64	59,8	70,6	67,2	64,3	63,4	62,5	57,1	53,7	54,6
65 +	13,8	15,2	17,7	20,1	21,7	24,5	29,6	32,4	32,2

Source: Czech Statistical Office 2020 and own processing

The current economic and social policy in the Czech Republic has long struggled with the unsustainability of the current pension system. From 2010 to 2018, the mandatory length of work activity gradually increased from the original 25 years

to 35 years. The amount of old-age pensions depends on the available public finances, which are in short supply due to the growing number of seniors and the declining number of economically active population. The most important factors are how long you need to work and how high your social insurance should be. So far, the situation can be improved by raising the retirement age and increasing the share of funds paid into public resources.

1.7 APPLIED INTEGRATION OF CIRCULAR SOCIAL ECONOMY INTO SOCIAL INTEREST GROUPS OF THE POPULATION

The quality of life of human resources is essential for a competitive economy. Extensive structural changes in the economy or in technological processes must not in any way reduce the mentioned quality (Trifonova, 2017). This is also the challenge in line with the advent of Industry 4.0. As a result of the innovations of Technology 4.0 (digitization, robotics, automation…), the disappearance of many existing professions and job positions is obvious, at the same time completely new job opportunities will be created and mass renewal of technological equipment will take place (Ford, 2017). It is obvious that not all individuals will find employment in the labor market as a result of these extensive technological changes (Novotná & Volek, 2014). People who will not be able to adapt to these changes will be particularly at risk (vulnerable). Here, a group of people with "special vulnerabilities" will emerge on the labor market, such as people with lower qualifications, before retirement (60+), with health disabilities (Volek & Novotná, 2015). In the context of the analysis of the current demographic development of the population and the expected forecast of future development, it is clear that the Czech Republic (but also the European Union) expects significant macroeconomic impacts in the coming decades with an enormous burden on public finances (Šetek & Alina, 2018). In addition, this problem may become more important through social spending on personal security due to the loss of the ability to adapt to the labor market due to technological innovations in Industry 4.0. Also, the daily commuting of the population for long-distance work activities is not sustainable in the long run, and is in direct conflict with the principles of sustainable development of the territory (Leitmanová, Petrách, Šetek, & Alina, 2017). Everyday commuting, no matter what the distance, always increases the demands on transport services with consequent negative impacts on the environment.

For the above reasons, it is necessary to create a concept of economic and social policy to reduce these side effects, where the main priority is the employment of particularly vulnerable people in the labor market (Šetek, Alina & Bajer, 2019). In addition, the employment of senior pensioners can contribute to reducing the burden on public resources. In this way, enormous expenditures on social benefits can be avoided and at the same time adequate revenues from public resources (tax and

insurance premiums) can be ensured. The applied circular economy in combination with the social economy can clearly contribute to the fulfillment of these macroeconomic goals to the social interest groups of the population. It is in this mix of economies that some basic services of the circular economy would be provided (eg dismantling and recycling of discarded technological equipment as a result of accelerated depreciation), when work activities do not require higher qualification skills and work commitment). The interdependence of the circular and social economy is thus an important economic and social factor (Schröder, Lemille & Desmond, 2020). The basis can be seen in respecting the principles of sustainable development and social responsibility.

In the world, one can encounter various forms of integration of social and environmental goals within a given microeconomic entity on the example of a municipality, city and region. In the context of the microeconomic belonging of the circular and social economy of territorial units, it is thus possible to ensure an innovative response to its ecological and social needs. For this reason, the interdependence of circular and social economies can be seen as a multifunctional significance that simultaneously fulfills several effects, namely economic, social and ecological. In implementing this program, the priority is to build on the principle of subsidiarity, which means allocating decision-making positions to municipalities and regions.

The labor market will be confronted with an aging workforce in the reflection of the forthcoming demographic trends, mainly due to the decreasing share of young people in the labor market. Due to their specifics, the older workforce is an endangered group of the labor market and long-term unemployment in the pre-pension age is often solved by early retirement (Zubíková, Švejnová-Höesová & Chytil, 2021). It is known that the aging of the workforce results in declining productivity, flexibility and creativity. The result can be lower economic performance, structural unemployment and a slower rate of innovation (Pavelka, 2017). However, the relationship between aging and productivity, flexibility and creativity can be influenced. These consequences, which manifest themselves in old age, can be prevented in particular by lifelong learning and investment in human capital. This requires, among other things, the emerging trend of Technology 4.0. However, it is quite certain that not all individuals, especially those with lower qualifications, will be able to adapt to this trend. In this context, the circular economy is a space for employment of these people of interest. Therefore, the tools of the circular economy are in integration with the social economy.

1.8 THE STRATEGIC IMPORTANCE OF THE APPLICATION OF THE PRINCIPLE OF SUBSIDIARITY IN THE INTEGRATION OF THE CIRCULAR AND SOCIAL ECONOMY

In managerial areas, macroeconomic and microeconomic policy of the state, regional policy in connection with the links of integration tendencies of the circular and social economy on the subsidiary principles is a very frequent concept of strategic

importance. The terms "system" and "systemic" can be considered certain of its competitors. In connection with the concept of the above-mentioned integration tendencies, applied managements, plans, goals, documents, resources can be considered strategic, but also the achieved successes and lessons learned from past mistakes (Armstrong, 2006). In this sense, the term “strategy” can be understood as consistent systems, value principles, limitations of methods and procedures that are of significant importance to the given regional stakeholder (Blomé, Borell, Håkansson, & Nilsson, 2020). At the same time, they are created and used to focus and implement the main attributes of its own existence and development.

The future interest of the territorial unit and its system environment can be seen in the strategic interest on the object of integration of the circular and social economy within the municipality, city and region. The object to which the strategy relates can be characterized by a system of attributes with the appropriate structure, synergetic links and the ability to include the creation of completely new attributes (Mareš, 2006). Each of these attributes changes over time, thus describing its states at given (preselected or operationally determined) times. This applies to both the planned and actual development of the territorial unit of interest. It is quite certain that all regions within the Czech Republic are significantly differentiated, especially in terms of economic, ecological and social. Therefore, from the point of view of the application of the principle of subsidiarity within the integration tendencies of the mentioned economies, the basic strategic area is the guarantee of appropriate quality of life standards of all interested social groups of the region's inhabitants. The essence and at the same time an important prerequisite for the concept of integration of circular and social economy on a subsidiary principle is that the deployment of modern technologies in these areas does not only provide isolated solutions for individual economic entities and small groups, but also create synergetic effects with an impact on the region and macroeconomic sphere.

1.9 CONCLUSION

It can be stated that the application of the principle of subsidiarity with the subsequent decentralization of strategic decision-making for the creation of concepts of integration of circular and social economy within regional economic policy will bring with it a generally favorable change of values in various areas of life, including conscious orientation on social system and prosperity of nature. This is logical, as closer coexistence with nature in the context of social life within the region greatly affects both human behavior and overall optics. The benefits of applying the principle of subsidiarity are also associated with positive changes in social and economic essences, especially the creation of new job opportunities in the region of interest, and thus significantly reduce unemployment not only at the regional level but also macroeconomic.

The implementation of the principle of subsidiarity also presupposes a certain education of the population to take their own responsibility, as well as the real social situation, ie. space for one's own social action. The emphasis placed on this principle lies mainly in the crisis of the welfare state and the way in which the principle of solidarity is applied in it (Mareš, 2006). The reason is given by the fact that help and support goes to citizens primarily from the state, not by itself. The principle of subsidiarity breaks this link and it **is** therefore not surprising that it is not generally accepted.

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2 ANALYSIS OF ENTERPRISES AFFECTED BY THE CIRCULAR ECONOMY IN RELATION TO THE FINANCIAL INDICATORS

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Abstract: The circular economy is based on the flow of resources that are reused. There is created a closed production system that allows to create higher values. The transition to a system of circular economy is a complex process that cannot be used by all companies, e.g. due to their financial or performance insufficiency. This paper deals primarily with the analysis of companies and their financial indicators, broken down into companies affected and unaffected by the circular economy. The aim is found out which companies use elements of the circular economy most often and to propose recommendations for individual types of companies in this area.

2.1 INTRODUCTION

The aim of circular economy is to innovate the whole chain of production, consumption, distribution and use of materials and energy. The process of implementation elements of the circular economy nowadays seems to be a matter of course and, in a way, a simple reuse of individual resources. Whether resources are used appropriately is decided both at the micro level of individual enterprises and at the macro level as well. The basic prerequisites of the circular economy process are to reduce the consumption of basic resources while making the most of already used resources that have become waste. It also means minimising environmental pollution and regenerating natural resources. Kirchherr et al. (2017) defines the circular economy as an economy where the minimum of basic material is consumed, resources are reused at the same time and the basic material is reused in high quality. In the context of the growing scarcity of resources and the limited space for storing waste material resulting from pollution, the circular economy has gained momentum. A circular economy is an economy built on the production and consumption

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within human society, which is characterized by a linear flow of material and energy from nature. This is done by cyclical material flows, renewable energy sources and energy flows. A successful circular economy contributes to all dimensions of sustainable development (Keßler et al., 2021). The transition to a circular economy environment is difficult but it is an important process and requires cooperation at many intercompany levels at the same time. The circular economy is a very popular approach today. The EU Circular Economy Action Plan 2020 reports a future EU strategy (European Union, 2020).

2.2 LITERATURE REVIEW

The concept of circular economy is designed to change the current "Take-Make-Dispose" model of production and consumption, which threatens the sustainability of human life on Earth and is approaching planetary boundaries. Crucially, loop closures are necessary by reusing resources and waste (Rockstrom, Steffen, Noone et al., 2009). However, reusable materials can also have a negative perception. Although products made from recycled materials are a very important part of circular economics, products from these materials may not be accepted by the public. Judge et al. (2021) analysed products made from wastewater, such as recycled toilet paper, in an experimental study examining respondents' emotional responses to such products and whether emotional responses were affected by values. They expected people to have positive emotions towards products, which was only reflected in people with strong biosphere values.

Blum, Haupt & Bening (2020) in their work expand the concept of circular economy even further with sustainability. It argues that in the European Union, in addition to the conceptual criterion of material circulation, the economic, environmental and social aspects of the transition to a circular economy need to be carefully considered. The main objective should therefore not be to build as many circular production systems as possible, but rather to ensure economic sustainability and a clean planet, while contributing to the goals of sustainable development.

In relation to the environment, Scarpellini et al. (2020) define and measure the environmental capabilities used in the deployment of the circular economy in enterprises. The study provides information to bridge the gap between academic research focused on environmental accounting and exploring the implementation of a circular economy in enterprises. King & Lenox (2008) confirmed the link between lower environmental pollution and higher financial valuations.

Lieder & Rashid (2016) seeks to propose a framework that will be used as a strategy for implementing the cyclical economy. They focus on three aspects, the lack of resources, waste generation and economic benefits, and seek to provide a comprehensive overview of research efforts covering these aspects.

The circular economy, although it may not seem obvious at first point of view, is closely linked to another phenomenon of our time, Industry 4.0. In Industry 4.0 (as in the circular economy), all processes are optimized and streamlined in many areas (Schuh, Potente, Wesch-Potente, Weber, & Prote, 2014). The implementation

of Industry 4.0 elements is one of the important factors affecting financial indicators, financial information and the financial situation of the enterprise, but at the same time should bring benefits in the areas of productivity, income growth, employment and investment. It follows that it is important to link the two approaches.

Babuka, Sujová & Kupčák (2020) focuses on the possibilities of application of circular economy in the field of wood processing in the Czech Republic. Wood consumption is increasing every year, and wood resources are getting smaller and smaller. Even for the environment and animals that have their home in the forests, logging is a considerable burden. The threat of bark beetles in recent years does not contribute to this situation either. Wood biomass material is a renewable raw material and can be reused in a bouncy sequence. The authors analyzed the flow of wood in the Czech Republic using the principle of biomass use. Their study points to an opportunity to increase the efficiency of wood use in the Czech Republic. The circular economy system is also discussed in the contribution of Smejkalová, Shomplák, Nevrlý & Pavlas (2018). They deal with waste management and its development. They argue that in order to waste management to function efficiently, a high-quality forecast reflecting the analysed timeframe is needed. When planning waste management, it is the production forecast and the structure of waste that are very important. At the same time, however, the data available do not have sufficient informing capacity due to short time series and poor availability of socio-economic data. The authors propose a mathematical model for predicting future waste-related parameters that would eliminate the existing shortcomings of previous models.

2.2.1 CIRCULAR ECONOMY IN RELATION TO FINANCE

Figge et al. (2021) say that an analogous relationship in the circular economy exists in finance where the desired return on investment is associated with undesirable investment risk and that, through the creation of effective portfolios, the individual risks are at least partially diversified. The problem is how to quantify the value that the circular economy creates both in human society and in the business environment. Sustainable finance is finance that meet social, environmental and human criteria without compromising the ability of future generations to meet their own needs, and which strikes a fair balance between societies (Weber, 2016). While there are many financial methods in the scientific world, there are few methods that have been put into practice to assess the results that the circular economy provides. Two criteria are important in financial decision-making, which is the expected return and the risk to be passed on. Investors tend to have a risk aversion and prefer minimal risk, but at the same time demand high returns, which are unfortunately also associated with high risk. It is therefore necessary to achieve some balance in this area (Fama, 1970).

The economic model which is based on the profit maximization may be too limited to incorporate the analysis of the maximization of social returns. Sustainability of economic development aims to overcome the narrowness of dominant economic models and incorporate the broader aspects of economic well-being related to environmental and social values. This could lead to investment putting the economy

on a different growth path, managing to improve the standard of living, and mitigating the problems of external effects that can hinder a higher quality of social welfare (Rodrigo-González et al., 2021).

Therefore, businesses that implement elements of a circular economy need to consider carefully whether their implementation is appropriate. It is possible that businesses that are not prepared for this change will not be sufficiently familiar with their financial possibilities and may be in financial trouble. It is therefore necessary for companies to be able to analyse and correctly assess their financial situation. For this purpose, the financial analysis serves as a tool for evaluating the financial indicators of the enterprise. It quantifies the impact of management decision-making on the performance of the company, assesses financial trends and forms the basis for managing future developments. The aim of the evaluation of financial indicators is to assess the financial health of the enterprise and to identify the strengths and weaknesses of its performance. However, Scarpellini et al. (2021) say that the economic and financial analysis of investments in own consumption (e.g. photovoltaic) has so far focused mainly on investment factors such as return time, costs, low efficiency and risk of loss are the main obstacles. It is stressed that there is a need to stimulate more investment in the circular economy by removing bureaucratic obstacles.

Fige et al. (2021) argues that decision-making affects the relationship between revenue and risk. This is due to the fact, that a return on financial investment is desirable, while risk is undesirable. To achieve higher returns, investors must take higher risks. Scarpellini et al. (2021) say that the main factors facilitating decision-making are the availability of own resources and the availability of various financing options for the circular economy, such as loans or public financial incentives such as preferential loans, reduced tax rates, etc.

Scarpellini et al. (2021) emphasize the available financial resources as one of the key factors for investment in the circular economy. From an economic point of view, investment barriers are linked to low levels of profitability and difficulties in accessing financing in some countries. They say these barriers must be overcome to support sustainability. Centobelli et al. (2018) say that countries that have both economic and financial potential are the most involved in renewable management. At the same time, they add that new financial models can be expected in the context of sustainability to optimise resource consumption, especially in the field of energy.

In this chapter, we will look away from the risk involved and will only evaluate financial indicators. These indicators will be calculated from the financial statements of individual companies, namely from the balance sheet and from the profit and loss account. The aim of this chapter is to define companies that have implemented elements of the circular economy in terms of financial indicators.

2.3 METHODOLOGY

The aim of the chapter is to analyse financial data obtained from 245 companies from the Czech Republic and their relationship to the circular economy. The data

were collected by means of questionnaire surveys, when a proportional sample of almost 13,000 enterprises in terms of the business sector was created to match the distribution in the Czech Republic, then, in 2020, data from 245 companies were obtained with a return of almost 2%. The enterprises were divided according to individual regions of the Czech Republic, but in terms of the representativeness of the sample, the statistical analysis was performed for the Czech Republic as a whole (due to the lower number of enterprises in some regions).

The enterprises were divided according to implementation of the elements of circular economy for research purposes. Subsequently, the individual relationships between financial data and elements of circular economy were analysed.

As a statistical test, Mann-Whitney U test was used. This test is used to evaluate unpaired experiments when comparing two different samples. It was tested the hypothesis that two variables have the same probability distribution. At the same time, these variables may not correspond to Gaussian normal distribution, it is sufficient to assume that they are continuous. The test involves the calculation of a statistic, usually called U, whose distribution under the null hypothesis is known. U is then given by:

$$U_1 = R_1 - \frac{n_1(n_1+1)}{2}, \quad (1)$$

where n_1 is the sample size for sample 1, and R_1 is the sum of the ranks in sample 1. An equally valid formula for U is:

$$U_2 = R_2 - \frac{n_2(n_2+1)}{2} \quad (2)$$

The smaller value of U1 and U2 is the one used when consulting significance tables. The sum of the two values is given by:

$$U_1 + U_2 = R_1 - \frac{n_1(n_1+1)}{2} + R_2 - \frac{n_2(n_2+1)}{2} \quad (3)$$

Knowing that $R_1 + R_2 = \frac{N(N+1)}{2}$ and $N = n_1 + n_2$, and doing some algebra, we find that the sum is $U_1 + U_2 = n_1 n_2$.

2.4 RESULTS AND DISCUSSION

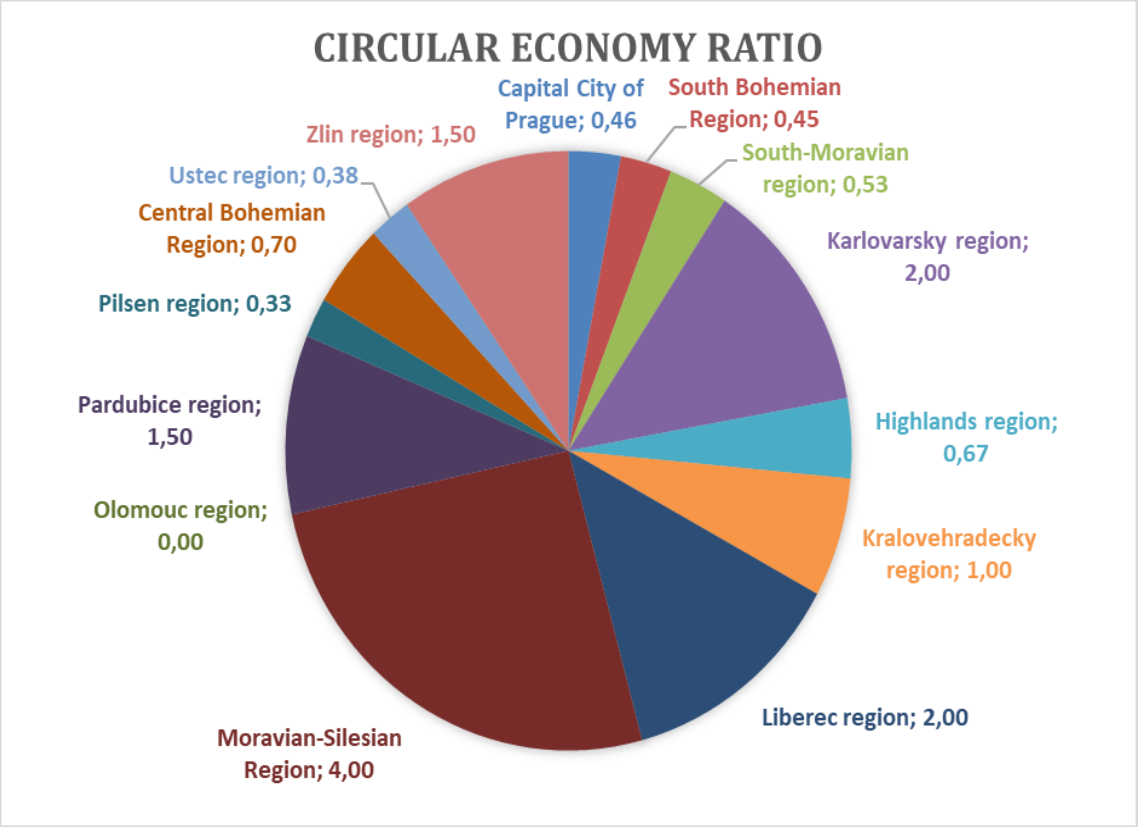
The questionnaire survey obtained data from 245 companies from all 14 regions of the Czech Republic. Subsequently, the companies were classified according to their relationship to the circular economy. It was found that out of the total number of 245 analysed enterprises, 102 enterprises have implemented elements of circular economics and 143 enterprises do not. The implemented elements of circular economy in the companies were most often the following:

- backup of plastic packaging, increasing the life of packaging – 31.37 % of respondents,
- recycling and re-use of waste – 35.29 % of respondents,
- use of renewable resources – 19.61 % of respondents,
- others – 13.73 % of respondents.

The following graph shows the ratio of the number of enterprises that have implemented elements of the circular economy to enterprises that do not have them,

broken down by individual regions of the Czech Republic. It was found out that more companies with implemented circular economy elements are in the Moravian-Silesian region, Liberec region, Karlovy Vary region, Pardubice region and Zlin region. In other regions, outside the Kralovehradecky region and Olomouc region (there was small number of respondents) are more companies without implementation of circular economy elements.

Figure 1: Circular economy ratio in the regions of the Czech Republic



Source: Own research

In the next section, financial data and financial analysis indicators will be analysed for companies that have elements of the circular economy in place and for companies that do not. The analysis will take place at four levels: assets analysis, liabilities analysis, costs and revenues analysis and financial analyses' ratios. The evaluation uses data from 160 companies for which data were obtained from balance sheet statements and profit and loss statements from the last known period, which is 2019. Of this number of enterprises, 76 companies have elements of the circular economy and 84 companies do not have elements of the circular economy.

2.4.1 ANALYSIS OF THE ASSETS IN RELATION TO THE CIRCULAR ECONOMY

In this section, an analysis was carried out of the dependence of the implementation of circular economy in enterprises in relation to asset items obtained from the balance sheet. These items were: total assets, tangible fixed assets, fixed assets, current assets, inventories, short-term receivables and short-term financial assets. The Mann-Whitney U test was performed at significance level 0.05. The hypotheses H0 = x0.50 – y0.50 = 0 were tested, where it is assumed that the financial indicators in these enterprises are the same (or very similar) in both groups (Circular economy elements YES or NO) and the hypothesis HA= x0.50 > y0.50, which assumes that the financial indicators in these enterprises are different. The results are shown in the next table.

Table 1: Mann-Whitney U test analysis of the assets in relation to the circular economy

Financial indicator	**Circular econ. NO**	**Circular econ. YES**	**U**	**Z**	**P-value**
Total assets	7074.000	5806.000	2880.000	1.064362	0.287166
Tangible fixed assets	6074.000	5554.000	2834.000	-0.167898	0.866664
Fixed assets	6918.000	5962.000	3036.000	0.531327	0.595193
Current assets	7414.000	5466.000	2540.000	2.226105	0.026008
Inventories	5218.000	4373.000	1888.000	2.093164	0.036335
Short-term receivables	6162.000	4864.000	2236.000	1.916284	0.055330
Short-term financial assets	7134.000	5746.000	2820.000	1.269375	0.204308

Source: Own Research

In this analysis, a statistically significant difference was found only in the values of current assets and inventories. By the fact that inventories are an essential part of current assets, we can assume that fundamental differences are only achieved for the inventory indicator. The graphical view shows that both indicators are higher for enterprises that do not have implemented elements of a circular economy. This may be due to the fact, that these companies manage stocks worse than companies that have implemented elements of the circular economy and leave them in stock in a non-economic way. This is also related to higher storage costs, higher wage costs for warehouse workers' wages, or additional costs for liquidation of unsellable or unused stocks. An interesting value is also for the short-term receivables´ indicator, where the p-value is at level 0.055, thus just above the set

significance level. According to the graphical view, the value of short-term receivables is higher for enterprises that do not have implemented elements of the circular economy.

2.4.2 ANALYSIS OF THE LIABILITIES IN RELATION TO THE CIRCULAR ECONOMY

This second part analyses the dependence of circular economy in companies in relation to liabilities´ items obtained from the balance sheet. These items were: total liabilities, equity, basic capital, funds, profit from previous years, foreign sources, long-term liabilities, bank loans and current liabilities. The same hypothesis was established, in this case in relation to liabilities, and was tested again at a significance level of 0.05. The results are shown in the next table.

Table 2: Mann-Whitney U test analysis of the liabilities in relation to the circular economy

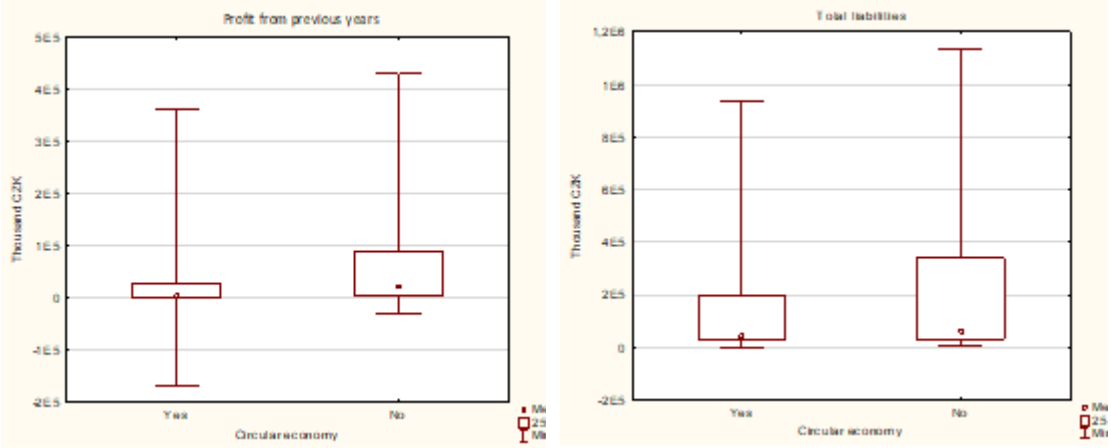
Financial indicator	**Circular econ. NO**	**Circular econ. YES**	**U**	**Z**	**P-value**
Total liabilities	5822.000	7058.000	2896.000	-1.00969	0.312644
Equity	5314.000	7247.000	2388.000	-2.53169	0.011352
Basic capital	5580.000	6048.000	2808.000	0.26384	0.791904
Funds	6276.000	6604.000	3034.000	0.53816	0.590467
Profit from previous years	3931.000	6509.000	1720.000	-3.42209	0.000622
Foreign sources	6030.000	6850.000	3104.000	-0.29898	0.764957
Long-term liabilities	6386.000	6494.000	2924.000	0.91402	0.360708
Bank loans	6282.000	6279.000	2876.000	0.83346	0.404587
Current liabilities	5706.000	7174.000	2780.000	-1.40605	0.159710

Source: Own research

In this analysis, a statistically significant difference was also found for only two values, equity values and profit from previous years. The value of profit from previous years is a part of the total value of equity, so we can assume that this significant difference is due to the indicator profit from previous years. As can be seen on the figure below (on the left), the value of profit from previous years is higher for enterprises that do not have implemented elements of the circular economy. This may be due to the fact, that these enterprises "accumulate" their profits in a special account, while enterprises that have implemented elements of the circular

economy will use those profits or invest to improving the circular economy system in those companies. Below, on the figure on the right, you can see the difference in values for the total liabilities item. As can be seen, the value of this indicator is also higher for enterprises that do not have implemented elements of the circular economy, although this difference was not confirmed on statistically significant level of 0.05.

Figure 2: Mann-Whitney U test – circular economy in relation to profit from previous years (on the left) and in relation to total liabilities (on the right)



Source: Own Research

2.4.3 ANALYSIS OF THE COSTS ND REVENUES IN RELATION TO THE CIRCULAR ECONOMY

The last part of the analysis analyses the dependence of the implementation of the circular economy elements in enterprises in relation to costs and revenues and the related profit obtained from the profit and loss account. The analyzed items were selected as follows: material and energy costs, operating revenues, revenues from operating activities, labor costs, operating costs, interest income, income tax, profit or loss, total cost, total revenues and special indicator cash flow. The same hypothesis was established, in this part in relation to costs and revenues, and it was tested again at a significance level of 0.05. The results are shown in the next table.

Table 3: Mann-Whitney U test analysis of the costs, revenues, profit and loss and cash flow in relation to the circular economy

Financial indicator	**Circular econ. NO**	**Circular econ. YES**	**U**	**Z**	**P-value**
Material and energy consumption	3927.000	4588.000	1960.000	0.59715	0.550406
Operating revenues	5746.000	7134.000	2820.000	-1.26938	0.204308

Financial indicator	Circular econ. NO	Circular econ. YES	U	Z	P-value
Revenues from operating activities	5722.000	7158.000	2796.000	-1.35138	0.176574
Labor costs	5614.000	7266.000	2688.000	-1.72041	0.085360
Operating costs	5762.000	7118.000	2836.000	-1.21471	0.224479
Interest income	2686.000	2985.000	1090.000	-1.95876	0.050142
Income tax	2975.000	3811.000	1264.000	-2.30529	0.021151
Profit or loss	4379.000	5774.000	2168.000	-1.38862	0.164949
Total cost	5770.000	7110.000	2844.000	-1.18737	0.235083
Total revenues	5742.000	7138.000	2816.000	-1.28304	0.199478
Cash flow	5506.000	7374.000	2580.000	-2.08943	0.036670

Source: Own research

In this analysis, there was confirmed a statistically significant difference on the set level in three items, specifically for values of interest income, income tax and cash flow. All these values are higher at companies that have implemented elements of circular economy. Higher value of interest income can be due these companies have unused financial resources in cash or in a bank account. Higher values of the income tax can be due these companies, that have implemented elements of circular economy, have possibilities of reduction of the tax base, for example, the deduction of research and development costs and thus also achieve lower values of income tax. Higher value of cash flow in companies that have implemented elements of circular economy should be due these companies do not have to spend money on the implementation of the circular economy in their business. If it would be increased a level of significance on 0.10, then there would be a statistically significant difference for the labor cost indicator. This value is also higher in companies, that have implemented elements of circular economy. As already was described at the beginning of this chapter, the circular economy closely relates even with Industry 4.0. In Within Industry 4.0, production processes are automated, where a human work is replaced by a machine work. For this reason, companies that have implemented elements of circular economy probably have lower labor costs.

2.4.4 ANALYSIS OF THE RATES OF RETURN AND DEBT RATIO IN RELATION TO THE CIRCULAR ECONOMY

This section analyses the dependence of the implementation of circular economy elements in companies in relation to the rates of return and debt ratio, all calculated from the balance sheet and profit and loss account. The analyzed items were selected as follows: return on equity, return on total capital, return on long-term capital, return on sales and debt ratio. The same hypothesis was established, at this part in relation to the rates of return and debt ratio, and it was tested again at a significance level of 0.05. The results are shown in the next table.

Table 4: Mann-Whitney U test analysis of the rates of return and debt ratio in relation to the circular economy

Financial indicator	**Circular econ. NO**	**Circular econ. YES**	**U**	**Z**	**P-value**
Return on equity	5898.000	6982.000	2972.000	-0.75001	0.453251
Return on total capital	5766.000	7114.000	2840.000	-1.20104	0.229738
Return on long-term capital	5662.000	7218.000	2736.000	-1.55639	0.119615
Return on sales	5890.000	6990.000	2964.000	-0.77734	0.436957
Debt ratio	6960.000	5920.000	2350.000	2.87531	0.004037

Source: Own research

In this analysis, no statistically significant difference was found at the specified significance level for rates of return values. On the contrary, a statistically significant difference was found in the item debt ratio and the p-value was under level 0.05. This indicator was higher for enterprises that have implemented the elements of circular economy. We can therefore assume that these companies invest more to the circular economy, thus, they have higher demands on external resources and thus increase their debt ratio. Similarly, Scarpellini et al. (2021) have found that, from an economic point of view, the biggest obstacles for investing to the elements of the circular economy are uncertainty about the rate of return, the volume of investment and difficulties in accessing financing for small investors and companies.

Vlčková (2021) analysed indicators in relation to individual elements of the circular economy, which are backup of plastic packaging, increasing the life of packaging; recycling and re-use of waste; and use of renewable resources. In the analysis of financial indicators and the recycling and re-use of waste element, a significant difference was found in the liability's indicator. When analysing the use of renewable resources element, a difference was found in the fixed assets indicator. In the analysis of the element of backup of plastic packaging, increasing the life of packaging, a significant difference was found in the owner's equity indicator, total assets,

operating revenues and operating costs indicators. All these indicators were lower for companies that have implemented the elements of the circular economy.

2.5 CONCLUSION

The circular economy is a phenomenon of this time and will become an integral part of many businesses in the coming years. As the paper shows, almost 42 % of companies have implemented the elements of the circular economy and most of them are companies from the Moravian-Silesian region, Liberec region and Karlovy Vary region. Research has shown that there are statistically significant differences between certain balance sheet indicators and profit and loss statement indicators, as well as financial analysis indicators calculated from these statements. Specifically, assets, liabilities, costs, revenues, profit or loss and the rates of return and debt ratio were analysed. In the area of assets and liabilities, it was found that indicators of current assets, inventories, profit from previous years and equity are higher for companies that do not have implemented the elements of circular economy. In terms of costs, revenues and profit or loss, interest income, income tax and specific item cash flow indicator were also found to be higher for companies that do not have implemented the elements of circular economy. In the last part, i.e., in the area of financial indicators, the rates of return and debt ratio were analysed, showing a difference in the debt ratio indicator, what is higher for companies that have implemented the elements of circular economy.

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3 ROAD AND CIRCULAR TAXES IN THE MEMBER STATES OF THE EUROPEAN UNION

Kristýna Smejkalová, Bc.[3], Jarmila Rybová, Ing., Ph.D.[4]

Abstract: Road transport is subject to various taxes and charges. This article focuses on part of the total tax burden on transport, namely the tax burden on owners and users of road vehicles used for passenger and freight transport. The road tax is called a circular tax in some states. This tax has mainly a fiscal, stimulating and allocation function. The tax burden on transport helps to regulate transport and affects the prices of products and goods on the market. The functioning and regulation of transport is part of the sustainable management of the company, household and state. It is an important topic in the field of circular economics.

The aim of the article is to compare road and circular taxes in the member states of the European Union between 2007 and 2019. Cluster analysis of three selected indicators shows the similarity of countries grouped in individual clusters.

3.1 INTRODUCTION

Regulation in the field of transport through taxes and charges can be considered as part of the sustainable functioning of economic processes at the level of the individual, company, state or community of states. Therefore, the authors consider this regulation to be part of the circular economy. In each state of the European Union, the size of regulation is different and is perceived differently by owners and users of vehicles, state institutions and consumers of transport services.

Revenues from taxes and fees in the field of transport are used to finance various areas of the economy. This revenue should be used mainly to finance government expenditure on transport infrastructure. The road and circular tax can be used in individual Member States to finance the maintenance and construction of roads

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and motorways, to eliminate the consequences of environmental damage and to protect it. Incentive functions are also inextricably linked to this tax. The tax system makes it possible to obtain various bonuses or reductions or a complete exemption from road tax across countries, which may, for example, be a motive for buying new cars, and thus stimulate certain behaviour of entities. It can support the purchase of more environmentally friendly vehicles, limit the use of older cars, etc.

Each state of the European Union views the road or circular tax somewhat differently. Some countries have similar taxation as in the Czech Republic. Here, the tax is a payment for the use of roads by the company. Other countries tend to classify it as an environmental tax. In contrast, some states do not have much developed on this issue of vehicle taxation. The two major groups of transport taxes in the Member States that fall under vehicle taxation are the registration tax and the use (property) tax.

Road tax is included in the OECD classification in designated group 5200 entitled *"Taxes on the use or authorization of the use or exercise of certain activities"*. This group is further divided into regular taxes with the designation 5210, where the road tax is included. The taxes levied in the Member States included in this group are called road tax by the authors.

The article answers the question of which countries are similar to each other in the tax burden of vehicle owners and users in the period 2007 - 2019. The Member States of the European Union are divided into groups according to their similarity in 2007 and 2019. The results of the study show which countries or groups of countries have the highest traffic load and which the lowest in this period.

3.2 ROAD TAX IN THE MEMBER STATES OF THE EUROPEAN UNION

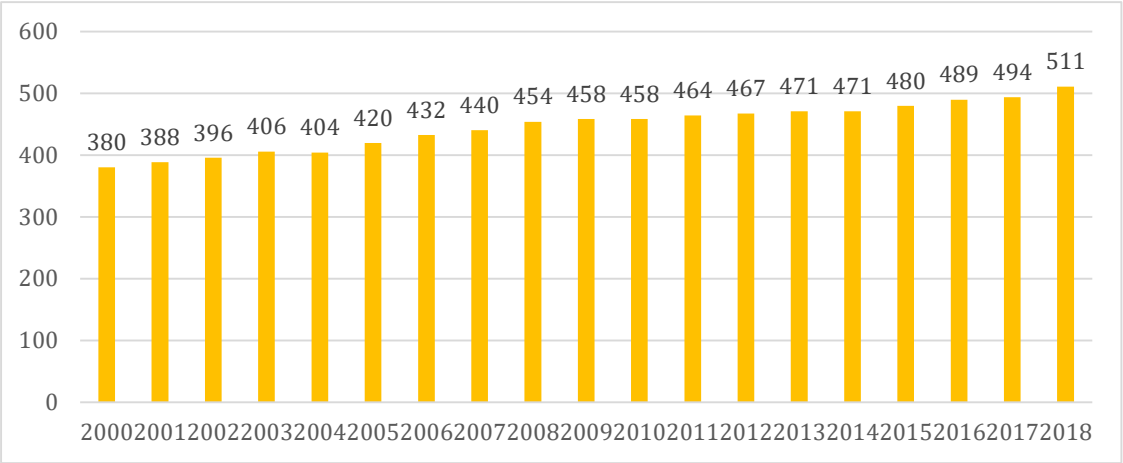
The process of harmonizing the legislation of the states of the European Union has introduced various transport measures in order to make them more environmentally friendly.

The set of measures was the basis for the calculation of road and motorway user charges. Directive 1999/62 / EC on the European motorway sign is governed by the motto "the polluter pays". Pollutant charges include costs related to the use of infrastructure by lorries. As part of the harmonization, emission standards have been adopted for light commercial vehicles and new passenger cars due to CO2 reduction. The maximum permissible vehicle weight and dimensions are also set between Member States. Directive 1999/37 / EC, which harmonises registration documents, serves to simplify the control of ownership and transfers between the buyer and the seller of two different European Union countries.

Other directives in the field of transport are, for example, Directive 96/53 / EC, which lays down maximum permissible dimensions and weights of vehicles for national and international traffic. Directive 2006/126 / EC concerns driving licenses. More detailed data on road and circular taxes in the member states of the European Union are given by Smejkalová (2021, pp. 13-20).

For a more comprehensive overview of this issue, a graph of the number of means of transport in the European Union is added. The following Figure 1 shows the average number of passenger cars in the European Union per 1000 inhabitants. It is evident that with the rising standard of living, the number of passenger cars increases. From 2000, there was a gradual increase by 34.5% until 2018.

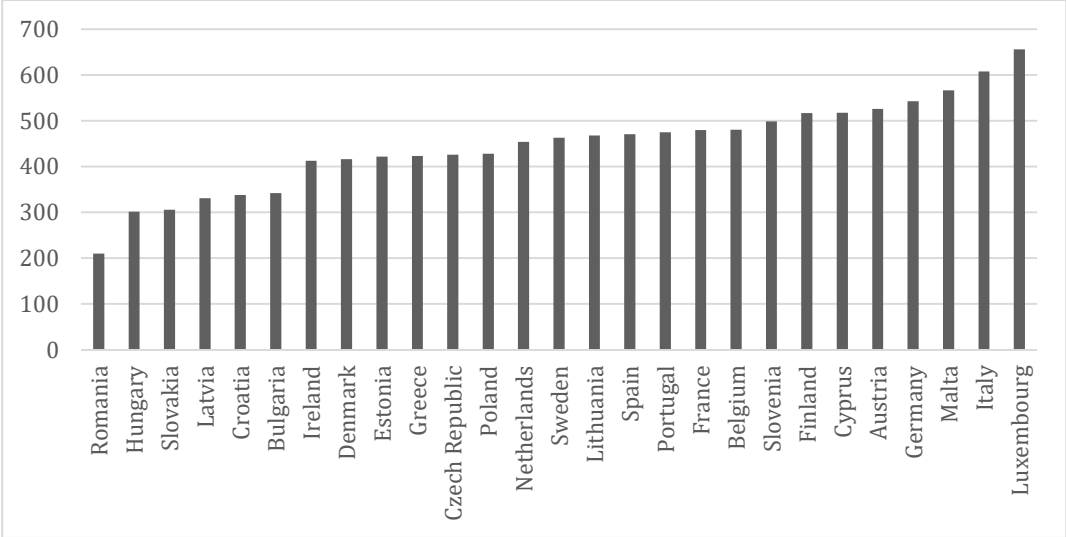
Figure 1: The average number of cars per 1000 inhabitants in the European Union



Source: Eurostat database (2021)

The number of passenger cars in each Member State is also interesting. Eurostat offers data on the number of passenger cars per 1000 inhabitants. Figure 2 shows the average number of cars in the Member States in the period 2000-2018.

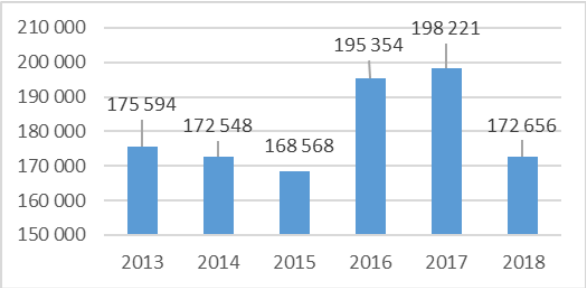
Figure 2: The average number of cars per 1000 inhabitants in the Member States



Source: Eurostat database (2021)

The following Figure 3 shows the average number of trucks over 3.5 tons. Most trucks are registered in Poland, Italy and the third highest number of trucks is in Germany. In all three states, the number exceeds 500,000 trucks.

Figure 3: The average number of trucks over 3.5 tons



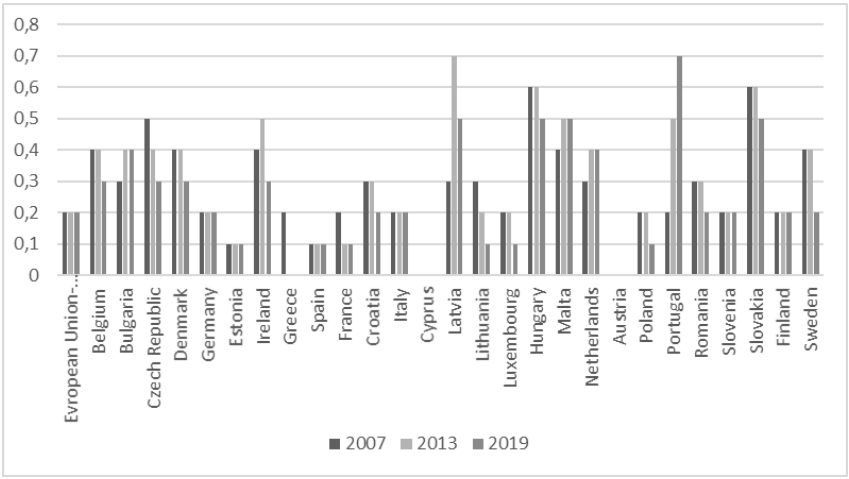
Source: Eurostat database (2021)

Based on Eurostat data on trucks over 3.5 tonnes by type of drive, Figure 2 was created, which shows the average number of trucks in the European Union. Data are available from 2013. However, the data are not complete, some data are missing, so the average was used. According to the European Automobile Manufacturers Association (ACEA), registration of new trucks fell in 2020 in all Member States of the European Union.

3.3 FIRST INDICATOR – THE SHARE OF ROAD AND CIRCULAR TAX IN TOTAL TAXATION

The average share of road tax in the total tax revenues of all Member States of the European Union is 0.2% of the total tax revenues for the entire period 2007-2019. It is clear that Member States are not trying to increase this share.

Figure 4: Changes in the share of road and circular tax in total taxation



Source: Eurostat database (2021)

Figure 4 shows the constant development of road tax revenues on total tax revenues in some states. These are, in particular, Germany, Estonia, Spain, Italy, Slovenia and Finland. We can see large fluctuations in values in the states of Latvia and Portugal.

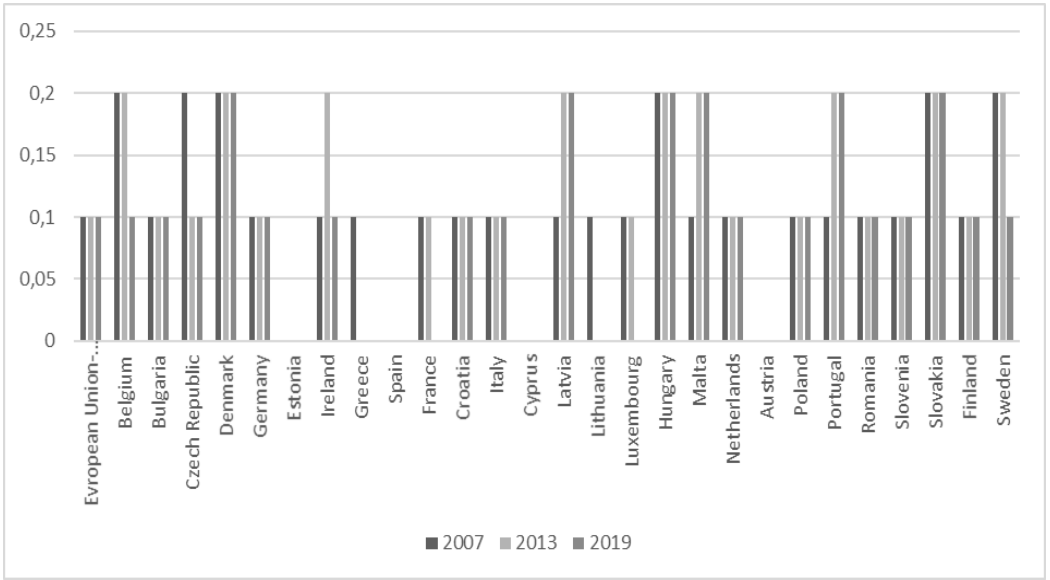
Greece, Cyprus and Austria report a very low share of this tax. Greece reports significant values only in the year 2007. Its other values are zero after rounding. This also applies to Cyprus and Austria. Although these states have traceable values, this aggregate forms a value of zero. This is again due to the rounding of the data.

Revenues have fallen over the years, for example in Belgium, the Czech Republic, Denmark, Lithuania or Hungary. In other countries, revenues are mostly rising, but fell in the year 2019. It is not possible to determine from the data whether the change in the indicator is caused in the area of road tax. A change in the share of road tax in the tax mix can be caused not only by changes in road tax, but also by changes in income and the share of other taxes.

3.4 SECOND INDICATOR – THE SHARE OF ROAD AND CIRCULAR TAX IN GROSS DOMESTIC PRODUCT

Another descriptive statistic is the partial tax quota. Here, the percentage share of road tax in gross domestic product, as well as GDP, is examined. These values were obtained from the Eurostat database as well. The average partial tax quota of all 27 surveyed Member States of the European Union is 0.1% of GDP for the whole period 2007-2019. Like the first indicator, its share is not increasing. The burden of this tax on the population of the European Union is relatively stable.

Figure 5: Changes in the share of road and circular tax on gross domestic product



Source: Eurostat database (2021)

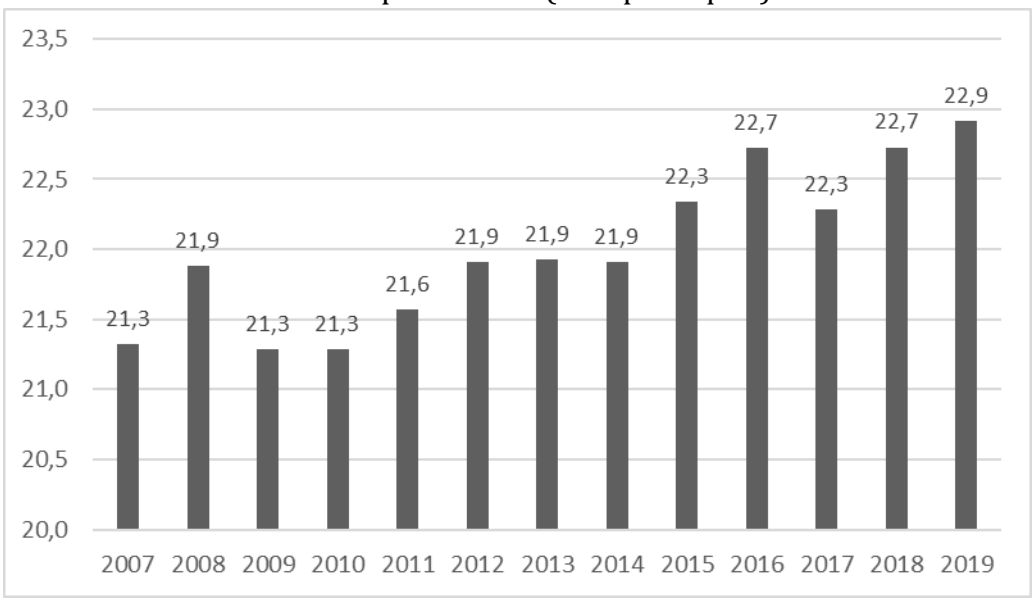
Figure 5 shows the constant values of the partial tax quota in most countries. This value did not change for twelve Member States. The values of these countries correspond to the European average. The decline in the shares of this tax in gross domestic product has taken place in five countries over the years. Four Member States have a zero partial tax quota in a given period.

Three states saw an increase in the partial tax quota for road and circular taxes. The fluctuation of the partial tax quota in Ireland was detected in the year 2013, but then gradually returned to its original value.

3.5 THIRD INDICATOR - ROAD TAX REVENUE PER CAPITA IN THE MEMBER STATES OF THE EUROPEAN UNION

The last indicator entering the cluster analysis is the tax revenue from road tax per capita. Data on tax revenues were again provided by the Eurostat database. The values were determined in millions of euros and then recalculated per capita. The reason is the comparability of data between countries. Populations are as of 1st January 2020 in the Eurostat database. Figure 6 shows the development of the average tax revenue per capita of road tax for the whole European Union in the period 2007-2019. Unlike the previous indicators, the development of this average is different. Absolute revenues from this tax per capita are growing in the observed period.

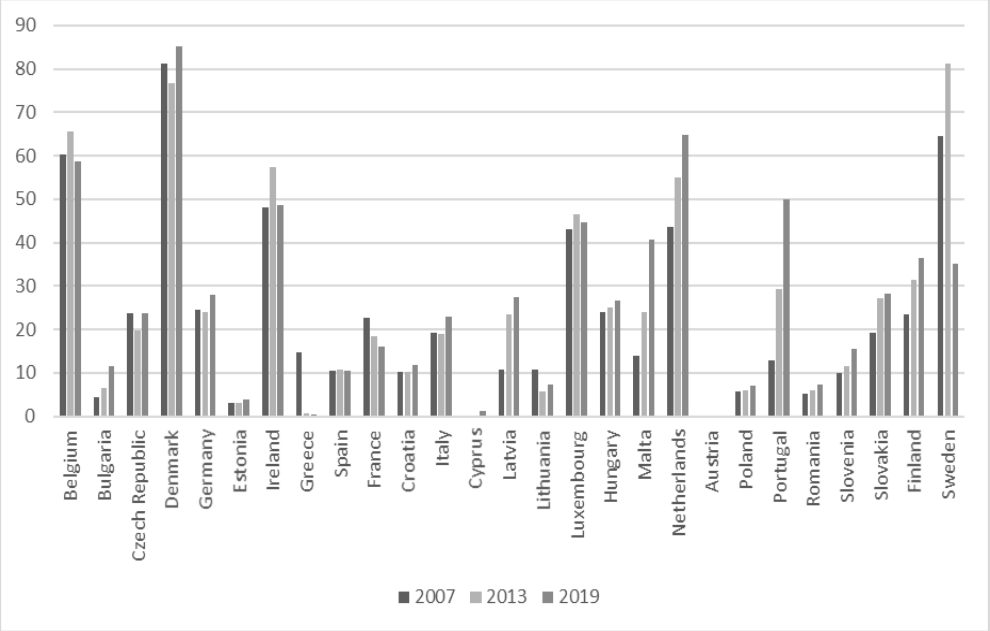
Figure 6: Changes of road and circular tax revenues – average of the Members of the European Union (EUR per capita)



Source: Eurostat database (2021)

The following Figure 7 shows the income from road tax per capita in each state of the European Union. Values are also in EUR per capita. In Denmark, for example, the high income from this tax per capita is around 80 EUR. On the contrary, the values are very low in Greece. Here the value fell to only 0.3 EUR per capita in the year 2019.

Figure 7: Road and circular tax revenues in the Member States of the European Union



Source: Eurostat database (2021)

3.6 THE ACTUAL CLUSTER ANALYSIS

The aim of the article is to compare road and circular taxes in the Member States of the European Union between 2007 and 2019. The reason for choosing this period is the availability of data for as many Member States as possible in the Eurostat database.

Road tax (use tax) falls in part (aggregate) D29B in the ESA 2010 classification: "Taxes on the use of fixed assets". This classification of the road tax is crucial. Within this D29B aggregate, the three descriptive statistics mentioned above are examined:

- the share of road tax in the tax mix
- the share of road tax in gross domestic product, the so-called partial tax quota
- and road tax revenue per capita across the European Union; the population is determined as of 1st January 2020.

Cluster analysis groups similar states into clusters. Ward's method, Euclidean distance, was used. The result of clustering is individual clusters of states. The cluster includes states similar to each other in the field of road and circular tax. The output is two diagrams (tree diagrams) for the two years. The results of the analysis have limited informative value. The number of characters is relatively small. For example, Rybová (2015) or Rybová (2017) used the application of cluster analysis in the area of excise duties. This author used Ward's method as well.

3.6.1 CLUSTER ANALYSIS RESULTS IN THE YEAR 2007

The cluster of states in the year 2007 includes all Member States of the European Union except Croatia, which acceded in 2013. At a joint distance of 5.00, 4 clusters were defined:
Cluster 1/2007: Czech Republic, Hungary, Slovakia
Cluster 2/2007: Estonia, Spain, Cyprus, Austria
Cluster 3/2007: Bulgaria, Germany, Greece, France, Italy, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovenia a Finland
Cluster 4/2007: Belgium, Denmark, Ireland, Luxembourg, Netherlands a Sweden

Figure 8: Map of clusters in the year 2007

Source: Clustering process on data of Eurostat database in the year 2007

Figure 8 shows the differences between different parts of the European Union in the field of road and circular tax. Table 1 shows that the clusters differ significantly from each other, especially for the second and third indicators.

Table 1: Average values of characters in clusters in the year 2007

	Average values of characters		
	Partial Tax Quota (%)	Road and circular tax revenues per capita (EUR)	The share of road and circular tax of total income tax (%)
Cluster 1/2007	0.2	22.29	0.57
Cluster 2/2007	0	3.44	0.05
Cluster 3/2007	0.1	13.64	0.25
Cluster 4/2007	0.15	56.86	0.35

Source: Eurostat database (2021)

3.6.2 CLUSTER ANALYSIS RESULTS IN THE YEAR 2019

All 27 Member States of the European Union participated in the 2019 data aggregation process. The European Union countries are grouped into four clusters:
Cluster 1/2019: Estonia, Greece, Spain, France, Cyprus, Lithuania, Austria
Cluster 2/2019: Latvia, Hungary, Malta, Portugal, Slovakia
Cluster 3/2019: Belgium, Denmark, Ireland, Netherlands
Cluster 4/2019: Bulgaria, Czech Republic, Germany, Croatia, Italy, Luxembourg, Poland, Romania, Slovenia, Finland a Sweden

Figure 9: Map of clusters in the year 2019

Source: Clustering process on data of Eurostat database in the year 2019

Figure 9 shows a map of the European Union members grouped into individual clusters. We can see that the central part of the European Union uses rather lower motor vehicle loads. The north-west of the European Union has a slightly higher load on motor vehicles. The neighborhood of the states with high and lowest motor vehicle taxation, i.e. cluster 1 and cluster 2, is interesting. There could be competition in these countries for road transport taxation.

Possible consequences of competition between neighboring countries:

- Users and owners of vehicles can register vehicles in neighboring countries with lower taxation,
- They can make more use of transport services from the neighboring state,
- Limitation of the number of registered cars in the territory of a state with higher taxation,
- Lower taxes and fees due to a lower number of registered cars,
- Nevertheless, the number of vehicles moving in the territory of a state with higher taxation may not decrease.

Table 2 shows the breakdown of Member States by road and circular tax burdens. Some countries have changed their position compared to the year 2007. These changes may be due to other taxes or a change in gross domestic product in the period 2007-2019.

Table 2: Average values of characters in clusters in the year 2019

	Average values of characters		
	Partial Tax Quota (%)	Road and circular tax revenues per capita (EUR)	The share of road and circular tax of total income tax (%)
Cluster 1/2019	0	5.59	0.06
Cluster 2/2019	0.2	34.64	0.54
Cluster 3/2019	0.13	64.39	0.33
Cluster 4/2019	0.09	22.13	0.21

Source: Eurostat database (2021)

The group of states with minimal partial tax quote has expanded. Three states were added in 2019. These are Greece, France and Lithuania. On the other hand, the number of countries with the highest taxation decreased compared to 2007. The highest taxation remains in Belgium, Denmark, the Netherlands and Ireland. The average amount of road and circular tax revenues per capita increased compared to 2007.

3.7 CONCLUSIONS

The most appropriate indicator for determining the real burden on citizens by road and circular tax is the indicator "Road and circular tax revenues per capita". Tax income from this tax per capita has been growing over the years and the other two indicators are relatively stable over the years and better express the relationship of this tax to public budgets.

The lowest burden of road or circular taxes is in Austria, Cyprus, Estonia and Spain. France, Lithuania and Greece joined these countries in 2019. Several countries show a zero partial tax quota this year, or a low percentage of road tax on gross domestic product. The decline in the indicator may be due to an increase in the gross domestic products of countries, ie the prosperity of local economies. This group of countries generally has a very low income from road tax per capita. They are therefore countries with low sub-indicators concerning road and circular tax.

Countries with a very high per capita income from road tax demonstrably stand out from the results of a cluster analysis across both years. Citizens pay the highest absolute amounts of road or circular tax in Belgium, Ireland, the Netherlands, Denmark. We can say that in these states, indicators such as the overall tax burden, living standards, number of vehicles are high as well. These states are mostly states with a sophisticated tax system and their tax quotas are high.

Another group consists of Latvia, Hungary, Malta, Portugal and Slovakia. They differ from other states by a higher share of road tax in the tax mix, even higher than countries with a high income from road tax per capita. The correlation between the increase in the share of road tax in the tax mix together with the large increase in tax revenue per capita from road tax is demonstrable for this group of countries.

The rest of Europe, including the Czech Republic, is averaged over all indicators. However, we can see some countries that have been included in the group, due to a decrease in either the partial tax quota or the share of road tax in the mix.

as other taxes, so the changes might not have such a significant impact. The clusters of states changed relatively between the observed years, with the mentioned exceptions. It is not possible to prove the geographical similarity of the states completely. The similarity of states in vehicle taxation can also be found in some of them, which are apart across Europe.

National clusters are mixed in terms of the old (EU-15) and new Member States, which joined the EU in 2004 and beyond. States are very different in the road tax, the calculation methodology and its concept differ significantly across countries.

Road and circular tax is a topic of the time associated with innovation in new vehicles. Further changes in the area of this tax can be expected in the future. The main reason may be the greater use of hybrid or electric cars, which are usually exempt from this tax. However, it is necessary to mention that the road tax does not have such a share (weight) among other taxes in the tax systém.

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4 CIRCULAR ECONOMY IN TRANSPORT

Lucie Samková, Ing., EJLog[5]

Abstract: Transport is an integral part of everyday life and is constantly growing and modernizing. It is important to focus on the constant growth of the automotive industry, but also the negative effects of transport on the environment. In this respect, there are opportunities for a circular economy that is environmentally friendly and sustainable. Further use of circular economy could be in the integrated transport system and transport in the city. Here it is possible to give examples of good practice from the world and the Czech Republic and at the same time show some statistics of current situation.

Key words: circular economy, sustainability, transport, integrated transport system, city transport, automotive industry

4.1 INTRODUCTION

Transport is a widespread and important economic sector (accounting for more than 10% of the European Union's GDP and employing around 8.8 million people), so its impact needs to be addressed. (Maryáš & Vystoupil, 2004).

According to data from ACEA (The European Automobile Manufacturers' Association, 2021), 14.6 million Europeans work in the automobile industry, it is 6.7% of all EU jobs. 3.7 million (11.5%) of EU manufacturing jobs are in the automotive sector. Motor vehicles are responsible for € 398.4 billion in tax revenue and more than 8% of EU GDP is accounted for by the car industry. The automotive sector is the largest private contributor to innovation, investing around € 62 billion annually in research and development (i.e., 33% of total EU spending).

Automobile production, tourism, fuels and chemicals are among the four largest world economic sectors. It generates a lot of income, jobs, but also pollution and waste. (Arbulú, 2015).

According to Zielecki (2006), the typical ecological life cycle of a product has three basic phases that accompany transport processes:

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1. Pre-production - customer identification, concept creation and product design according to the required technical standards.
2. Production - material acquisition, production itself and distribution process.
3. Post production - use and recycling.

4.2 NEGATIVE ASPECTS OF TRANSPORT

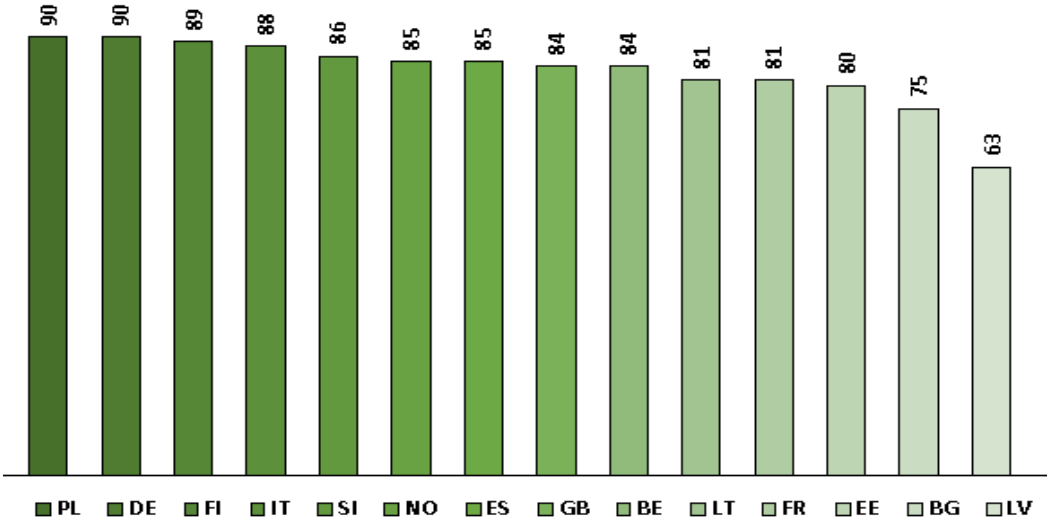
The negative aspects of transport include negative externalities of production that is strongly linked with vehicle production and fuel production and the negative aspects of operating the vehicles.

Next to the pollution (emissions and waste), the negative effects of traffic also include noise, vibration, land grabbing, congestion, etc. The already mentioned emissions and waste seems to rank among the biggest problems for our planet and society (see e.g. Chapman, 2007; (Gao et al., 2018).

The big problem today is that a large number of cars are produced that stand in car parks and are not used. People are constantly ordering new vehicles and changing them after a few years. Vehicles are so little used, and a large amount of unwanted waste is generated. Across the European continent, there are 290 automobile factories, which produce passenger cars, commercial vehicles, but also heavy vehicles, buses, and engines. (ACEA, 2021).

Figure 1 shows their under-utilization in several EU countries.

Figure 1: Car underuse rates in the EU (%)

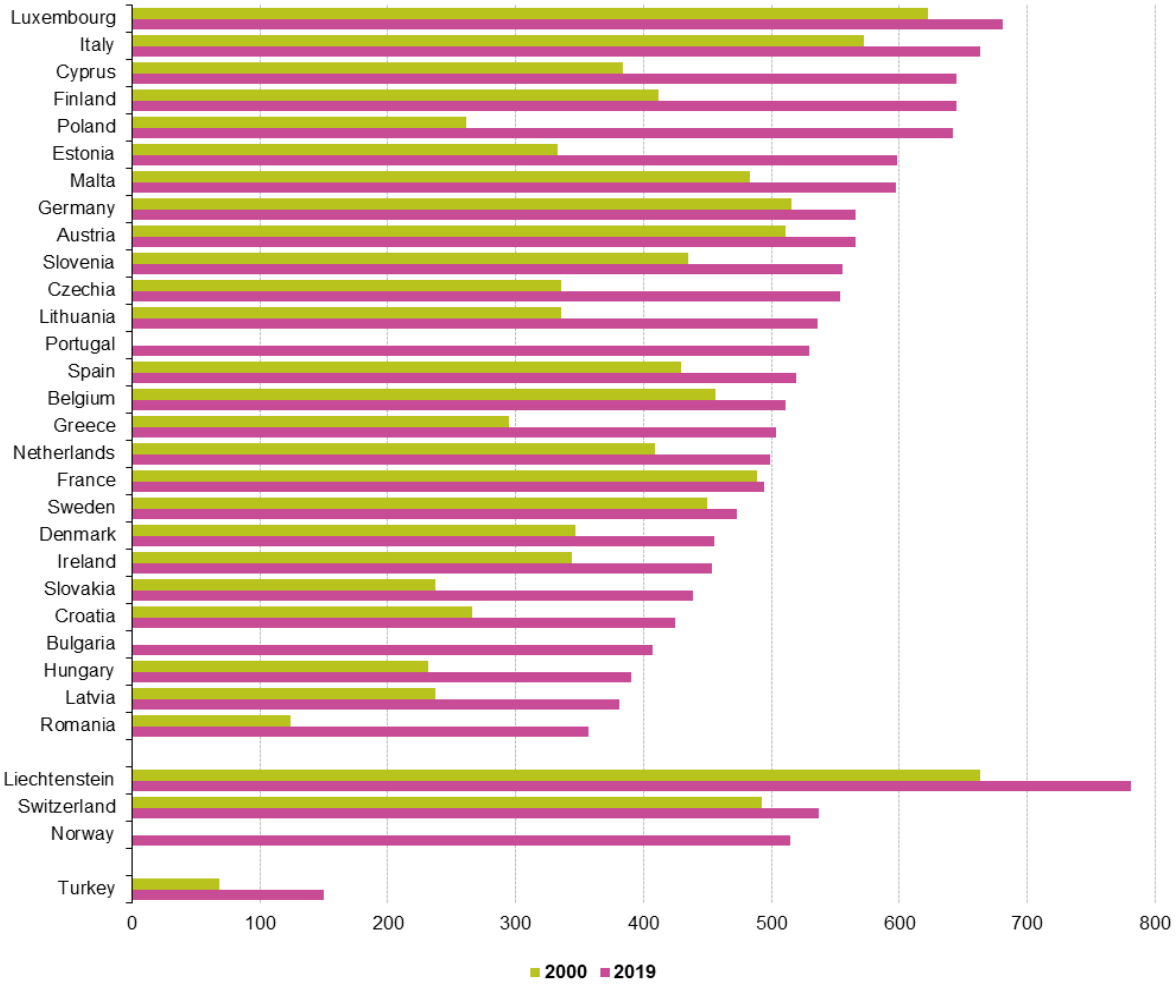


Source: Goudin, 2016

According to The European Automobile Manufacturers' Association (ACEA, 2021), the average number of passenger cars in EU countries is 569 per 1000 inhabitants. The highest car density has Luxembourg – it is 694 cars per 1000 inhabitants and the lowest (342 cars per 1000 people) is in Latvia. Difference between years 2019 and 2020 in more countries of the European Union is in the figure 2.

The highest average annual growth over the period has Romania (+5.7 %) and Poland (+4.9 %). At the opposite end of the scale, countries recording average annual growth between 2019 and 2000 less than 1 % were France (+0.1 %), Sweden (+0.3 %), Luxembourg, Austria and Germany (+0.5 %), Belgium (+0.6 %) and Italy (+0.8 %). In general, over the period 2019-2020 have registered the Baltic, Eastern and Central European Member States stronger growths than West European countries.

Figure 2: Number of passenger cars per 1000 inhabitants, 2000 and 2019



Source: Eurostat, 2021

Probably the biggest negative aspects are emissions and greenhouse gases. According to Report on the Environment of the Czech Republic (2018), greenhouse gas emissions in the Czech Republic from transport are still growing. In the period 2000–2017, carbon dioxide (CO2) emissions increased by 65.2% and nitrous oxide (N2O) emissions by 69.7%. Individual transport accounts for the largest share of emissions, accounting for more than half of total CO2 and N2O emissions and more

than 90% of polyaromatic hydrocarbon emissions. The growth of emissions depends on the composition and age of the vehicle fleet, which is very old in the Czech Republic.

4.3 POSSIBILITIES OF CIRCULAR ECONOMY IN TRANSPORT

Transport is the process of moving passengers and goods. It is possible to focus on the area of transport accessibility, mobility and capacity, quality of infrastructure and surroundings or fleet characteristics. According to Manniche et al. (2018), transport is an inseparable part of tourism and offers many opportunities and challenges for improvement, ecological sustainability and efficiency. Negative impacts of tourist travel could be reduced by fewer trips, traveling on shorter distances, longer stays in destination or traveling with ecological transport systems.

For sustainable transport, the following options need to be focused:

- reduction of CO2 and greenhouse gas emissions,
- driver training on eco-driving,
- alternative fuel vehicles with alternative power units (electric, hybrid) or alternative vehicles (e.g., wheels, scooters, etc.),
- sustainable fleet management,
- traffic regulation,
- shared transport,
- ecological production of vehicles,
- appropriate infrastructure.

Shared transport is a rapidly growing trend and also an opportunity for the circular economy. It is necessary to deal mainly with transport in the city or within the selected area around cities. It is mainly the sharing of cars, bicycles, scooters or rides. There are many platforms and mobile applications for using this type of alternative transport, which are easy for the user to operate. The most important providers include Blablacar, Uber, Grab, Car2Go, Didi and Lyft. Bikesharing or scootersharing is still more popular, mainly in big and developed cities. It offers quick, easy, interesting and ecological transport trough whole city. (Cohen & Kietzmann, 2014).

More and more people are resorting to the so-called active form of mobility, such as walking, cycling, scooters or rollerblading, because they are considered healthier and safer than traditional public transport. Investing in shared multimodal infrastructure, which includes options for shared bikes and others, could make people more likely to use these means of transport. These include investments into the integration of bicycle lanes and other infrastructure, more parking spaces and electric bike charging stations. It is anticipated that these multimodal transport systems could reduce global CO2 emissions by 70% by 2040 and at the same time reduce costs for European households by 70% by 2050.

Circular economics is still a relatively young concept, so there is no precise methodology for measuring it. As mention Moraga et al. (2019), no single metric can accurately show a complete picture of circular economy. As stated by Fufa et al. (2019) or Bonato and Orsini (2018), indicators of the share of the circular economy in the transport sector are the share of zero-emission vehicles, the number of shared vehicle rentals (cars, bicycles or scooters) and the share of private and public vehicle journeys.

The options used, such as shared vehicles, fall more into the shared economy. In order to be a purely circular economy, it is necessary to further develop the transport system and use, for example, ecological fuels, recyclable vehicles and others. Various investments contribute to the creation of a more resilient mobility system, but the two major and attractive circular investments include multimodal infrastructure and car refurbishment and infrastructure repairs. These opportunities can address both short-term and long-term public and private sector goals.

Renault was the first carmaker, who directly invest into the circular economy and also has shown the benefits of eco-friendly vehicles in numbers. Vehicles can be designed to be 85% recyclable, 43% engines to be remanufactured and 95% usable. With vehicles produced in this way, water, energy and chemicals are saved by more than 80%. Customers are then offered a warranty for as a new car, but the price of the vehicle and spare parts is 30-50% lower. (Renault Groupe, 2017).

Batteries and ecological vehicles are the basis for the sustainable mobility of the future. In order to rapidly increase the sustainability of the emerging value chain in the field of electromobility batteries and increase the circulation potential of all batteries, the European Commission (2020) will propose this year a new regulatory framework for batteries, taking into account the following elements:

- Rules on the content of recycled material and measures to improve the collection and recycling rate of all batteries, ensure the reuse of valuable materials and provide guidance to consumers.
- Addressing the issue of non-rechargeable batteries with a view to phasing out their use and replacing them with alternatives.
- Sustainability and transparency requirements for batteries, which take into account, for example, the carbon footprint of battery production, ethical sourcing and security of supply, and facilitate reuse, reuse and recycling.

The European Commission (2020) will also propose a recast of end-of-life vehicle legislation to promote business models that contribute to greater circulation. These will include a functional link between vehicle design and end-of-life processing, rules for mandatory recycled content of materials and components and improved recycling efficiency. Furthermore, measures to ensure the collection of waste oils and their processing in an environmentally friendly manner will be assessed. The future comprehensive European strategy for sustainable and intelligent mobility will focus more broadly on strengthening synergies with the transition to a circular economy through "product-as-a-service" solutions to reduce the consumption of original materials, use sustainable alternative fuels in transport,

optimize infrastructure and vehicle use, increase occupancy rates and load factors and eliminate waste and pollution.

According to The European Automobile Manufacturers' Association, recycling facilities are also increasingly being promoted, because they keep high-value materials in circulation. Cars designed for dismantling can thus be recycled and processed with minimal loss of material and quality. The European End-of-Life Vehicles Directive has set a target of 95% recyclability per vehicle per year. It is also a matter of introducing various rules for compulsory recycling and improving the efficiency of recycling. The aim is to ensure better coordination of subsequent end-of-life processes and thus strengthen the market for secondary materials and components. (ACEA, 2021).

In the field of the urban environment, EU policy supports the principles of sustainable planning, which also includes innovative approaches to urban public transport and mobility - smart city. Digital technology is being used to use resources more efficiently and reduce the negative impacts on the society and environment. In the field of infrastructure and mobility, there are many possibilities. Adequate and intelligent infrastructure must be put in place to achieve zero greenhouse gas emissions.

In 2020, more than one in 10 cars registered in the EU was electric, it was 5240 cars and also 2573 gas vehicles. Investment in alternative propulsion vehicles is paying off, but this trend is only sustainable if there is more investment in infrastructure and the necessary measures.

Technological innovations in transport play an important role. Thanks to carsharing, smart materials, autonomous driving and electromobility, the price per kilometre could be reduced by up to 75% by 2030.

The main goal when implementing circular economy into transport systems is to make the logistical system economically, environmentally and socially more sustainable by modularization and the increased connectivity, transparency and sharing of resources (Rajahonka, Bask, Yawar, & Tinnilä, 2019). There is a specific role of freight transport and passenger transport within a circular economy (Muñoz-Torres, 2019).

4.4 CIRCULAR ECONOMY IN INTEGRATED TRANSPORT SYSTEM IN PASSENGER TRANSPORT

Mobility is a key element of all cities and surrounding areas and is essential for the proper functioning of the city. It also has a significant impact on the quality of life and the environment. Effective urban mobility systems must include all suitable modes of transport and can be optimized through their integration and spatial planning.

The share of public transport in the total transport performance of passenger transport is significant, for example in 2017 it accounted for 33.9%. For this reason, it is appropriate to address public transport and its possibilities. In the Czech Republic, alternative fuels and drives are still little used, but it is in public transport

that the increase is noticeable. In 2019, 636 new electric cars were registered, which was a year-on-year increase of 2.9%.

Spatial planning, i.e., coordinated and systematic management of urban growth, is essential to ensure sustainable urban infrastructure. This planning can be done at macro (regions and metropolitan areas), meso (sub-regions, corridors and districts) or micro (communities, neighbourhoods and streets) levels. In larger areas, the possibility of reducing emissions, saving energy and the overall introduction of the circular economy is greater, but it is important to plan the involvement of all smaller levels and connect everything appropriately. (Seto et al., 2014).

Mobility is an integral part of everyday life, and transport is linked to energy consumption and other negative aspects. Energy savings can be achieved through technological innovations (electric vehicles) or by promoting other sustainable modes of transport (suitable public transport, walking, cycling). Cities should create quality public transport networks and support the shift away from car use (restrictions in parts of the city, construction of P + R car parks, support for an integrated transport system). In the transport sector, renewable energy options include, for example, electrically powered trains, light rail vehicles or road vehicles, as well as biofuels (liquid or gaseous) or hydrogen-powered road vehicles. Cities should build charging stations and also introduce benefits for electric cars. (IRENA, 2016).

4.5 EXAMPLES OF GOOD PRACTICE

According to The European Automobile Manufacturers' Association (ACEA, 2021), in the European Union in 2020, 5.4% of all sold cars were battery-powered and 5.1% of total car sales were plug-in hybrids. 11.9% of all new cars in the EU were hybrid electric and 0.6% of sold cars were on natural gas. Only a small amount (i.e., 0.01%) of all vehicles sold in 2020 had fuel cells. As can be seen in the figure 3, between 2019 and 2020 there is a significant decrease in registrations of petrol and diesel vehicles, while the number of electric and hybrid vehicles is increasing. Hybrid electric cars dominate among alternatively powered cars in all European Union countries.

Figure 3: New car registrations in the EU, by fuel type

Trends over time in the EU (in units, 2014-2020)

	2014	2015	2016	2017	2018	2019	2020
Petrol	4,174,069	4,752,707	5,481,409	6,205,957	7,055,394	7,514,812	4,713,778
Diesel	5,359,263	5,762,740	5,890,470	5,551,109	4,655,747	4,106,951	2,778,817
Electrically-chargeable	55,356	119,323	118,542	168,901	240,347	387,325	1,045,082
→ Battery electric	30,820	49,231	53,215	84,070	131,954	247,371	538,023
→ Plug-in hybrids	24,536	70,092	65,327	84,831	108,393	139,954	507,059
Hybrid electric	139,280	174,695	226,940	359,093	503,618	742,084	1,182,792
Fuel cell	32	165	113	218	230	483	749
Natural gas (CNG)	97,214	78,511	57,609	49,553	65,023	68,129	55,028
Other (LPG + E85)	141,452	140,321	118,430	156,710	164,270	186,141	153,344

Source: ACEA, 2021

Although the introduction of charging stations for electric vehicles has increased in recent years (+ 750% since 2014), their total number in the EU is insufficient (less than 225,000 places). Only about 1 in 9 charging points is a quick charger (less than 25,000 has a capacity > 22 kW). According to the Commission's calculations, the target of reducing CO2 emissions from cars by 50% by 2030 would require around 6 million public charging points. The gradual increase during the years 2014 to 2020 can be seen in the figure 4. (ACEA, 2021).

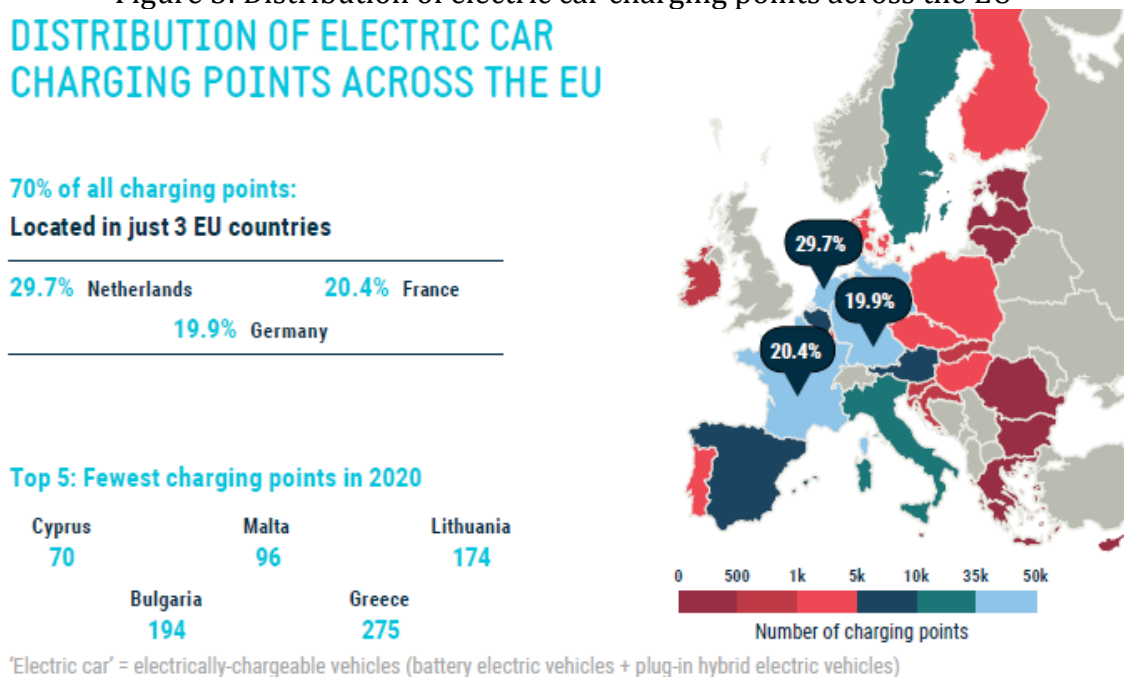
Figure 4: Rollout of charging points in EU

EU total	2014	2015	2016	2017	2018	2019	2020	% 14/20
ECV charging points	26,391	49,363	77,038	109,896	123,727	171,287	224,237	+750%

Source: ACEA, 2021

70% of all charging stations in the EU are located in three countries: the Netherlands (66,665), France (45,751) and Germany (44,538). The fewest charging stations are in Cyprus (70 places). The diagram with the marked number of stations for individual states can be seen in the figure 5. In addition, there were 124 hydrogen filling stations and around 4,000 natural gas filling stations in the EU in 2020 (two thirds of these are in Italy and Germany).

Figure 5: Distribution of electric car charging points across the EU



Source: ACEA, 2021

As mentioned in the London's Walking Action Plan (2018), is expected that congestion will cost the city £ 9.3 billion a year by 2030. London is thus introducing a transport plan that includes a special action plan for pedestrians and an increase in

pedestrian traffic. GBP 2.2 billion will be invested in street redevelopment, pedestrian crossings, better signage and maps, as well as in public transport. According to the analysis, the plan can save up to GBP 1.6 billion in public health costs, use land more efficiently, increase retail sales, increase social cohesion and, above all, reduce emissions. Furthermore, Transport for London (TfL) collects a huge amount of anonymised data about the movement of people, cars and public transport vehicles. Due to the analyses, it is possible to optimize the integrated transport system, improve conditions, monitor and reduce negative impacts and predict changes and future developments. The data are publicly available and there are around 700 applications that more than 40% of London residents use regularly. In 2017, it was estimated that investing GBP 1 million in open data generated annual economic benefits and savings of up to GBP 130 million (for the city, TfL and tourists).

The city plan of São Paulo for 2014 also focuses on mobility and support for public transport. The intention is to increase the number of people living close to public transport from 25% in 2015 to 70% in 2025. 30% of all urban development funding is earmarked for this strategy, because it involves the development of economic, social and environmental opportunities.

In Pontevedra, Spain, CO2 emissions and pollution have been reduced by 70% due to some transport arrangements in the city centre as car ban. They also calmed traffic in the city thanks to the construction of an underground car parking on the periphery, construction of roundabouts and extension of zones with reduced speed to 30 km/h. Among the benefits recorded is less congestion, fewer accidents and deaths. (Burgen, 2018).

In the Czech Republic in Brno, in 2018 was established project The Circular Transport in Brno, supported by the Institute of Circular Economics (INCIEN). The main idea is to use biomethane, generated from biodegradable waste (spent food, food scraps and wastewater) as a fuel for city buses. The origin of the project was inspired by the Netherlands and Finland, where a local engineer on a small farm designed a biogas purifier (from cow dung and waste) for biomethane. He then used it to drive cars.

The project required the cooperation of three companies that participated in its implementation. The transport company of the city of Brno set aside one CNG-powered bus for testing, which filled biomethane and operated on a standard line. The company Brno waterworks and sewerage provided biogas, which is generated by the treatment of sewage sludge, and provided the facilities for the Wastewater Treatment Plant in Modřice for the location of the technology and the dispenser. The research company MemBrain provided its unit for the conversion of biogas to biomethane to the project free of charge and completely took care of the technical side of things.

Biomethane is a biogas containing at least 95% methane. It has the lowest greenhouse gas emissions and compared to other conventional biofuels, the lowest energy consumption in the entire life cycle, especially if it is produced from waste biomass. Its properties are identical to natural gas, so it is not even necessary to modify the buses. A wide range of biodegradable materials can serve as a source for biogas production - anything that can be easily broken down by bacteria. Biogas

can thus also be produced from past food, livestock excrement or from purposefully grown crops.

The "BioCNG bus" traveled almost 5,000 km while consuming 1,660 kg of biomethane. The transport company of the city of Brno wants to change part of its fleet to so-called "circular operation" and the capital city of Prague is also considering the possibilities of driving biomethane for public service vehicles. Biowaste from all over the Czech Republic could power almost 1,400 buses. On average, for every 8 kg of bio-waste from citizens, it is possible to produce so much gas that a city bus can travel 1 km. (Cerqueirová, 2020).

4.6 CONCLUSIONS

The principle of circular economy can be used in many industries, including transport. Transport generates not only work places and incomes, but also waste, pollution and other negative impact. That is why it is necessary to focus on this sector and find principles of circular economy, which could be use. The transport sector is a participant in the linear economy, but efforts to move to a circular economy are considerable. Components to transformation already exist, but progress is slow.

The concept of the circular economy in transport (as well as in the integrated transport system) brings a number of possibilities and opportunities for research. Although transport systems are gradually being optimized, studies of shared transport and a quality green transport system are still underdeveloped.

The priority in transport should be environmental sustainability, i.e., the creation of low carbon emissions and a high level of energy self-sufficiency. There is a need for cities to support public transport, its optimization and alternative modes of transport, such as cycling, walking and more.

One of the biggest opportunities is the use of bio waste to convert to fuel, which is easily able to power vehicles. Bio-waste is now transported to landfills and incinerators, so its potential is not exploited.

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5 SUSTAINABLE AGRICULTURE - CURRENT TREND OR NECESSARY FUTURE

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Abstract: The model of sustainable development is projected into all spheres of society. Sustainable agriculture is based on the idea of sustainable development. It is more of a kind of philosophy without specific principles. Sustainable agriculture primarily seeks to take account of environmental issues, prevent environmental degradation and, last but not least, lead to the conservation of resources. Development is sustainable if all requirements (economic, environmental and social) are respected in the same way even if the given goals are eventually met to varying degrees. These requirements and goals are based on each individual and are implemented in the form of government policy in the country. Unfortunately, the thinking of all farmers is not based on the ideas of sustainable agriculture and therefore it is highly desirable to define this area in legislation and, at the same, time support farmers with various subsidy programs. The basic aim of this paper is to map the current trend of the possibilities of using the circular economy in agriculture, the so-called sustainable agriculture in the Czech Republic and to point out the possibilities of using sustainable agriculture in the case of Czech farmers. At the same time, this chapter points to the demands placed on farmers in sustainable agriculture.

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5.1 THE ESSENCE AND IMPORTANCE OF AGRICULTURE

Since ancient times, the agriculture has been the main means of subsistence for the rural population, and it is one of the oldest human activities that have a major impact on the shape of the landscape and nature. Its essence and significance is still strong even in today's modern age despite the constantly turbulent world.

The following numbers prove the importance of agriculture. According to data from the BusinessINFO.CZ server (2020), over 130,000 people are employed in the agriculture in the Czech Republic, around 3.5 million hectares of the agricultural land are managed, and the production of the agricultural sector is approximately CZK 145.4 billion.

5.1.1 PREREQUISITES FOR THE AGRICULTURE FUNCTIONING

The agriculture is the part of the global economy and market relations despite the peculiarities of production processes or soil wealth which often vary across countries. The related export and the import of the agricultural products is associated with the question of whether our goods can withstand global competition. The farmer must therefore analyze very well what products they will supply to the market and how they will produce them. In the agriculture, the range of raw materials is limited but also the number of the customers. It is thus necessary for the farmers to monitor developments and trends in technology and focus on the type of products that have a chance to succeed in such an environment. The quality of goods is the basis from which their prices and the possibilities to participate in the international division of labor are derived. The qualification is also an integral part of success. It is knowledge that allows the farmers to combine different options that will ultimately ensure efficient production and productivity. Although, it is not obvious, at first glance, the farmer must have knowledge of biological or chemical factors in his activity, and at the same time he must follow new trends as well as related legal regulations (Čuba et al., 1998).

The large-scale production is a gradual trend in the world while small farms have only a complementary character. However, the nature of small businesses is different than it was, for example, 50 years ago due to the development of technology and labor productivity. A large part of the enterprises also disappears because dysfunctional and unprofitable enterprises are no longer artificially maintained as was the case in the times of socialism. The world needs viable farms that are just following the path of the trends and new technologies. And one of these important markets is the sustainable agriculture (Čuba et al., 1998).

5.1.2 NATURAL CONDITIONS AND STRUCTURE OF THE AGRICULTURAL LAND FUND

The field of the agriculture also affects the nature of natural conditions in a given country in addition to economic and social factors. These conditions determine the functionality and direction of the agricultural production and affect the productive capacity of agricultural land. The Czech Republic has worse preconditions for the agricultural production compared to neighboring countries. The territory of our state has the character of relief which consists mainly of highlands and hills which has an impact on soil and climatic conditions. This also creates differences among individual regions in the Czech Republic. The possibilities of the agricultural production are specifically limited, for example, by altitude, the slope of the relief, the grain size, and the type of the agricultural land or climatic conditions. These factors thus cause noticeable differences in the nature of the agricultural production across the country. Central Moravian districts or the Elbe region meet the best natural conditions. On the contrary, the lowest productivity of agricultural land is in border districts, i.e. in the Bohemian-Moravian Highlands and in districts with high altitude (Jančák & Götz, 1997).

The structure of the agricultural land fund is divided into 3 categories: agricultural land, arable land and permanent grassland. The agricultural land began to shrink significantly due to growing built-up areas and the expansion of transport networks in the last century. Specifically, the BusinessINFO server (2020) reports a reduction in the size of sown areas compared to the last century by more than 30%. The decrease is mainly due to significantly higher efficiency and productivity of the agricultural production, which allows with smaller inputs (i.e. amount of labor, capital and land) to produce a much larger volume of the agricultural products. However, this is not a clearly unfavorable phenomenon due to the agricultural surplus of the Czech Republic in comparison with other countries. In Western Europe, land losses have been much more pronounced in history, and there have been unused land or significant food surpluses in these areas. In some parts of the country, on the other hand, the area of the agricultural land is slightly increasing. Decreases were also recorded for arable land which were partially stabilized by the Act on the Protection of the Agricultural Land Fund. The subsidy policy also affects the grassing of arable land in areas with worse natural conditions where there is an increased risk of soil erosion. It is the last category of the agricultural land – permanent grasslands such as meadows and pastures that slow down the occurrence of water erosion and their existence is necessary especially in the foothills. Their area will continue to grow or at least stagnate due to the subsidy policy for maintaining the landscape (Jančák & Götz, 1997).

5.1.3 PLANT AND ANIMAL PRODUCTION

The basis of the agricultural production is crop production which, in addition to the consumer crops and raw materials, also represents a feed base for livestock. Ac-

cording to the BusinessINFO.cz server (2020), the value of the crop production increased to CZK 82.8 billion in 2020 which was mainly affected by the quality harvest of cereals, legumes or rape. The value of the total harvest was 6.3% higher in 2020 than for the previous year. The intensity of the crop production is influenced by the natural conditions and differences among individual districts in the country. In particular, cereals dominate in crop production – specifically wheat where the Czech Republic is completely self-sufficient in this commodity. Other important cereals are barley, rye, and oats. This production has dominated in the last century. The remaining share of the crop production is occupied by the crops such as corn for grain, potatoes, rape, and others (Jančák & Götz, 1997).

The second component is an animal production in order for the agricultural production to be in balance. In the past, the level of the livestock production increased at the expense of crop production. Today, this trend is the opposite the share of the animal production continues to decline. According to the BusinessINFO.cz server (2020), the value of the animal production increased to approximately CZK 53.7 billion in 2020 mainly due to increased production of eggs and milk. The intensity of the animal production is also influenced by differences among individual districts while the above-average intensity is in districts with large feedlots and, conversely, below-average in districts with predominant fattening of slaughter animals. The livestock production includes cattle breeding where specifically cow breeding is important for the reproduction of breeding and for milk production. According to data from the BusinessINFO.cz server (2020), the number of the cattle decreased by 27,000 in 2020. On the contrary, an increase was recorded in pig breeding, namely by 2.5% compared to 2019. The remaining part of animal production is occupied by poultry for slaughter – chickens, ducks, hens or geese, as well as horses or goats, whose numbers as with cattle are declining (Jančák & Götz,1997).

5.2 SUSTAINABLE AGRICULTURE

Other, alternative directions, methods of agriculture have developed in advanced countries and also in some developed countries where they have existed with the predominant way of farming (predominant in the area of cultivated land) which is undoubtedly conventional agriculture. These alternative directions are also conquering the world of the food industry and are thus becoming an integral part of the agricultural policy of developed countries. However, these alternative methods of agriculture do not emphasize exclusively the intensity of the production, and the economic side of things. It seeks to take, more or less, into account environmental issues and prevent environmental degradation. The most common alternatives are mainly organic farming, integrated agriculture, and in recent years so-called precision agriculture. The sustainable agriculture has a specific role in which case it is more a philosophy without specific principles of cultivation or breeding. It is defined by goals and it is based on the principles of the sustainable development. On

a smaller scale, other methods also appear such as organic farming, organic farming, biodynamic farming, low input, etc.

The sustainable development has been one of the European Union's (EU) fundamental objectives since it was included in the Treaty of Amsterdam in 1997. The European Union's vision of the sustainable development was described in the Treaty of Amsterdam. As stated, the sustainable development is built on the economic growth and the price stability, on a competitive and social market economy, and above all on a high level of the protection and the improvement of the environment.

Sachs (2015) describes the sustainable development as the development that is able to enable the current generation to meet their needs without such behavior jeopardizing the satisfaction of the needs of future generations. Furthermore, behind economic growth is the fact that natural materials have a limited amount and that it is therefore necessary to take into account future generations.

The sustainable development is also defined by Act No. 17/1992 Coll., On the Environment which states that the sustainable development of society is such development that preserves the opportunity to satisfy basic living needs of the current and future generations without reducing the diversity of nature and preserves the natural functions of ecosystems.

The sustainable agriculture has its roots in the idea of the sustainable development. The definition of the sustainable agriculture is not uniformly defined due to the number of stakeholders trying to define the concept. Below are only some selected authors defining the concept of the sustainable agriculture:

- Ikerd (1997) describes the sustainability is a long run, people-centered concept and adds that the sustainability is also broader than current ecological or social theory.
- Francis & Youngberg (2020) describe the sustainable agriculture as a philosophy based on human goals, knowledge of impacts, which in turn leads to conservation of resources, has a lower impact on environmental damage, maintains agricultural productivity, supports the economic viability of the agricultural systems in the short and long term and, last but not least, leads to the stability of rural communities.
- According to Francis (19987), the sustainable agriculture can also be seen as a strategy to help producers choose among varieties, soil fertility, crop rotation, minimize environmental impact, and ensure a sustainable level of production and profit.
- Váchal & Moudrý (2002) describe the sustainable agriculture as such agricultural development that satisfies the needs of the present and does not limit the needs of future generations.
- Gliessman (2020) describes the sustainable agriculture as a system that does not degrade the soil, a system that preserves the resource base, a system that controls pests and minimizes artificial resources from the outside.

Gliessman (2000) describes the parameters below that the agricultural technologies should meet in order to be sustainable, they would:

- have minimal negative effects on the environment and release no toxic or damaging substances into the atmosphere, surface water, or groundwater;
- preserve and rebuild the soil fertility, prevent the soil erosion, and maintain the soil´s ecological health;
- use water in a way that allow aquifers to be recharged and the water needs of the environment and people to be met;
- work to value and conserve biological diversity, both in the wild and in domesticated landscapes;
- rely mainly on resources within the agroecosystem, including nearby communities, by replacing external inputs with nutrient cycling, better conservation, and an expanded base of ecological knowledge;
- guarantee equality of access to appropriate agricultural practices, knowledge, and technologies and enable local control of agricultural resources.

- Niggli et al. (2008) describes that the sustainable agricultural practices, such as organic agriculture, strongly reduce the reliance on external inputs by recycling wastes as nutrient source, improving cropping systems and landscapes, avoiding synthetic pesticides, or integrating crops and animals into a single farm production sector and including grass clover leys for fodder production while avoiding purchase of feed concentrates. The sustainable agriculture must not have negative effects on the environment, it must protect and restore the soil fertility, protect the soil from erosion, use water appropriately, protect the biodiversity in the natural environment and the used rural landscape.
- In their contribution, Lewandowski et al. (1999) focus on the sustainable crop production in relation to the sustainable agriculture. The authors state that the sustainable agriculture is mainly a way of managing and using the agroecosystem in a way that maintains biodiversity, productivity, regeneration and viability.
- As Hatfield & Karlen (1994) add, the sustainable agriculture is one that over the long term enhances the environmental quality and the resource base on which the agriculture depends. The sustainable agriculture provides for basic human food and fiber needs, is the economically viable, and enhances the quality of life for the farmers and society as a whole.

From the above definitions, it can be summarized that the sustainable agriculture should prevent the soil degradation, strive to maintain its fertility in the long run. Furthermore, efforts should be made to prevent pollution of both surface and groundwater and to ensure sufficient water in the landscape. The sustainable agriculture should seek to reduce agriculture's dependence on non-renewable energy

sources and this system is economically viable and has a positive impact on the quality of life for farmers and society as a whole.

The sustainable agriculture depends on a whole system approach whose overall goal is the continuing health of the land and people. Therefore, it concentrates on long-term solutions to problems instead of short-term treatments of symptoms (ATTRA, 2003).

The basic definitions of the sustainability are the follows:

- economic sustainability;
- environmental sustainability;
- social sustainability.

The sustainability is defined using these three pillars of the economic, environmental and social sustainability, as Adams (2006) confirms. It is necessary to respect these three pillars which are interlinked and overlap each other, in order for the agriculture to be sustainable. ATTRA (2003) adds that the sustainable farming meets the economic, environmental, and social objectives simultaneously because these three objectives always overlap they are managed together.

5.2.1 THE ECONOMICAL SUSTAINABILITY (ECONOMIC REQUIREMENTS)

The economic sustainability increasingly depends on selecting profitable enterprises, financial planning, proactive marketing, risk management, and good overall management. Every farm needs a marketing plan of some type. Marketing can take many forms – ranging from passive marketing in the commodity chain to marketing a retail product directly to consumers. Which marketing method the farmer chooses will have profound effect on the price his or her product commands. According to ATTRA (2003), some of indicators that the farm achieves economic sustainability, are as follows:

- increasing family savings and the net worth;
- a reduction in debt of farmers;
- the farm enterprises are consistently profitable from the year to year;
- purchase of off-farm need and fertilizer is decreasing;
- decreasing reliance on government payments.

5.2.2 THE ENVIRONMENTAL SUSTAINABILITY (ENVIRONMENTAL REQUIREMENTS)

The sustainable agriculture can be viewed as ecosystem management of complex interactions among the soil, water, plants, animals, climate, and people. The goal is to integrate all these factors into a production system that is appropriate for the environment, the people, and the economic conditions located farms. The farms become and stay environmentally sustainable by imitating natural systems. Nature tends to function in cycles so that waste from one process or system becomes input

for another. ATTRA (2003) lists some of indicators that the farm achieves the environmental sustainability, these are:

- there is no bare ground on the farm;
- there are clean water flows in the farm´s ditches and streams;
- abundance of wildlife;
- there are prolific fish in the streams that flow through the farm;
- the farm landscape is diverse in vegetation.

5.2.3 THE SOCIAL SUSTAINABILITY (SOCIAL REQUIREMENTS)

The social sustainability also includes the quality of life for those who live and work on the farm, including good communication, trust, and mutual support. Decisions made on the farm have effects in the local community. Full family participation in the farm planning is an indicator that the quality of life is high. Other indicators include talking openly and honestly, spending time together, a feeling of progress toward goals, and general happiness. Quality of life will be defined somewhat differently by each individual and family based on their values and goals. As ATTRA (2003) adds interactions among farmers play a very important role in social sustainability:

- the farm is able to support other businesses and families in the community;
- money circulates within the local economy;
- an increase or stable the number of rural families;
- young people take over their parents´ farms and want to continue farming;
- college graduated return to the community after graduation.

5.3 GROWTH VERSUS SUSTAINABILITY

Hatfield & Karlen (1994) descriebe the definition of the growth where the economic growth is as increase in the gross national product. Conventional measure of the gross national product emphasizes reproducible goods and services. However, no account is taken of wear and tear on the environment, depletion of the natural resource stock, or changes in the quality of the human capital. As a result, this conventional definition of the economic growth really captures only a portion of wat comprises “quality of life” or prosperity. The definition does not include such factors that may vitally affect the potential for growth in the future.

The agriculture´s most direct contributions to the improvement in the quality of life are employment for the farmers and nutrition for society as a whole. The agriculture competes for natural resources with other activities that also contribute to the quality of life (for example one land devoted to the agriculture cannot be used for recreation, or housing). Synthetic chemicals also play a role. The chemicals which are applied to crops sometimes degrade the ecosystems and can contaminate water supplies and can also be as a health danger to the farmers and consum-

ers. To ensure the sustainability is needed a better accounting of all aspects of quality of life and gains in the agricultural output must be balanced against undesirable side effects and against competing demands for the resources being used (Hatfield & Karlen, 1994).

More and more evidence indicates that the dependence on nonrenewable resources and the environmental degradation associated with today´s agriculture technology will contrain future agricultural production. But on the other hand, the history of technological breakthroughs in the agriculture is encouraging. Continued advances from research in the area of biotechnology hold at least the promise of reducing dependence of the natural resources used to produce food (Hatfield & Karlen, 1994).

The economic growth and sustainability are not mutually exclusive but there is certainly a kind of "conflict" between them – the conflict in terms of spatial variation and social variation. The spatial variation reflects global differences in natural resource endowments, and in social variation attitudes about their use, and in pressures of human population and standard of living (Hatfield & Karlen, 1994).

5.4 POSSIBILITIES OF USING SUSTAINABLE AGRICULTURE IN FARMERS´ PRACTISE

The biggest problem of the agricultural system is its mismatch between the profit from agricultural production and sustainable agriculture. This imbalance stems mainly from economic and other influences that break this balance. However, the principles of the sustainable agriculture and circular economy can help to at least partially balance (Biom.cz, 2020).

5.4.1 BIOGAS STATIONS

Not only in the agriculture, but also, for example, in the food industry or in the breeding of livestock a large amount of biological waste is generated which can be used very efficiently for biogas production. The biogas produced in the biogas stations serves as a source of the electricity or heat. In addition, the energy obtained by burning biogas comes from a renewable source thus reducing dependence on fossil fuels.

The philosophy and main message of the biogas stations from the point of view of the circular economy is to process only waste which will make the use of otherwise wasted energy more efficient. However, this philosophy is not entirely clear. The production of the suitable waste for the biogas station is large but not sufficient to cover energy consumption or the replacement of fertilizers with a digestate (i.e. the remaining product in the production of the biogas which is an environmentally friendly liquid substance). At the same time, crops that are grown for consumption in the biogas stations are important for the basic essence of the agriculture which is the production of feed or energy. In this case, the use of the biogas stations for both variants is ideal. Today, the use of the digestate from the biogas stations seems

necessary due to declining crop yields. The digestate is an essential source of nutrients which has a significant fertilizing effect and brings farmers cost savings for mineral fertilizers, it is a high-quality fertilizer. According to surveys, the digestate can replace the fertilizers for up to CZK 20 million in one decade (Biom.cz, 2020). However, this is not only a positive economic effect but also a fundamental benefit for the agricultural land that the digestate together with the nitrogen fertilizers brings. However, it is necessary to mention that the establishment of the biogas station is a massive investment for the farmers and a significant operating cost despite its indispensable added value. However, other advantages of the biogas station include, for example, non-production of waste in biogas production, recovery of a large amount of waste that would not otherwise mean any benefit, or the release of a small amount of harmful substances into the air, etc.

The original message of the biogas stations was to save pig farming. Energy costs were to be reduced thanks to the biogas stations and the use of manure was to be made more efficient. This has succeeded to some extent but pig farming in the Czech Republic has been declining since 1990. According to data from the Czech Statistical Office, 4,789,898 pigs were bred in the Czech Republic in 1990. The number of pigs has decreased over the years now only 1,518,402 pigs are bred in the Czech Republic (Český statistický úřad, 2021a).

At the same time, the biogas stations also have a significant benefit for some crops that are not attractive to the market. This crop is consumed in the biogas stations and the resulting digestate is given to the soil (Biom.cz, 2020). In this way, the farmers can also use, for example, a sugar beet where a sugar beet pulp is used as a fertilizer element in the field when converted into the digestate. But the sugar beet has another meaning for the farmers which is a molasses. Although the molasses is a waste after obtaining the main sugar product, it is also an important source of nutrients that the farmer can use as a quality component of animal feed. In a similar way, the farmers can use, for example, a malting barley. The waste remains after the processing of the barley. This waste can be used as a by-product by the farmer because it contains the large amount of nitrogen and can be treated as a supplement to livestock. In the same way, the farmers can also use the so-called rapeseed pomace which is the waste after pressing rapeseed oil. Waste from the crop production thus finds efficient use which is actually the basis of the sustainable agriculture.

The operation of the biogas stations thus contributes to the support of the agriculture and efficient management in rural areas. At the same time, the biogas production is therefore both ecological and economical.

5.4.2 SOIL AND ORGANIC MATTER

The soil organic matter consists of dead plant and animal substances that go through various processes such as mineralization or carbonization. Some of these substances form humus which is the most complex component of the soil. As the soil contains less humus than minerals the farmer must actively contribute to re-

turn the humus to the soil. Quality organic matter positively affects the soil cohesion but also its retention capacity, thermal and air regime of the soil, or detoxifies harmful substances. At the same time, the presence of humus also causes better absorption of the nutrients which contribute to the growth of plants.

Unfortunately, there is currently a so-called dehumification of the organic matter which caused by increased cultivation and plowing of the soil, the cultivation of monocultures, and the insufficient addition of organic matter. Water and wind erosion cause losses too. The main reason for the dehumification of the fields in the Czech Republic is the insufficient supply of the conventional organic fertilizers and post-harvest residues in the form of manure, slurry, and compost. This problem has helped to partially reduce the trend of biogas plants. Deepening dehumification causes poorer the soil stability and the retention capacity, reduces biological factors and soil life (Dubský & Plíva, 2019).

An equally significant problem, in addition to the dehumification of organic matter, is the loss of the total sown area of the agricultural crops in the Czech Republic. The total sown area of the agricultural crops has been declining since 1990. In 1990, the total sown area was 3,270,963 hectares in the Czech Republic, and in 2021, the total sown area fell to 2,452,133 hectares (Český statistický úřad, 2021b).

Various factors that can be perceived as elements of the sustainable agriculture help to optimize soil organic matter. The first factor is the regular fertilization of the soil with the help of the organic fertilizers whose nutrients are in the organic matter. Namely, it is the compost, digestate or separate which are ultimately waste for which the farmer has found efficient use. In addition, the livestock manure is also used which is a by-product of the livestock farming (such as the manure or slurry and plant residues such as a straw or broom). Again, this is the waste that is recycled and thus returned the nutrients back to the soil. Other factors by which the farmer helps to stabilize the organic matter content are, for example, plowing crop residues back into the field after harvest or targeted cultivation of catch crops (Dubský & Plíva, 2019).

As Hofmanová (2003) adds, if the agriculture is to be sustainable it is necessary to supply so much organic fertilizer to the soil that the balance of not only organic substances but also nutrients is balanced. It no longer matters if the nutrients are supplied in the form of livestock or mineral fertilizers.

However, the soil is not an inexhaustible resource and thus climate change can be mitigated or partially stabilized with the right care. It is therefore necessary for the farmer to keep this in mind at all times in his or her activities.

5.4.3 RESIDUAL STRAW FROM THE FIELDS

Even the straw cannot be understood as the mere waste after the grain harvest. Its use is multipurpose:

- The use of the residual straw from grain and rapeseed fields in the heating plants for the production of the heat and electricity or as a source of fuel in the form of pellets. The waste from farms and the agricultural holdings can thus ultimately be used for bioenergy.

- The recycling straw directly in the field through plowing. It is a component of the organic matter that prevents the erosion and, at the same time, is an element that retains water and maintains a stable temperature which helps the soil fertility.
- Use of the straw in the animal production where it serves as a bedding for the farm animals.

The most optimal solution would be to continue to use the straw as a quality source of the fertilizer and its other part for the bioenergy production. However, due to the fact that there has been a decrease in the animal production in the Czech Republic since 1990 (see data from the Czech Statistical Office) and thus a lack of manure as a source of the fertilization, the straw cannot be used as a source for the bioenergy production as much as possible.

And Hofmanová (2003) states, there are enough agricultural enterprises in the Czech Republic at present that farm without the livestock production. It is these farms that should focus on the proper management of post-harvest residues and the use of all sources of the organic matter such as green manure.

5.4.4 APPLICATION OF SLUDGE FROM SEWAGE TREATMENT PLANTS

Although it is not obvious at first glance the sludge from sewage treatment plants is now a widely used source of the renewable energy as well as the organic matter which can also be used for the soil remediation. The use of the sludge has several advantages in terms of the sustainability and circular economy:

- the sludge improves the soil quality and properties as a fertilizer;
- the sludge reduces the amount of waste in landfills;
- the sludge reduces the greenhouse gas emissions;
- the sludge can also be processed in the biogas stations.

However, the sludge as the organic matter is mainly a very valuable fertilizer especially when applied correctly by the farmer because it is a quality source of nitrogen and phosphorus for the soil. However, the sludge must undergo a cleaning process before use which removes harmful substances and impurities so that it can be used as fertilizer. For the sludge that meet risk standards and leachate is processed from them, the advantage is that there are no emissions and reduction of nitrogen content in the fertilizer (Dubský & Plíva, 2019).

The use of the sludge in the Czech Republic partially eliminates the problem of the lack of the traditional fertilizers such as the manure and manure. In recent years, the legislation concerning the treatment of the sludge from the sewage treatment plants has also been amended. Specifically, this issue is addressed by the Waste Act and the Decree on the Conditions for the Use of Treated Sludge on Agricultural Land. These regulations set standards and limits, methods of the sanitation or storage of the sludge which must be met in other EU countries. These regulations try to prevent the soil from being fertilized with harmful substances and, in addition, the regulations promote to fertilize only with high-quality fertilizer. Based on

these regulations, the farmer must also report sludge management and submit annual reports on waste management and waste production including records and related documents.

5.4.5 COMPOSTS

Composts that are based on separated digestate contribute to increasing the content of the organic matter and nutrients in the soil. Composts with a proportion of the manure or slurry or composts to which ash from biomass combustion is added traditionally have a higher nutrient content. The farmers can multiply the effect of the composting themselves if they follow the right sowing practices in the crop rotation. However, sowing procedures should only be followed by the farmers because of the less stressed soil. Then the soil has a much better quality and does not pose such a risk of erosion (Dubský & Plíva, 2019).

The use of the composting has in the past solved many problems with the storage of the cut grass and other natural waste in the centers of municipalities or cities. In the past, this vision was supported by the subsidy under the Operational Program Environment for the construction and equipment of the composting plants as part of the improvement of waste management. It was a package for CZK 27 billion which was distributed among business entities or territorial self-governing units after meeting a number of conditions and submitting a project application for the subsidy (Dotační.info, 2013).

Even today, the existence of the composting plants is financially protected. According to the magazine Biom.cz (Dvořák, 2019), projects focusing on the prevention of the municipal waste generation, energy recovery of waste or their material recovery are mainly supported too. The applicant for the subsidy must be a public entity and his or her idea can be supported by the subsidy of no more than 85% of the total costs.

A completely unique project in the Czech Republic is the production of the fertilizer from coffee grounds in the composting plant which is processed like any other bio-waste. The pioneering project is not known even in the context of the entire European Union. It is a unique idea on a global scale (Horáček, 2021). Only time will tell to what extent the new project will take place in the future.

5.5 PROBLEMS OF AN AGING POPULATION OF THE FARMERS

As Eurostat (2021) states, slow generational renewal and a high average age for farmers are widespread issues across the EU's farming sector. Access to finance is a particular concern for many young farmers: a high proportion of loan applications from young farmers are rejected by banks. In May 2019, the European Commission and the European Investment Bank launched a loans package for agriculture and the bioeconomy with specific targets to support young farmers. It forms part of a

broader Young Farmers initiative that is managed by local banks and leasing companies active across the EU that includes a minimum 10 % allocation for farmers under the age of 40 years. Data from Eurostat (2021) further indicate that approximately around 10% of all.

Zagata et al. (2015) describes that the problem of the ageing population of the farmers is very often mentioned in European discussion on the future sustainability of the Agriculture. A number of policy measures, including the recent reform of the EU's common agricultural policy, seek to address this issue. Zagata et al. (2015) adds that the average age of the farmers is increasing due to the minimal presence of the younger farmers (entrepreneurs) in this sector. For example, available statistics data from Eurostat show that approximately every second farm (53.1%) in Europe is managed by a farmer aged over 55 years, and almost one-third of all farms (29.6%) has a holder aged over 65 years. The aging population of the farmers is a Europe-wide problem. This phenomenon poses a serious risk to the sustainable development of the agriculture.

The Common Agricultural Policy (CAP) pays particular attention to the decline of young farmers in the European Union. For this reason, there have been established plenty of different policy measures and motives for new entrants in agriculture. The most important measures to facilitate the entry of young people into Agriculture are the additional payments to young farmers (the condition of under 40 years of age and for five years since the start of the new business) (European Commission, 2014). The fact remains that young farmers in the EU, especially recipients of Common Agricultural Policy subsidies, are considered to be able to ensure the sustainability of the European agricultural model. The key objectives of the CAP are economic efficiency and business competitiveness, aversion to rural depopulation and environmental protection, and all young farmers are expected to play a significant role in achieving these goals (Kontogeorgos et al., 2017).

The Czech Republic, and therefore the EU, supports young farmers through the subsidy programs. The main objectives of the programs are the restoration, preservation and improvement of the ecosystem, the innovation of the agricultural holdings and the promotion of the entry of young people into the agriculture. One of the significant subsidy is the "Payment for young farmers". These are beginning farmers under 40 years of age who either start a business or have started it within 5 years before submitting the first application. The subsidy can be provided for a maximum of 90 hectares of agricultural land. The measure seeks to bring the young agricultural generation into the business and thus contribute to the rejuvenation of the countryside. In 2020, the State Agricultural Intervention Fund (SAIF) received 3,985 applications for the subsidy program “Payment for Young Farmers”, and CZK 168 million was distributed to applicants (SZIF, 2021). According to the news website EURACTIV.cz (2019), the subsidies represent approximately one third of the income of the agricultural farms within the EU. However, according to Černá (2021), the applications for the subsidies are a relatively demanding bureaucratic matter for which the private farmer does not have enough time. Nevertheless, the subsidies are paid ex-post to farmers only after all the conditions of the subsidy

have been met. It follows that the private farmer is in many cases dependent on financing through bank loans.

Findings of the Zagata et al. (2015) study suggest that the Czech Republic belongs among the group of countries which is not so much affected by the problem of ageing and that the differences between farms run by young and older farmers are not as large as in other European countries. But Zagata et al. (2015) adds that evaluation of the problem is partly distorted by the survey methods used by Eurostat.

5.6 SUSTAINABLE AGRICULTURE LEGISLATION

5.6.1 EU DIRECTIVE CE MARKED FERTILISING PRODUCTS

The aim of this directive was to promote the use of the recycled materials for the fertilization and thus apply the circular economy. The secondary objective was to reduce imports of the fertilizers and nutrients from third countries and to promote the use of organic fertilizers, and to establish uniform conditions for the use of the "CE" marking within the EU. Among other things, this proposal regulates the criteria for the use of sewage sludge and waste containing cadmium. The proposal of the directive is considered to be one of the main pillars for the application of the circular economy which should also eliminate the shortcomings of previous regulations, and which should favor the conventional industrial fertilizers over the innovative organic fertilizers (Kos, 2018).

5.6.2 STRATEGY „FARM TO FORK“

This strategy seeks to convince the EU institutions of the importance of focusing on the most efficient and best forms of the fertilization, the introduction of the modern technologies combined with the principles of the modern agriculture. The aim of the draft strategy is, in particular, to eliminate the nutrient losses from the soil under the common agricultural policy in accordance with the regulations currently in force in the EU. Other agricultural policy instruments include the crop rotation and individual nutrition strategies for the farms, advice for the farmers, and increasing storage capacity for the organic fertilizers (Štěpánek, 2020).

5.7 CONCLUSIONS

To treat nature and the environment consciously and gently is the duty of all of us towards future generations. Only with the sustainable development can people's needs be met in the future. Responsibility for the sustainable development exists worldwide - in all areas of life and the economy. The agriculture also has this responsibility. Sustainable agriculture primarily seeks to take account of environmental issues, prevent environmental degradation and, last but not least, lead to

the conservation of resources. Development is sustainable if all requirements (economic, environmental and social) are respected in the same way even if the given goals are eventually met to varying degrees. These requirements and goals are based on each individual and are implemented in the form of government policy in the country.

The sustainable agriculture is a relatively new direction but for farmers, although they often do not admit it, it is an ancient philosophy. Farmers' feeling for the landscape, their respect for the land, and their humility for the wealth that offers is in fact the core of all sustainable agriculture. In their activities, they are clearly aware that their care for the land will be partially accounted for at harvest. Land and landscape are very limited and scarce resources, and only the right approach can preserve this monument. The farmers are co-creators of nature. The farmers are dependent on the sustainability of the natural goods and thus on their careful, gentle use and development. Only in this way the farmers can ensure economically successful production of plant and animal products in the long run and thus permanently meet their economic goals.

Unfortunately, the thinking of all farmers is not based on the ideas of the sustainable agriculture and therefore it is highly desirable to define this area in legislation and, at the same, time support the farmers with various subsidy programs. The farmers are thus supported for the benefit of society as a whole by various programs from which special activities for the protection of nature and the environment are honored. The disadvantages associated with the farming are thus compensated to the farmers.

The sustainable agriculture thus opens the perspectives to the farmers and enables further mitigation of the possible negative external effects of the agriculture.

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6 CIRCULAR ECONOMY AND MARKETING

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6.1 INTRODUCTION

Marketing has, naturally, to follow current trends in society and various movements that influence the market. Marketers seek to catch the trends and tendencies in order to fulfill the expectations of customers and all the market. The circular economy represents such a challenge for both marketing scholars and practitioners in companies producing products and services and also in marketing agencies. Of course, first, we need to grasp the concept of the circular economy itself and also to understand the functioning of the main principles of the circular economy in a particular industry and in a specific company or business.

The problem for practical application of circular economy in the day-to-day business activities could be the doubts related to the unclear notion. In fact, circular economy has not one strict and globally adopted definition (Cavaleiro de Ferreira & Fuso-Nerini, 2019]. Actually, the meaning of the notion "circular economy", is widely based on legal norms or many positional documents. There are also many various bodies and subjects who try to promote the circular economy and give rise to many different but not contradictory definitions of the circular economy. Such definitions emerge for different purposes, for instance, from a business perspective or a political perspective. Circular economy was probably first defined and conceptualized in an Ellen MacArthur Foundations report (Lewandowski, 2016).

The circular economy concept is seen as an industrial system that is restorative or regenerative by intention and design. It replaces the end-of-life concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse and return to the biosphere, and aims for the elimination of waste through the superior design of materials, products, systems and business models (Ellen MacArthur Foundation, 2013a, Ellen MacArthur Foundation, 2013b; Ellen MacArthur Foundation & McKinsey & Company, 2014). According to the report by Ellen MacArthur Foundation; and McKinsey & Company (2014), the circular concept fosters wealth and employment generation against the backdrop of resource constraints.

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Ellen MacArthur Foundation (2017) defined basic axes of the concept for industries as follows:

Any business

- produces and provides access to high-quality, affordable, and, if needed, individualised product
- runs on renewable energy and uses renewable resources where resource input is required,
- contributes to regenerating natural systems and does not pollute the environment,
- reflects the true cost (environmental and societal) of materials and production processes in the price of products.

Winans, Kendall, and Deng (2017) Summarized three thematic categories within the concept of the circular economy:
(1) policy instruments and approaches;
(2) value chains, material flows, and product-specific applications; and
(3) technological, organizational, and social innovation.¨

Marketing within the implementation of the circular economy is narrowly linked to organizational and social innovations. In this way, marketing has to be a part of circular economy business models that promotes dialogue with suppliers (in the process of shopper marketing) and to persuade business clients and consumers to find a follow "circular solutions ", i.e., for instance, to accept refurbishing or reusing materials or to prefer reused or recycled products.

6.2 CIRCULAR ECONOMY BUSINESS MODELS

Generally, a business model is a system of resources and activities, which creates a value that is useful to the customer, and the sale of this value makes money for the company (Slavik, & Bednár, 2014). Even a circular economy business model should have the same primary objectives – to satisfy their customers and to bring the most revenue possible to the owners of the company. Circular economy business models should generally adopt the manner of production technology that leads to keeping products and materials in use. If not, they should assure the use as long as possible to get the maximum value from the products and services. The business models should allow any business to become a part of circular supply chains.
Yang, Smart, Kumar, Jolly, and Evans (2018) summarize the findings and opinions of many subjects and scholars into the following characteristics of circular supply chains:

- The inner cycles are prioritised over outer ones (e.g., reuse and recovery comes before recycling)
- Slowing the cycles (e.g., using resources for as long as possible)

- Reducing waste at every stage of the product life cycle
- Reduce, reuse, recycle and recover resources as much as possible

For designing a business model, there are various approaches to identify key components or key areas of the circular economy business models (e.g. Lewandowski, 2016; Hopkinson, Zils, Hawkins, & Roper, 2018; Lüdeke-Freund, Gold, & Bocken, 2019), but yet the marketing is rather neglected as a potential key area.

6.3 MARKET APPLICATION OF THE CIRCULAR ECONOMY

More and more scholars deal with the question of generations when thinking about the viability of the circular economy concept in the society and when studying people's approaches in this domain and perception of the current situation (e.g., Brinson, 2019; Krasulja, Ilić, & Marković, 2020; Korsunova, Horn, & Vainio, 2021). They also do research in particular sectors, like the fashion industry (Gazzola, Pavione, Pezzetti, & Grechi, 2020), food production (Jurgilevich et al., 2016).

6.4 CIRCULAR ECONOMY AND CONSUMER BEHAVIOUR

Consumption in the context of the circular economy and circular solutions is becoming an area of increased interest for researchers (Camacho-Otero, Boks, & Pettersen, 2018). Understanding consumer behaviour in the context of the circular economy represents, naturally, a cornerstone for any marketing strategy and partial marketing actions (van Loon, & Van Wassenhove, 2020). Gronlund (2015) finds the need to study the importance of recognizing key global trends and their potential impact on society and business to be the first task of all marketers. The success of the circular economy depends, of course, on the general attitudes of consumers. Marketers (and also scholars that study in this field, of course) have to consider collective elements and social structures that are also active elements in configuring consumption (Camacho-Otero, J., Tunn, V. S., Chamberlin, L., & Boks, 2020). Individual propensity to gather additional information about environmental features about products bought is different (Testa, Iovino, & Iraldo, 2020) and should be focused by marketing communication. Ferdousi and Qiang (2016) concluded that the widespread implementation of circular economy approaches would require profound changes in industrial practice and patterns of consumption.

Consumption in the context of the circular economy can be considered a form of sustainable consumption (Camacho-Otero, Boks, & Pettersen, 2018). Marketers can then deal with the consumers' attitude to sustainability and their purchasing behaviour, of course. Still, when focusing on the consumers' needs, they have to

keep in their mind the consumer behaviour is not only governed by individual factors.

Particular marketing actions have to take into consideration the age of the target segment consumer. Scholars conclude a need to deal differently with the particular age group of consumers. Gronlund (2015) considers the segment of millennials very interesting compared to other groups of consumers. According to his findings, the millennials differ significantly from other market segments. They grew up in an embarrassingly unequal world, polluted, running out of resources, and with the leadership, they don't trust. He believes millennials are particularly interested in activities supporting a healthy and cohesive society and culture. Gronlund's implications are confirmed, for instance, by Lakatos et al. (2018). They found the Y generation more open in reducing resource consumption, recycling, and reuse than generations X and Z.

Sorensen & Johnson Jorgensen (2019) see millennials as a potential generation for future marketing focus as most of them are still limited in their choices by low incomes – their life stage influences this.

6.5 ROLE OF MARKETING IN THE CIRCULAR ECONOMY

The circular economy also represents an entirely new challenge for marketing and marketing communication. Marketing actions in the circular economy can play a dual role. Next to promote companies and their products (or services), marketing can play an educative role (Jung, & Jin, 2016; Wojciechowska-Solis, & Smiglak-Krajewska, 2020). To support the successful implementation of the circular economy, marketers have to explain, using public relations and social media, the topic itself, as well as the need of using sources responsively and accentuate the sustainability to the detriment of the other characteristics of the product.

Circular economy marketing can become an extension of social marketing (Kotler, Roberto, & Hugo, 1991; Andreasen, 1994) and play a role of supporting a social change (Dibb & Carrigan, 2013). It can follow the effort of corporate social marketing. However, the circular economy is not only in the interest of companies but much more of the governments and the public sector. Circular economy marketing should be less a pure public relations activities of a company.

Introduction and an exemplary implementation of the circular economy requires a shift away from a focus predominantly on functional, aesthetic, and ergonomic considerations of products (Pitt, & Heinemeyer, 2015) among consumers as well as producers. Those young people exposed to the new concepts linked to the circular economy while still at school will be advantageous in their working lives and wider citizenship (Pitt, & Heinemeyer, 2015).

The challenge or opportunity for businesses can be to transform the movement connected with the circular economy into a brand that will attract and motivate people and thus gain wider acceptance, the most important being to identify and

then connect with target customers and find out what their emotional desires are (Gronlund, 2015).

Marketing action can also serve as a B2B incentive to adopt a circular economy (Marques, 2019). These incentives should foster sustainable practice with the supply chain.

The challenge will be significant, all the more so that implementation of the circular economy is costly for consumers and companies (van Langen, 2021). According to Jánoš (2021), the level of awareness of the population is at a relatively low level in the field of eco-innovation and the introduction of the circular economy globally. These conclusions can be confirmed by other scholars (Marios, Giannis, & Dimitra, 2018). Internet or widely digital media are a more and more important source of information even in the case of environmental information and, potentially, information on the circular economy (Xue et al., 2010; Jánoš, 2021; Humalisto, Valve, & Åkerman, 2021).

6.6 SOCIAL MEDIA, INFLUENCERS, AND CIRCULAR ECONOMY

Social media are a strong enabler in consumer involvement (Antikainen, Uusitalo, & Kivikytö-Reponen, 2018). Influencers play their role, especially in some sectors, where they can become the opinion-leaders (Lin, Bruning, & Swarna, 2018; Kim, 2019; Žák & Hasprová, 2020). Consumers perceive their lifestyle as more authentic and attractive than traditional advertisements (Gazzola et al., 2020). Social media will presumably play a role in promoting a circular economy. There are already some research results that support this presumption. For instance, the zero-waste consumer, among others, follows social media influencers' videos in zero waste matters and is active in social media groups (Saplacan, & Márton, 2019).

6.7 CIRCULAR MARKETING

A completely new approach is emerging in marketing - circular marketing. It is based on three characteristics:

- strategic marketing - long-term benefits with a clear goal to support corporate strategy,
- quality replaces quantity - abandoning clichés and empty slogans in favor of real added value,
- building relationships, personalization, and customer care - communication with a focus on building deep relationships with customers, where companies are aware of the value of their customer

Kelleci and Yıldız (2021) classify circular marketing under the growth-oriented approach, together with mass marketing and green marketing. On the other hand,

they consider sustainable marketing and sufficiency marketing to be a well-being-oriented approach.

As the circular economy and circular systems generally aims on reuse and recycling, circular marketing can be linked with the idea of reverse marketing that has been studied for a long time and represents a well-established approach (e.g., Leenders, & Blenkhorn, 1988; Blenkhorn, & Banting, 1991), where the clients are rather pushed to come to the seller than the contrary. However, reverse marketing has not predominantly been used to support circular economy until now. Its way of use is different. Initially, it was used for an aggressive kind of purchasing, where the company purchasers actively identify potential suppliers and offer suitable partners a proposal for long-term collaboration (Biemans & Brand, 1995). Later the concept of reverse marketing developed into a strategy that encourages consumers to seek out a company or a product on their own (Reverse, 2020). The customer takes a more active role in the relations with the provider/seller (Smerek, 2018). In the context of the circular economy, the eco-friendly thinking customer could push the seller to seek together for the way of ensuring the recycling or reuse the bought products.

Circular marketing can also be linked to the concept of the reverse channel in marketing. The reverse channel approach is well established between a manufacturer and its supplier (Morris, & Morris, 1992) and can be applied in the relations of consumers and their suppliers as well. Gupta, Czinkota, and Ozdemir (2019) see the increasing efforts to adopt reverse-channels to be an important factor to enhance customer equity, growth of the business customer, and profits of the business customer.

6.8 CONCLUSION

Marketing can play an essential role in the dissemination and implementation of the circular economy. As the awareness of the notion and the phenomenon is still relatively low, the marketing communication campaign can serve as an educative tool.

Researchers started to study the circular economy from the marketing point of view. We can certainly feel a gap concerning consumer behaviour towards the effort of the circular economy. Many studies are available as for sustainability in consumer behaviour and consumers' attitudes to the sustainable production and environmentally friendly behaviour of companies. However, sustainability is mainly understood as doing pro-environmental steps and taking pro-environmental measures. The attitude to support and readiness to participate in creating the real circles with active contribution to the recycling and reuse the used product need more profound research.

It seems the marketing communication will play a primary role within the marketing actions in the circular economy context. Other marketing activities and tools are rather side-lined.

Marketing will face new challenges in the domain of strategic marketing, branding, and brand building and also in relationship management with customers. The current trend of individualisation or personalization of customers (especially in business-to-consumer relations) will get a new dimension with switching from linear to circular relations.

A new notion – circular marketing – occurred. It requires more effort about conceptualization and analysing, if there is a real need for a new approach in marketing or if the situation demands only an extension of social marketing.

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7 ROLE OF CONSUMER ENGAGEMENT IN THE CIRCULAR ECONOMY CONTEXT

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Abstract: Circular economy as a phenomenon has been discussed from many different angles. In this chapter, attention is paid to the role of consumer engagement, a kind of behaviour that goes beyond the purchase itself. Academic research on consumer engagement in the circular economy context is still scarce these days; however, the number of published papers and citations is growing, indicating a current and living topic. Therefore, the first part of this chapter aims to find inspirational thoughts about consumer engagement in the circular economy principles in general. The second part of this chapter focuses specifically on the consumer electronics market and specific possibilities for engaging consumers in the circular economy. Consumer willingness to engage is crucial because companies can prepare excellent circular business models but these models will fail without consumer engagement.

Key words: Consumer engagement, circular economy, consumer electronics.

7.1 INTRODUCTION

The popularity of circular economy can be illustrated by comparing the terms "circular economy", which tends to grow in worldwide searching queries on the internet, and the term "corporate social responsibility", which tends to decrease slightly (Google Trends, 2021). Nevertheless, both circular economy (CE) and corporate social responsibility (CSR) are terms under the umbrella of sustainability (Esken et al., 2018), where the word "sustainability" can be understood as a synonym for "sustainable development" (Ruggerio, 2021).

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According to McCulloch (2021), building a circular economy means corporate social responsibility. When the circular economy is traditionally described by the words "reduce, reuse, and recycle" as 3Rs (Goyal et al., 2018; Mocho, 2020) and corporate social responsibility by the well-known triple bottom line in the form of "people, profit, and planet" as 3Ps (Basanta & Vangehuchten, 2019; Gbejewoh et al., 2021), it can be deduced that the whole concept means reducing, reusing, and recycling when considering people, profit, and planet. This thought is supported by Alhawari et al. (2021), who claim that CE points out meaningful economic, social, and environmental consequences.

Several studies make a considerable effort to define CE clearly (e.g., Kirchherr et al., 2017; Alhawari et al., 2021); however, there is no universally accepted definition these days. Therefore, Alhawari et al. (2021, p. 18) tried to formulate it as follows:

> *"CE is the set of organizational planning processes for creating and delivering products, components, and materials at their highest utility for customers and society through effective and efficient utilization of ecosystem, economic, and product cycles by closing loops of concerning resource flows".*

For purposes of this chapter, the definition by Alhawari et al. (2021) is taken as a starting point for further thinking in this chapter. CE seemingly focuses more on production and consumption patterns and presents ideas for eliminating linear systems in production and consumption to boost sustainability (Awan et al., 2020). This effort is reflected in designing new sustainable business models (Lahti et al., 2018), or in sustainably oriented business practices (Hitka et al., 2019).

By combining the widely discussed topic about the circular economy with consumer engagement, this chapter aims to find inspirational practices on engaging consumers in the circular economy principles. To maintain a manageable length of this chapter, solely a market of consumer electronics is analysed. As for used methods, content analysis of relevant world literature sources, their comparison, mining the most valuable ideas, and synthesis of inspirational ideas are applied.

7.2 CONSUMER ENGAGEMENT IN THE CONTEXT OF THE CIRCULAR ECONOMY FROM THE ACADEMICAL POINT OF VIEW

When discussing customer relationship management, usually abbreviated as CRM, the concept of consumer engagement cannot be overlooked (Solarova, 2014) because it is recommended to treat consumers as company partners these days (Antropov, 2016) as for consumers can co-create meaningful value (Falkenreck & Wagner, 2021). Weber (2016) states that companies need to make their consumers feel like they are in the same team. To put it in a nutshell, consumers are not passive

anymore. According to Kotler et al. (2021, p. 37), *"today's consumers are better informed, more connected, and more empowered than ever before."* Therefore, consumer engagement leads to obtaining knowledge and value co-creation; hence, there is a visibly significant potential to enhance a company's performance (Chang et al., 2021).

Consumer engagement is based on interactions between a company and its consumers/customers – these interactions can strengthen customer relationships (Paton, 2020). Sometimes, instead of the word "company", the word "brand" is used – that is why some researchers use the term "consumer brand engagement" (e.g. Nery et al., 2021; Cheung et al., 2021).

It is usually agreed that consumer engagement is a kind of behaviour that goes beyond transactions, i.e., it goes beyond the purchase itself (Ng et al., 2020). However, it is not only consumers' behaviour; but also emotions and cognitive processing that are highly important to ensure consumer engagement will work (Harrigan et al., 2018). Engagement can work only if both parties, i.e., consumers and companies, perceive a particular benefit of their activities.

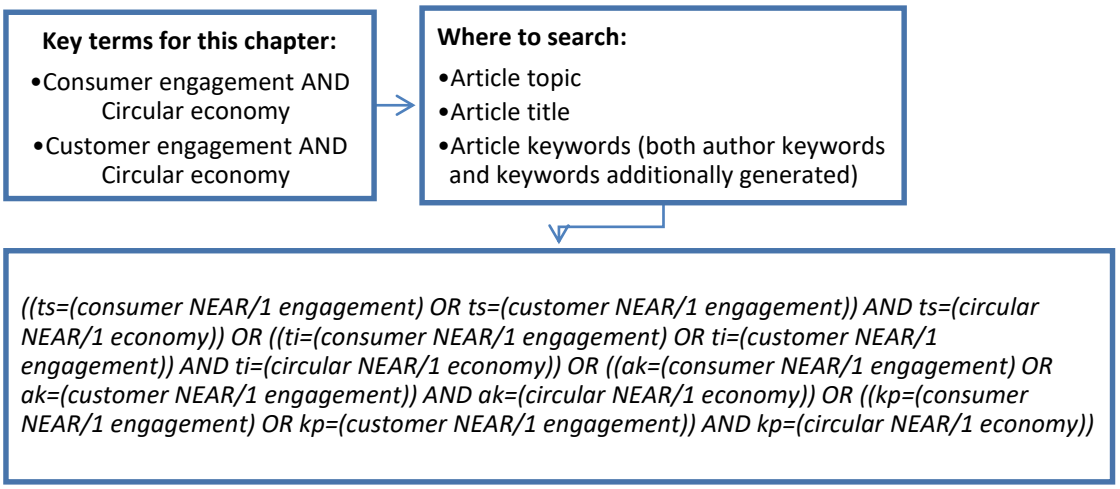
Today's business environment is highly dynamic and interactive (Brodie et al., 2011); interactions among consumers are boosted by the immense number of available online communication tools. Many companies prefer to engage with consumers through communications on social networking sites (Yesiloglu et al., 2021).

Bolton (2011) states practical examples of specific customer activities that fulfil the idea of consumer engagement – typically, there can be activities with companies initiated by customers, participating in brand communities, or information sharing with other consumers (blogging, writing customer reviews, both online and offline word-of-mouth, giving recommendations). According to Samala & Katkam (2019), participation and involvement are crucial drivers of consumer engagement that can be initiated either by a company or a consumer (Obilo et al., 2021).

Therefore, when discussing consumer engagement in the circular economy context, it may be claimed that the circular economy system cannot work without consumer engagement (e.g., without consumer support). It is just consumers who decide whether to participate or not – whether to support ideas about the circular economy or not. Companies could still create activities, build unique business models, and launch specific business practices to boost the circular economy, but it will not work without consumers and their active engagement.

Academic research on consumer engagement in the circular economy context is still scarce (Camacho-Otero et al., 2020). This is very well visible when entering a combination of terms "consumer/customer engagement" and "circular economy" into the Web of Science database (using the tool Advanced Search). These keywords were applied to the article topic, title, or keywords (either as author keywords or keywords additionally generated using the Clarivate Analytics algorithm). The final research query with used Boolean operators is presented in Figure 1.

Figure 1: Process of creating own research query for the Web of Science database (using the tool Advanced Search)



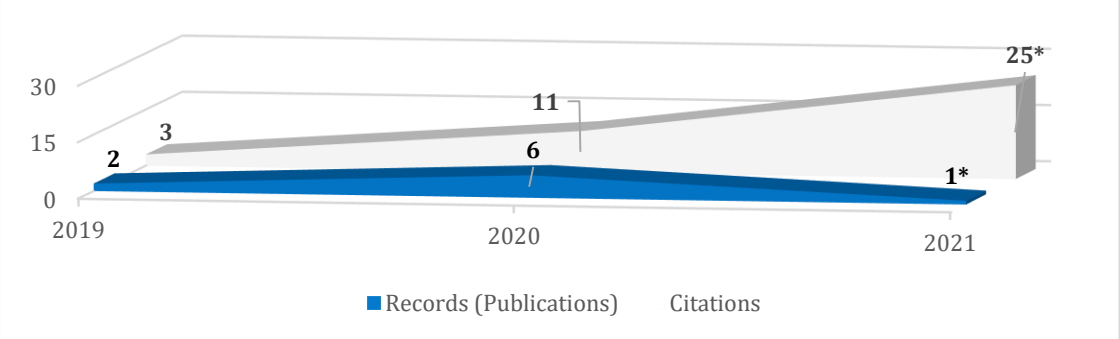
Source: Own processing

After entering the above-presented research query, there were nine relevant records (August 4, 2021). The first two publications appeared in 2019. Furthermore, a significant increase in the number of citations, which continues to these days, can be identified. It indicates that this is a living topic that is being discussed increasingly. It is worth noting that it takes some time to index papers in the Web of Science database. Therefore, it is possible to assume there have been more relevant papers (publications) from the beginning of the year 2021, but they have not been indexed yet.

Figure 2 visually shows the number of records (publications) and citations related to the above-presented research query for the Web of Science database.

Figure 2: Records/publications and citations related to consumer/customer engagement and circular economy, found in the Web of Science database

*Note: The year 2021 is not complete (this figure was created on August 4, 2021)



Source: Own processing

The following Figures 3a, 3b and 3c present an overview of these nine records (publications) – the attention is paid to authors' affiliations (based on their affiliations, countries where they are from, are derived), analysed industry (sector), and important details about consumer/customer engagement in the circular economy context.

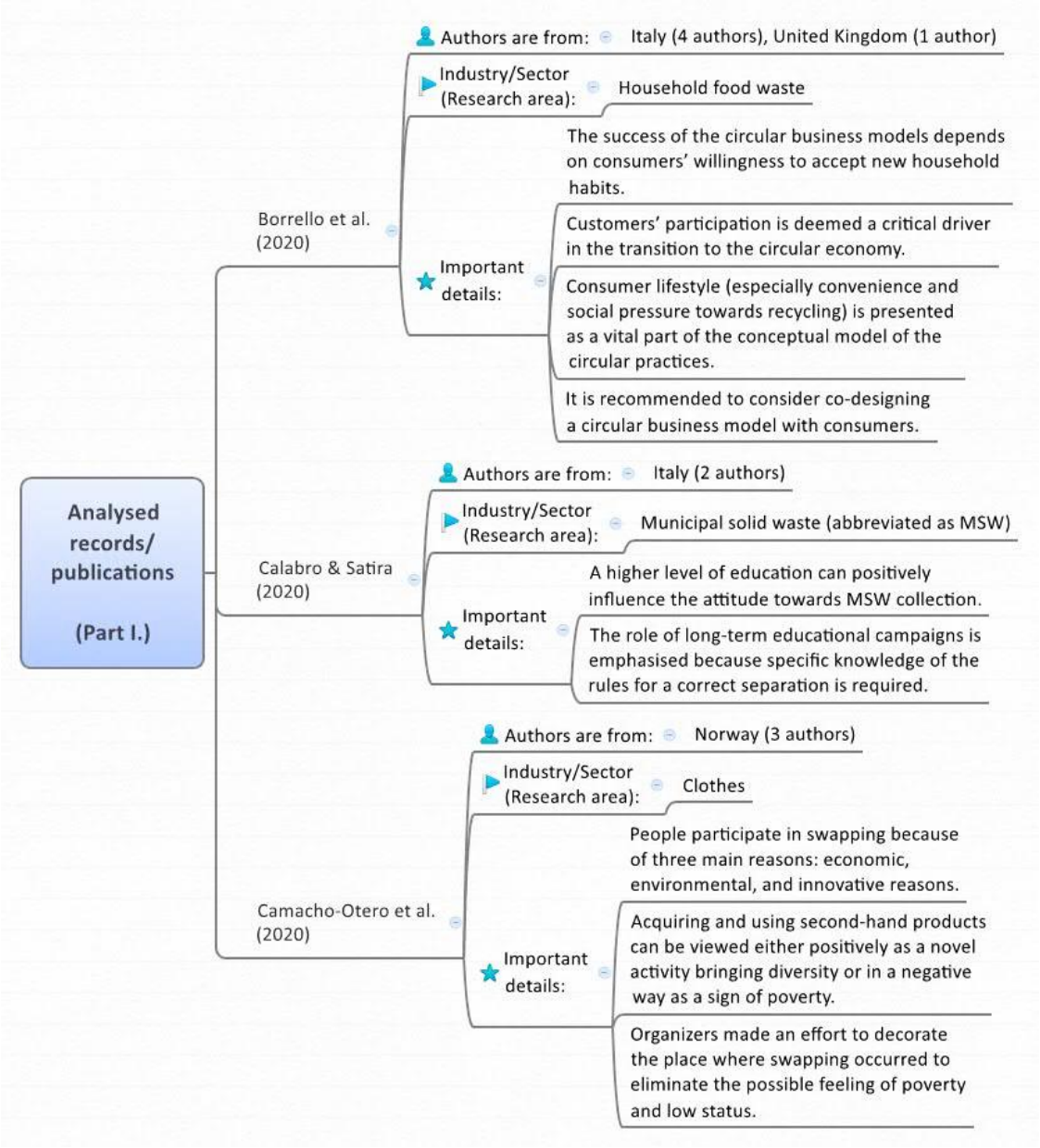
Interestingly, the authors of the analysed publications are predominantly affiliated with universities or organisations located in Europe where countries like Germany and Italy visibly dominate. This finding can be added by the fact that Germany has its specialised institution focused on applying the circular economy principles into practice (Circular Economy Initiative Deutschland, n.d.), and Italy takes the top position in circular economy in the European region (Construcia, 2020).

Based on the analysed publications, it can be concluded that consumer willingness to participate is crucial – companies or organisations can excellently prepare their business models, but these models cannot work without consumer engagement. Koszewska & Bielecki (2020, p. 1694) sum this idea as follows: *"Even the most effective system introduced by the manufacturer will not succeed without consumer engagement."*

Some external and internal influences that can support consumer willingness to fulfil the circular economy ideas can be derived from the analysed publications. As for external influences, educational campaigns and consumer incentive programs providing some rewards for consumers can be helpful. Also, social pressure towards recycling, which is understood as a kind of desirable behaviour, can be counted to external influences. On the other hand, pure altruism is an example of internal influence.

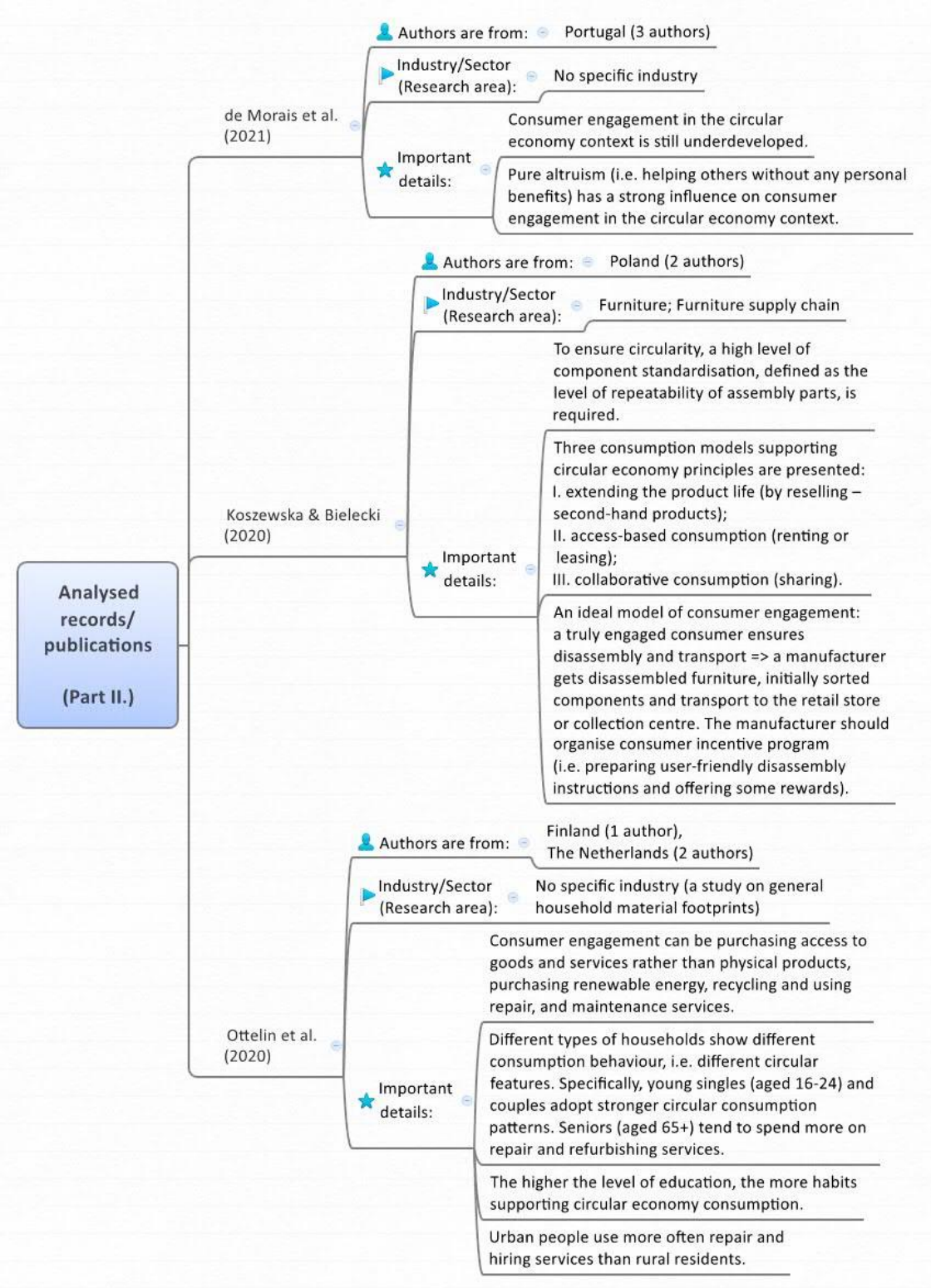
When analysing the terms "consumer/customer engagement" and "circular economy" from the academic point of view, searching for records only in the Web of Science database may be understood as a somewhat limiting factor – other databases could be used, for instance, the Scopus database. However, the Web of Science database is considered the most widely used research publication and citation database (Birkle et al., 2020), therefore, it makes sense to work preferentially with it.

Figure 3a: Analysed records/publications – ordered alphabetically (Part I.)



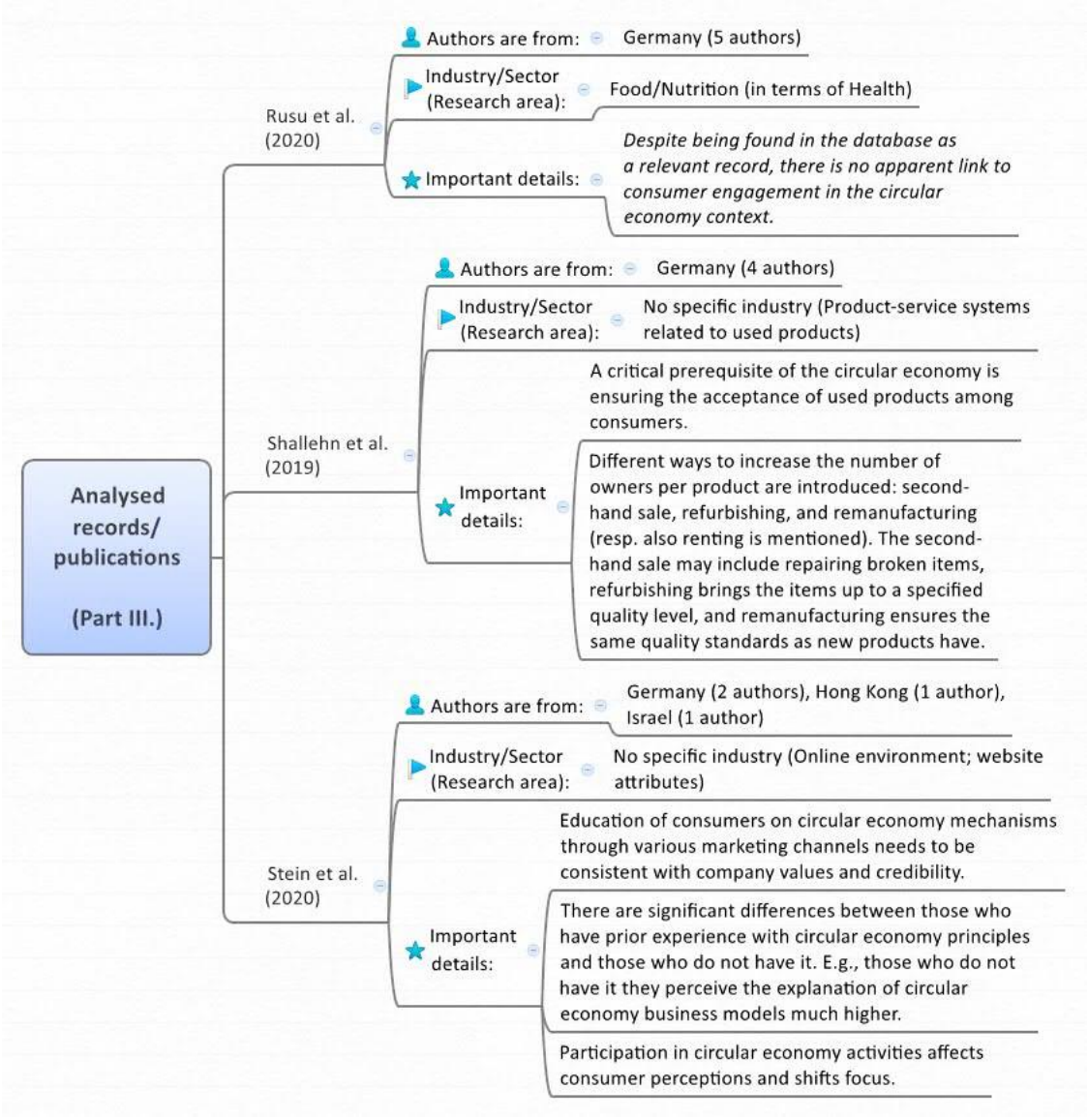
Source: Own processing, using XMind 6

Figure 3b: Analysed records/publications – ordered alphabetically (Part II.)



Source: Own processing, using XMind 6

Figure 3c: Analysed records/publications – ordered alphabetically (Part III.)



Source: Own processing, using XMind 6

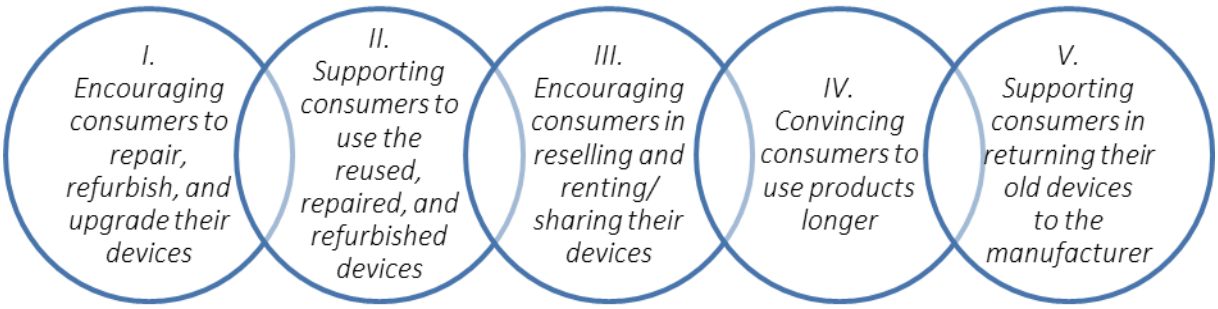
7.3 PRACTICAL EVIDENCE OF CIRCULAR ECONOMY CONCERNING CUSTOMER ENGAGEMENT IN THE CONSUMER ELECTRONICS MARKET

Consumer electronics influence our lives and belong indisputably to our daily companions these days. From the consumer behaviour point of view, a linear consumption model described as "take, make and dispose" is usually followed (Esposito et al., 2018). It is no surprise that the global consumer electronics market is still growing, and therefore, electronic waste growth (or e-waste growth) is visible (PACE, n.d.). According to Kazancoglu et al. (2020), there is a direct connection between the consumption rates of electronic devices and the amount of generated e-waste. Therefore, it means an urgent need to bring feasible solutions to coping with this situation.

The circular principles "reduce, reuse, and recycle" can be applied to the consumer electronics market namely in these ways: companies can use fewer materials, reuse certain materials multiple times, use recycled and recyclable materials, separate waste, design products for longevity, convince consumers to use products longer, or help to reduce demand for new products (McCulloch, 2021; PACE, n.d.). LE Europe et al. (2018) also suggest supporting repairs of products if they break (either by professionals, or by family/friends or self-repair) and leasing products instead of purchasing them. It is also essential to adapt supply chains (Murphy, 2021). However, it is not only about consumers' and companies' effort – also public authorities play a very important role in the circular economy (Loonela & Stoycheva, 2020) because it is policymakers (Garcia et al., 2021) who can set the rules.

Figure 4 presents an overview of specific possibilities for engaging consumers in the circular economy context, further described in the accompanying text below.

Figure 4: Specific possibilities for engaging consumers in the circular economy context, focused on the consumer electronics market



Source: Own processing

I. Encouraging consumers to repair, refurbish, and upgrade their devices
Repairing, refurbishing, and upgrading electronics devices can be done by consumers or also by professionals. According to Ellen MacArthur Foundation (2018), companies may enable their users to do it. This can be achieved by available spare parts and manuals (especially in the online form). Repairs performed by consumers should be simple and safe (Circular Electronics Partnership, 2021).

When supporting this idea, products should have been designed in order to enable these user improvements. In this context, a term "design for circularity" is used (Circular Electronics Partnership, 2021).

II. Supporting consumers to use the reused, repaired, and refurbished devices
It is about driving demand for circular products (Circular Electronics Partnership, 2021), respectively for so-called pre-owned products (Malecova & Prochazka, 2021).

From the macroeconomic point of view, spreading refurbishment services brings more jobs for citizens because refurbishment of different products requires more labour than manufacturing the same items (Moss & Bapna, 2020). However, it is necessary to realise that more labour will be reflected in the higher final price.

On the other hand, consumers can perceive some barriers to choose used and refurbished electronics devices. For instance, some consumers tend to think that using second-hand products is rather a sign of poverty – for them, it is connected with negative emotions (Camacho-Otero et al., 2020). To change this unfavourable user attitude, Ellen MacArthur Foundation (2018) suggests targeting the so-called "leading edge" users who can act as leaders: experience shows that these influencers can inspire other users who will follow them, and hence, the acceptance of reused and refurbished devices will probably increase in the society.

Professional refurbishing includes checking, repairing, and cleaning a particular item (Morris, 2020). In the Czech Republic, refurbished electronic devices are sold, for example, by Alza.cz – this company offers refurbished Apple iPhone smartphones, refurbished Apple Watch, and refurbished laptops (Alza.cz, 1994-2021c, d, e). In Europe, there is a marketplace for refurbished electronics, called Refurbed – a startup that provides a 12-month warranty and offers goods for cheaper prices (Butcher, 2021). In the world, the Amazon company offers refurbished and used consumer electronics such as smartphones, laptops, desktops, or tablets (Amazon.com, 1996-2021a, b).

III. Encouraging consumers in reselling and renting/sharing their devices

To encourage consumers to resell their devices, they need to be ensured there is a particular value of circular products, especially in terms of social, environmental, and economic benefits (Circular Electronics Partnership, 2021). Experience shows that online platforms push resale (Moss & Bapna, 2020).

In the case of two private end-users (consumers), it is a matter of consumer-to-consumer (C2C) e-commerce. Many online platforms enable transactions between consumers, e.g. eBay which is deemed a world leader in this field. (Statista.com, n.d.) Other favourite platforms for selling used stuff are Wallapop, Milanuncios, Facebook Market Place, and Letgo (Sala, 2021). In the Czech Republic, consumers are accustomed to using platforms such as sBazar.cz or Hyperinzerce.cz.

Instead of direct buying items, consumers can pay for temporal use of them. For instance, a German startup called Grover is based on a subscription business model when consumers pay fees for renting electronics like smart phones, game consoles, or computers (Lunden, 2021). In the Czech Republic, the Alza company brings similar offer; this offer also includes the possibility to rent and use a new model of iPhone every year (Alza.cz, 1994-2021b). If consumers do not own electronic devices, they do not need to deal with their recycling – this task is shifted to companies/manufacturers that know how to dispose of old devices at best (Deutsche Welle, 2020).

IV. Convincing consumers to use products longer

It seems that providing product durability information at the point of purchase leads to the higher consumer demand for products with the highest claimed durability – it means that consumers can be stimulated to keep their things for a longer time (LE Europe et al., 2018), and therefore, it is a way to reduce demand for new products (McCulloch, 2021; PACE, n.d.). Companies should reflect it and start to design their products for longevity. However, it is important to point out that products lasting longer are likely to cost more money – the crucial question is whether consumers will be willing to pay higher prices.

To prove the longevity in business practice, some companies offer consumers the possibility to pay for additional years of durability – in the Czech Republic, the Alza company and the CZC company offer a paid warranty extension above the standard obligatory warranty (Alza.cz, 1994-2021a; CZC.cz, n.d.).

Another approach to demonstrate product seamlessness and reliability over time is publishing information on complaint rates for individual products –

the Alza company does it in the Czech Republic. This information is supposed to stimulate consumers' decision to choose such a product that will last for a long time. However, it is debatable whether consumers desire to have electronic devices for a long time because products in this sector become obsolete relatively quickly.

V. Supporting consumers in returning their old devices to the manufacturer

Stimulating consumers to recycle unwanted things is a matter of reverse logistics – creating reverse logistic chains (Makarova et al., 2021); Clardy (2019) speaks about returnable or take back systems. However, there are some significant barriers why consumers do not want to participate in returning e-waste: consumers are afraid of data safety, they do not understand the value of used devices, and last but not least, they do not know how to return unwanted electronics devices (Ellen MacArthur Foundation, 2018). As another meaningful perceived obstacle can be considered consumers' convenience – not all consumers are convinced about the usefulness of recycling.

Consumer electronics contain precious metals such as gold, silver, copper, platinum, rhodium, iridium, palladium, ruthenium, indium, and osmium. Besides them, there are critical raw materials, for instance, cobalt or antimony, and also some non-critical metals, for example, aluminium and iron. (Forti et al., 2020) This list of elements that can be found in e-waste indicate it is improvident to throw everything away. According to Forti et al. (2020), it is debatable whether to mine these elements from e-waste due to the high costs of recycling. Experience shows that recycling can be economically viable only for products containing high contents of precious metals.

As for Europe, it is a continent with the highest documented recycling rate and e-waste collection in the world, whereas Asia is the second one and Americas are on the third position in the world. (Forti et al., 2020)

Opportunities for engaging consumers are evident: the success depends on communication with consumers and the effort to increase their willingness to participate actively in these actions. Consumers will engage only if they are sure their endeavour will really pay off. Hence, marketing communications striving to engage consumers successfully must be planned into carefully integrated programs (Kotler et al., 2021). In this context, influencer marketing using social media (Chen, 2020) can be a part of vital strategy how to work with target groups of consumers. As influencer marketing enables more personalised relationships (Kale, 2021), consumers may perceive communications much more trustworthy.

However, experience shows that changing consumer perspectives and behaviour is a very challenging task because, among other things, some consumers tend to think that new products made from recycled or sustainable materials are of

lower quality (Murphy, 2021). Other meaningful barriers, complicating consumer engagement in the circular economy principles, can be the follows: price-quality ratio (as lower prices lead consumers to buy less durable and less repairable products), lower consumers' interest in durability and reparability of fashion items (such as smartphones), consumers' convenience (it is easier to replace products than repair them), expensive or arduous repairing, and also fears that repaired products will be obsolete and out of fashion. Last but not least, there is a perceived lack of helpful information on how products could be repaired; consumers are not always sure how products could be further sold (as second-hand products) or rented/shared. Consumers perceive it is rather challenging to find this kind of information and that this information is not crystal clear to them. (LE Europe et al., 2018) From the practical point of view, the attention needs to be paid to these perceived barriers and their subsequent elimination.

7.4 CONCLUSION

Academic research on consumer engagement in the circular economy context is still relatively scarce. For purposes of this chapter, publications indexed in the Web of Science database were analysed. The authors of the publications related to consumer engagement in the circular economy context are predominantly affiliated with universities or organisations located in Europe. Besides this, it was found out there is a significant increase in the number of citations of these publications which tend to continue, indicating a living and discussed topic.

To maintain a manageable length of this chapter, the attention is subsequently paid solely to a consumer electronics market. Therefore, consumer engagement in the circular economy context means that consumers consider how to dispose of electronic devices sustainably – their thoughts go beyond the purchase itself.

Some inspirational ideas for engaging consumers in the circular economy context, focused on the consumer electronics market, were identified from business practice: (I.) Encouraging consumers to repair, refurbish, and upgrade their devices; (II.) Supporting consumers to use the reused, repaired, and refurbished devices; (III.) Encouraging consumers in reselling and renting/sharing their devices; (IV.) Convincing consumers to use products longer; (V.) Supporting consumers in returning their old devices to the manufacturer.

It is worth noting that consumers will engage if they are sure their endeavour will pay off. Consumer willingness to participate is crucial – companies or organisations can prepare circular business models, but these models cannot work without consumer engagement.

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8 THE CONTRIBUTION OF CIRCULAR ECONOMY TO SUSTAINABLE REGIONAL DEVELOPMENT. CASE STUDY OF WASTE STRATEGIC MANAGEMENT

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Abstract: The aim of this work is to highlight the contribution of the circular economy to the importance of cultivating ethics, values, attitudes, skills and actions that are governed by the goals of sustainable regional development, as defined in the international conferences. Sustainable regional development is a key and key element for the smooth operation of businesses and expresses ethical, social, cultural and environmental standards. The methodology used in this paper is based on bibliographic research, text analysis and the study of secondary sources. A case study of waste management will be presented and proposals for the expansion of the circular economy will be submitted in the context of beneficial environmental management. The expected results of the research aspire to highlight the importance of the circular economy in terms of sustainable environmental management and are considered important because they provide new data in environmental management. At the same time, they lead us to the conclusion that it is necessary to strengthen the environmental ethics of companies, with the ultimate goal of achieving a model of environmental management through the principles and values of the circular

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economy that will promote the prudent use of the environment in terms of sustainability.

Keywords: Circular economy, Sustainable regional development, Environmental ethics

"For most of history, man has had to fight nature to survive; in this century he is beginning to realize that, in order to survive, he must protect it."
Jean-Yves Cousteau, 1910-1997, French oceanographer.

8.1 INTRODUCTION

It is a fact that after the end of the Second World War, the countries that belonged to the western coalition experienced the golden thirty years (1945-1973). The ever-increasing production of various consumer goods, always combined with the rapid advancement of technology, justify the belief that the rapid development of science, technology and of course human knowledge, are connecting elements for the development and prosperity of all mankind. The way the economy was organized both from the post-war era until today, relied on the Industrial Revolution. A basic and fundamental principle was the stable economically viable supply of available resources. Based on this, the well-known linear model was created, which is characterized by the extraction or production of resources that will be required to be used, their consumption and finally their disposal. Undoubtedly, the linear model of the economy creates a huge negative environmental footprint. In particular, it contributes to the further burden on the environment, climate change, acid rain, the ozone hole, the greenhouse effect and more. In recent years, there has been a particularly intense exacerbation of the problem, with increasingly uncontrollable dimensions. The need for increased economic growth combined with the minimization of the environmental consequences undoubtedly create a difficult problem which is considered imperative by the need to be solved immediately with the ultimate goal of gaining benefit for the whole society. Thus, the concept of the Circular Economy was born, a model that aspires to provide immediate solutions by reducing the need for resources while providing an improvement in the living standards of people. The shift from the current linear relationship of production-use-disposal of waste to a more cyclical model, where the use and usefulness of resources, products and services is maximized, is now necessary (Karagouni, 2020).

The shift to this new "cyclical model" concerns all companies and industries in terms of how to deal with their waste. This environment created by individuals, entities and companies is particularly ideal in order to apply various innovative

models of circular economy, which will change the way in which companies-industries will produce different types of urban services as well as consumer resources. (Hazem, 2018).

In the blue planet, companies have to develop a more humane face to protect the environment and thus benefit themselves. After all, research has shown that consumers reward socially responsible businesses that adopt innovative circular economy models as well as various types of Corporate Social Responsibility actions. Actions that form a positive sign for the environment itself at any cost (Aspridis, 2015; Koukoumbliakos, 2021). The need for a sustainability-oriented development is now considered imperative, as the burden on the environment nowadays is becoming greater (Mitritsa, 2016).

8.2 CONCEPTUAL BOUNDARIES

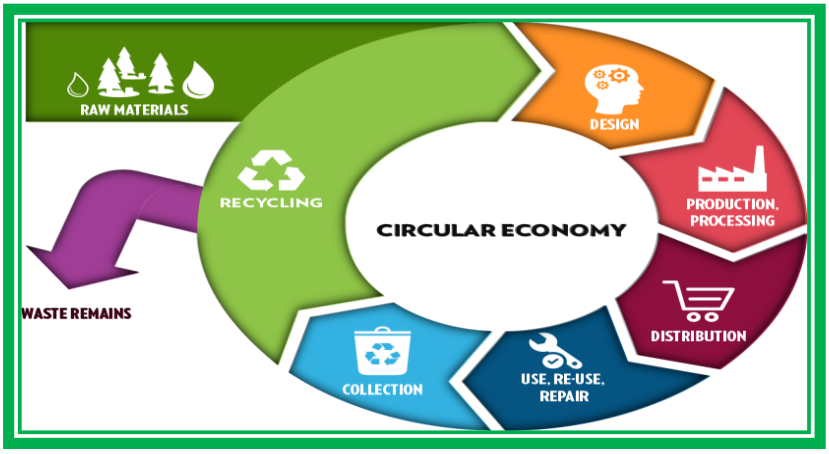
The concept of Circular Economy was first introduced in the early 1970s and is inspired by the natural world, where there is no rubbish. In 2017, Kirchherr, Reike and Hekkert in a survey they conducted, they located one hundred and fourteen (114) descriptions of the circular economy. Based on this research, they came up with a widely accepted definition.

In particular, the circular economy describes an economic system based on various business models that have the characteristic of replacing the end of a product's life with reduction, reuse in alternative ways, recycling and recovery of materials in consumption and production and product distribution. The ultimate goal is to achieve sustainable development in order to create economic prosperity and environmental equality (Hekkert, et all 2017).

François Michel Lambert, Member of Parliament for Ecologists in France and President of the Institute of Circular Economics, in an interview with CNN Greece 3 years ago, stated that in the context of the Circular Economy we should see everything next to us as an opportunity to create value, but not at the end of their life cycle but at every stage of the use of each product.

Undoubtedly, the transition from the linear to the circular economy will provide a wealth of opportunities, increased competitiveness, innovation, as well as will contribute to further growth and job creation (Trigas, 2018). Anything that was considered "waste" can now be turned into raw materials. The diagram below shows the model of the Circular Economy.

Figure 1: Circular Economy Model



Source: Online available on the website (www.thesafiablog.com/2020/03/19/Circulareconomytheeuropeanactionandthegreek), accessed 08-07-2021).

The various internal operators of organizations and bodies must adopt circular economy models at each of the stages of the value chain. While in fact the various researchers in the theoretical approach propose the adoption of circular economy models, as a matter of fact, a study conducted in Greece and involving large Greek industries, showed that in the adoption of circular economy models by companies and industries, there is a large shortage of properly designed and at the same time integrated approach in the context of the adoption of the circular economy (Trigas et al., 2019).

It is a fact that the concept of circular economy is often associated with the term sustainable development. According to the literature review, the first definition of sustainable development came from the Norwegian Ministry of the Environment in 1987. In the same year, the World Committee on Environment and Development introduced the definition of sustainable development for the first time. In particular, sustainable development has been defined as the development that best meets the current needs without, of course, the very ability of future generations to satisfy themselves. Sustainable development is related to various objectives, both economic and environmental, which are pursued through sustainable development techniques, the use and utilization of energy, the proper management of natural resources, as well as the various waste from industrial production and others. (Dočekalová et al., 2015; Rutkauskas et al., 2014; Straková, 2015).

In conclusion, there is an urgent need to mention that sustainable regional development incorporates various types of activities and instruments that have as their ultimate goal and objective (both in the short and long term) the promotion of sustainable development within the various regional economic priorities. Regions play a particularly important role as mediators between the local and national levels in this endeavor (Clement et al., 2003).

8.3 RESEARCH METHODOLOGY

The research adopts the qualitative method and more specifically the literature review. The aim is the holistic approach and analysis of the subject under investigation. Through the literature review, the long-term views on the contribution of the circular economy to sustainable regional development will be presented. In addition, the search for new, modern and innovative ideas and practices will be attempted, which will be examined by the bibliographic research, and will be a springboard for change proposals for the circular economy and sustainable regional development. The present methodological approach includes the presentation of the main concepts and events, in order to highlight the importance of the subject under investigation. For this purpose, both original texts and secondary publications on the subject were selected (such as historical studies, written documents, articles, reports, e-books, texts from websites and others). In the context of this tool, the adequacy of the literature review was evaluated and the value of the subject under investigation was criticized in order to record new knowledge (Babbie, 2018 · Saunders et al., 2015).

8.4 PRESENTATION OF RESULTS

A case study was carried out in a large oil company, which operates throughout Greece. The company estimates that the utilization of material and natural resources throughout their life cycle, is a great business opportunity but also a response to the commitment to satisfactory protection of the environment. The petroleum materials and by-products of the company, which are characterized as waste at a certain stage of their life cycle, are an important opportunity for their utilization as raw material in the production facilities of the company and as fuel, according to the business approach to the direction of the circular economy. The steady reduction of the amount of waste of the company to final disposal contributes significantly to minimize the adverse effects on the environment and the burden on human health but also to significantly reduce the operating costs of the company (https://sustainabilityreport2019.helpe.gr/ materiality-topics / environment-energy-and-climate-change / waste-and-circular-economy / accessed 08-07-2021).

One of the company's priorities is the adoption and implementation of an investment strategy in the principles of the circular economy through best practices and technologies throughout the product life cycle through a series of specific actions such as the following:

- Systematic reuse of water with the ultimate goal of reducing fresh water consumption and wastewater production.

- Significant reduction of solid waste leading to landfill, through new innovative investments in modern waste treatment plants and through partnerships for further utilization by partners, such as the energy recovery of refinery oily waste from third parties, or other waste as additives in their products.
- Development of collaborations for the utilization of waste for the recovery of energy and raw materials among the numerous activities of the whole company, such as refining of oily liquid waste produced by trading facilities.
- Starting from the application of best available techniques in the production process and reaching the operation of innovative final processing and waste utilization processes, the company continues to utilize significant quantities of oily waste in the company's refineries, while proceeding with steady steps to reduce the percentage of materials that become waste and therefore cannot be further exploited.
- The priority of the company is the constant and continuous increase of the percentage of utilization of materials and natural resources throughout their life cycle, through the process of recycling and reuse during the production process and the development of wider partnerships.
- A constant goal is the significant reduction of waste that will lead to final disposal and landfill (up to 15% by 2030) (https://sustainabilityreport2019.helpe.gr/materiality-topics/environment-energy-and-climate-change/ waste-and-circular-economy / accessed 08-07-2021).

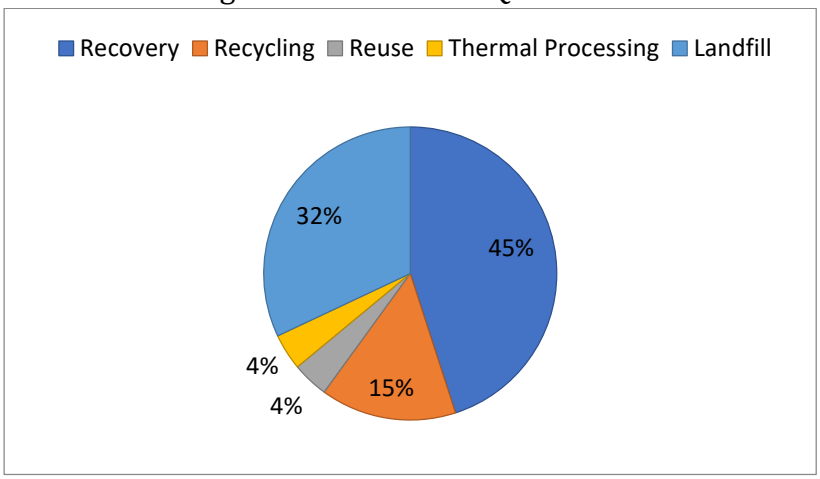
Regarding the management of liquid and solid waste, in 2019 the effort to reduce their production was successfully implemented, as well as the maximization of the recycling process for as many waste streams as possible and then, for the rest of the waste streams, their on-site management was adopted with the best possible way to protect the environment and protect human health. The company has installed modern waste treatment plants, such as integrated three-stage wastewater treatment plants of the whole company refineries, which ensure the continuous improvement of the company's performance, as presented in detail below. In accordance with the course of the last six years, the improvement of waste and water indices from all the activities of the company continued in 2019.

More specifically for liquid waste, there was a decrease in the production of liquid waste compared to the previous year while the total water consumption and the rate of recycling and reuse remained at about the same levels.

Regarding solid waste, in 2019 there was an increase of 22% in the total amount of treatment compared to the previous year. It is worth noting that the quantities of solid waste for the most part depend to a large extent on the cleaning of product tanks and therefore change from year to year, depending on the scheduling of maintenance of existing tanks primarily and secondarily with the availability of solid waste treatment plants (either inside or outside the facility). More specifically, in 2019, the largest increases were observed both at the Elefsina refinery,

where scheduled general maintenance took place and at the Thessaloniki refinery, where the increased quantities of hazardous waste were treated at the biodegradation plant and finally disposed of as non-hazardous.
More specifically, it was observed that 64% of the total waste was either reused, or recycled, or further recycled through a raw material recovery process, where the percentage is reduced compared to the previous year due to the final disposal of the aforementioned waste. In particular, 45% was recovered, 15% recycled, reused while 4% was heat treated and finally 32% ended up in a landfill (https://sustainabilityreport2019.helpe.gr/materiality-topics/environment-energy-and-climate-change/waste-and-circular-economy/ accessed 08-07-2021). For better clarification of the above data, diagram 2 follows.

Figure 2: Solid Waste Quantities



Source: Personal data processing

In addition to the typical industrial waste of the sector, it was found that in 2019 a model project of an integrated waste management system was implemented at the Aspropyrgos facilities, where separation was carried out at the original source of all materials, such as metal, batteries, plastic, paper, etc. Their collection takes place in specially designed bins that have been placed in most parts of the facilities where employees work. With this circular economy plan, it is estimated that approximately 250 tons per year have been collected from the company facilities. The ultimate goal of this integrated management program is to reduce waste by 75%, so that 65 tons are collected annually.

In addition to enhancing the recycling of waste batteries nationally, from 2018 the company receives used car batteries at selected points of its network throughout the country. In this way, it enables its customers to directly assist in the recycling of this hazardous waste. Through the proper process of their collection, transport and recycling (which should be noted that it reaches 95%), the principles of the circular economy are approached, as the dangerous toxic materials contained in the batteries are not disposed of with environmental burden but at the same time utilized in the production process as an important raw material. More

specifically, since the beginning of this action, 186 batteries have been collected in twelve different points of the company's network with a total weight of 1921 kilos. Based on these results, the company decided to extend this action throughout Greece.

Especially for the oil refinery sector, the percentage of petroleum waste that is recovered and returned to the production process as a raw material for refining is also monitored. These quantities of waste come from both the production process and cooperating bodies. The following table presents in detail the quantities and percentages of recovery, on the total supply, from the refineries of the company while it is worth noting that in the last six years a total of over 1 million tons of oily liquid waste have been refined. (https://sustainabilityreport2019.helpe.gr/materiality-topics/environment-energy-and-climate-change/waste-and-circular-economy/ accessed 08-07-2021).

Table 1

Facility	Recovery rate	Quantity in tons
Aspropyrgos Refinery	1,12%	103.830
Elefsina Refinery	2,87%	154.687
Thessaloniki Refinery	1,99%	78.604

Source: Personal data processing.

8.5 CONCLUSIONS

From the above case study presented in detail, it is understood that the benefits arising from the application of the principles of the circular economy are multiple and important and can significantly contribute to regional development. In the specific case study, it emerged that through the actions of the company the regional units of Thessaloniki, Aspropyrgos and Elefsina have been significantly helped. In addition, with the program of collecting used car batteries in the company networks throughout Greece, it is certain that other regional units of the country will be relieved and will be further developed, while protecting the environment.

A necessary condition for our society to continue to grow and to ensure the adequacy of natural resources, stability and durability, is to follow an economic growth model that will reduce waste, but also reduce the need for new resources that must be at great economic and environmental cost. Sustainable development means that we upgrade the living standards of the people, through the optimal use of resources and a modern economy that contributes to the well-being of citizens. The transition to a cyclical economy, including a cyclical bioeconomy, is a great opportunity to create competitive advantages in sustainable development. The application of the principles of the circular economy in all sectors and industries, according to the European Commission's Reflection Paper "Towards a Sustainable Europe

by 2030", has the potential to generate a net economic benefit of 1.8 trillion by 2030, to bring more than 1 million new jobs to the European Union and to play a central role in reducing greenhouse gas emissions (https://www.ekt.gr/en/magazines/features/23377 accessed 16-07 -2021).

The circular economy is to some extent the evolution of recycling, but it also has an essential difference: In recycling, a used product decomposes into raw materials that are recovered to be reused in the production of new products. In the circular economy, the product is designed from scratch so that it can be rebuilt to be reused as new. This puts a limit on the reckless depletion of the planet's wealth-producing resources and the destruction of the biosphere due to environmental pollution and the resulting climate change. The model of the circular economy presupposes new ways of conceiving and designing products. Processes, value chains, and even business models of production and consumption are designed from the beginning with the aim of reconstructing, reprocessing, repairing and reusing existing materials and products and of course the active participation of all actors in economic life is required. Many countries have put the circular economy at the core of their development strategy, as it contributes to energy savings and the more rational use of natural resources, to the reduction of air, soil and water pollution, and to tackling climate change. In addition to the benefits for the environment, it can contribute to social and economic well-being, creating jobs and being a source of growth and innovation (https://www.ekt.gr/en/magazines/features/23377 accessed 08 - 07 - 2021). Therefore, the application of the principles of the circular economy is a safe and sustainable solution for the regional development, the protection of the environment, the sustainability and the development and evolution of the companies and the regional units in which they operate.

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9 SMART CITIES IN CONTEXT OF CIRCULAR ECONOMY: CASE STUDY OF PÍSEK CITY, CZECH REPUBLIC AND SAN JOSE, CALIFORNIA, USA

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Abstract: This chapter deals with the practical applications of the circular economy in smart cities. We compared two smart cities - Písek and San Jose, which implementing various projects mostly aligned with the circular economy concept. These projects boast a comprehensive approach and innovative technologies that often positively impact sustainability and the environment. We have focused on the characteristics of the current state of the art of smart cities, their benefits and withdrawal.

9.1 INTRODUCTION

In recent decades, there has been massive urbanization and depopulation of villages. From smaller towns, people are moving en masse to cities, which are thus required to meet the high demands of such a large population. It is estimated that almost 70% of the world's population will live in cities in the space of the next thirty years (Townsend, 2014). The rapid pace of increasing urbanization puts high pressure on transport and technical infrastructure, civic amenities and public spaces. The cities we live in can be more efficient, vivid and sustainable in the short and long term. It is in the interest of every municipality to improve the quality of life and the satisfaction of citizens. It can be achieved through a more environmentally friendly approach to mobility, security and energy. Fully self-sufficient smart cities

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meet the principles of the circular economy. Although new technologies are an essential element for their development, the concept of smart cities does not mean only the integration of digital technologies into urban infrastructure. What is also crucial is the people themselves, who should improve communication, cultivate culture and promote the sport to make cities pleasant places to live. In line with the circular economy, energy and waste management is an integral part of smart cities.

The circular economy turns end-of-life goods into resources for others, closes loops in industrial ecosystems and minimizes waste (Stahel, 2016). A circular economy means a waste system that does not skip any part of the cycle. The cycle runs from resource extraction through production, distribution to consumer use. Every aspect of the product and material is used beyond its useful life through innovation, recycling, reuse, repair, and remanufacturing (known as 4R). A central principle of the environmental benefits of the circular economy is whether secondary production activities reduce or crowd out primary production that creates significant environmental damage. The downstream consequences caused by the chosen end-of-life disposal method are significant (Zink & Geyer, 2017).

The circular economy is essential for the development of smart cities. A smart city with circular economy principles means implementing the strategy of increasing economic and social value and increasing the value of the environment (X. T. Li, Bao, Sun, & Wang, 2021). The smart city concept is guided by technology to improve the quality of life and ensure safety in cities (Zvirgzdins & Geipele, 2020). Zvirgzdins & Geipele (2020) compared circular economy and smart city concepts based on the content analysis of keywords from their definitions. Similarities of both concepts are management of resources (4R, waste, closed loops), resource efficiency, smart society (knowledge, behaviour, consumption), industrial symbiosis (data, information exchange), renewable energy, sustainability, smart mobility (sharing services), business models, and innovation.

Smart cities are rooted in the circular economy. When most of the population still lived in the countryside, the circular economy was already in place, as all products were organic, biodegraded well, and animal waste was used to restore the fertility of the fields. Subsequently, various synthetic substances began to be used in production, which created waste at the end of the product's life cycle, which accumulated in landfills and made life very difficult for residents, especially in cities. Therefore, the circular economy tries to influence production technology so that all groups of substances (metals, plastics, wood, etc.) can be easily dismantled and returned to production. Thus, in the circular economy, there is no waste.

The development of an intelligent waste disposal system using Industry 4.0 technologies and circular economy principles could be effective in critical planning for smart cities (Chauhan, Jakhar, & Chauhan, 2021). The circular economy concept emphasizes life cycle thinking, systems thinking, and value preservation (Zvirgzdins & Geipele, 2020). Intelligent transport and surveillance systems support the circular economy as a strategic waste management tool (Luttenberger, 2020). The circular economy is an interconnected ecosystem where waste is prevented, repaired or reused but recycled and recovered as new products. The circular economy fundamentally changes the economic view of production because it replaces

efficiency with sufficiency: reuse what can be reused, recycle what cannot be reused, fix what's broken, remanufacture what's broken and cannot be repaired (Stahel, 2016).

Smart City can be understood as a concept of strategic city management. Modern technologies are used to influence the quality of life in the city and, consequently, achieve the city's economic and social goals (Slavík, 2017). Smart cities are complex urban structures with a long-term vision and environmentally friendly approach, integrating intelligent technologies towards sustainability and a higher standard of living for citizens (Benevolo, Dameri, & D'Auria, 2016). As a part of the Economy and Governance, Smart City understands the environment as a city in which sustainable development is part of everyday life (Meng, Liu, Wang, Wang, & Wu, 2020).

Smart cities combine challenges affecting their competitiveness and the sustainability of their development. These competitive cities of the future have intelligent technologies and sustainable energy, which enhance the population's quality of life (Russo, Rindone, & Panuccio, 2014). Smart cities should strive to remain smart. Therefore, they should innovate and use the latest information and communication technologies to improve the quality of life of their citizens, improve city services and general operations, and remain competitive. Most importantly, however, cities need to meet the needs of current and future generations of citizens, taking into account economic, social and environmental aspects (Mohanty, Choppali, & Kougianos, 2016).

The smart city, according to Svítek & Postránecký (2018), meets the requirements of Industry 4.0 for:

- interoperability (interconnectivity of the different parts of the socio-cyber-physical system);
- virtualization (a virtual copy of city as a Twin City);
- decentralization (allows independent decision-making);
- real-time decision-making (control systems can make decisions based on data analysis);
- smart service orientation (interaction between residents, tourists and service providers);
- modularity (flexible adaptation to change).

Smart cities include smart governance, smart use of natural resources, smart human capital and a smart economy based on competitiveness (Gil-Garcia, Pardo, & Nam, 2015). A typical smart city includes smart homes, smart energy and wastewater management systems, smart mobility, and a digitized environment for accessible communication using modern information and communication technologies (Raghuvanshi & Singh, 2020). According to Giffinger et al. (2007), smart cities consists of the smart economy (competitiveness ability to transform), smart people (social and human capital), smart governance (participation in political strategies and perspectives), smart mobility (transport and ICT), smart environment (natural resources and sustainable development), and smart living (quality of life-related to cultural, health, safety, and social conditions). The smart city conceptual reference model includes a conventional layer of the city services and layers of green city,

interconnection, instrumentation, integration, application and innovation (Zygiaris, 2013).

Benevolo et al. (2016) report the benefits of smart mobility: reduced congestion, reduced travel time, reduced travel costs, reduced pollution, reduced noise and increased safety. The increased interest in the future of mobility is primarily attributed to the rapid growth of new technologies and business models for electric, autonomous and shared mobility. According to Moscholidou & Pangbourne (2020), shared mobility includes car-sharing, i.e., ride-sharing (e.g., Uber, Lyft); car-sharing, i.e., car-sharing (e.g., Zipcar, Turo); bike-sharing, i.e., bike-sharing (e.g., Mobike, Lime, Jump); and electric scooter-sharing, i.e., scooter-sharing (e.g., Lime, Lyft, Tier). An essential step in the automotive and engineering industry is the introduction of automation of driving elements, which will lead to the production of autonomous vehicles without the need for a driver. In this case, the car could arrive at the customer's request, eliminating the problem of garaging or finding free parking spaces (Fagnant & Kockelman, 2015)

Cities should also be designed to take advantage of new technologies that lead to more efficient waste management. It could lead to waste reduction and recycling into new energy sources (Vaněček & Pech, 2018). Another way to increase energy savings is to build buildings using renewable energy sources. The roofs of buildings and garages should have conveniently placed solar panels that can produce significant amounts of solar energy to cover nighttime lighting and charge electric vehicles. In addition, intelligent lighting in common areas should detect human movement and operate only when needed, which can reduce energy consumption by up to 40% (Bhati, Hansen, & Chan, 2017).

The dangers of digitization also lie in the potential misuse of data for population surveillance, cyber-attacks or industrial espionage. Security could also be compromised by the unguarded intelligence of smart things, which, if unchecked, could cause irreversible consequences (Vaněček & Pech, 2018). While innovations in information technology create new economic and social opportunities, they also pose risks to security and loss of privacy. People are now communicating with smartphones and devices, using smart energy meters and security systems, and living in smart homes with smart appliances. These Internet of Things (IoT) based systems share and use data to offer people unprecedented convenience and improved quality of life (Elmaghraby & Losavio, 2014).

Urban green spaces are the cheapest Smart measures ever. They clean the air and prevent the urban heat island effect, in which the centres of large cities overheat in the summer months due to a lack of greenery. They also have an aesthetic function and are ideal for revitalizing city centres. Greenery subsequently affects the physical and aesthetic properties of buildings. It acts as a natural air conditioner and improves the environment both inside buildings and in their surroundings. It has a crucial function in this respect during the summer in supporting biodiversity (Slezáková, 2019). Miketa (2017) discusses smart homes more in terms of energy efficiency, arguing that they are buildings that ideally have zero energy consumption and do not require heating to achieve the desired temperatures using optimal building materials. In Smart City, smart grids are used in smart buildings. When

surplus energy is generated by their own energy, they can feed it back into the grid and thus reduce their cost.

To achieve all the benefits that smart cities can offer, city administrations need to communicate correctly with their citizens. Communication is a crucial element to understand the project and achieve its goal collectively. Therefore, it is essential that the city administration straightforwardly informs its citizens, prepare for changes, explain the reasons for introducing new elements that occur over time, and proactively anticipate upcoming smart city developments (Nicolas, Kim, & Chi, 2021). Cities seeking smart growth should use information technology for communication, mainly focusing on popular platforms among users. Furthermore, city authorities should promote and develop e-government services that allow communication and handling of issues without the need for a citizen to be physically present in the office. It would enable people to communicate and handle their affairs quickly, flexibly and efficiently (Kowalik, 2021). Thanks to the "Open data" approach, it is possible to open the data. Such data can be used, reused and redistributed by anyone, with an obligation to acknowledge the source or share it (Pollock, 2006). However, communication in smart cities will not be limited to passing information between people. By leveraging the IoT architecture, users will communicate directly with resources and achieve easy access to information and services. It will be possible to use private and public clouds, transport networks, mobile networks, wireless sensor networks and smart grids to communicate (D. Li, Deng, Liu, & Su, 2020). Information and Communication Technology (ICT) platforms have become the heart of the Smart City due to their ability to offer advanced services in Intelligent Transport Systems (ITS), environmental and energy monitoring, building management, healthcare, public safety, security and telework. In other words, ICTs play a crucial role by connecting all the actors of a Smart City (Piro, Cianci, Grieco, Boggia, & Camarda, 2014).

Some projects are based on the sensors, RFID, actuators, mobile applications and IoT maintaining waste management of smart cities (Caragliu, del Bo, & Nijkamp, 2011). Li, Bao, Sun, & Wang (2021) describe the implementation of wireless sensors for the economic growth of smart cities that have improved transport, smart national and social infrastructure to ensure reliability and low energy consumption. Other technologies include smart bus stops, rechargeable benches, photovoltaic panels, smart lamps, smart grid, smart water supply, cogeneration units, smart parking spaces, sharing economy products, smart green transport, electric vehicle charging stations, monitoring systems, etc.

Large cities in arid regions suffer from water shortages. An attractive exhibit for desert countries, for example, will be the unique S.A.WQ.E.R technology, which will extract water from the air and will be demonstrated at this year's World Expo in Dubai, United Arab Emirates (Stingl, 2021). The technology produces up to 500 litres of water per day, which irrigate the Czech pavilion. The energy will be supplied by photovoltaic cells located on the roof of the pavilion. This water production method was developed by scientists from the University Centre for Energy Efficient Buildings at the CTU. It is a waste-free technology.

Another exhibit, also at the Dubai World Expo, focuses on water conservation in everyday toilet use. This technology is offered by Siko, a company best known for selling bathroom accessories. It has bought Swiss Aqua technologies, a technology start-up that deals in water-saving technologies. A hit at the exhibition should be the energy-saving toilet, which, thanks to the use of forced air, uses only 2.5 litres of water per flush, compared to conventional toilets, where the consumption is about 9 litres. If we calculate the savings per household and the number of families that could use this technology in the future, the savings are significant (Kotrbatý, 2021).

Smart cities allow enterprises to focus on less common commodities, mainly concentrating more people in a limited space. Czechs like to drink coffee, and coffee grounds are produced as waste, the further processing of which is an exciting example of value-added products. Nafigate Cosmetics has calculated that the Czech Republic produces around 80 tonnes of coffee grounds per year, ending in landfills. The new technology will make it possible to produce biopolymers at 5 euros per 1 kg. Still, after special treatment, the bio-waste can have deodorants in cosmetics, where the price rises to 35 euros per kg. With further treatment suitable for biomedicine, the cost of this product can reach 50-100 euros per 1 kg. This biopolymer is also ideal because it degrades well (Janíková, 2021).

9.2 METHODOLOGY

The research aimed to analyze and compare the characteristics of two smart cities. The method of case studies was used to evaluate the results. The comparison was then used to synthesize metadata and formulate the findings. The methodology is based on data from two questionnaire research (Hoangová, 2021; Homola, 2020) conducted by students of the Faculty of Economics of the University of South Bohemia in České Budějovice in cooperation with thesis supervisors. The case studies were used to compare both smart cities.

The first research (Homola, 2020) was carried out among the residents of Písek in 2020 through an online questionnaire survey. Two hundred ninety-three respondents took part in the survey, 78% of whom are permanent residents of Písek; 54% were women, and 46% were men. The age of respondents: 3% under 19 group, 62% by the 19 to 30 group, 26% by the 31 to 50 group, and 9% by the 51 to 70 group. Among the questions asked in the questionnaire, we were interested in the familiarity with the smart city concept (yes/no answers) and evaluating the innovations introduced (rated on a Likert scale: 5 - maximum satisfaction, 1 - maximum dissatisfaction). The investments considered were the flexibility of traffic flow, parking, waste management, public wi-fi, the openness of city offices, smart public transport, sensor data collection and environmental care (Homola, 2020).

The second research (Hoangová, 2021) relies on an online survey conducted online in 2021 in San Jose. Two hundred forty-six respondents participated in the survey, of which 53.7% were female, and 46.3% were male. The age composition of the respondents was 24.4% 16-30 years old, 43.9% 31-45 years old, 19.5% 46-

60 years old, and 12.2% 61 years old and above (Hoangová, 2021). From the results, the case studies included questions focused on familiarity with the smart city concept (responses: very familiar, familiar, unfamiliar) and satisfaction ratings with the four smart city priority areas (rated on a Likert scale: 5 - maximum satisfaction, 1 - maximum dissatisfaction). These topics were: transport (public transport, charging stations, shared mobility and micromobility, development of autonomous cars), energy savings (renewable energy, waste sorting, public LED lighting, installation of solar panels on rooftops), security (security cameras, gunshot detection, police patrols) and communication (open data, public Wi-fi, 5G connectivity, up-to-date information on the city's website).

In addition to the two questionnaire surveys, the findings of the study are based on structured interviews. In the city of Písek, these were interviews with two experts involved in the smart city concept. In addition, an interview was conducted with a San Jose city official who is also a member of the innovation and technology oversight board. The purpose of these interviews was to get a contrarian view of the current situation, the projects implemented, successes and failures related to the smart city concept.

The case studies were chosen to conduct a specific contextual analysis. There were significant differences between the selected cities already in terms of their size or regional importance. Case studies can exemplify or validate research assumptions in specific organizations, especially in significantly different or unique cases (Eisenhardt, 1991). Their advantage is logical induction to broaden the perspective on the studied problem (Flyvbjerg, 2006). For a case study, it is recommended that each case study follows a framework outline (Stejskalová & Rolínek, 2008). Our case studies consisting of three key areas - an introductory section (characteristics of the city and its vision), a descriptive section related to the four areas of interest (transport, energy, security and safety, communication) and a conclusion. The case studies are then followed by an analytical section (section Comparison and Discussion) examining the differences between the cities. Two indicators were used based on the first and second questionnaire surveys for the evaluation: familiarity with the smart city concept and satisfaction ratings with the four smart city priority areas. The analytical part includes the subjective intervention perspective of the practitioners interviewed. The results of the questionnaire surveys and structured interviews were then synthesised into an analysis of the benefits and drawbacks of each city.

9.3 CASE STUDY: SMART CITY PÍSEK, CZECH REPUBLIC

Nowadays, the town of Písek is one of the most visited and architecturally beautiful towns in South Bohemia. It is localized on the road connecting Prague with České Budějovice, approximately one hundred kilometres south of the capital and fifty kilometres north of the South Bohemian metropolis. Currently, the population is around 30,350, and the area is 63.22 km2. Besides its attractiveness, the town of

Písek is focused on the industry. Already after the Second World War, Jitex was built here. Today, foreign companies such as Schneider Electric, Faurecia Automotive, AISIN Europe Manufacturing have their production plants in Písek. In the last few years, private business has boomed in Písek, especially in information and communication technologies and software development (Homola, 2020).

Smart City Vision:
Pillar I: Sustainable urban mobility.

- Sustainable urban mobility is primarily related to "clean mobility", specifically in three areas, namely logistics, tourism and services. These areas are intended to support the introduction of electric or hybrid vehicles or infrastructure. Then the main goal is to reduce environmental impacts by making the operation of local social, health or municipal services more efficient through facilitating innovative approaches for the design of logistics chains using electric cars. At the same time, it is necessary to increase the attractiveness of the tourist product offer and the main tourist attractions in Písek. It includes the management and regulation of transport in the city, the promotion of user-friendly public transport as a fully-fledged alternative to an individual vehicle and the rise of sustainable logistics and urban services (Svítek, Slavík, Zadina, & Polanský, 2015).

Pillar II: Smart Buildings and Neighbourhoods

- The main focus in this domain is to improve the energy efficiency and effectiveness of buildings and neighbourhoods using modern technologies. First and foremost, this involves carrying out energy audits and observations of existing and new buildings with a view to intelligent energy management. The use of new materials and intelligent solutions for temperature control in buildings, lighting and energy-saving measures that will lead to the construction of zero-energy buildings, including the creation of charging points for electric vehicles across the city, is encouraged (Svítek et al., 2015).

Pillar III: Integrated infrastructures and processes in energy, ICT and transport

- Ultimately, it is about linking all pillars through information and communication, digital technologies. More specifically, it is about deploying sensors, the extension of the city's fibre optic networks, which will help build a data bus and data centres—building infrastructure to improve citizen connectivity to open data. This data will be further used in emergencies that may arise. The city will resolve these events affecting traffic, energy, water quality or communications in the shortest possible time. The cooperation between the infrastructure and the Smart Grid should improve the communication and energy networks, which will further assist in innovations in transport and the general satisfaction of residents and visitors to the city (Svítek et al., 2015).

Transport
The city is developing transport plans to unify cooperation between transport, energy, and information and communication systems. Traffic data is being used to manage traffic concerning weather forecasting, energy consumption or environmental impacts. Another optimization was to be recorded by waste collection using sensors placed in bins and containers to monitor the current status and plan waste collection (Svítek et al., 2015).

- Sustainable transport planning
- Promotion of shared transport facilities
- Clean mobility and logistics (electric/hybrid vehicles)
- Integrated multi-modal public transport (public transport interconnected with mobile phones, GSM/GPS modules)
- Traffic management and detectors
- Parking systems
- Waste collection
- Clean mobility and tourism (cycling)

Energetics
The environmental damage in the production of electricity and heat is minimized through modern technologies. Efforts are being made to adapt energy supply to decentralized energy produced from renewable and secondary energy sources (biomass, solar thermal energy, ambient thermal energy and geothermal energy with heat storage, cogeneration and central heating, among others). The projects aim at intelligent management of urban services towards efficient use of energy and natural resources (Svítek et al., 2015).

- Integration of existing and new buildings in urban neighbourhoods using biomass, solar thermal energy, ambient thermal energy and geothermal energy with heat storage, cogeneration and central heating)
- Energy audit and monitoring of urban neighbourhoods
- Creation of a "green energy network" and development of green infrastructure
- Use of new materials and innovative solutions (bright lighting, heating, cooling, sustainable building materials)
- New zero-energy and low-energy solutions

Security and Safety
This area is not a priority in the smart city Písek concept. However, it affects all areas of intelligent infrastructure. It is about ensuring safety in transport, protecting property and maintaining public order, and protecting IT systems and data obtained from sensors or information systems of the state administration. The Municipal Police operates its camera system, which consists of security cameras and is connected to the Police of the Czech Republic. The purpose of this system is to maintain public order. Furthermore, the Municipal Police operates a call-centre for

municipal flats, which receives reports of problems in these flats and pieces of damage to municipal furniture (Svítek et al., 2015).

- ensuring the centralization of computing resources and data security;
- Improving the safety of rail, road, cycling and pedestrian transport (barrier-free access, sound and another signalling)
- Security camera systems supporting the maintenance of public order
- Monitoring and security systems to protect property and citizens in the city, including fire alarm and environmental monitoring.

Communication

In ICT equipment, the city has 53 information systems, including 16 operational information systems and 37 public administration information systems. The objective in communication is to complete and develop the smart grid system and fibre optic backbone routes. This infrastructure is essential for the transmission, collection and evaluation of data and communication to the public. The primary communication tool is the city's website, which provides information on what is happening. This information is related to the town's administration and can be automated, such as receiving and managing suggestions from citizens on what is happening in the city (Svítek et al., 2015).

- Use of information and communication technologies, information on energy consumption/production and multi-modal transport and mobility services to citizens and end-users
- Information on emergencies
- Systematic use of synergies through Smart Grid
- Use of up-to-date, multi-modal information
- Sensor distribution
- Creating conditions for the development of third-party applications and the possibility of using open data
- Real-time energy management

The overall evaluation

The city of Písek started to label itself "smart" after writing the "Blue Book" in 2015, but it only started to implement the projects in 2017. The first projects were implemented in 2017, and Písek is at the beginning of its journey towards "smartness". In August 2017, work was completed on the Písek parking system, which then underwent beta testing to be put into live operation in early 2018. In addition to this system, a smartphone app, "eParkomat", was introduced, which also works in Prague outside the city of Písek and allows the driver to find an available parking space in real-time, including the hourly parking rate, and navigate to a specific position. Parking at the Exhibition Grounds was supplemented during construction by two fast-charging stations for electric vehicles from the energy company E.ON. Smart mobility also includes the innovation of traffic lights at busy intersections in Písek. The control systems use a wide range of sensors, starting with partial detectors in

buildings or on traffic infrastructure and ending with the processing of, for example, space images (weather forecasts, city temperature maps, emission maps). The smart cities programme also includes advanced actuators, physical devices on the infrastructure and virtual information systems, offering practical solutions concerning the available information (Homola, 2020).

There is no single, universal solution that can be applied to all cities. Písek is a smaller city, and many employees in the local factories have to commute to work. Therefore, the city has focused primarily on transport-related projects. The Czech Republic will receive CZK 39 billion in subsidies from the European Union for the Green Savings Programme. It opens up an excellent opportunity for smart cities in the field of energy savings and also shows the EU's significant financial contribution to the future development of smart cities.

9.4 CASE STUDY: SAN JOSE, CALIFORNIA, USA

San Jose is the third-most populous city in California and the tenth-most populous city in the United States, with 1,021,795 in 2019, covering 466.1 square miles. It is the county seat of Santa Clara County, which is one of the wealthiest counties in the United States. San Jose is connected to San Francisco and Oakland with its metropolitan area and falls under the better-known San Francisco Bay Area (US Census Bureau, 2020). The southernmost part of the Bay Area conurbation is called Silicon Valley8, so named because of the high concentration of silicon microchips and computers. San Jose has become known as the "Capital of Silicon Valley" due to its location, a burgeoning high-tech industry, cultural, political, and economic centre. The technology boom of the 1980s brought considerable prosperity to San Jose. The city became known for its importance in developing semiconductors and computer technology, making it a global centre of innovation (Eaves, 2007). Today, major technology companies such as eBay, Apple, IBM, Facebook, PayPal, Samsung, Acer, Google, Hewlett Packard Enterprise and Zoom are headquartered.

As the capital of Silicon Valley, San Jose is uniquely positioned to harness the knowledge and creativity of its citizens, corporate partners, and leading academic institutions to reshape the current perceived blend of technology and connectivity. The term Smart City has different meanings for different stakeholders, and San Jose has defined its SMART vision as a safe, multi-modal, vibrant, responsive and transparent city. Each of these characteristics is briefly discussed below (City of San Jose, 2021):

S - Safe

Due to the high rate of traffic crashes, the city strives to reduce all fatal crashes as quickly as possible. For example, to achieve more safety, the innovative Vision Zero plan was approved in 2015.

M – Multi-Modal

The city wants to achieve a connected and multi-modal transport network that would allow San Jose residents to travel conveniently and the Bay Area.

A – Activated
The ethnically diverse community living in San Jose is associated with a rich culture, local foods, sports activities, and other various activities that are most often downtown and help shape the character of San Jose. The city would like to embrace technological innovation and support the community. Examples of this are the working wireless internet connection downtown and the deployment of 5G technology.

R – Responsive
The traffic infrastructure in San Jose is already at a relatively high level, and the introduction of a priority passage system for emergency services has created a significant shift. In the future, the city would like to equip intersections with advanced sensors that can respond to traffic behaviour and ensure the smooth flow of traffic.

T – Transparent
To increase private and public involvement in city management, the city administration wanted to become completely transparent. In 2018, this vision point was fulfilled when the city committed to an open, transparent and efficient government.

Transport
Many intelligent solutions in the context of smart mobility have already been implemented in San Jose. These solutions are based on new technologies and include systems for vehicle navigation, autonomous driving, traffic light modification and car, bike and scooter sharing. Furthermore, the city has managed to increase demand for electric vehicles and has been able to create an adequate charging infrastructure that reduces barriers to adoption. However, it is essential to remember that innovative solutions are not necessarily only related to new technologies. The city has long struggled with many traffic accidents and air pollution; it would be advisable to promote public transport and cycling more. Although the city is currently building new lines and trails, they must be used once they are made. Public transport should build on each other, with stops within walking distance of schools, neighbourhoods and businesses; a simple app for finding connections and buying tickets should be created to support it. Financial incentives could be a way to increase public transport; for example, employer subsidies, a reduction in the tax base and discounted fares for students (Hoangová, 2021).

- Photo cameras and speed cameras
- Autonomous and Electric cars
- Priority passage system for emergency services
- Micro mobility and shared mobility
- Public transport

Energetics
The current climate crisis is a significant driver for the city to increase energy savings and investment in renewable energy. Due to villages being displaced and mov-

ing to cities, stringent energy legislation has been created to manage existing buildings and new ones. While these regulations are an effective solution for the current situation and future developments, they may not be welcome for many residents, especially in high initial and renovation costs. The city has also focused on the transition to renewable energy; the community energy choice system at a favourable price can be seen as a positive development, especially if using 100% renewable energy is an optimal choice for many multinational corporations based in the city. The emphasis on waste management and recycling, which is relatively unusual compared to other parts of America, is also very positive. What is lacking in the city is some education of residents about consumption. People may mistakenly believe that if they recycle everything, there is no need to moderate their lifestyle. Thus, it is common to see the use of large quantities of plastic coffee cups, disposable plastic utensils, straws, plastic bags and other items that are no longer used as much (Hoangová, 2021).

- Energy monitoring
- Renewable energy sources
- Energy performance of buildings
- Waste management and recycling
- LED lighting

Security and Safety

The motivation for introducing smart city technologies is also to increase public safety and protect public property. The increasing number of crimes in San Jose is leading to the installation of more public cameras, and the creation of a private camera registry is a positive step that can save police officers a lot of work and time. However, there is also a loss of privacy associated with closed-circuit television (CCTV). Therefore, some balance must be struck between the stated purposes of CCTV and the extent of the invasion of privacy. San Jose's new firearms gunshot detection system is also working - given that this is a technology that has been on the market longer, I believe this system should have been installed in schools, at least in the public budget, a long time ago. At the same time, the city's late response to a potential cyber attack and the creation of the Office of Cyber and Information Security only in 2018 is quite striking. The city considers itself a global hub for the high-tech and internet industry, so it should not forget the risks and dangers inherent in this industry (Hoangová, 2021).

- Public Information System
- Online crime map
- Security cameras
- Firearms Shot Detection System
- Cybersecurity

Communication
The city has made considerable strides in the way it communicates with its residents. The current website design provides visitors with all the critical information, works in four languages, and strives to reach every community living in San Jose. In the future, the San Jose 311 mobile app should also be improved, as it currently only works for reporting breakdowns and is not working to its full potential. The city's efforts to make the office transparent and open data can be evaluated positively. Unfortunately, the possibility of using electronic administrative services that would allow communication and handling of matters without the necessary physical presence of the citizen at the office is not functioning. However, the Covid-19 pandemic may make this idea more successful in the future. Investing in public wireless internet and deploying 5G broadband networks is a big step towards successfully creating a holistic smart IoT environment (Hoangová, 2021).

- Social networks
- Transparent Authority
- Public wireless internet
- Fifth-generation wireless systems (5G)

The overall evaluation
San Jose's extensive efforts to create and implement projects under the smart city concept offer many opportunities in using new technologies to improve the lives of residents. The city has also won many awards for its efforts, most notably last year's The Most Innovative City in US 2020 for its year-long pursuit of smart city concepts. According to the CDG, San Jose's most outstanding achievements are the dozens of innovative projects that the city has implemented that are working (Hoangová, 2021). Examples include modernized digital services for planning and building energy code enforcement, upgrading the city's web presence on multiple platforms, reducing language barriers with citizens of different ethnic backgrounds, and the use of CAD in emergency response. The city's intentions to reduce road deaths and its organization in providing information, testing and vaccinations during the Covid-19 pandemic outbreak are also positively evaluated (Grenslitt, 2020). The fourth year in a row, San Jose has been ranked in the top 10 most innovative cities in the US, but the first time it had been ranked number one in 2020. But the city has won other awards in the past, such as the 2019 IDC Smart City Award for implementing a priority passage system for emergency responders.

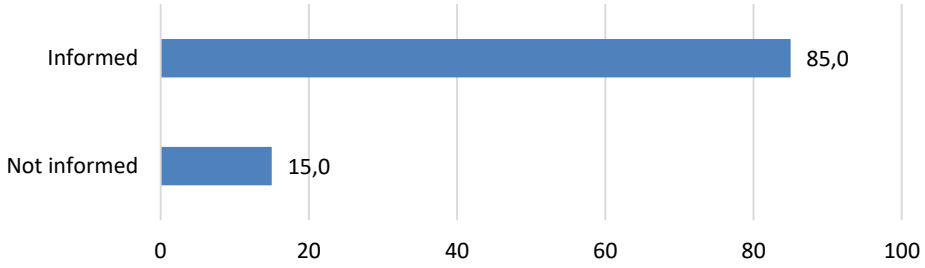
We chose San Jose as a city with significantly different conditions compared to Písek. The relatively high representation of the Chinese and Vietnamese community among the Americans here complicates communication between city authorities and residents. Also, some of the problems we in the Czech Republic consider to be the municipality's task, such as the city bus service, are only marginally addressed in San José. It is assumed that every resident here has his car and can transport himself to where he needs to go. The examples given in the case study are intended to suggest possible solutions to some of the problems, which may be very different in different regions.

9.5 COMPARISON AND DISCUSSION

This section compares and discusses the main findings of the smart city concept in both cities. Then we synthesise results by comparison of the benefits and drawbacks.

Comparison of the acquaintance degree with the smart city concept
Based on research (Homola, 2020), it was found that 85% of respondents were aware of Písek as a Smart City. The remaining 15% answered "No". This question shows (Figure 1) that citizens have an awareness of Písek being a Smart City.

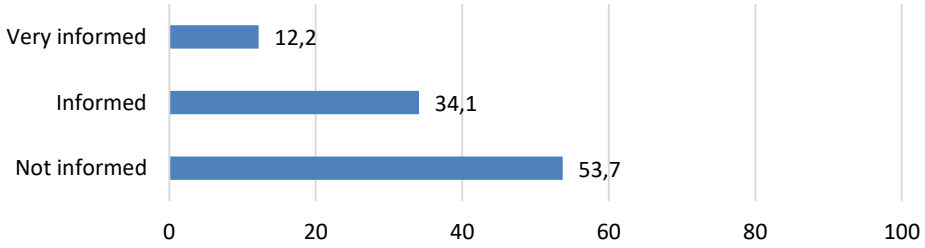
Figure 1: Degree of acquaintance with the smart city concept in %



Source: authors calculations based on Homola, 2020

Figure 2 shows the results of the degree of acquaintance with the smart city concept in San Jose. In terms of San Jose residents' awareness of the smart city concept, 12.2% of residents are very familiar with the smart idea, and 34.1% are familiar. Thus, a total of 46.3% of residents have some awareness of the smart city concept. More work could be done to increase the familiarity with the Smart City San Jose concept to exceed at least 50% (Hoangová, 2021).

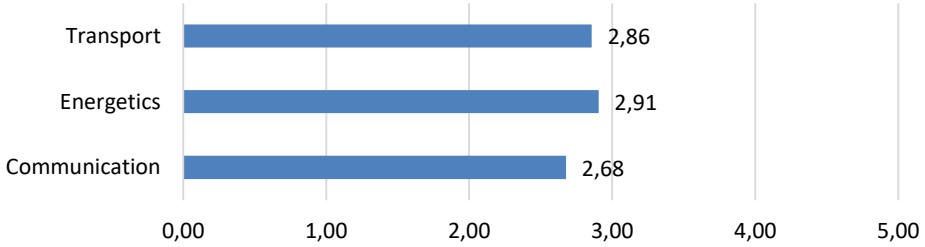
Figure 2: Degree of acquaintance with the smart city concept in %



Source: authors calculations based on Hoangová, 2021

Comparison of the satisfaction ratings for each area of smart innovation
The next question focuses on specific innovations that came with the Smart City phenomenon in the city of Písek (Figure 3). It aimed to find out the respondents' satisfaction with particular technologies. As with the previous question, we consider linking the positive responses, which are "satisfaction" and "maximum satisfaction", which at first glance have lower ratings compared to the negative ones, “dissatisfaction” and "maximum dissatisfaction". For comparison with the San Jose research, we combined the responses into three dominant areas: transport (transport flexibility, city traffic flow, parking, smart public transport), energy (waste management, environment) and communications (public wi-fi, openness of offices, sensor data collection). The results were averaged to identify differences between the different areas. As security is not a priority area in smart city Písek and does not have its pillar, it was not evaluated in the residents' responses (Homola, 2020).

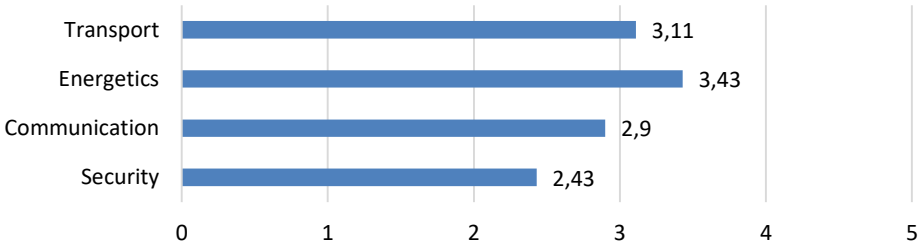
Figure 3: Satisfaction ratings for each area of Innovation



Source: authors calculations based on Homola, 2020

For comparison, respondents rated four areas of San Jose's smart city: transport, energy conservation, safety, and communications. The responses were compiled into the following Figure 4, which provides a view of the averaged results. The higher the final score, the more satisfied residents are with the area. The results show that residents are most pleased with energy conservation, which is very much addressed by the City's leadership. The San Jose Clean Energy Community Choice system is a significant contributor to residents' positive perceptions. Safety came out the worst of the areas surveyed, with an average score of 2.43. The low score in this area is not surprising given the city's rising crime rate (Hoangová, 2021).

Figure 4: Satisfaction ratings for each area of innovation



Source: authors calculations based on Hoangová, 2021

Comparison of the benefits and drawbacks of the smart city

We analyzed the benefits and drawbacks of Smart City Písek (Table 1) based on the data collected through the first questionnaire survey and interviews with experts (Homola, 2020). One of the advantages is the know-how acquired by the organisational unit involved in projects and planning in smart city operation and development. Another advantage is the cooperation with enterprises based on long-term cooperation. The Technology Centre is a tremendous strategic advantage due to its uniqueness and the fact that it is located directly in Písek. It gives the Smart Office a more incredible opportunity to coordinate technology development, rather than a company more distant from the city. The most successful project in Písek so far is undoubtedly the parking navigation portal, which made the town of Písek visible at the national level in the "Golden Compass" competition. An undeniable advantage is the renovated bus station and smart public transport stops. Among the last advantages is the participatory budget, which eliminates funding gaps and attractive incentives in the city's development. It can also increase citizens' involvement in decision-making in the city and thus increase their interest in information and events in Smart City Písek.

We consider the disadvantages to being mainly the persistently low level of information. Although most city citizens are aware that the city of Písek is a Smart City, they do not have a greater awareness of this concept. This lack of further information may lead to some resistance and doubts about the projects and Smart concept management among a significant part of the population. The lack of trust in the smart concept makes citizens suspect that it is a waste of the city's money. A large part of the population is still convinced that there is a better possible use of these funds for its development. The survey found that almost half of the residents appreciated more greenery in the city or the construction of urban gardens. The disadvantages are currently the waste management and the citizens' dissatisfaction with the order in the town (lack of waste bins, although the city has started to install "smart bins").

Table 1: Benefits and drawbacks of the smart city Písek

Benefits	***Drawbacks***
Know-how	Poor public awareness
Cooperation with enterprises	Mistrust in the smart concept
Parking navigation system	Lack of green space
Public transport infrastructure	Uncleanliness of the city
Participatory budgeting	Projects are still in a pilot phase

Source: based on Homola, 2020

Silicon Valley is considered a global hub of innovation, so it's no surprise that San Jose's leadership is focused primarily on leveraging new technologies to achieve its smart city vision (Table 2). Through the use of new technologies, the city has been able to secure its operations, communicate with its citizens, support its shuttered businesses. It is possible due to the platform that has enabled it to provide needed food for more than 2 million citizens in San Jose and surrounding cities. The rapid expansion of the 5G high-speed network is the next logical step to ensure the continued technological development on which the city is building its smart city foundation. San Jose is in a unique position in the United States because it can benefit from enterprises based in the town. The city works with many businesses, non-profit organisations, and the private sector. It can provide research and development facilities and gain a technological edge over other cities.

Table 2: Benefits and drawbacks of the smart San Jose

Benefits	***Drawbacks***
Know-how	Poor public awareness
Technological background	Conflicting legislative agendas
International awards	Loss of project funding
Energy savings	Rising crime and security needs
Innovation in mobility	Consolidation or dissolution of departments

Source: authors synthesis

San Jose's most significant challenges are conflicting legislative agendas, loss of funding, reduction in staff and hours due to cost-cutting, reduction in the tax base, consolidation, merger, or department dissolution.

The concept of smart cities is based almost exclusively on new technologies and their adaptation for a pleasant life in them. The focus is mainly on various submeasures. For example, in smart homes, it is switching on, off or dimming the light according to the presence of people, similarly heat regulation. Other measures relate to the security of the building, identification of available parking spaces, adjustment of traffic lights at intersections, monitoring of harmful emissions in differ-

ent parts of the city, etc. However, these sub-measures form a comprehensive system. New technologies are thus rapidly finding practical applications. They can be further developed to improve the quality of life of their inhabitants, including the expansion of tree planting and the application of the circular economy.

However, in the literature, some of the negative consequences of the current trend and use of technology are underestimated. There were already homeless people living in cities, groups of foreign workers who wanted to have fun in the evening after intensive work and disrupted the established order with excessive noise or disorder. It is also easy to buy drugs in the cities and gradually become addicted to them. In addition, however, smart cities must accommodate groups of people who, for various reasons, are in financial distress, single mothers, people released from prison who find it challenging to find work or people with disabilities.

It could then appear that smart cities are beneficial mainly for the wealthier classes, who can increasingly benefit from the advantages and opportunities offered. On the other hand, they completely neglect the care of the more imperfect people. A homeless person may appreciate the fact that the park bench on which they will sleep at night has a wi-fi connection or the possibility of charging their mobile phone. But it doesn't solve his problems. For this not to be the case, cities need to do more to promote their social policies and put them in the context of smart cities. Otherwise, it would look like smart cities are dividing rather than uniting citizens.

9.6 CONCLUSION

Cities across Europe are constantly striving to improve the quality of life for their residents. More and more people are moving to metropolitan areas, bringing traffic congestion, pollution, energy consumption, rising housing costs and waste production. One of the ways of solving the various problems associated with city life is to introduce multiple modern technologies that enable better cooperation and communication between residents and institutions. Cities do not want to lose pace with information technology and are investing considerable financial and personnel resources to achieve the title of a smart city.

In conclusion, our study highlights the challenge of sustainability of contemporary cities development. We synthesised the main results into the benefits and drawbacks of each city. The main advantages and disadvantages of the smart cities comparison are drawn together and discussed. Smart City Písek is in the pilot phase of smart projects realization. In particular, projects focusing on mobility and transport have already been implemented. The main shortcomings are poor public awareness, lack of trust in the concept, lack of green space and urban clutter. The smart city San Jose is developing its strengths thanks to Silicon Valley in technology, energy savings, transport innovation. It has already implemented many projects. Overall, San Jose is rated as a city of the future in several prestigious awards. Problems have been identified mainly concerning the increase in crime and loss of

security. For running projects, the main risk is primarily the conflict of some legislative agendas, loss of funding or dissolution of innovation departments. The analysis also found that technology may not solve some of the social problems in larger cities.

In smart cities, the circular economy appears more in the implementation of energy projects or in improving the traffic situation. These projects have a direct impact on the environment and lead to sustainability. The circular economy will have its main application in large cities where waste problems are growing to immense proportions. However, the high concentration of population in a relatively small area is also advantageous for creating new companies. Enterprises can more easily follow the emergence and application of new technologies and have easier access to financing for operations, consultancy services, university staff, and so on. New start-ups are being created here whose products will have an impact on our lives.

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10 THE ADOPTION OF CIRCULAR ECONOMY PRINCIPLES IN DESTINATION MANAGEMENT ORGANISATIONS: THE OBJECTIVES, IDEAL PRACTICE AND REALITY IN THE CZECH PARADIGM

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Abbreviations used in this text:

CE = Circular Economy

DMO = Destination Management Organisation

10.1 INTRODUCTION

The pressing issues pertaining to growing production and consumption, such as climate change, pollution, or insufficient resources, have already inspired a number of both formal and laic movements or schemes; some of them are more successful in their operation than others. Defining principles for production and consumption, the Circular Economy (CE) thoroughly differs from the prevailing 'take-make-dispose of' approach of current market economies single-mindedly focused on economic growth (Manniche et al., 2017). The key premise of CE is creating an equilibrium in which both healthy economies and the environment may coexist (Park et al., 2010). CE appears to be a prevailing concept in sustainability-related discussions (Cornejo-Ortega & Chávez Dagostino, 2020) and is often seen as a condition to achieve sustainability (Geissdoerfer et al., 2017). Contrary to the linear growth-based model of the current consumer paradigm, the CE model is non-linear, proposing a circular life-cycle of products, services, or any materials or other inputs used in their creation (Cornejo-Ortega & Chávez Dagostino, 2020).

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The economic model based on CE seeks to address four fundamental functions: resources, production, consumption, and recycling, all the while resolving the issues connected to carbon emissions, waste treatment, and water pollution (Manniche et al., 2017). Geissdoerfer et al. (2017) warn that the implementation of CE is impossible in isolation. Fully circular business models must involve the interaction with various stakeholders and extraneous forces, mainly within the supply chain (Cornejo-Ortega & Chávez Dagostino, 2020). Value creation through reprocessing or reuse is mainly possible among novel business models and consumption modes that reject ownership and encourage active using in opposition to passive consuming (Manniche et al., 2017). Ghisellini et al. (2015) propose three essential actions that form the CE called the 3R: Reduce, Reuse and, finally, Recycle. The reduction should occur by adopting more efficient technologies, developing more compact or simpler products, better or multi-purpose appliances, plainer packaging on the manufacturer's or retailer's side, or a minimalist lifestyle on the customer's side. Reusing a product means that fewer resources are needed. Recycling helps reduce the amount of waste needing treatment and thus lessen the impact on the environment. Ghisellini et al. (2015) stress the importance of prioritising reduction to reuse and then reusing to recycling because of no further (or at least lower) labour and energy demands. Gwehenberger et al. (2003) warn that if a product or material can be recycled completely, companies and society may never understand the importance of reduction.

Manniche et al. (2017) assert that CE principles are mainly being adopted at the level of individual organisations in only specific areas of economic activity. Implementing CE at the full-scale level seems to be a very far-away thought. Most companies still regard CE as unnecessary and too innovative, and the implementation too complicated or simply too expensive (Cornejo-Ortega & Chávez Dagostino, 2020). Vargas-Sánchez (2019) observe the slow transition towards circularity in the economies and warn about an insufficient understanding of its concept and application.

Some researchers believe that the successful implementation of CE in tourism is problematic. For example, Friedl (2021) claims that the obstacles surrounding the transition towards CE currently greatly outweigh the benefits it offers. Zhu et al. (2021) warn about the ostensibly opposing interests of businesses and the environment, which, when communicated insufficiently, may result in delayed policy implementation or non-compliance. Haid et al. (2021) make light of the issue by reminding the so-called 'misery research' of the end of the 20th century, when implementation research often failed to offer some steps for success, listing instead numerous reasons for why implementation (of any given idea) was problematic, impossible or unsuccessful (McLaughlin, 2008). To avoid the 'impossibility of implementing the CE' become a self-fulfilling prophecy, Friedl (2021) stresses that: "we must continue to invest efforts in research, politics and civil movements…, "and that "the tireless search for new, suitable solutions increases the chance of actually finding viable solutions," (Friedl, 2021).

The following chapter aims to analyse the application of principles and procedures of Circular Economy in the environment of destination management organisations (DMOs) to determine whether these are, indeed, applicable and how. The analysis seeks to identify which problems or limitations may occur in practice and how they might be avoided or solved.

10.2 CIRCULARITY IN DESTINATION MANAGEMENT ORGANISATIONS

There has been little to no scientific or literature research focusing specifically on the circularity in DMOs. This research, therefore, begins by exploring the possible adaptation of CE in the tourism industry as a whole. Afterwards, the role and the specifics of the practice in DMOs will be explained, and the possibilities of integrating sustainability into this practice will be explored. The CE principles relevant to the DMO practice can then be selected, and an ideal approach may be outlined and analysed in more detail. Lastly, the actual methods and procedures from tourism and the DMOs worldwide will be introduced.

10.2.1 CIRCULAR TOURISM

According to World Tourism Organisation (2019), tourism grows faster than merchandise trade. In 2019, tourism contributed 5% to global GDP and 7% to global service exports[i]. Reportedly, one in every 12 jobs worldwide belongs to the tourism sphere as tourism generates roughly 235 million positions (World Tourism Organisation, 2019). Tourism has a significant impact on the environment and the prosperity and welfare of cities (Cornejo-Ortega & Chávez Dagostino, 2020). Previous research focusing on the environmental impacts of tourism is based on the industry in its entirety, and destination-specific data (pointing to various adverse effects of linear economies) is sadly scarce (Manniche et al., 2017). Zorpas et al. (2021) present considerable evidence that tourism activities disturb the environment. Among the impacts, waste generation and resulting pollution and lost biodiversity are seen as most critical. Other problematic areas include the use of local resources and infrastructures, and seasonality and resulting job shortage in off-season months (Zorpas et al., 2021).

The interest in CE is reportedly growing in the tourism sphere (Cornejo-Ortega & Chávez Dagostino, 2020). Manniche et al. (2017) lament the lack of previous research examining the favourable circumstances for a transition towards better circularity in tourism. They believe there is much space for tourism CE initiatives and analyses both in the academic and industry sectors. The tourism industry is mainly seen as unsustainable because:

- Tourism poses a strain on local resources such as land, water, energy, and food;

- The current tourism industry largely follows the linear economy model of acquiring sums of cheap (often disposable) resources;
- Waste generation (solid and wastewater) and noise and air pollution increase with the accumulation of tourists;
- The global amount of solid waste is estimated at more than 35 mil tonnes annually, which means that tourists produce twice the amount of waste per capita than the local communities;
- The waste is composed of a mix of various materials, among them organics (food waste), plastic or hazardous materials (sanitary, batteries);
- Hotels are estimated to dispose of 1 kg of unsorted waste per guest-night;
- The main component of tourism consumption and production is travelling; and
- Tourists favour visiting more distant destinations (often by air or car), and such travelling is therefore connected to considerable CO2 footprint and pollution; and
- Recent trends point to shorter but more frequent travels; and
- The air travel industry, unfortunately, declines to address the issues of the environment and global warming;
- The pressure is substantial within 'blue tourism': coastal and marine tourism that is to experience the fastest growth; but
- Some destinations fail to withstand the pressures of overcrowding and its results;
- Pollution and overcrowding in destinations discourage tourists from visiting, thus adding more pressure on local communities in the form of loss of jobs and unmaintained infrastructure. (Smith, 2011; Zorpas et al., 2021; Manniche et al., 2017)

Malik et al. (2016) estimate that if destination managers properly adopt CE and sustainability principles, they may address the abovementioned impacts adequately. Many authors believe that significant opportunities lie in adopting the CE model in the tourism industry:

- Tourism significantly contributes towards employment and growth even in rural and underdeveloped areas; and
- Regional development is supported by infrastructure created for the benefits of tourism;
- Tourist destinations rely on the attractiveness of the environment and its natural and cultural heritage;
- Tourism belongs to an 'experience economy', in which not the tangible products but the immaterial but memorable aspects of services play the most significant role;

- Such experiences must lay outside the ordinary life and may offer a 'look into a greener or minimalist way of life' (green, environmental, cultural or natural conservation tourism);
- Tourism most usually involves interpersonal communication and a relationship between the visitor and the service providers, creating an opportunity for a deep conversation about values and influencing the tourists' views and behaviours in favour of sustainability;
- New technologies offer innovative options for virtual or online travel every day, including 3D virtual tours or online screenings from events, which are, however, understandably less popular than traditional immersive travelling. Virtual cannot, by definition, be defined as tourism. (Mannicche, 2017; Zorpas et al., 2021; Pine & Gilmore, 1998; Caru & Cova, 2007; Hansen & Mossberg, 2013)

By acknowledging the non-renewable nature of critical resources, a tourist destination should, according to Manniche et al. (2017), renounce the take-make-dispose of an economic model and support the transition towards circularity. Circular tourism will lead to higher sustainability and profitability in accommodation, food, wellness, and experience services. As the transition towards CE warrants honest communication and cooperation within the destination and depends on the stakeholders' experience, skills, and ideas, its application has been inadequate (Cornejo-Ortega & Chávez Dagostino, 2020). Some hotels have started to adopt eco-friendlier measures such as recycling or educating their guests on the importance of sorting waste and reusing their towels (Zorpas et al., 2021).

Zorpas et al. (2021) argue that a new mindset within the tourism industry is required for advancing the understanding of circularity and its adoption. This revolutionary change should be based on the principles of Environmental Management Systems (Zorpas et al., 2021), the 'R' strategies: reuse, repurpose, remanufacture, reorganise, redesign, recover, reduce, …. When such an approach gets adopted across the entire tourism industry, the environmental sustainability shall improve white, concurrently, regional jobs will be created and costs saved. Manniche et al. (2017) attribute significant responsibility to the tourists themselves: the reduction of externalities of travelling lies in fewer travels per year, shorter distances between home and destinations, longer stays per one travel, and finally travelling by means that do not rely on non-renewable energy. Zorpas et al. (2021) mention educating, training, and inspiring both the employees and the visitors as necessary, complemented by deep engagement of all stakeholders, especially local authorities who should provide special measures for businesses that perform well concerning circularity (tax breaks, extended permits, funding or credit). Other measures for both the visitors and the operators that Zorpas et al. (2021) propose include:

- Product or service limits: separate bins in rooms, lighting timers, no plastic cutlery or dishes, reusable cups, additional fee for excessive laundry;
- Novel practices: new materials for dishes or towels in dining & wining, green cleaning or DIY cleaning solutions;

- Demarketing, discouraging from visiting certain places or buying a specific problematic product or service: entry fee in Venice, charging for plastic straws;
- Decommodification of tourist practices: shared accommodation, utilities and travel
- Gamification: i.e. include the environmental performance of a destination (or a business) on travel websites such as TripAdvisor or Booking to raise competitiveness.

10.2.2 THE SPECIFICS OF DMO PRACTICE

Buhalis (2000) defines a tourist destination as a particular entity that creates a political and legislative framework for planning and management by the DMO. Thus, destination management should be the area leader in acquiring resources and implementing the strategic management goals of the chosen area, all the while bearing full responsibility for it. The role of the destination is to offer products and services to the customer, therefore satisfy their needs. Bartl and Schmidt (1998) understand DMOs as mutually competitive entities aiming for complex organisation of all the products and services offered in the destination and delivering it to intermediaries or end customers. The traditional tasks of the DMOs include mainly marketing and promoting a destination (Hanna et al., 2018) while also effectively managing, planning, and operating daily tourism-related activities (Hounnaklang, 2016). The planning and management functions then, according to the World Tourism Organisation (2019b), comprise strategic planning, formulation and implementation of the tourism strategy in a destination, market analyses, product and service development, digitalisation and innovation, monitoring, crisis management, employee training and workshops for other stakeholders' employees, funding and investing. By strategically utilising the base principles of destination management, it is possible to achieve a systematic, harmonious, and complex destination development.

To the author's knowledge, no research has focused on implementing CE and circular practices specifically in DMOs. There are, however, many studies on sustainability in DMOs, and while not commutable, the CE is believed to be one of the essential conditions of achieving sustainability (Manniche et al., 2017). While a genuinely sustainable destination may seem unachievable at the moment, Saraniemi and Kylänen (2011) propose that destination management towards sustainability should be considered the primary tool for incorporating sustainable development practices in the whole destination. Arbogast et al. (2017), Morrison (2018), and Pike and Page (2014) all identified DMOs as the most crucial stakeholders whose main goal should be developing and managing sustainable tourism. DMOs have the power to influence the important local actors on the level of integration and development of sustainable practices (Yrza and Filimoniau, 2021). Intentional destina-

tion marketing for sustainability may also inspire suppliers to implement more sustainable methods and tourists to consume and behave more sustainably (Haid et al., 2021). Researchers list sustainable DMO initiatives such as:

- Addressing CO2 emissions and climate change;
- Destination resilience;
- Waste management;
- Visitor management;
- Digital media. (Fyall and Garrod, 2019; Kebete and Wondirad, 2019; Buhalis and Foerste, 2015)

Pike and Page (2014) argue that sustainability has a substantial impact on customer behaviour. A DMO that adopted sustainable principles into its daily operation, therefore, possesses a particular competitive advantage. The scope of adopting sustainable plans and policies varies among destinations. Yrza and Filimoniau (2021) attribute its success to DMO managers' capacity for understanding the worth of sustainable development. Boom et al. (2021) also mention the impact of respective managers' worldviews on DMO's (un)sustainable vision and mission (World Tourism Organisation, 2015). Haid et al. (2021) explain that successful sustainability promotion and implementation depend on a) which proposals or strategies the DMO considers sustainable and b) how the DMO implements them. Mihalic and Kaspar (in Mihalic, 2016) adapted the different stages of sustainability implementation (Frey, 1985) for tourism: ignorance (stakeholders perceive no issues), awareness (the recognition of existing problems), agenda (conceptual adaptation of sustainability, strategy formulation), and action (the act of sustainability implementation).

The challenges that, to a great extent, influence the success of sustainability implementation are numerous. Yrza and Filimoniau (2021), who explore the adoption of sustainability in DMOs in post-Soviet states, are most concerned about the ambiguity of the term 'sustainability', the prioritisation of short-term financial gains from unsustainable practices over long-term environmental programs, and the tourism sphere's limited flexibility, materialising in significant resistance to change. Cornejo-Ortega & Chávez Dagostino (2020) attribute the smaller companies' resistance to change to the fear of weakened profit maximisation. Yrza and Filimoniau (2021) also mention the lack of community interest (that might inspire more profound stakeholder interest in the topic) due to a limited understanding of the importance and advantages of sustainability and the lack of qualified specialists. According to Haid et al. (2021), the implementation of sustainable practices or plans is often held up by some of the actors' lack of managerial competence. Klimek (2013), however, debates whether the destination managers should now, in addition to proficiency in management and marketing, be experts in ecology and environmental management. A vital component of "instance(s) of seemingly inexplicable disorder" (Colebatch, 2006) seems to be the character of stakeholder collaboration. (Haid et al., 2021). Hörisch et al. (2014) note that in advocating for sustain-

able practices, knowledge is a crucial aspect of mutual understanding. Other implementation issues are often caused by the questionable authority over tourism in the destination, conflict between stakeholders, and insufficient support or funding (Haid et al., 2021). Dredge and Jenkins believe that the political situation or cultural influences and expectations may also be to blame.

10.2.3 THE IDEAL CIRCULAR PRACTICE IN DMOS

The Ellen MacArthur Foundation & McKinsey Center for Business and Environment (2015) propose an alternative ReSolve framework for CE integration into active business practice. It comprises six directive steps:

- Regenerate: the environment; use green energy; reclaim or retain materials and products; return clean resources to biosphere;
- Share: assets such as modes of transport, accommodation, appliances; use second-hand or reuse products; reinforce repairability and upgradability from design;
- Optimise: product performance, effectiveness, and durability from design; avoid waste in supply chains; plan for automation; leverage big data;
- Loop: recycle and remanufacture components;
- Virtualise: administrative actions, popular media, experiences, online shopping;
- Exchange: old non-renewable and ineffective with a new, renewable, repairable, and more effective technology (3D print, public transport).

We may divide the many activities of the DMO into which CE shall be integrated into two categories: that of the management of the tourist destination and that of self-governance and operation of the organisation itself.

Activities connected to tourist destination management:

- Destination management
  Yrza and Filimoniau (2021) believe that efficient leadership promotes the destinations' attractiveness and thus competitiveness but also helps further sustainable development. The crucial task of the leadership is then to reach an equilibrium between the financial, societal, and environmental benefits. Stakeholder collaboration between the DMO and its partners is crucial in developing circular practices in a tourist destination. The main actors identified as the most important partners of the DMO include the local tourism and hospitality businesses, regional and state authorities, investors, and academics (Sheehan and Ritchie, 2005). One stakeholder (usually the governmental body) should not dominate in the discussion and decision-making: the collaboration should ensure that the voices of smaller businesses, local communities or environmental authorities are heard, and any plans or policies are then more likely to be universally understood and accepted (Boluk, 2011). The challenge of conflicting interests of different stakeholders may

be overcome by active and continuous education about sustainability and CE of all parties involved. Only if the majority of stakeholders view sustainability (not to mention CE) favourably can it be implemented into tourism plans and policies (Hardy and Beeton, 2001). A three-axis model was developed for this purpose that specifies that the educational actions and communication should focus on a) public administration, b) resident population, c) tourism sector (Escuela de Organización de Empresas, 2020 in Cornejo-Ortega & Chávez Dagostino, 2020).

- Strategic planning and strategy implementation
  The ultimate focus of destination management should be making the destination more circular (Yrza and Filimoniau, 2021). The only way to ensure economic growth while preserving ecosystems when implementing the principles of sustainability is the integration of CE into the DMO's strategic plan (Cucculelli & Goffi, 2016). The development of circular strategies depends on careful market analysis and can also benefit from surveying the existing circular practices of the competition. The DMOs should create and implement sustainability strategies with direct empowerment from state or regional governments (Hildebrandt & Isaac, 2015). Especially the destinations featuring natural or cultural protected areas depend on the careful strategic planning of regulations, transport, access points, and use of resources Gu et al., 2021).
- Monitoring
  When the principles of circularity are being implemented, cautiously devised monitoring is crucial to continuous performance improvement. The approach must be repeatedly adapted to answer the current situation and new findings (Lloret, 2016; Zorpas et al., 2021). Monitoring and evaluation activities should be applied both for the performance of the DMO itself and for the environmental performance of partner businesses (to be explained further).
- Policymaking
  Creating new policies or regulations for the businesses and visitors of the destination usually comes about through the collaboration of the DMO and the local governmental body. Individual businesses' achievements in applying CE principles in their practice should be displayed in sustainability reports or through certifications to further circularity and support competitiveness between enterprises (Zorpas et al., 2021). The DMO may propose certain financial benefits for those businesses that perform well regarding circularity or offer credit for companies that plan to implement CE into their practice. That would, however, highly depend on the inclination and knowledge of the members of local government and financing abilities of both the municipality/region and the DMO. A certification granting sustainable or circular methods may appeal to certain visitors. However, an addition to the excessive use of various business labels or certifications today

might confuse the average visitor without any additional benefit to the business (Cornejo-Ortega & Chávez Dagostino, 2020).

- Marketing and promotion
  Destination marketing (primarily digital marketing) strongly influences the decision-making process of visitors (Buhalis and Foerste, 2015). The DMO should continuously educate the public and the (future) visitors about sustainability and circularity through well-thought, attractive campaigns and media appearances (Cornejo-Ortega & Chávez Dagostino, 2020). Destination marketing managers should apply the principles of circularity on their marketing materials and practice as well: digitisation, innovation and automation, use of recycled paper, use of eco-biological materials for print or other promotional materials and products, reuse or adaptation of promotional materials, and their design for durability and universal application for more tourist seasons (Cornejo-Ortega & Chávez Dagostino, 2020; Ellen MacArthur Foundation & McKinsey Center for Business and Environment, 2015). Circular marketing requires rigorous strategic planning and careful evaluation. In the form of an i.e. visitor mobile application, digitisation offers additional tools for crowding management, visitor analyses and research, and marketing based on precise segmentation (Haid et al., 2021). The DMO should also consider de-marketing in the cases of unsustainable business behaviour or overcrowding.
- Tourism products and services
  As the local tourist information centre is often under the DMO management, the products and services offered by this centre should therefore conform to the CE principles. The guides and maps should be digitised, and the use of the digital version strongly supported. Memorabilia such as postcards or magnets should be made of recyclable materials, sold with minimal packaging. Tourists may also become exciting consumers for other products remanufactured as memorabilia (Manniche et al., 2017). Tickets should again be either digitised or printed on recycled paper. The services of DMOs may include leasing a kitchen or other equipment or operating laundry points. DMOs also often create, sell and manage tourist packages or bundles of products and services. They may vary in complexity, price or sometimes the theme. Such packages may include transport, accommodation, entrance to cultural or natural sites, food and more. The aspects of CE may be implemented into this practice either through a) creating 'sustainable packages' where the DMO includes only those business partners that follow the principles of CE or at least some principles of sustainability. Or the DMO offers b) a 'green experience' packages, which should be marketed towards a specific target audience as an experience of circular living and travelling and offer an 'all circular' service. According to Manniche et al. (2017), the four essential fields of focus to consider when implementing CE in the tourism industry are accommodation, hotel restaurants, wellness and energy. Such circular packages should therefore include, for example, transport options

based on renewable energy sources, stay in an alternative accommodation designed for circularity, eating luxury food created from 'food waste', and more.

- Training
  Employee training, workshops for stakeholders and partner businesses and their employees belong to the tasks that a DMO should organise and perform regularly. The DMO should hold a solid advisory position to the acting regional government representatives and local tourism businesses. As such, it is in the best position to mentor partners about the importance of CE and advise them on its planning and implementation in their tourism-related activities (Yrza and Filimoniau, 2021). The topics such mentoring should cover include:
    - Restaurants: packaging, transport, preparation, cleaning, storage flows, managing food waste;
    - Accommodation: circular operation and management systems, energy, water flows, cleaning and laundry;
    - New construction and reconstruction: eco-design, reuse of materials, energy, circular refurbishing, response to the deterioration of tourist infrastructure;
    - Wellness industry: water consumption and cleaning, greywater use, chemicals, organic products;
    - Waste management: recycling bins, separating, educating visitors, managing and repurposing waste in tourism businesses. (Adapted from Manniche et al., 2017; Zorpas et al., 2021; Cornejo-Ortega & Chávez Dagostino, 2020.)
- Funding and investing
  If possible, the DMO should prioritise investing or leasing credit to businesses that apply CE principles in their activities. The DMOs may also become eligible to receive funding from non-tourism oriented grants or agencies to implement principles of the circular economy.

At the scope of DMO self-governance, the main fields to be considered are:

- Renewable energy and energy-saving technology and appliances;
- Water consumption and treatment, use of greywater, water-saving appliances;
- Recycling, separating trash, composting food waste;
- Using transport modes based on renewable energy or public transport;
- Circularity from the design during construction/reconstruction and interior decorating;
- Use of eco-biological products for cleaning, creating, or cooking;
- Reuse of existing materials such as paper. (Adapted from Cornejo-Ortega & Chávez Dagostino, 2020; and Manniche et al., 2017.)[ii]

10.2.4 EXAMPLES OF (UN)SUCCESSFUL CE IMPLEMENTATION IN DMOS AND TOURIST DESTINATIONS AROUND THE WORLD

While this paragraph was meant to be named 'The examples of good CE practice in the DMOs worldwide', sadly, the 'misery research' (McLaughlin, 2008) has not truly ended in the 20th century and thus, most of the scientific works focus on the problems of establishing CE practices in their chosen DMOs or the lack of circularity in destinations altogether. Therefore, this work will continue by studying the practice pertaining to circular economy in tourist destinations and DMOs and relevant scientific findings related to the planning and implementation of CE in the tourism industries around the world.

In some countries, CE is being adopted through a top-down national approach (China), while in the EU, it is treated more as an instrument for designing environmental guidelines bottom-up (Ghisellini et al., 2015). Zorpas et al. (2021) call for a new international standard (ideally from the International Standard Organization) so that CE approaches can be more widely adopted. Haas et al. report the level of development of CE in Europe at a weak position where only 6% of processed materials are used as resources for further purposes. In the tourism sector, Cornejo-Ortega & Chávez Dagostino (2020) report promising CE initiatives, for example, in the Spanish Basque Country. The UK, Denmark and Switzerland apply CE principles mainly within waste management in the tourism scheme, while Korea aims to educate the visitors on their responsibility for material use and disposal (Winans et al., 2017). Falcone (2019) selected an Italian region of Salento as an ideal space for investigating the socio-political dynamic, an 'open laboratory' for the implementation of state of the art environmental and renewable technology. The Salento peninsula lies in the south of Italy and spans over 5000 km2 with 1.5 million inhabitants. Tourism belongs to the top sources of income, with the registered tourist arrivals solidly rising (80% between 2002 and 2009) before the Covid-19 pandemic (Falcone, 2019). The development of tourism caused a noticeable increase in generated waste. Its ineffective management can negatively influence the area's attractiveness, while its use based on circular models may help close the material and an energetic loop. Falcone (2019) approaches his investigation by determining and electing relevant SWOT factors and identifying their importance based on a survey of stakeholder prioritisation to uncover external pressures and internal dynamics. The leading five influencing factors of implementing circular technology within the tourism region are social acceptability (threat), excessive bureaucracy (weakness), green jobs (opportunity), lack of long-term governmental planning (threat), and lack of technology and infrastructure (weakness). As most of the factors represent negative influences or circumstances for the implementation of circularity, Falcone (2019) proposes a reduction of administrative difficulties, social awareness campaigns ('not in my backyard'), and supporting investments in public infrastructure.

Both the works of Haid et al. (2021) and Yrza and Filimoniau (2021) attribute the level of CE adoption in a DMO to the beliefs and abilities of their directing managers. Haid et al. (2021) explored the situation in some regions of New Zealand and Tyrolean Oberland in Austria. They interviewed multiple destination managers

from these regions to determine which projects are seen as sustainable and implemented. In both regions, the destination managers prioritised the projects aiming towards economic sustainability such as seasonality, transport, infrastructure or product development, and only focussed on some environmental schemes regarding mostly conservation (which, in addition, were usually not wholly within the managers' mandate). Cultural sustainability was usually mentioned only concerning product development. In Tyrolean Oberland, the DMO focuses strongly on improving arrival mobility and public transport (even if the construction might be unsustainable). They are actively pursuing projects and marketing activities to diminish the effects of seasonality through promoting the summer season. Their products include 'alternative offers' such as stays in nature parks, and one manager explains: "Whether a cycle path or a hiking trail, I think it is crucial that you develop it in such a way that it is environmentally friendly and sustainable" (Haid et al., 2021). The destination managers in New Zealand explain that if new infrastructure could only be built unsustainably or with damage to the environment, they apply de-marketing as an alternative action for the overcrowded or otherwise affected spots. They focus on supplying their popular destination spots with sufficient waste bins and toilets (environmental water-saving off-grid toilets). They promote tours and discourage individual visits as those create higher environmental impact and generate more waste and CO2 emissions. The New Zealand destination managers also lobbied the government to charge the visitors (of natural sites) entry fees and use these contributions to finance conservation projects. They aim to become sustainability leaders and support other businesses that want to implement sustainable strategies (Haid et al., 2021). Oncioiu et al. (2018) surveyed the managers of small and medium Romanian enterprises, including hotels and restaurants, and mentioned that more than 60% of these enterprises had implemented at least one activity related to the circular economy since 2013. The biggest challenges for the implementation were financing and legal barriers. They found that most tourism businesses and destinations finance circular and sustainability projects and implementation from their funds. Cornejo-Ortega & Chávez Dagostino (2020) describe the state of adoption of CE in the Mexican region of Puerto Vallarta, where CE is being integrated as a part of sustainability strategy. They interviewed the managers of tourism-related companies and found that most interviewees strongly suggested that CE certification should be mandatory in the industry and that the most important aspect of CE for them is renewable energy. However, a large number of managers stated that the costs pertaining to the adoption of CE and weakened profit maximisation prevent them from implementing CE in their practice. The destination management aims to involve all its stakeholders in applying CE and the discussion about the ideal local identity and the positioning of the destination – the success thereof is currently unreported (Cornejo-Ortega & Chávez Dagostino (2020). In Romania, eco-related tourism is on the rise as, i.e., Insse.ro (2020) showcases a steady growth of 20.4% in agro-tourism since 2018. In a conference study case research, Teodorov et al. (2020) explored the online presence of a Romanian eco-tourism oriented DMO to determine the tools in use to promote sustainability. Teodorov et al. (2020) report that quality content based on visual storytelling is

regularly shared through a DMO website, blog, Facebook page, and YouTube channel. The DMO mostly uses emotions to trigger the desire to visit the destination and does not focus strongly on education or community building (which the researchers recommended using to encourage the followers' interest). Guizhou is a province in China where CE should get realised through top-down policies (Ghisellini et al., 2015). Tourism is a vital part of the agricultural region's economy and its main developmental force. Shao (2019) lists the most common types of rural tourism in the region: agritainment, farm leisure tours, vegetable and fruit picking, rural sightseeing, and minority cultural experience tourism. As the main problems burdening the development of tourism CE, Shao (2019) notes mainly the absence of regulations, environmental protection laws or a statistical system. There is no established destination management system, and enforcing circular tourism projects in rural China would also require strategic planning and experienced management. Shao (2019) explains that the province has no systems for recycling, solid waste or water management systems. It would seem that the top-down CE policy has not reached the rural tourism sector yet.

The examples of successful CE initiatives of DMOs worldwide are not numerous. New ideas and projects, however, are being discussed and implemented every day. Sweden, for example, uses multiple certifications for tourism businesses. The 'Nature's Best' certification presents a chance for businesses to attract customers and gain a competitive advantage through showcasing their eco-friendliness. The principles of Nature's Best relevant to CE include least possible impact on nature, supporting local economy, environmentally sustainable operation, active contribution to conservation, promoting knowledge and respect, and quality and safety (Manniche et al., 2017). Samsø, a small town of 4000 inhabitants in Denmark, strives to become the international example of full-scale community CE implementation. The town also established the Energy Academy, an exhibition and space for locals and visitors interested in sustainable energy and development. The Academy organises workshops, courses and conferences for the professionals and general public from around the world. The Academy operates as a destination for those interested in circular economy and sustainable living, and this also provides the town, which strives to become a fossil-free island by 2030, with income from sustainable tourism (Energy Academy, 2021). The city of Helsinki aims to become carbon neutral by 2035. The Helsinki DMO created and now monitor the 'Think sustainably criteria' that address transport, construction, energy, travel, and hospitality. Both the locals and the visitors are encouraged to contribute to achieving this goal through the DMO's website, which directs towards sustainable attractions, restaurants and accommodation. The website also showcases the DMO's action plan for reducing the carbon footprint by using electric cars and extending the charging network, replacing old inefficient lights, building heating plants based on renewable energy, and creating sustainable products and services. This action plan was developed with the help of local residents, business representatives, and experts from various fields (My Helsinki, 2017). Berlin's DMO Visit Berlin based its sustainability strategy on creating criteria for its event partners that guarantee that any meeting or

event held in the city will be responsibly supported to achieve environmental balance and economic success. Anyone can read the DMO's tips for sustainable event planning and choose from several sustainably operating service providers or event organisers on their website. The 62 sustainability criteria based on which the businesses are chosen contain categories such as business, society, environment or governance (Sustainable Meetings Berlin, no date). The French city of Lyon is now famous for promoting sustainable modes of transport to its visitors. The local DMO won the European Capital of Smart Tourism 2019 award for a mobile application that identifies the restaurants and cafés that use ethical and local ingredients, shows its users queue and waiting times for different attractions or services and offers them alternative activities in the area (Smart Tourism Capital, 2019). The Jordan Tourism Board address the increasing numbers of tourists with the 'Meaningful Travel Map of Jordan'. The map directs towards 12 social enterprises such as ecolodges or local village tour operators across the country and offers insight into their practices and how to support them (Jordan Tourism Board North America, 2020).

Projects relevant to CE in tourism include Peerby, an online platform where its users may offer commodities (such as caravans or boating equipment) to those who would like to borrow them when they visit the area (Manniche et al., 2017). Another platform, 'Thuisafgehaald' allows its users to share extra homemade food, which dramatically reduces food waste and may also be used by tourists (Manniche et al., 2017), and 'Jídlov', a mobile application where restaurants or bakeries may offer leftover products or unsold food for reduced prices (Zachraň jídlo, 2019). KitSplit is a mobile application for renting creative equipment such as cameras or drones among its users (KitSplit, 2021). The DMOs could support any of the mentioned projects or platforms by recommending them to the visitors or even collaborating with them, i.e. through interactive maps or during events.

10.3 THE ADOPTION OF CIRCULAR ECONOMY PRINCIPLES IN THE ČESKÝ KRUMLOV DESTINATION

Český Krumlov is a small historic town with 13000 residents (Český statistický úřad, 2020) in the south of Bohemia. It was included in the UNESCO world heritage list in 1992 (Stovel, 1994) and nowadays belongs to the most visited destinations within South Bohemia with just over 2 million yearly visitors before the Covid-19 pandemic. The visitor structure consisted mainly of tourists from Asian countries who were slowly taking the place of other, more creditworthy foreign or local visitors (Jihočeská centrála cestovního ruchu, 2019). During the last decade in the destination, the main topic has been so-called overtourism (Luger, 2019) with its large externalities (Capocchi et al., 2019).

A semi-structured interview was conducted with the then-acting product manager of the Český Krumlov DMO, Miroslav Březina. (He has since then resigned from his position and remains an advisory figure in the DMO.) The interview aimed to analyse the destination management's general outlook on CE and the state of its

adoption by the DMO. These open questions were devised to encourage further discussion of the topic to uncover any unanticipated practices or novel ideas:

1) What does the term Circular Economy (CE) mean for you personally?
2) Are the principles and procedures[iii] of CE applicable to the environment of destination management organisations (DMO)?
3) Are you following any legislative or institutional regulations or advice from governmental or superior tourism organisations[iv] when applying CE principles or procedures in the Český Krumlov DMO?
4) Which CE principles or procedures are you currently using in your practice, and how[v]?
5) Are you considering the CE principles already when devising the strategic plan for the DMO?
6) How do you monitor and evaluate the success of CE procedures in the DMO and in the destination itself?
7) Do you encounter any obstacles while incorporating the CE principles and procedures into your strategy and practice, and where could you improve?

10.3.1 RESULTS

The actual interview was much shorter than expected, and, unfortunately, it did not leave much scope for further topic discussion. Mr Březina sees CE as an essential paradigm to aspire to reach in the future. Due to lack of resources, however, the DMO has not considered the application of CE in its operation and, as such, is unsure of the range of its applicability. The DMO does not follow any legal or institutional regulations from governmental or tourism organisations, and Mr Březina is uncertain whether they exist. No organisation has so far contacted them and informed them about any shortcomings. Mr Březina currently considers CE a utopian concept for the Český Krumlov DMO. The lack of funding and human capital makes it impossible for the DMO to consider such a complicated issue. Mr Březina does not yet include CE in their strategic planning. He, however, views CE as an important topic for future planning if the situation allows. The DMO, therefore, currently does not evaluate CE and has no solid strategy for doing so in the future. Mr Březina recognises the insufficient funding and human capital available to the DMO as the most pressing obstacles to examining the options and devising a strategic plan for incorporating CE in the DMOs practice. The lack of a clear management structure and a weak advisory position of the DMO amongst the municipal government also often arises as a hindrance to innovation and a more active approach to sustainability.

10.3.2 DISCUSSION

The DMO (partly but not purely due to Covid-19 related reasons) faces such prevalent existential obstacles that prevent it from applying its full capacity to address

the Circular Economy challenges. The destination management initially stated no space for incorporating principles of CE into their operation. For example, the DMO launched a new destination website last year, originally planning to develop and launch a mobile application where the visitors could find their tickets, check waiting times or find services as well. Such application does not yet exist. The DMO also plans for 'eco mentoring' for local businesses but does not practice it yet for lack of financial resources and human capital. However, some principles of CE have already been unknowingly adopted for cost-saving, and some were put into action through collaboration with other municipal bodies. Last year, the DMO collaborated on creating and implementing a SMART city and destination strategy, which included, i.e. installing energy-efficient automatic lights or traffic monitoring in the historic town. The DMO focuses almost solely on digital and prints a minimum of new promotional materials in its marketing activities. The DMO currently endeavours to implement some essential reuse and recycling principles in its own operation and during significant cultural events, i.e., introducing reusable cups. The management attempts to encourage sharing (reducing) by, i.e., recommending car or bike rentals to the visitors through the destination website.

The DMO continuously attributes its shortcomings pertaining to sustainability or CE to the lack of funding and human capital. Although also the municipal government strives for changes in tourism (in which it has been more successful during the last two seasons due to travel constraints imposed by the pandemic) and an introduction of green policies, the collaboration between the municipality and the DMO on these issues is not ideal. The destination management lacks the authority and resources to launch its projects and initiatives. To meaningfully incorporate CE into the DMOs practice, a strategic plan based on CE must be developed. Such a strategic plan would necessitate the involvement of experts and open collaboration among the DMOs stakeholders. However, a strategic plan would only be beneficial if the DMO received proper stable funding from other than municipality sources, which would allow the DMO to hire new expert employees and focus on other than immediate existential and economic issues.

10.3.3 BETTER DMO PRACTICE PROPOSAL

The implementation of new practices in the DMO is currently scattered without following a sustainability-oriented strategic plan. Some procedures or initiatives with which the DMO could change their operation for more circular include:

- Lobby activities to municipal and regional governments for greener initiatives and infrastructure;
- Developing criteria of sustainable business practice in the destination;
- Recommending circular or sustainable businesses to its visitors based on these criteria, i.e., through a mobile application, website, or a free map;
- Encouraging visitors to use digitised maps, guides and tickets;
- Developing or taking part in a sustainable business / sustainable destination certification;

- Creating and selling sustainable packages and green experiences in collaboration with certified business partners;
- Encouraging sharing or renting with certified business partners or through partnerships with sharing platforms;
- Focusing on creating more sustainable events (recycling, green energy and transport, marketing, food waste);
- Focusing on renewable energy, sustainable transport, recycling and reuse in its daily operation;
- Starting a dialogue or training with stakeholders about circularity in their practice in accommodation, dining and other tourist services.

All these points above may be studied in more detail in previous chapters of this work.

10.4 CONCLUSION

On the grounds of existing research of the adoption of CE and sustainability in tourism and sustainable methods of DMOs, a proposal for the ideal circular practice of DMOs was created and accompanied by examples of successful circular initiatives around the world. The state of adoption of CE in the destination of Český Krumlov was outlined along with the issues the destination faces. This brief exploration allowed for devising numerous prompts for a more circular DMO practice. While some CE initiatives could be implemented relatively easily in Český Krumlov with little monetary input, others require substantial funding, human capital, and a stronger leadership position of the DMO acting managers in the destination. The Český Krumlov destination might continue implementing some CE and sustainability practices into their operation without a strategy, and any such practices would surely make at least a small impact; a strategic adoption of CE by the DMO to create an essentially circular destination would understandably warrant substantial changes in its funding, position among stakeholders and organisational hierarchy.

10.5 RESEARCH LIMITATIONS AND FURTHER RESEARCH

This research does not consider the situation of destination management caused by the world pandemic of Covid-19, which may limit their resources and, therefore, their ability to plan their operation strategically. The field research took place in only one specific destination, whose acting director has recently resigned from his position. The timing of the study did not allow for a more in-depth analysis as it took place during the summer months when the DMO has the least time to pay their full attention to academic researchers. Further research exploring the adoption of

CE practices in the destination of Český Krumlov and other destinations is vital. The causes of problems and hindrances have already been researched and explained. More research must now focus on the successful implementation of CE in DMOs and examples of good practice.

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[i] The data from pre-Covid tourist season were used for the purposes of continuity.
[II] Many researchers have already focussed on the implementation of CE practices into daily office or organisational operation.
[III] In this case, we may consider the CE principles theoretical concepts while procedures refer to their practical application in the destination management organisation and its extended operation.
[IV] Such as Czech Tourism or other organisations with which the regional DMOs cooperate.
[V] Including the advisory function to cooperating businesses.

11 CIRCULAR ECONOMY IN ACCOMODATION SERVICES

Michaela Koubková, Ing., EJLog. [20]

11.1 INTRODUCTION

Up to now, the circular economy concept has mainly focused on manufacturing industries. However, concentration on tangible product manufacturing depreciates service-dominated industries, such as travel and tourism, and their role in the global circular economy transition is needed. That is the reason why this chapter will focus on the circular economy in accommodation services.

The barriers of the transition from linear to circular economy from the point of view of tourism will also be of interest. The circular economy will also be examined in terms of sharing, especially in sharing accommodation. All aspects will be judged in the context of tourism services.

11.2 CIRCULAR ECONOMY IN HOTEL INDUSTRY

Economic activity is currently built on a linear model of production and consumption: extract/produce and consume/throw, which deplete natural resources and waste production. The nowadays linear economy does not optimize materials nor prefers its recycling, reuse, or recovery. That 's why, the concept of Circular Economy (CE) is receiving rising attention between policymakers and stakeholders worldwide.

The connecting literature is mainly focused on the manufacturing sector, and just a few studies are focused on the tourism sector even though huge consumption of energy and water, food waste, or CO2 emissions take place in tourism as well (Rodríguez, Florido & Jacob 2020; Julião, Gaspar, Tjahjono & Rocha 2019).

Naydenov (2018) states worldwide cases of circular practices in the tourism sector, indicating that hospitality and tourism organizations can forward to sustainable tourism when they use the circular economy principles.

According to Oreve (2015) the circular tourism meets the expectations of European travellers because:

- nine out of ten Europeans say they are attentive to the environmental impact of their travel,

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- 60% of European customers perceive the sustainability of a living as a plus, equal delivery,
- 10% of European customers consider sustainability as an essential criterion
- 17% of tourist establishments engage in environmental challenges.

Circular tourism, according to Naydenov (2018), follows the logic of the circular economy - a business model coincident with the tenets of sustainable development. Similarly, circular tourism suggests a model in which each tourism actor, it means traveller, host, tour operator, and supplier, embraces an eco-friendly attitude. Circular tourism is a necessity for the sustainable development of each sector.

Figure 1: Circular Tourism

Source: Oreve (2015)

It is necessary to consider the barriers during the transition from a linear to a circular economy. Vatansever, Akarsu & Kazançoğlu (2021) assess the barriers that the tourism industry would be confronted with during the transformation from linear economy to circular economy. This study also arranges the revealed barriers in an order according to their weights specified by the assessment of relevant literature and expert opinions. The outcome of their study is ten significant barriers in the transformation from linear to circular economy in the tourism industry:

1. the most critical barrier is "*organizational structure/infrastructure that creates inconvenience with supply chain on transition to CE*". This barrier has the highest weight amongst all ten barriers. A fruitful transition needs the cooperation and engagement of each actor in a supply chain. To surmount this

barrier could demand rising the awareness and participation of the actors of the supply chain in the tourism industry.

2. The second most significant barrier by the study result is "*high initial investment costs and/or low returns*". It can be deduced that the industry experts believe the changes for a circular economy transformation request a large budget for the organization, and they also suppose the potential gains of this transition are not profitable enough in comparison to the money invested in now.

3. The next most important barrier is "Lack of corporate social responsibility". CSR is a well-liked idea between private sector organizations, which helps them to be accountable in a social point of view. The expert opinions point out that the adoption of CSR practices is not at an adequate level in the tourism industry to fruitfully support a transition to the circular economy and other environment-friendly practices.

4. The fourth most significant barrier is "additional human resource needs"for the transformation to circular economy. Govindan, Kaliyan, Kannan &Haq (2014) state that organizations will need further human resources to a transition to green supply chain management practices. Agyemang et al. (2019) affirm that the organizations find it expensive to hire qualified employees required for circular economy transition. The outcome of the presented research agrees with these claims because authors can imply that the experts from the tourism industry believe they would need a supplementary employee to adopt circular economy practices, and the difficulty of recruitment and the cost of extra workers take them away from adopting circular economy tenets.

5. Another significant barrier is "Lack of awareness/preference/pressure of the consumers". Transformation to the circular economy model requires efforts and participation of all actors of the current supply chain, and consumers are a huge part of it (Lieder & Rashid, 2016; Rizos et al., 2016). The industry experts believe that the low consumer awareness level about circular economy characteristics makes it difficult to adopt circular economy model in the tourism industry.

6. "Lack of new technologies, materials and processes",

7. "Cost of environmentally friendly packaging",

8. “Lack of governmental support”,

9. “Lack of knowledge and training possibilities“,

10. “Complexity of CE 103 friendly product designs”.

This finding confirms research from Agyemang et al. (2019), who state three main barriers in transformation from linear to circular economy:

- unawareness,
- cost and financial constraint and
- lack of expertise

Another research comes with finding that awareness is an issue in connection with the transition from linear to the circular economy. This study shows that many of the study respondents know about the circular economy concept at an individual level. However, at an industry-wide level, there was a lack of awareness. The lack of a broad consensus of what the circular economy looks like in the built environment could be a contributing factor. This perceived absence of an industry-wide awareness, supported by the survey and breakout session findings that parts of the supply chain, such as clients and designers, have just little knowledge on how to implement circular economy tenets is likely to prevent adopt circularity in the short term (Adams, Osmani, Thorpe & Thornback).

11.3 CIRCULAR HOTELS

Pamfilie, Firoiu, Croitoru & Ionescu (2018) mention in the study that the utilization of circular economic principles can afford hotel organizations the needed framework for business development and can support the formation of a more sustainable experience for all stakeholders by eliminating the negative impacts on social and environmental sustainability.

Florido, Jacob & Payeras (2019) create standards on feasible activity and opportunities to apply a prosperous development towards a circular model in hotel organizations and characterize a model for this development in a tourist destination.

In general, there is firm proof that tourist operations cause huge pressures on the environment. Between them, waste generation is one of the most significant, as it transforms into an enormous environmental footprint and excessive environmental pressures, mainly on coastal areas ecosystems, mostly in the form of pollution and following by loss of biodiversity, discouraging others from traveling to such affected destinations (Zorpas, Navarro-Pedreño, Panagiotakis & Dermatas 2021).

This is strengthened by over-tourism, a vital, clear, and present challenge in many locations around the globe, extremely rising the pressure on many ecosystems, e.g., if no actions are undergone by the crucial tourism stakeholders as soon as possible, the weight of plastics ending in our seas is estimated to be much higher than the weight of fish over the next decades (Zorpas, Navarro-Pedreño, Panagiotakis & Dermatas 2021).

A new belief to increase circular business models in tourism appears to be an essential step forward, to improve environmental actions, while at the same time generate cost savings and growth of revenue and encourage the formation of new local jobs (Zorpas, Navarro-Pedreño, Panagiotakis & Dermatas 2021).

Rodríguez, Florido & Jacob (2020) have come with several findings, such as "the hotel sector is a principal consumer of resources and a waste generator", which means
the governments are to encourage circular tourism. They should focus on defining circular strategies and designing circular certifications for hotel organizations. The authors also provide some recommendations:

- it is required to design awareness programs for tourists, which could help them with the understanding of circular economy model,
- another important suggestion is for the hotel industry; hotels should present their good environmental practices to their guests,
- to consider waste generation - a very significant aspect due to the enormous amount of waste generated by the tourist sector. Laws and common rules should be designed and implemented to eliminate waste generation in the tourism sector,
- hotels can apply some actions to eliminate their waste generation, such as:
    - composting organic waste,
    - prefer repair than replacement or
    - offering closed menus at restaurants to eliminate food waste,
- to orient on the global problems of marine litter - an integrated and cooperative effort is needed by all stakeholders to eliminate its accumulation on the coasts.

11.4 SHARING ECONOMY

A new innovative form of economy and sustainable development is the so-called sharing economy and sharing tourism (Tescaşiu, Epuran, Tecău, Chiţu, & Mekinc, 2018; Genç, 2019; Roblek, Stok, & Mesko, 2016). In today's globalized world, sharing economy is becoming more and more widespread.

Definitions, principles, attitudes, sustainability, and the legal framework are addressed by several authors, such as Schlagwein, Schoder & Spindeldreher (2020); Hamari, Sjöklint, & Ukkonen (2015); Matzler & Kathan (2015); Donovan, Eberwine, & Woodring (2015); Na & Kang (2018); Frederik & Edeltraud (2017) or

Manuel, Frey & Veit (2018). Opportunities and threats of sharing economy are addressed by Heinrichs (2013), Hernaes (2015) or Malhotra & Van Alstyne (2014).

The sharing economy is a modern socio-economic system based on the sharing of human and natural resources. The original sharing economy (it means neighbour help, mutual free exchange of an apartment or other property) initially had a social character (people helped each other free of charge). We perceive the original sharing as a social exchange between people within closed social groups (neighbours, family). If the participants do not know each other, it is not sharing in the true sense of the word. The consumer in the role of user pays a certain fee to intermediaries for allowing him or her access to someone else's goods or services. It is a model of economic exchange, where the transaction has a utilitarian, not a social character. At present, sharing economy is an economic model that connects suppliers with consumers through technological platforms. According to The Office of the Government of the Czech Republic, this connection takes place mainly through mobile applications (Úřad vlády České republiky 2016).

The sharing economy platforms' impacts on society and the economy are different. Between positive effects, we could include:

- a more intensive use of certain goods (e.g., carsharing or sharing accommodation),
- a simplicity of financial transactions using online payments,
- a new service sector creating new jobs or
- gaining a new experience by engaging in sharing transactions.

On the other hand, the use of products or services of a sharing economy raises concerns about:

- respecting the agreed terms of the transaction,
- the possibility of complaints,
- the possibility of compensation for damage,
- unprofessional performance of services (often performed by unqualified providers – the platforms try to capture this dissatisfaction through a system of reviews),
- avoiding tax liability (Veber, Krajčík, Hruška, Makovský et al. 2016).

The use of digital technologies is gaining an unprecedented place in all aspects of the social, and economic processes of human life. Digitization is an accelerator of sharing economy, and, therefore, the world economy is at a new turning point. According to Li (2020) the global economy will reach digital ascendancy by 2023, which means it will reach the point where all products and services provided by digitally transformed companies will account for more than half of total global GDP.

Most services are turning to digitization, making it easier to access a variety of information for users. Development of such platforms and apps deals e.g. Shivakumar & Sethii (2019) or Cusumano, Gawer, & Yofie (2019).

New platforms used in tourism are addressed by several authors such as Sharafutdinov, Onishchenko & Nakonechnyi (2020); Akiko & Bayu (2014); Zhaojie, Xuefen, Yuefeng & Gang (2019).

Digitization is changing the way people live, work, and travel, bringing new opportunities for tourism. Tourism digitalization impacts apply for example Linton & Öberg (2020); Kalabukhova, Morozova, Onokoy, Chicherova & Shadskaja (2020); Happ & Ivancsó-Horváth (2018); Stankova & Ivanov (2020); Nyurenberger, Sewruikov, Luchina, & Shchetinina (2019); Grah, Dimovski, & Peterlin (2020).

In the context of digitization, sustainable tourism also needs to be addressed (Cernat & Gourdon 2011; Martin 1995; Hughes 2004; Høyer 2000; Pamfilie, Firoiu, Croitoru & Ionescu 2018).

11.5 SHARING ACCOMMODATION

Sharing accommodation is also called peer-to-peer (P2P) accommodation. Sharing accommodation is a system where the host offers the property or part of it to guests for short-term use, free of charge or for a fee. The host is a private person who may or may not be the owner of the property. (Úřad vlády České republiky 2017).

Sharing accommodation is divided into accommodation provided free of charge or accommodation for a fee that is part of commercial services. In terms of free accommodation, the intermediaries often operate based on a non-profit organization.

The leading position in the market of sharing accommodation for a fee belongs to the Airbnb. The HomeAway, Wimdu, Vacation Rentals or House Trip platforms operate on similar principles.

Several pieces of research are focused on sharing accommodation. For example, Heo & Blengini (2019) is focused on sharing accommodation from a macroeconomic point of view. This contribution came with several findings. Authors assumed that Airbnb is more widespread in countries where people are very comfortable using technology. This research also showed that level of technological development is the most important factor affecting the number of Airbnb listings. Another interesting finding is the negative relationship between GDP per worker and the number of Airbnb listings. In addition, international arrivals are highly related to private room rentals, but not to entire houses.

According to research from Alrawadieh & Alrawadieh (2018) the entrepreneurs in the sharing accommodation sector are mostly relatively young, male providers who have past professional experience in the tourism and hospitality industry and master one or more foreign language(s).

This study was also focused on the motivation of providers to start their activity in sharing accommodation sector. The main motivations are:

- economic benefits,
- cultural interaction,
- avoid unemployment,
- interaction with people from different cultural backgrounds.

11.6 CIRCULAR ECONOMY IN CONNECTION WITH SHARING ECONOMY

Although there is no textbook definition, circular economics is often defined as a concept in which there is no waste. The circular economy is a sustainable development strategy that creates functional and healthy relationships between nature and human society. Circular economics applies this idea in the human world. The basic principles that define the circular economy include:

- closing material flows in functional and endless cycles where they do not lose value,
- drawing energy from renewable and sustainable sources, and
- designing products and services that do not have a negative impact on natural ecosystems and human resources (Institut Cirkulární Ekonomiky, z.ú.).

Some researchers have found out that the main point of sustainable consumption in the context of sharing economy is direct movement towards using local resources and respecting others' well-being in terms of production and consumption processes as well (Heinrichs 2013, Belk 2014, Cohen & Muñoz 2016).

Wan, Doub & Zhou (2008) define traditional sustainable consumption as personally oriented consumption, it means advantageous for individuals' consumption. However, some new studies of sharing economy have researched sustainable consumption behavior with technology support (Belk 2014, Allan & Berg 2014, Cockayne 2016).

He & Mai (2021) state example of it in sharing economy models on the forums, where this topic has been studied in terms of opportunities and challenges, pointing to a circular economy that reflects the relationship between supply and demand for the mutual benefit of stakeholders.

However, according to Cohen & Muñoz (2016) this sustainable consumption model has also been remoulded to the sustainable development aim of minimizing the utilization of natural resources and the reduce waste and pollutants at the macro and micro levels based on circular economic activities.

In today's globalized world, more and more attention is paid to innovation. Konietzko, Bocken, Hultink (2020) identify three crucial groups of principles for circular innovation:

1. The first main principle for circular innovation is collaboration, i.e., how a company can interact with other organizations in their ecosystem to innovate towards circularity.
2. Secondly, there is experimentation, i.e., how a company can organize a structured and action-oriented trial-and-error process to implement greater circularity.
3. The third crucial principle for circular innovation sees Konietzko, Bocken, Hultink (2020) in "*platformization*", i.e., how a company can organize social and economic interactions via online platforms to achieve greater circularity).

Konietzko, Bocken, Hultink (2020) perceive product or service sharing, mainly sharing through digital platforms, as an enabler for a circular economy. Schwanholz & Leipold (2020) examined the potential of digitalization and sharing economy for realizing a circular economy.

The results of this study contribute to the literature on sustainable production and consumption under a circular economy paradigm in several ways. It has been found out that circular economy in connection to sharing economy requires closer attention.

Based on this variation in digital sharing platforms' pursuit of circular economy goals and principles as well as their business models, this study suggests a typology of digital sharing practices, including:

- social interaction,
- profit and sustainability, and
- mixed goals and business models.

They complement evolving theoretical frameworks and categorizations of (digital) sharing practices with a stakeholder-based perspective. The contribution suggests two mail factors for the emergence of certain digital sharing practices:

- the presence of certain actors, e.g., large corporations, seems to influence the business models and motivations of digital sharing platforms.
- the business models that digital sharing platforms take on and the motivations they pursue is likely related to their analogous 'heritage'.

Other findings of this research are from Schwanholz & Leipold (2020) are:

1. The majority platforms do not directly consider fundamental tenets and aims that academic analyses and public discourses connected with their services.
2. Several circular economy tenets continue be unresearched and characteristic sharing economy models do not symbolize the analysed platforms in large degree. This does not bode well for their future contribution.
3. This study shows a significant research gap - digital practice. The ends they pursue and the means they apply to reach these ends remain obscure.

11.7 CONCLUSION

As mentioned above, currently, the circular economy concept has mainly focused on manufacturing industries. However, concentrate on tangible product manufacturing depreciates service-dominated industries, such as travel and tourism, and their role in the global circular economy transition is needed. The connecting literature mainly focuses on the manufacturing sector, and just a few studies are focused on the tourism sector even though massive consumption of energy and water, food waste, or CO2 emissions also occur in tourism.

From literature research result several barriers in transformation from linear to the circular economy. There are three main barriers in the transition from linear to the circular economy:

- unawareness,
- cost and financial constraint and
- lack of expertise.

According to literature, there is a considerable pressure on the environment from the tourist operations; the most important one is waste generation. A new belief to increase circular business models in tourism appears to be an essential step forward, to improve environmental actions, while at the same time generating cost savings and growth of revenue and encourage the formation of new local jobs.

According to the literature there are some recommendations in the context of circular economy: to design awareness programs for tourists, hotels should present their good environmental practices to their guests, consider waste generation, and orient on the global problems of marine litter.

In today's globalized world, more and more attention is paid to innovation. This contribution found out three crucial principles for circular innovation: collaboration, experimentation and "*platformization*".

Konietzko, Bocken, Hultink (2020) perceive the product or service sharing, mainly the sharing through digital platforms, as an enabler for a circular economy. Schwanholz & Leipold (2020) examined the potential of digitalization and sharing economy for realizing a circular economy.

In today's globalized world, more and more researches will be focus on sharing services. However, this is a relatively new topic, and many academic resources have not yet focused on it in the circular economy. From this point of view, I see a lot of space for future research, gaining new knowledge, and deriving theoretical background.

At present, sharing economy is an economic model that connects suppliers with consumers through technology platforms; this connection occurs mainly through mobile applications. It is necessary to turn to digital ways of offering and services commercialization and offer new opportunities to tourism participants from information processes to services sale and consumption. Digital platforms currently work very well in sharing economy. Still, they are set up mainly globally from a macroeconomic point of view and do not consider the need for economic impacts of individual countries or regions. The benefits of the global platform must be also transferred to the local ones (for example, tourist tax, economic effects towards city or state budgets).

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Conclusion

At the end of this publication, it is necessary to mention that the circularity of production and consumption is becoming a mandatory component of decision-making at all levels of both national economies and companies, and public institutions. Following the entry into force of the EU obligation for large companies to declare their Corporate Social Responsibility each year, from 2023 there will be an obligation to issue annual reports within the factors of the so-called ESG (stands for Environmental, Social, and Governance).

Already today, investors are following these ESG components, or in old-fashioned definition "sustainability" is the alpha and omega for rational decisions about the entry of capital or private investment of citizens. A suitable method of implementation, effective setting of processes for the best possible targeting of this development stage will certainly be an important area of further research. Not only mandatory big companies, but also the area of small and medium-sized companies must find the right procedures for innovation in the sense of ESG and implement them in the internal environment, communicate correctly to their employees and stakeholders. But they are to use also these ESG-principles in PR externally, because it is about increasing the value and at the next level about increasing the image of this value of the company or institution.

Previous chapters presenting the possibilities of the circular economy from different perspectives together brought an up-to-date insight into this issue. The circular economy is conditioned by other changes that affect areas outside of economics and economics. Acceptance of the new paradigm and preparation of society for new forms of production and consumption is important for the very application of the circular economy. These changes, if they take place in a controlled manner and at all levels of society, with the intentions of the principles:

- Eliminate waste and pollution,
- Keep products and materials in use,
- Regenerate natural systems.

We have reached theories and applications of the circularity of production and consumption systems, as part of sustainable development. However, this concept has long been known and applied to some communities, especially where resources are severely limited. These examples can be used to learn from the mistakes and examples of good practice of previous generations and open up the possibility of healthy development for future generations.

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