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

Editor Dagmar Škodová Parmová

Team of authors

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Introduction

While opening this book you will have the possibility to obtain a closer overview about the theory of circular economy, about particular examples of circular economy in regions and in the industry or services. It will help you to understand the consequences for using it and to apply it in the future.

In recent times, trends have emerged several times that appeared to be a revolution in either economic science or a revolution in economic practice with the potential to cause earthquakes in theory. These trends had ambitions not to be an opinion revolution, but a system revolution, which, according to its pioneers, should completely change the view of the whole economic issue. In the end, it always turned out that the mainstream of economic thinking was ultimately not skewed and only absorbed some as yet unthoughtful views on the matter or unexplored issues. It also turned out that economic life continued to revolve around the same things. Perhaps only with the difference that new possibilities, new perspectives, new approaches have been added to the used procedures or, for example, control mechanisms.

We can certainly name as a strong example a significant wave of thought from the turn of the twentieth and twenty-first century, which was then called new economy or new economics and which included, for example, the rise of so-called soft data, ie indicators unrelated to financial statements and financial results of corporations.

We could also go back to 2009 and 2010, when the very fashionable and socially successful trends in the alternative economy associated with movements such as Occupy Wall Street emerged. It is worth noting here that on their journalistic and political level, the ideas of the representatives of alternative economic experiments were often connected with the so-called conspiracy theories. Of course, these are not theories in the scientific sense of the word, but this is secondary at this level.

From a somewhat different point of view, we could then cite as a fundamentally related case a wave of interest in the so-called creative economics and the associated methods of informal management and many other stimuli. It should not be forgotten that, on a theoretical level, this line of thinking has been defined in the so-called creative economy.

Now we live again in times when circular economics and circular economy gain great influence in theory and in practice. The legitimate question, therefore, is

whether circular economics and its theoretical reasoning and thinking (circular economy) awaits a similar fate as the new economy, alternative schools of thought in economics or creative economy. That is, after a few years of strong interest, these concepts will not go out and be postponed as a temporary historical story, which only partially enriched economic theory in detail or in specific views and was reflected to a greater or lesser extent in economic practice and politics. In this book we are summarizing some chosen aspects of circular economy practical use or its consequences on chosen branches and regions. It will help to understand the framework, the extension and also the consequences of circular economy in use for our regions.

doc. Dr. Ing. Dagmar Škodová Parmová

1 CIRCULAR ECONOMY – CONCEPT AND DEVELOPMENT OF BUSINESS MODELS

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Abstract: As of late, it has been possible to observe the growing importance of the concept of the circular economy, which plays a very important role in the lives of individuals, companies and policymakers. The circular economy is just one way to attain sustainable development with special characteristics and has both similarities and differences when compared to the concept of sustainability. Many authors list differing ways of understanding this concept. This paper attempts to suggest a consensual view of the basic concepts of the circular economy framework in the context of the concepts of closed loops, the concept of sustainability, and business models that are developing in connection with the concept of the circular economy. The paper focuses on systematic literature review, other research studies on the subject and the view of professional institutions on the issue to fulfil the outputs of the paper. These include: overview analysis of the main terms, concepts, approaches and principles of the circular economy and overview analysis of the development of business models and their basic elements in terms of the circular economy.

Key words: circular economy, sustainability, business models, concepts, closed loops, literature review

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1.1 INTRODUCTION

The circular economy is a strongly trending topic of research and is also a very important concept for today's practitioners and policymakers. This is due to the many problems of the current world, mainly in ecology (water problems, biodiversity loss, soil pollution etc.), but also socioeconomic issues (unemployment, the poverty trap, intergeneration equity, financial and economic instabilities of companies, supply risks, etc.) – for more, see Geissdoerfer et al. (2017), Prieto-Sandoval et al. (2018), Meadows et al. (2004), WBCSD (2010), Seiffert, and Loch (2005), Markard et al. (2012), Rockström et al. (2009), Jackson (2009), WWF (2014), Banerjee and Duflo (2011), Sen ((2001), Prahalad, (2004) or Sachs (2015).

The circular economy is a way to find greater sustainability of the sociotechnical system, as society needs a new system for possible future development and better life. As Murray et al. (2015) claims, the circular economy represents the most recent attempt at a sustainable system that uses the connection between ecological and economic activities. This interesting concept has many different approaches and characteristics, and the selected specifics of this concept and its development are presented in this paper.

This paper is also devoted to the issue of business models that are used in connection with the circular economy concept, as companies are also important agents in the introduction of approaches and practices of the circular economy into life. Business models and their innovations are then used as a tool to integrate the principles of the circular economy. We believe that the question of how companies are adopting this new paradigm and how they are changing their business models needs to be addressed.

The paper has the following structure: First, we performed a systematic analysis of the basic approaches and principles of circular economics, as it is difficult to apply the elements of circular economics to any level, whether microeconomic or macroeconomic, without a knowledge of the characteristics of this basic theoretical framework. Then, the paper deals with the theoretical framework of business models and their innovations in the context of the circular economy. Possible modifications of basic elements of business models based on basic principles of the circular economy were analysed. The article is based on an overview analysis of professional sources, both on the level of research articles and international institutions such as the OECD or the European Commission. The article uses a systematic literary search. Various approaches to the problem are presented and also discussed.

1.2 DEVELOPMENT OF THE CIRCULAR ECONOMY CONCEPT

The concept of the circular economy has been gaining momentum since the late 1970s. The main reason for creating this new concept is linked with the global economy and spreading signs of resource depletion. Based on this fact, there have been calls for a new economic model. As a reaction to these calls, businesses have begun to explore ways to reuse products or their components and restore more of their precious material, energy and labour inputs, and economic concepts are increasingly focusing on the circular economy, i.e. the better use of resources (EMF, 2013).

Several authors (see for example Andersen, 2007; Ghisellini et al., 2016 or Su et al., 2013) attribute the introduction of the concept of the circular economy to Pearce and Turner (1989), who discuss pollution and deal with this problem as an important negative externality, which is also known as external costs and external diseconomy. Pearce and Turner's definition (1989, p. 61-62) states that "external costs exist when the following two conditions prevail (these two conditions must be met at the same time):

1. an activity from one agent causes a loss of welfare to another agent,
2. the loss of welfare is uncompensated."

However, other research work such as that by Boulding (1966) highlights the circular economy, emphasizing the fact that, given that the Earth is a closed circular system with limited capacity, the economy and the environment need to coexist in equilibrium.

As the EMF (2013) states, the circular economy is a concept which replaces the linear economy (linear concept). It is an industrial system that is restorative and has new characteristics in comparison with the 'end-of-life' concept and shifts towards the use of renewable energy, eliminates the use of toxic chemicals (which impair reuse), and aims for the elimination of waste through the superior design of materials, products, systems and the business models within them. This economy concept is based on the following three simple principles:

1. the aim to 'design out' waste,
2. strict differentiation between consumable and durable components of a product,
3. the energy required to fuel this cycle should be renewable by nature, again to decrease resource dependence and increase system resilience.

Authors list varying approaches to the concept of the circular economy, and it is necessary to highlight the fact that these approaches are very similar. For example, Stahel and Reday (1976) in connection with the circular economy conceptualised a

loop economy which is focused on waste prevention, regional job creation, resource efficiency, and dematerialisation of the industrial economy.

1.2.1 CONCEPTS OF CLOSED LOOPS AND THE DEFINITION OF THE CIRCULAR ECONOMY

The definition of the circular economy concept has evolved from concepts that share the idea of closed loops. Some of the most relevant theoretical concepts of closed loops are presented in Table 1.

Table 1: Selected concepts of closed loops - the most relevant theoretical influences

Authors	***Concept***	***Definition of the concept***
McDonough and Braungart, 2002	cradle-to-cradle	"Cradle-to-cradle is an integration of design and science that provides enduring benefits for society from safe materials, water and energy in circular economies and eliminates the concept of waste."
Commoner, 1971	laws of ecology	Four "laws of ecology" which are: 1. Everything is connected to everything else; 2. Everything must go somewhere; 3. Nature knows best; and 4. There is no such thing as a free lunch.
Stahel, 2010	loop and performance economy	Loop economy: "reusing, repairing, re-manufacturing and re-marketing goods and components in an industrial context – is where you get the biggest financial benefit, that being the lowest price for the consumer or the highest profit margin for the manufacturer." Performance economy: "takes the principles of the circular economy to the extreme, where we no longer buy goods but simply services."
Lyle, 1994	regenerative design	"Regenerative design is nothing less than a user's manual for planet Earth that integrates the principles of ecological design with practical realities."
White, 1994	industrial ecology	"Industrial ecology is the study of the flows of materials and energy in industrial and consumer activities, of the effects of these flows on the environment, and of the influences of economic, political, regulatory, and

Allenby, 2006		social factors on the flow, use, and transformation of resources." "Industrial ecology is the systems-based, multidisciplinary discourse that seeks to understand emergent behaviour of complex integrated human/natural systems."
Benyus, 1997	biomimicry	"Biomimicry is a new science that studies nature's models and then imitates or takes inspiration from these designs and processes to solve human problems."
Pauli, 2010 European Commission, 2020a	blue economy	"The theory of blue economy highlights benefits in connecting and combining seemingly disparate environmental problems with open-source scientific solutions based upon physical processes common in the natural world, to create solutions that are both environmentally beneficial and which have financial and wider social benefits." "Blue economy are the economic activities related to the oceans, seas and coasts. The Blue Economy covers a wide range of interlinked established and emerging sectors."

Source: own, based on selected authors, 2020

McDonough and Braungart (2002) state that the cradle-to cradle concept "reframes design as a positive, regenerative force—one that creates footprints to delight in, not lament. This paradigm shift reveals opportunities to improve quality, increase value and spur innovation. It inspires us to constantly seek improvement in our designs, and to share our discoveries with others" and define three principles derived from nature:

1. Everything is a resource for something else.
2. Use clean and renewable energy.
3. Celebrate diversity.

Commoner (1971) says: "We are in an environmental crisis because the means by which we use the ecosphere to produce wealth are destructive of the ecosphere itself. The present system of production is self-destructive; the present course of human civilisation is suicidal." Furthermore, Egan claims that Commoner practically invented the science information movement as "a method of communicating technical information so that the public could better participate in complex social, political, and environmental debate". The Nation's Peter Dreier said that "Commoner linked environmental issues to a broader vision of social and economic justice. He called attention to the parallels among the environmental, civil rights, labor

and peace movements. He connected the environmental crisis to the problems of poverty, injustice, racism, public health, national security and war." (for more see Butler, 2012).

As Commoner (1971) claims, the four laws of ecology can be defined as the following:

- "A simple fact about ecosystems – all healthy ecosystems are interconnected and self-stabilising: if any part of a natural ecosystem is damaged or overstressed it can trigger far wider problems."
- "Everything must go somewhere – great amounts of materials have been extracted from the Earth, converted into new forms, and discharged into the environment and there is a material in places where, in nature, they do not belong."
- "Nature knows best – there is a high probability that any significant change in the natural system caused by man will be harmful the ecosystem."
- "There is no such thing as a free lunch – every gain is won at some cost".

Commoner (1976) criticized social systems for leaving a terrible ecological heritage. Commoner's conclusion to the crisis of the ecosystem is the following: "If the environment is polluted and the economy is sick, the virus that causes both will be found in the system of production. And that is where their cure can be found as well."

Stahel claims that by thinking 'smart', companies and governments can economically profit from technological progress and at the same time contribute to sustainable development (Making It, 2020).

When Benyus (1997) presented the book "Biomimicry", it was a very revolutionary topic and an interesting inspiration for many scientists and engineers. This new concept of bio–inspired products was primarily used by architects and in the construction industry.

The "Blue Economy" is explained by different authors in different ways. As the European Commission (2020b) states, economic activities that are marine-based or marine-related play the main role in this concept. Examples of these activities according to the European Commission (2020b) are the following:

- Marine-based activities: include the activities undertaken in the ocean, sea and coastal areas, such as marine living resources (capture fisheries and aquaculture), marine minerals, marine renewable energy, desalination, maritime transport and coastal tourism.
- Marine-related activities: activities which use products and/or produce products and services from the ocean or marine based activities like seafood processing, biotechnology, shipbuilding and repair, Port activities, technology and equipment, digital services, etc.

In connection with the aforementioned concepts of closed loops, some definitions of the circular economy may be presented. Some of the definitions used in the research are listed in Table 2.

Table 2: Selected definitions of the circular economy

Authors	***Definition of the circular economy***
EMF, 2013, 2014	"an industrial economy that is restorative or regenerative by intention and design"
Geng and Doberstein, 2008	"realization of closed loop material flow in the whole economic system"
Bocken et al., 2016	"design and business model strategies that are slowing, closing, and narrowing resource loops"
Geissdoerfer et al., 2017	"a regenerative system in which resource input and waste, emission, and energy leakage are minimised by slowing, closing, and narrowing material and energy loops. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling"
Pearce and Turner, 1989	"a closed system of economy-environment interactions"
Yand and Feng, 2008	"abbreviation of closed material cycle economy" "resources circulated economy"
Murray et al., 2017	"integration of economic activity and environmental wellbeing in a sustainable way"

Source: own, based on selected authors, 2020

1.3 CIRCULAR ECONOMY AND SUSTAINABILITY

Today the differences in circular economy concepts and sustainability are not as large, but some still exist and the topic remains ambiguous. Many authors in research studies do not focus on the differences, but rather highlight shared characteristics.

The circular economy is naturally an issue of sustainability and is a topic which has recently gained importance (Brennan et al., 2015). Policymakers and companies are becoming increasingly aware of concerns regarding sustainability. The modern concept of the term sustainability has its origins in forestry (see von Carlowitz, 1713 or Mantel, 1990). In the new concept, this term was transferred to the context of ecology (Duden, 2015). For example, the term sustainability can be defined as a situation in which human activities are in connection with the earth's ecosystems

and these activities conserve the function of the ecosystems (ISO 15392, 2008). The most commonly accepted definition of sustainability is given by Brundthland (1987) – sustainability is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". Geissdoerfer et al. (2017) give a definition of sustainability as the balanced and systemic integration of intra and intergenerational economic, social, and environmental performance.

Based on this aforementioned definition of the circular economy and sustainability, it is possible to find both shared characteristics and differences between these concepts. Geissdoerfer et al. (2017) state the following similarities and differences between concepts of sustainability and the circular economy.
Selected similarities:

- Intra and intergenerational commitments.
- More agency for the multiple and coexisting pathways of development.
- Global models.
- Integrating non-economic aspects into development.
- System change/design and innovation at the core.
- Multi-/interdisciplinary research field.
- Potential cost, risk, diversification, value co-creation opportunities.
- Cooperation of different stakeholders is necessary.
- Regulation and incentives as core implementation tools.
- Central role of private business due to resources and capabilities.
- Business model innovation as a key for industry transformation.
- Technological solutions are important but often pose implementation problems.

The differences between these concepts are presented in Table 3.

Table 3: Selected differences between sustainability and the circular economy

Concept	***Sustainability***	***Circular economy***
Origin	Environmental movements, NGOs, non-profit and intergovernmental agencies, principles in silviculture and cooperative systems	Different schools of thought like cradle-to-cradle, regulatory implementation by governments, lobbying by NGOs, inclusion in political agendas

Goal	Open-ended, multitude of goals depending on the considered agent and her interests	Closed loop, ideally eliminating all resource input into and leakage out of the system
To whose benefit	The environment, the economy, and society at large	Economic actors are at the core, benefitting the economy and the environment. Society benefits from environmental improvements and certain add-ons and assumptions, like more manual labour or fairer taxation
Perceptions of responsibilities	Responsibilities are shared, but not clearly defined	Private business and regulators/policymakers

Source: Geissdoerfer et al., 2017

In comparison with the concept of sustainability, the circular economy refers mostly to individual economic benefits and social aspects (EMF, 2013; Elkington, 1997; Allwood et al., 2012; Bakker et al., 2014).

1.3.1 DEVELOPMENT OF BUSINESS MODELS IN THE CONTEXT OF THE CIRCULAR ECONOMY

Before we deal with the issue of circular business models, it is first necessary to define the concept of business models. Literature offers various perspectives and definitions of business models. Most generally, a business model is a conceptual tool that describes how a company does business (e. g. Beattie and Smith, 2013; Bocken et al., 2014; Zott and Amit, 2010) and how it makes a profit (Fiet and Patel, 2008). Defining business models is also often associated with value creation. It can be said that the creation of a certain value is the core of any business model. According to Teece (2010), it is an organizational and financial architecture of the company that considers customers and their needs, competition and the development of costs and revenues. Simply put, a business model shows how to translate a company's resources and capabilities into economic value.

Several authors agree that a business model should capture these three basic elements (Osterwalder and Pigneur, 2010; Bocken et al., 2014; Teece, 2010):

- **value proposition** - this is a range of products and services that should generate economic value when considering customer segments and customer relationships,
- **value creation and delivery** - describes individual activities, resources, business partners and distribution channels, ability to use new business opportunities or new markets,
- **value capture** - presents a revenue model and cost structure associated with products and services offered.

A business model connects resources, processes and activities that lead to a successful and competitive business in the long run (Nielsen and Lund, 2014). A business model also explains how the company holds a competitive advantage, and where the company offers a unique hard-to-imitate value (Bray, 2010). Business models are a valuable tool not only in the study of business value creation, but also in innovation and business profit (Teece, 2010). A constructed business model is also closely related to business performance. Business models thus serve not only to find the essence of value creation, but also to determine the relationship between the business model and the performance of the company, as well as related strategic concepts (Zott et al., 2010). The impact of a business model on business performance is an important area of model research. The business model should contribute to better value creation and higher business performance.

1.3.2 BUSINESS MODEL INNOVATIONS

Business model theory is evolving and business model innovations are often discussed in connection with new development trends in society. Thus, the topic of business model innovation is widely discussed in connection with the topic of sustainability and, currently, if we focus on the environmental and economic pillar of sustainability, it is also discussed in the context of the circular economy.

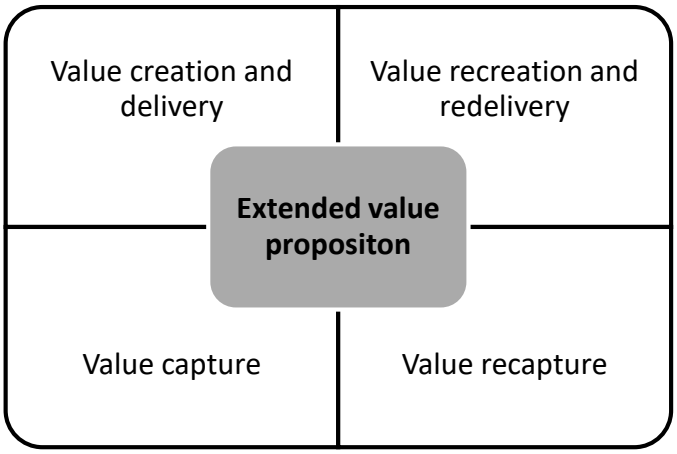
Together with the topic of sustainability, business model innovation helps to create business cases for sustainability. This creates value for the customer and society through the integration of environmental, social and business activities of the company (Schaltegger et al., 2012). In this respect, business model innovation is also seen as a way to ensure greater social and environmental sustainability in the industrial system (Lüdeke-Freund, 2010). As stated by Bocken et al. (2014), the main elements of a sustainable business model continue to be value proposition, value creation and delivery and value capture that can deliver economic value while meeting environmental and social sustainability.

The circular business model is one of the types of sustainable business models that brings the creation of environmental and economic value from the flow of reused

materials and products over time (Bakker et al., 2014; Bocken et al., 2016; Linder and Williander, 2017). The traditional business model with a linear flow: "resources - products - waste" is replaced by a circular flow: "resources - products - waste - renewable resources" in the circular economy (Urbinati et al., 2017).

In the case of circular business models, the basic three elements of the business model (value proposition, value creation and delivery and value capture, as were mentioned above) are extended by another two elements - value recreation, redelivery and value recapture; value proposition is also extended during the introduction of circular products and services, as shown in Figure 1.

Figure 1: Circular business model key elements



Source: Guldmann and Huulgaard (2020), developed from Richardson (2008) and Bocken et al. (2016)

Value is re-created when products are reused or repaired, or when recycled materials are used to make new products. Thus, value is re-created through the realization of circular services. Re-delivery takes place through the direct sale, leasing or sharing of re-used or upgraded products. If a profit is generated from direct sales or the leasing or sharing of circular products and services such as repairs, upgrades, and refurbishments, value is recaptured (Guldmann and Huulgaard, 2020).

Urbinati et al. (2017) discuss four possible modifications of the business model towards the circular economy: There is a change in the value proposition of companies, which consists of a range of service systems and products that will serve to meet the needs of customers. Customers no longer own the products, but become their users. The products thus remain the property of the producers and the circular economy thus becomes a functioning economy based on the idea that customers pay for the use of the products and not for their ownership. In terms of customer relationships, we encounter a greater number of interactions. Within the circular

business model, reverse supply chain activities, i.e. reverse logistics, control and evaluation of the current state of products, their redistribution or reuse, need to be added to forward supply chain activities such as planning, raw material purchasing, production, marketing and product distribution, reconditioning and recycling (Bakker et al., 2014). The revenue stream is derived mainly from payments for use-oriented or results-oriented services, a result of the above-mentioned transition from a payment for ownership to payment for use (Tukker, 2004). Table 4 below summarizes the abovementioned modification.

Table 4: Business model modifications according to the principles of circular economy

Value proposition		**Value creation and delivery**	**Value capture**
Circular product-service system, transition from the payment of ownership to payment of use a product	Higher degree of cooperation between companies and customers	Reverse supply chain activities, higher degree of cooperation with supply chain actors	Payment for use-oriented or result-oriented services

Source: own, based on Urbinati et al. (2017), 2020

1.4 CONCLUSION

Sustainability and the circular economy are inseparable parts of the development of today's world in the context of limited and exhaustible resources. They have become new phenomena that are being investigated and analysed and whose elements are implemented in the functioning and behaviour of individuals, companies and states for the purpose of the sustainable development of regions. The paper explores the basic concepts of the circular economy framework in the context of the concepts of closed loops, the concept of sustainability and business models which are developing in connection with the concept of the circular economy.

We believe that companies are becoming one of the major players in the field of the circular economy and the fulfilment of its basic principles. Also, if we look at the level of companies and their management towards sustainable development, the circular economy and its principles has been one of the most frequently discussed topics as of late. The transition to circular business models is one of the initial preconditions for changing the traditional functioning of companies and fulfilling the principles of the circular economy. The authors agree that in a circular economy,

the traditional business model with a linear flow is replaced by a circular flow. Elements of business models are extended by value recreation, redelivery and value recapture; value proposition is extended during the introduction of circular products and services. However, there is still an insufficient amount of research into the implementation of circular business models at the microeconomic level (Franco, 2017; Urbinati et al., 2017; Guldmann and Huulgaard, 2020). It is also necessary to take into account that the innovation of business models also faces various obstacles. The main obstacles include conflict with the current business model, problems with the basic configuration of assets, and a lack of clarity about the right model of innovation (Chesbrough, 2010). Further research into the framework of the application of circular economics to the enterprise level is therefore desirable, as it is difficult to fulfil the main principles of circular economics and thus contribute to a sustainable future without functioning circular business models.

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2 SUPPORT FOR THE CIRCULAR ECONOMY IN THE CZECH TAX SYSTEM

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ABSTRACT: The aim of the article is to examine the measures in the tax laws of the Czech Republic that could support the functioning of the circular economy in the environment of companies and consumers in the Czech Republic. We have examined tax laws to see if the tax benefits set out in them can support the functioning of the circular economy in practice.

2.1 INTRODUCTION

Climate change and environmental pollution pose a threat to the world. That is why the Green Deal for Europe was set up to ensure a greener and more sustainable EU economy. It is a set of measures by the European Commission to, among other things, reduce pollution and promote more efficient use of resources by moving to a circular economy. This leads to longer product life cycles and waste minimization through the sharing, repair and recycling of existing products and raw materials.
The Czech Republic is not a newcomer in this area. It is not an exaggeration to say that the Czech Republic is a state of returnable bottles. Already in the period of socialism, Czech society focused on reducing waste.
One of the goals of the strategic framework of the Czech Republic called "Czech Republic 2030" is to increase the share of the circulating economy. Its introduction

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needs to be reflected in the legislation. Tax laws belong here. Taxes affect the behavior of consumers and businesses. It is true that consumers and companies want to pay as few taxes as possible or avoid taxes. Therefore, changing existing taxes or introducing new environmental taxes can reduce waste, promote the use of recycled materials and more environmentally friendly production of goods.
Taxation also falls on areas that are not directly taxed. Studies of the tax impact or incidence conclude that each tax falls on a specific person. Taxes imposed on companies and firms must in fact be paid by final consumers. These can be customers, owners or employees. The specific tax is divided between them in different proportions. In the economy, the tax burden is shifted to the population, regardless of the area that was initially affected by taxation. Changes in the size of taxation should be well considered.

2.2 METHODOLOGY OF WORKING WITH CZECH TAX LAWS

The authors focused on the issues of environmental protection and circular management included in the tax laws of the Czech Republic. The results of the work contain direct tax measures in the current tax laws, valid for the year 2020 and then a discussion of these measures. These discussions contain suggestions for changes in the law, practical experience and problems that can be encountered in practice.

The results are divided into two groups:

- Direct measures in specific tax laws;
- Discussions and proposals for a specific tax.

2.3 INCOME TAX FOR INDIVIDUALS AND COMPANIES

2.3.1 DIRECT MEASURES

Income taxes of individuals and legal persons (companies) are regulated by one law. This is Act No. 586/1992 Coll., Income taxes, as amended. Nevertheless, some provisions of this Act apply only to certain entities. The first part of this Act apply only to individuals, the second part is intended only for companies and the last part is common to both entities.

FIRST PART - INCOME TAX FOR INDIVIDUALS

- The circular economy can be supported by subsidies. They are exempt from tax. (Section §4 para. 1, letter u) Act No. 586/1992 Coll.).
- If a person provides a gift for ecological purposes (its value is at least CZK 1,000 or exceeds 2 %), he can deduct its value from the tax base (in total he will deduct a maximum of 15% from the tax base) (Section §15 para. 1 Act No. 586 / 1992 Coll.).

SECOND PART - CORPORATE INCOME TAX

- Payments from producers or operators of solar power plants (according to the law governing waste) to operators of a collective system ensuring the take-back, processing, use and disposal of electrical equipment or separate collection, treatment, use and disposal of electrical waste, if registered under the law governing waste are exempt from tax. The exemption may be applied to the use of contributions only for the treatment of electrical and solar panel waste and the necessary costs related to this purpose. The exemption shall not apply to the costs of setting up the collector's collection point. with the exception of the costs of establishing a collection point for the solar power plant operator (Section §19 para. 1, letter zc) Act No. 586/1992 Coll.).
- The company may reduce the tax base by the value of the gift for environmental purposes (the minimum value is CZK 2,000 and a maximum of 10% can be deducted from the tax base) (Section §20, para. 8 of Act No. 586/1992 Coll.).

THIRTH PART - COMMON PROVISIONS

- Expenditure on achieving, maintaining and securing income can be deducted from income to determine tax bases (Section §24 Act No. 586/1992 Coll.). Circulating costs may be part of them. For example, expenses (costs) for the operation of one's own environmental protection facility in accordance with special regulations are tax deductible.
- Tax depreciation – a wastewater treatment plants, a raw material treatment plants outside buildings are included in the 5th depreciation group (Annex No. 1 to Act 586/1992 Coll.) The depreciation period lasts 30 years. These assets can be depreciated more conveniently than usual. This law allows you to increase depreciation by 15 or 20% of the entry price of assets in the first year of depreciation. Theoretically, higher depreciation reduces the amount of tax in a given year. The amount of tax depreciation is lower and the tax is higher in subsequent years.

- Expenditure on research and development can reduce the corporate tax base. The area of research and development is not specified in the Income Tax Act. It can be used in the field of processing of secondary raw materials (Section § 34 of Act No. 586/1992 Coll.).
- Companies that employ people with altered working ability can use the tax rebate. This discount can be used by companies or plants where secondary raw materials are processed. (Section §35 of Act No. 586/1992 Coll.).

TRANSITIONAL AND FINAL PROVISIONS

- The granted exemption of income from the operation of small hydropower plants, wind power plants, solar and geothermal energy sources and biogas plants from the income tax of the population continues even if the law has changed. This applies until the expiry of the period for which this income is covered by the exemption. If the operation of small hydropower plants, for which the income is exempt, exceeds the limit of 200,000 kWh of energy produced per year, only income from energy produced above this limit is subject to the tax. If the exemption has been applied to a specific establishment under the previous personal income tax laws (i.e. on the basis of Act No. 145/1961 Coll., Income Tax of the population, and according to Act No. 389/1990 Coll., Income Tax of the population) this income cannot be exempted again under the new Act (Section § 4 par. e), Act No. 586/1992 Coll.). (Section §40, Paragraph 3 of Act No. 586/1992 Coll.)

2.4 DISCUSSION ON THE MEASURES OF THE INCOME TAX ACT A

Companies that use the circular economy could be able to reduce direct taxes more than others. This could be done, for example, by an item deductible from the tax base. Not every company can afford the secondary processing of raw materials for various reasons. Firms without circulation should be able to pass on waste to other firms for which waste treatment is the main activity. However, we can imagine that these companies will be subsidized from public budgets.
Regarding the third part, we can say that when the depreciation increases in the first year, the depreciation amounts change at the time of depreciation. Depreciation period is not shortened. However, it could be more effective. It can be assumed that shortening the depreciation period would increase depreciation in all years of depreciation.

2.5 RESERVES ACT

Act of the Czech Republic No. 593/1992 Coll., On reserves for determining the income tax base, as amended, contains provisions on the reserve for the management of electrical waste from solar panels placed on the market until 1st January 2013. The creation of a reserve is a tax deductible expense for businessmen. The conditions of this law must be met. An enterprise can continue to create reserves even after entering bankruptcy proceedings, the liquidation of the company or leasing company (Section §11a of Act no. 593/1992 Coll.).

2.5.1 DISCUSSION ON THE MEASURES OF THE RESERVES ACT

Creating a tax reserve for the introduction or repair of equipment ensuring circulatory management in the company could be a suitable solution for companies. Basically, a richer company with higher profits and conscious owners can afford secondary waste treatment.
At the same time, the technology of secondary waste treatment is evolving, the supply and demand of secondary raw materials are changing, preferences and subsidy policies within the state and internationally are also changing. We can say that the secondary processing of materials can be very expensive for some companies. Therefore, it is necessary for companies to be able to create enough funds themselves to maintain circular economy.

2.6 TAX

2.6.1 DIRECT MEASURES

Owners or tenants of real estate (buildings, apartments and land) are real estate taxpayers. The tax is set in accordance with the Act of the Czech National Council No. 338/1992 Coll., On Real Estate Tax, as amended. The law divides this tax into land tax and building tax. The current measures in this law relate to environmental protection.

Land tax

Lands of protective forests and water areas where fish are not kept intensively are exempt from this taxation (Section §2 of Act No. 338/1992 Coll.). This measure protects the environment.
However, some tax exemptions relate directly to the circular economy. These are, for example, land for waste treatment, remediation and reclamation of landfills and other land, contaminated land, dams, land for groundwater treatment, wastewater

treatment, sorting, collection and disposal of waste and others (Section §4 of Act No 338/1992 Coll.).

Building tax

The tax exemption applies to selected buildings for the circular economy. The purpose of the constructions is the same as for the liberated plots described above. The exemption is applied in the tax return. The municipality can partially free buildings in industrial zones. (Section §9 of Act No. 338/1992 Coll.).

2.7 ROAD TAX

2.7.1 DIRECT MEASURES

Road tax is imposed on taxpayers pursuant to Act of the Czech National Council No. 16/1993 Coll., On road tax, as amended. Road motor vehicles and trailers registered in the Czech Republic, used for self-employment (business) are subject to tax. Environmental protection affects the amount of tax. Environmentally friendly vehicles may be tax-exempt or tax-free. Vehicles with hybrid or electric drive are completely exempt from the tax. The tax rebate is provided in freight transport. This is the combination of road transport and rail or shipping.

DISCUSSION ON MEASURES OF THE ROAD TAX ACT

The road tax leads residents to use newer cars with more environmentally friendly operation. This tax supports the reduction of CO2 production in transport. This contributes to environmental protection.

2.8 VALUE ADDED TAX

2.8.1 DIRECT MEASURES

Value added tax (VAT) in the Czech Republic is determined by Act No. 235/2004 Coll., On value added tax, as amended. VAT payers manage goods and services as well as packaging material. The management of backed-up returnable packaging is part of the activities of many VAT payers. Returnable packaging is delivered to traders without value added tax. Returnable packaging must be registered in the company separately. They increase the administrative burden on the company.
Payers who purchase raw materials for secondary processing use the VAT reverse charge regime. The purchase of secondary raw materials by the payer is subject to a rate of 21% VAT. The VAT payer is entitled to a deduction. The amount of tax has

no impact on the taxpayer in the tax return. The tax deducted minus the claim is equal to zero.

DISCUSSION ON THE MEASURES OF THE VALUE TO TAX ACT

Consumers return backed-up packaging. Then the paid deposit is returned to them. The motivation for returning the packaging may be its price. Some traders, VAT payers, manage returnable packaging, some do not. This increases the company's warehousing costs. Some VAT-paying traders are reluctant to buy some back-up packaging. The reason may be an administrative burden, lack of storage space, employees, etc.

2.9 EXCISE DUTIES

2.9.1 DIRECT MEASURES

Act No. 353/2003 Coll., On excise duties, as amended, regulates the tax on mineral oils, the tax on alcohol, beer, wine and intermediate products, tobacco products, heated tobacco products and raw tobacco. These taxes include environmental aspects as well.
Tax rates for mineral oils vary. Biofuels and green fuels are taxed at lower rates. Petroleum products are burdened with the highest rates (Section 45 of Act No. 353/2003 Coll.). Other taxes do not include measures that could be directly related to the circular economy.

DISCUSSION ON MEASURES OF THE EXCISE TAX ACT

Consumption is taxed here. The amount of tax depends on the amount of taxed goods consumed. Excise duties have an indirect link to the circular economy. The size of the tax rate makes it possible to reduce the consumption of various products. Tax rates are fixed for all products except cigarettes. Here, the amount of tax consists of a fixed part and 30% of the consumer price. Higher absolute consumption of products brings a higher tax regardless of the price (excluding cigarettes).

2.10 ENERGY TAXES

2.10.1 DIRECT MEASURES

Energy taxes in the concept of the Czech tax system represent a tax on natural gas and some other gases, a tax on solid fuels and a tax on electricity. These taxes are regulated by Act No. 261/2007 Coll., On the stabilization of public budgets, as amended.
The natural gas tax rate has been increasing in the Czech Republic in recent years. The use of natural gas, for example in domestic boiler rooms, for electricity generation, in metallurgical and mineralogical processes or for the propulsion of ships, is exempted. (Section §8, Art. LXXII of Act No. 261/2007 Coll.)
Solid fuels used for the production of electricity, heat in households, mineralogical and metallurgical processes are exempt from tax. (Section §8 Art. LXXIII of Act No. 261/2007 Coll.)
The electricity tax contains measures for environmental protection as well. Electricity produced in an environmentally friendly way with a production output of up to 30 kW is exempt. Electricity produced from solid fuels is subject to taxation at the electrical output of the installation above 2 MWh. The electricity produced by the means of transport is also exempt. In addition, the use of electricity for various technological purposes, to cover losses in the transmission system, rail transport, etc. is exempted. (Section §8, Art. LXXIV of Act No. 261/2007 Coll.)

DISCUSSION ON MEASURES OF THE ENERGY TAXES ACT

Energy taxes are imposed on goods supplied to final consumers. The exemption applies only to the chosen purpose of use or to the selected consumer. Again, these are consumption taxes. The higher the consumption, the higher the absolute amount of tax. Tax rates in the Czech Republic are fixed, specific, so higher taxation for one product is achieved by higher absolute consumption.

2.11 CONCLUSIONS

We separate environmental protection and the circular economy. Both subjects should be addressed by legislation in various areas of human activity, including national tax laws.
Environmental protection appears in tax laws in the Czech Republic. Direct measures were found for income taxes and consumption taxes. The Czech Republic is not far behind in this respect. These provisions need to be revised and adapted over time to meet existing environmental protection requirements.

The current tax system of the Czech Republic partially supports the circular economy. Some tax measures support it, but if the tax system is to support the circular economy more for it to function more significantly in practice, then the laws need to be adjusted more. It offers the following options for fulfilling Green Deal documents. First, it is possible to create new taxes and replace existing ones. Secondly, it is possible to adjust more existing taxes and create conditions for compliance with the mentioned documents. Another option is to change non-tax laws.

The tax system is constantly being updated. This is often difficult and confusing for citizens. Therefore, the possibility of the creation of additional taxes, which would tighten the conditions for the circular economy, seems to be problematic. Additional environmental taxes would make the system even more difficult. The cost of tax administration and the tax burden would increase in the country.

On the other hand, certain changes to the taxes already in place will not lead to such high tax administration costs. The question remains whether changes in the current tax system will really lead to the necessary behavior and whether it would not be more appropriate to introduce separate new environmental laws. Nevertheless, our results show that some taxes have the potential to affect and influence taxpayers in the field of circular economy and environmental protection.

We believe that businesses that are paid directly by companies can have the greatest impact on business. One of them is value added tax. It can have a relatively large potential to influence companies and sole traders to try their best to manage not only their own resources, but also natural resources. The potential of energy taxes from the point of view of the circular economy is also relatively high. Here, support for circular management can be directly embedded. We believe that educational pressure should be directed at producers and importers in the Czech Republic, not only on the part of taxation.

In fact, consumers bear the full tax burden, but some are more sensitive. This causes major changes in consumer behavior when changing taxes. We consider income tax and property taxation to be such taxes.

Changes in consumption taxes, ie excise and energy taxes, are not perceived as sensitively. However consumers respond to the level of selling price in the market. Nevertheless, these taxes should not place a disproportionate burden on consumers. In the case of consumers, it is necessary to look at the overall tax burden, not just individual taxes. This applies throughout Europe, not just in the Czech Republic. Educating consumers to protect the environment and the circular economy should avoid increasing the tax burden on citizens.

An important element of taxation is the distribution of tax revenue between the state and lower territorial units. This issue was not the subject of our article, but it is related to our topic. Cities and municipalities, ie lower self-governing units, should play an important role in the circular economy. In connection with taxation, it is also possible to address the question of whether the distribution of tax revenues in the case of the application of Green Deal documents was satisfactory for

municipalities. We believe that the circular economy will increase the financial needs of municipalities. Changing tax laws for the circular economy means providing municipalities with enough money for waste treatment.
Opinions and practices in the field of the environment and secondary processing of raw materials are evolving. As well as society, including its views and preferences. Taxes are also constantly evolving in response to changes in the environment and society. Green Deal in the European Union documents are part of this development.

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3 BUSINESS MODELS IN THE CIRCULAR ECONOMY

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3.1 INTRODUCTION

Traditional business models where an individual supplier offers a product to an individual customer and where the company purely focuses on increasing sales are no longer suitable for the economy of the 21st century (Currie et al., 2004; Tonelli &Cristoni, 2019). These models have led the world into an enormous waste production cycle and extreme shortages of resources (Oghazi & Mostaghel, 2018). The way to overcome the traditional linear economic model is a concept of the circular economy (CE), which is increasingly receiving attention in different domains, including business areas (Centobelli et al., 2020; Fraccascia et al., 2019). Business models can potentially influence production and consumption practices. They could help tackle environmental problems, such as limited resources, global warming, climate variability, or waste disposal by reducing resource throughput and increasing the cycling of products and materials (Tunn et al., 2019). The CE requires companies to design their circular business model (CBM) to move businesses toward decreases in waste, as well as the reuse, recycling, and retention of materials (Centobelli et al., 2020; Oghazi & Mostaghel, 2018; Tonelli & Cristoni, 2018. However, despite the increasing use, there are no clear cut, generally valid categories of circular business models, and no common understanding of the concept has been established (e.g., Nußholz, 2017; Lewandowski, 2016, Tonelli & Cristoni, 2019). The definition of a circular business model leaves sufficient room for interpretation. Some used definitions of circular business models are introduced in Table 1.

Table 1: Definitions of CBM

Author/Authors	Definition
Mentink, 2014	*"A circular business model is the rationale of how an organization creates, delivers, and captures value with and within closed material loops."*

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Oghazi & Mostaghel, 2018	*"The rationale of how an organization creates, delivers, and captures value with slowing, closing, or narrowing flows of the resource loops."*
Author/Authors	Definition
Linder & Williander, 2017	*"The conceptual logic for value creation is based on utilizing economic value retained in products after use in the production of new offerings."*
Lahti, Wincent & Parida, 2018	*"The model designed to create and capture value while helping achieve an ideal state of resource usage. "*

Source: Mentink, 2014; Oghazi & Mostaghel, 2018; Linder & Williander, 2017; Lahti, Wincent & Parida, 2018

According to authors Laubscher and Marinelli (2014) & Lewandowski (2016), we can identify six key areas for integration of the circular economy principles into the circular business models:

- Sales model;
- Product design/material composition;
- IT/data management;
- Supply loops;
- Strategic sourcing for own operations;
- HR/incentives.

Circular business models could be systematized according to the ReSOLVE framework. ReSOLVE proposes six circular economy-based business model development strategies (Jabbour et al., 2019; Ceptureanu et al., 2018).

Table 2: ReSOLVE framework of CBM

Classification Criteria	Explanation	Example(s)
Regenerate	• Shift to renewable energy and materials; • Locating a business in efficient buildings or in eco-industrial parks; • Using renewable energy.	• Eco-industrial Park; • Eco-Enterprise Center.
Share	• Maximize utilization of products; • Peer-to-peer sharing of privately owned products; • Public sharing of products.	• Car-sharing; • Bike-sharing; • Sport equipment-sharing; • Home-sharing .

Optimize	• Improve the performance and efficiency of products without changing products or technologies; • Internal collection; • Reuse; • Refurbishing; • Resale of used products.	• Nitech rechargeable batteries; • Outsourcing.
Loop	• Keep components and materials in closed loops and prioritize the inner ones; • Using supplies from material loops, bio-based- or fully recyclable.	• Anaerobic-digestion plants; • Furniture from scrap wood.
Virtualize	• Deliver utility virtually; • Shifting physical products, services, or processes to virtual.	• Online music or books; • Online shopping; • Fleets of autonomous vehicles.
Exchange	• Replace old materials with advanced renewable ones; • The new technology of production.	• 3D printing; • Electric engines.

Source: Lewandowski (2016); McKinsey(2016)

Various basic categories of the circular business model are mentioned in the literature. This chapter presents some general types of the CE business model that companies can pursue to implement CE principles:

- Servitization;
- Product Life Extension;
- Sharing Platform (e.g., Centobelli et al., 2020; Tonelli &Cristoni, 2019; Witjes & Lozano, 2016).

3.2 PRODUCT LIFE EXTENSION

As a result of rapid changes in consumer preferences, increasing market competition, obsolescence of products (technological, economical and psychological) the lifespan of products is reduced (Khan et al., 2020; Cooper, 2004). The consequences of these aspects have a negative influence on the economy and the environment. *"As environmental issues surrounding the depletion of the earth's resources are attracting increasing attention, the present system, in which industrial products are*

produced and consumed and then finally disposed, is regarded to increase environmental loads enormously" (Okumura et al., 2001). Product life extension is one possible strategy for dealing with these negative impacts of materials production, that are becoming critical (Bakker et al., 2014). The study Huisman et al. (2012) found out the decreasing lifespan (17% for screens, 10% for IT) within all appliances between 2000 and 2010, which is connected with waste flows. It is expected that municipal waste will be increasing to 2.2 billion tonnes by 2025. It causes serious environmental threats all around the world (Bhada-Tata & Hoornweg, 2012). The trend of over-consumption might be a hazard for future generations (Lienig & Bruemmer, 2017). Product life extension could be a crucial business model of CE for finding the solution to these negative impacts (Ertz et al., 2019). Otherway the demands on product life extension is not only environmental but also economical – e. g. prices of materials have increased, it could be legislation and regulation, market dynamics, resource intensity, etc. (Bakker et al., 2014). Longer lifetime of products is beneficial, the increasing of 1% of value added by economic activities connected with a longer lifetime of products would have a total impact of € 7.9 billion per year within the European economy (Montalvo et al.,2016).

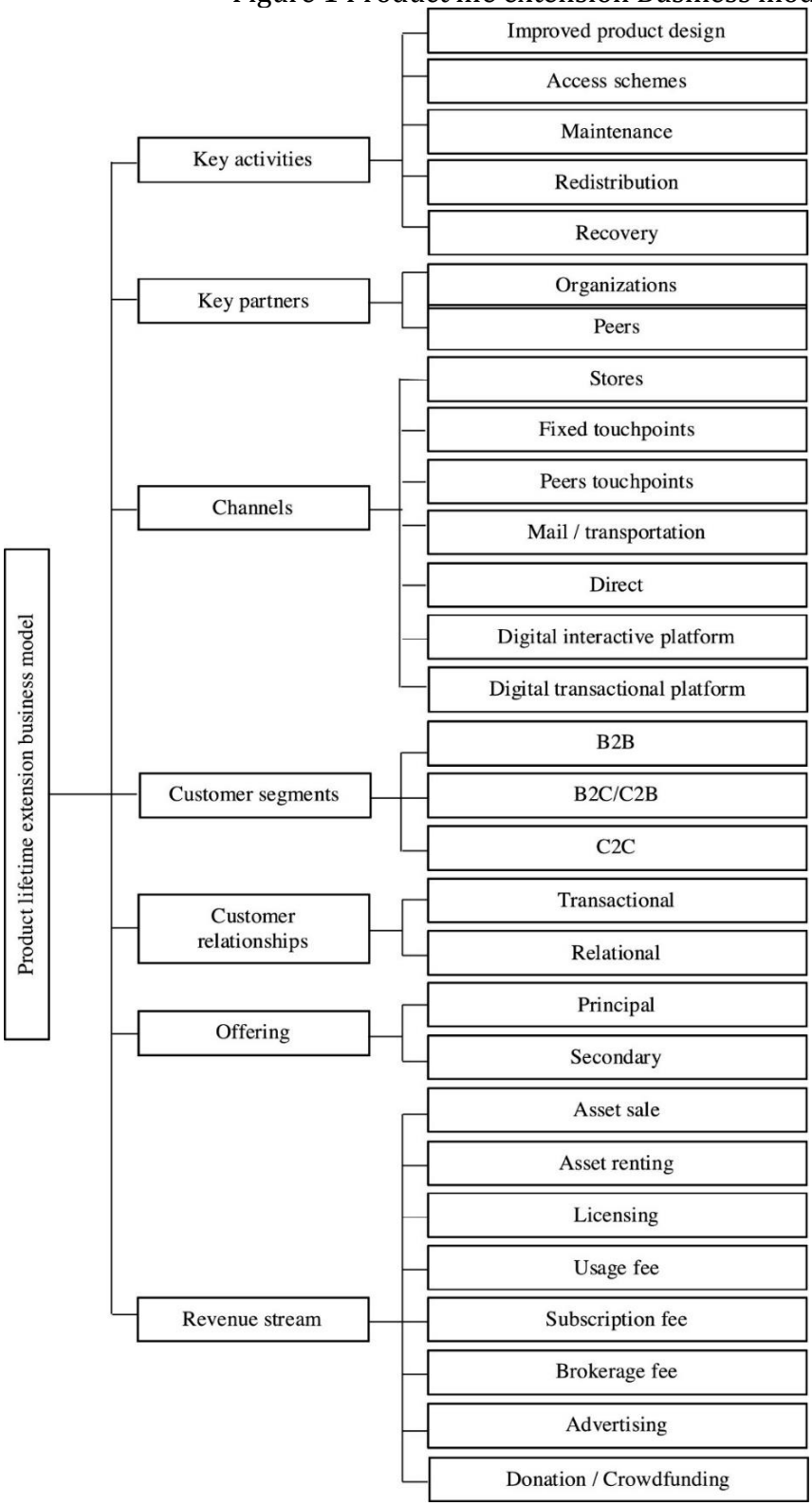
According to Stahel (2013), Nishijima et al. (2020), the product lifetime is a key component in the Circular economy. Product life extension (hereinafter PLE) is the concept of a product's lifespan and a slowdown of the flow of materials (Murikami et al., 2010; Khan et al., 2018) and it *"attempts to lengthen product life-spans, whether by improving intrinsic durability, influencing user behavior or promoting wider socio-cultural change"* (Cooper, 2016). It means prolonging the product life, refurbishment, and remanufacturing (Hatecher et al., 2011). Because for the Circular economy, it is really important to have "circular products". Circular products should be designed for trust, integrity, durability, compatibility, standardization, upgradability, adaptability, disassembly a reassembly (Silkstone, 2020; Den Hollander & Bakker, 2012). It exists a business model for product life extension, which you can see in Fig. 1. The model is divided into 7 categories/dimensions, and in every category, you can see the set of attributes. The model was created according to many research studies. Key activities represent the most important activities that the company has to do for the business model function. Key partners mean the network of partners and suppliers that support the business model. Channels are to process of communication with customers segments about the value proposition. Customer segments identify the aiming of different groups of people/organizations. Customer relationships describe the relationships a company with customer segments. Offering call value proposition describes the bundle of products and services that create value for a specific customer. The revenue stream presents the cash a company generates from each customer segment.

The length of a lifetime every product may be based on 'fast fashion' trend (obsolescence of fashion), it is related to the textile industry, mobile phones, etc. (Christopher et al., 2004). From the environmental point of the products, it is necessary to evaluate the environmental aspects of the product within all stages of the life

cycle (Ordoñez Duran et al., 2020). Lee & Suh (2008) divide the product life cycle into three basic stages:

- **Beginning of life** (BOL) – it takes the time from the design of a product to production stage;
- **Middle of life** (MOD)– it means the period of usage and maintenance stage;
- **End of life** (EOL) – it is the last recycling stage.

Figure 1 Product life extension Business model



Source: Ertz et al. (2019) 1

For every stage it is possible to recognize different PLE strategies:

- For the beginning of life, they are concentrated on design for durability, reliability, product attachment, ease of maintenance and repair, upgradability, disassembly, and reassembly.
- In the Middle of life of the product, we can use strategy product sharing, product reuse, preventative maintenance, predictive maintenance, refurbish, repair, midlife upgrade.
- At the end of life, we can remanufacture or remanufacture with an upgrade, part reuse or recycle (according to some studies - e.g., Den Hollander& Bakker (2012) recycling is not a strategy of PLE) (Khan et al., 2018; Den Hollander& Bakker, 2012; Bakker et al., 2014).

Beqiri & Jelonek (2018) highlight the four Rs of product life extension – **repair** (the process of restoring a product after damage), **reuse** (it covers all operations where a product is put back into service, essentially in the same form) **remanufacturing** (the process of recovering product and carrying out required restoration to return it), **recycling** (collecting the materials at the end of product life, which mainly reduce materials and energy inputs) (Flexner, 1987; Parker & Butler, 2007; Stahel, 2013). Wilhelm (2012) add strategies: to educate individuals about the problem of e-waste and to give them access to data on the design life of products and to increase value through information networks and secondary markets (e. g. eBay). Mainly last strategies are really important from the marketing perspective because the study of Govindan & Hasanagic (2018) shown that customers find products with PLE less attractive, and Vermunt et al. (2019) found out that market barriers are the most significant barrier of the business model of PLE.

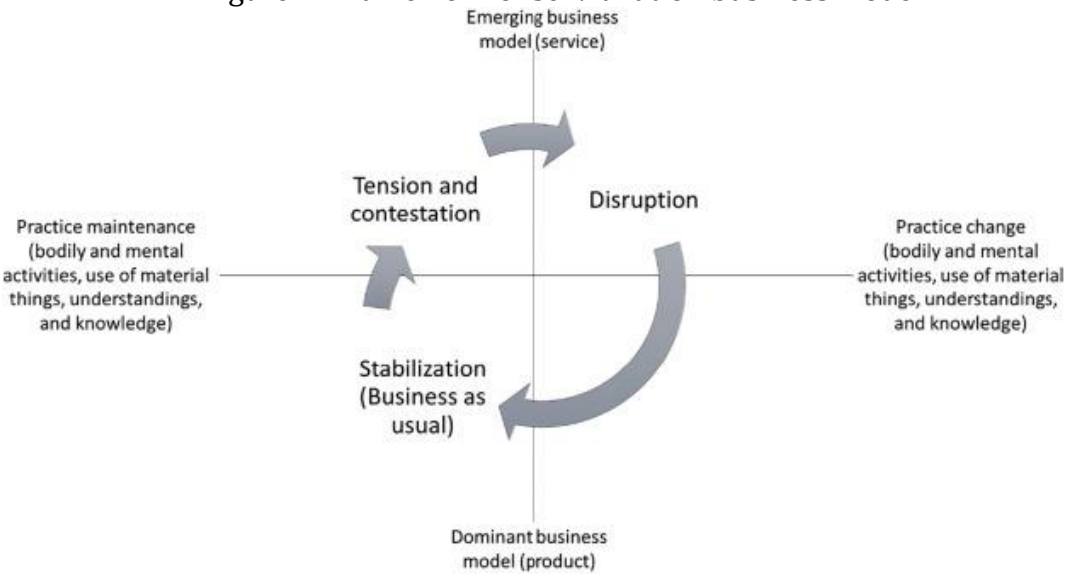
3.3 SERVITIZATION

The concept servitization was used to describe the idea of producers, wholesalers, and retailers, reducing their tangible portfolio in favor of an intangible one (Pinto et al., 2019). This term was coined by authors Vandermerwe a Rada (1988) as the efforts among B2B producers to develop new services to support their traditional product-based offerings. Their early research of servitization was largely conceptual, and subsequently, extensive research and literature have grown about this topic (Spring & Araujo, 2017). Servitization is seen as a reaction to growing and changing consumer demands and increasing commoditization of products (Kühl at al., 2018). Servitization brings product functionality (Martinez at al., 2010), a competitive advantage (Robinson, Clarke-Hill, & Clarkson, 2002), organizational culture (Grönroos, 1989), sophisticated services, and longer-lasting customer relationships (Oliva & Kallenberg, 2003).

According to Tonelli &Cristoni (2019), the way from the typical transaction-based system towards a service-based system implies the servitization business model. Modern enterprises adopt the servitization business model in either the stages of

pre-sale, sale or post-sale. It concerns areas such as trials, demonstrations, custom design, installation, training, support, and warranty (Pinto et al., 2019). In the past decade, a significant number of enterprises have started to consider the servitization business model due to the development of technological innovations (e.g., phone applications, sensors, Internet of Things) that make the servitization cheaper and easier to implement (Tonelli &Cristoni, 2019).

Figure 2: Framework of servitization business model



Source: Palo, Åkesson, & Löfberg (2019)

According to de Estarrona et al. (2019), the process of servitization has been acknowledged as one possible enabling factor of the circular economy into companies. The main subset of the servitization for the CE is the Product-service systems (PSS) characterized by long-term contact between producers and customers (Armstrong et al., 2015). There are three categories of PSS:

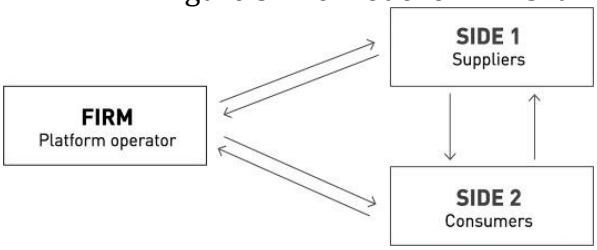
- **Product-oriented services** include customers who own the asset but who have decided to outsource maintenance (Annarelli, Battistella, & Nonino, 2020;). This category requires technical knowledge of the basic product, such as engineering skills, as well as knowledge of product architecture and his functioning (Visnjic, Ringov, & Arts, 2019).
- **Use-oriented services** are services when producers sell the utility or accessibility of products without transferring the ownership to customers (e.g., leasing, renting, and sharing). This category of PSS represents a more significant opportunity for meaningful environmental impact reduction (Van Ostaeyen, 2014; Emili, Ceschin, & Harrison, 2016).
- **Result-oriented services** focus on the results needed by the client (e.g., selling printed documents rather than printers). This category of PSS represents the highest level of service content, with the premise of the producer

taking responsibility for the entire product life cycle (Maaruf, & Mohamed Abdi,2017; Reim, Parida, & Örtqvist, 2015).

3.4 SHARING PLATFORM SUCH A BUSINESS MODEL

The sharing platform is a key business model of sharing economy, which is a building block for transitions to sustainability (Ritter & Schanz, 2019). The platform is easier and more effective, mainly due to digital technologies like apps (Piscicelli et al., 2018), it has lower cost and higher utility (Möhlmann, 2015). Sharing platform means redistribution, better capacity use, change of consumption patterns or digitalization of consumption like secondhand, freecycle, sharing cars, Netflix even Spotify, community gardens, food swaps, etc. (Ritter & Schanz, 2019). Many companies changed their business models from traditional business models to sharing platforms. Companies implementing sharing business models bring environmental (reduction in emissions), economic (increasing employment) benefits (Cannon & Summers, 2014). On the other side, there are many barriers and problematic points – low control over service quality, high cost of developing two market sides, and unexpected changes in the legal environment (Täuscher & Kietzmann, 2017).
The sharing business model is based on the related actors – consumers (peers), business, and government. Most attention is given to community markets (peer-to-peer9 relations on both sides – demand/supply (Frenken & Schor, 2017). The triadic business model for P2P platform (Fig. 2) includes a platform operator and two customer groups - suppliers and consumers (Piscicelli et al., 2018), the model is two market sides. Peer customers will pay to acquire resources shared by other peers via a platform (Tussyadiah, 2016). For sharing platforms, the main sectors are accommodation, food, utility, car and ride-sharing, peer-to-peer employment markets, and peer-to-peer platforms for sharing resources (Roh, 2016).

Figure 3 The model of P2P sharing platform (triadic model)



Source: Piscicelli et al. (2018)

According to Ertz et al. (2016), Ritter & Schanz (2019); Bardhi and Eckhardt (2012); Barbu et al. (2018) it might recognize crucial business models for sharing platform:

[9] P2P

a) Singular Transaction Models - dyadic relationships between supply and demand, with a utility-bound revenue stream (taxi companies, cinemas, secondhand). Customers are attracted via prices, logos, brands.
b) Subscription-Based Models - dyadic relationships between supply and demand with utility-unbound revenue streams (Netflix, Zipcar). Relationships are based on that ensure a certain amount of product/unlimited use of a defined product/an unlimited amount of a service by one supplier in a given timespan.
c) Commission-Based Platforms - triadic relationships amongst providers, intermediaries, and consumers with a utility-bound revenue stream (Uber, Airbnb, E-bay, Booking).
d) Unlimited Platforms - triadic relationships between providers, intermediary, and consumers with a utility-unbound revenue stream (Wikipedia).
e) Access-based business model – the model of surplus capacity. The consumer, instead of buying the product available, it will access when he needs it through an online platform.
f) Marketplace/platform economy - the platform where customer relationships are, in most cases, automated. The operator of the marketplace platform succeeds in facilitating access to transactions (Airbnb).
g) On-demand service provider - the users require specific services to be provided by other persons or by specialized companies.
The sharing platform is becoming favorite mainly within the sector of accommodation (Mao et al., 2020) and sharing cars (Yun et al., 2020) or bikes (van Waes et al., 2018).

3.5 CONCLUSION

The chapter presented business models for the Circular economy, that might be implemented by companies for effectiveness and acceptance of principles of CE. The business models are a reaction to global problems and environmental challenges. The important main side of these models is their environmental impact and value, but they also highlight the economic point of view (Tonelli & Cristoni, 2018). For the environmental evaluation of a business model for the Circular economy is possible to use the environmental value proposition (see research Manninen et al., 2020): Table 1 shows a basic overview of different models and their comparison.

Table 3 Comparison of the business model for Circular economy

Business Models	Product life extension	Servitization	Sharing platform
Definitions	It lengths product life-spans.	The transformational process whereby an enterprise shifts from a product-oriented to a service-oriented business model.	It means redistribution, change of consumption patterns, or digitalization of consumption.
Benefits	Cost-effectiveness; The sustainability of natural sources; Economic impacts.	Sophisticated services; Longer-lasting customer relationships; Improved financial stability; Greater profitability; Improved Commercial Resilience; Environmental Benefits	Lower cost; The higher utility of products; Better capacity use; Environmental and economic benefits.
Barriers	Fashion trends; Less attractiveness of these products; Obsolesce of the products.	Hidden costs; High investments; Customers' lack of acceptance and cooperation	Low control over service quality; High cost of developing two market sides; Unexpected changes in the legal environment.

Business models of the Circular economy might bring companies new segments of consumers, higher customer loyalty, even more effectivity within resource management. For maximization impact of principles Circular economy, it is necessary to engage companies, just cooperation between universities and the companies might be crucial for the implementation of these business models.

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4 SUSTAINABLE DEVELOMPENT THROUGH THE CIRCULAR ECONOMY IN THE SOCIAL AND TRANSPORT CONTEXT

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Abstract: In line with the strategy of sustainable development, the importance of the integration of the circular and social economy will be accelerated. With the onset of the Industry 4.0 era, one can expect an accelerated depreciation of technological equipment and a difficult ability to adapt some groups of the population, but especially the economically active population, to new innovation trends. The environmental aspects of these trends, often traffic-intensive, are therefore associated with emissions and pollution of air, water, or with not entirely sustainable non-productive land use. The circular economy thus offers a solution to global sustainability by moving from linearly controlled flows in the economy to a better use of existing, especially non-renewable, resources.

Keywords: sustainability, circular economy, social and environmental dimension, traffic flows

4.1 INTRODUCTION

The development of society and the demands to satisfy needs have necessitated greater cooperation, organization and management of activities that lead to the production of goods and services. Many entities are involved in the production of goods and the provision of services. With the growing division of labor, cooperation

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and specialization, the need for relocation grows. The physical movement of products from the place where they are manufactured to the place of their consumption is ensured by transport. Transport serves as a link between production and consumption, as well as between individual geographical areas and regions. In addition to products, people and messages are also transported.

Time and place are important market factors. Moving a product in space increases the value of the moved product, which is called the benefit of space. In addition to the benefits of the place, the benefits of time are also associated with transport. The speed and reliability of transport affect the costs and revenues of the business. However, the importance of transport is not only in relocating products for final or production consumption. Transport affects all areas of human activity. It affects the building of industry and trade networks, the growth of demand for goods, it also makes it possible to reduce the price at the point of consumption and to open up even more distant, hitherto difficult to access markets. The population is supplied faster and more smoothly with perishable products. The development of transport supports the construction of large cities, the population of uninhabited areas rich in minerals, the development of the international division of labor and international relations. Transport also has an impact on the development of science and technology and on strengthening defense. For transport to have a positive effect, it must be fast, with a dense transport network, regular, safe, reliable, smooth, comfortable and must easily adapt to the requirements of carriers (transport users).

An efficient transport system is essential for a competitive economy, employment, prosperity, but also for accepting social and environmental considerations. The expected growth of freight transport will lead to increasing demands on the transport system, which will already, or in the near future, hit the limits of existing infrastructure. The starting point for addressing transport issues should be a discussion of the objectives to be achieved. Is there an interest in the most massive traffic flows, or is it interested in the cheapest possible traffic or transport services, or in the most achievable mobility? Probably the intersection of interests will be the interest in fast, cheap, safe, space-saving and environmentally friendly transport. But are these goals compatible with each other or are they contradictory? In connection with the social aspects, efforts can also be observed to eliminate exclusion through smooth mobility, not only in terms of the workforce. The effort to achieve partial goals is complicated, because decisions in the field of transport policy are taken at various levels - the republic as a whole, regions or individual municipalities.

Freight transport is a fast-growing transport segment and causes significant environmental pollution due to increasing transport distances and quantities - mainly due to particulate matter, nitrogen oxide and noise emissions. There are also two development trends associated with the functioning of transport, which amplify the adverse effects of freight transport. On the one hand, there is the effect of the structure of goods (the share of goods of smaller but higher value is growing),

which is often transported by trucks or planes. On the other hand, there is a logistical effect (eg just-in-time), which is associated with a high degree of flexibility and reliability, often with the use of freight transport.

Economics as a science (in the macroeconomic dimension) examines the functioning of the economy as a whole and at the same time analyzes (in the microeconomic dimension) the behavior of individual subjects. Transport and transport companies operate within the entire economy and at individual territorial-administrative levels. The peculiarities of economic theory in transport are dealt with in applied economics of transport. It focuses on the economic relations between the transport sector and the sectors of the national economy and society, on the relations between individual modes of transport and competition between them, and on the relations within transport companies and the relations between the transport sector and the environment, including the impact of transport on public health.

4.2 INNOVATION OF APPLIED INTEGRATION OF CIRCULAR AND SOCIAL ECONOMY

Ecological modernization has been used in recent years as a continuation of the developmental and structural process of change in modern society. It cannot be overlooked that both productive and destructive forces have increased in the process of modernization, just as it cannot be overlooked that, along with the problems, the possibilities for solving them have also increased. The dynamics of modern society lie not only in the permanent emergence of problems, conflicts and crises, but also in their permanent overcoming and solution. At the same time, this society is able to make corrections on its own, has the ability to own a large capacity for readaptation to the changes it causes, and this growing capacity is part of the modernization process (Prittwitz, 1990 & Huber, 1993). In the spirit of this philosophy, the concepts of circular economics have been developing since the 1980s. In essence, it is an economy built from social systems of production - consumption maximizing the produced service from the linear flow of material and energy permeability between nature, society and (again) nature. This is achieved through the use of cyclical material flows, renewable energy sources and cascade-type energy flows. A successful circular economy contributes to all major aspects of sustainable development (ecological, economic and social). This also limits the permeability of streams to a level tolerable by nature, using ecosystem cycles in the economic cycle with respect to their natural rate of reproduction. And although consideration of environmental aspects seems to be a new phenomenon, various platforms of circularity have been in place for several decades. A comparison of the circular economy and the ecocycle between 1990 and 2010 in Sweden showed, among other things, that it is the state and the producers responsible for creating a closed material loop based on a fair distribution of resources (Johansson, N., & Henriksson, M., 2020).

The circular economy needs to improve institutional support in order to exploit its potential in the context of sustainable growth trends, in particular through an

increasing share of reused resources (Ranta, V., Aarikka-Stenroos, L., Ritala, P., & Mäkinen, SJ, 2018). Not infrequently, it is also possible to encounter excessive simplification of the implementation of circular economy principles for solving sustainability issues, eg in connection with the consideration of unexpected consequences, interdisciplinarity, limits, but also social and ethical aspects. Although circular economics seems to be a suitable alternative to the linear model, there are often opinions that the social and human dimensions of circular economics are lacking (Inigo, EA, & Blok, V., 2019, Schröder, P., Lemille, A., & Desmond, P., 2020). At the same time, the actual consideration of these dimensions will be in line with the Millennium Development Goals.

In addition to ecological aspects, social aspects also enter the subject of interest, as a result of the aging of the population, which took on a completely new dimension during the 20th century. On the example of the Czech Republic, demographic aging is monitored by measuring the shares of age groups in the total population, on the basis of indices, ie comparative numbers (age index, load indices of the productive component) and by means of average age or median age. The share of the three main age groups in the population is most often monitored, which are defined according to the expected economic activity of the majority of persons of a given age. It is therefore a pre-productive component of the population, which is mostly stereotypically defined by the ages 0-14 (respectively. 0-19 years). The productive component of the population consists of persons aged 15-64 (respectively 20-64 years) and the age group of post-productive persons aged 65 and over (age group 65+). Based on the age categories divided in this way, the aging process of the population is interpreted by means of indicators in the form of average age and age index (number of persons aged 65 + per 100 children aged 0-14) of addiction index I. (number of children aged 0-14) per 100 persons aged 15-64), addiction index II. (number of persons aged 65 and over per 100 persons aged 15-64), and the economic burden index (number of children aged 0-19 and number of persons aged 65+ per 100 persons aged 20-59). The most commonly used characteristic in an international comparison is the proportion of people aged 65 and over in a given population.

The consequence of the innovations of Technologies 4.0 is the obvious disappearance of many existing professions and job positions, at the same time completely new job opportunities will be created and a mass renewal of technological equipment will take place. It is obvious that not all individuals will find employment as a result of these changes. People who will not be able to adapt to these technological changes will be particularly at risk (vulnerable). Here, a group of people with "special vulnerabilities" in the labor market will emerge, such as people with lower qualifications, before retirement (60+), with disabilities. 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 (as well as the European Union) expects significant macroeconomic impacts in the coming decades with an enormous burden on public finances. 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.

Indeed, issues of uncompetitive or non-profit-making activities remain relevant, often in connection with working conditions, the distribution and redistribution of wealth, and also with public policies that co-create differentiated rules for for-profit and non-profit-making activities. The social and solidarity economy should thus address the constraints on institutional conditions and economic efficiency. (Moreau, V., Sahakian, M., Van Griethuysen, P., & Vuille, F.; 2017)

The labor market will be confronted with an aging workforce as a reflection of the forthcoming demographic trends, in particular as a result of the declining 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 prepension age is often solved by early retirement (Leitmanová, I., 2000). The aging of the workforce has resulted in declining productivity, flexibility and creativity. The result can be lower economic performance, structural unemployment and a slower rate of innovation. 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.

For the above reasons, it is necessary to create a concept of economic and social policy to reduce the mentioned adverse effects, where the main priority is the employment of the above-mentioned particularly vulnerable people in the labor market. 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, waste treatment…), where work does not require higher skills and work. The interdependence of the circular and social economy is thus an important economic and social factor. The basis can be seen in respecting the principles of sustainable development and social responsibility of stakeholders - business, self-government, etc .. In this context, the circular economy is a space for employment of these people. Therefore, the tools of the circular economy are in integration with the social economy.

4.3 TRANSPORT SYSTEMS AS A SUPPORT FOR ECONOMIC DECISION-MAKING

Transport has its place in the national economy. In addition to the relocation of products and people, its dominant functions, it also performs other functions that support the growth of the national economy. These functions include stimulation, social stabilization, substitution and complementary functions. The need to relocate encourages the development of transport infrastructure. Investments in transport routes and means of transport are growing, which, according to the model of the investment multiplier, are spinning the economy and leading to its recovery. The social stabilization function of transport is to prioritize the maintenance of social peace over the rationalization of the transport system. Transport has a strong socio-political significance. This function of transport is manifested mainly in passenger transport, when, for example, the inhabitants of small municipalities protest against the disruption of railway and bus lines, which, despite subsidies, do not even cover the costs associated with them.

Transport replaces some activities. The most frequently mentioned activity, replaced by transport, is storage. When purchasing inputs in the "just-in-time" model, the warehouses are used only for insurance stocks. This eliminates storage costs to a minimum. The actual "storage" takes place in the premises of the means of transport during the transport of entrances while driving. Passenger transport replaces housing in large cities and enables living in the countryside. Without passenger transport, rural people would be detached from the outside world, finding it difficult to get to work, to school, to a doctor or for culture, and for more shopping. The complementary function of transport is related to material production. Transport transports production products to the consumer, who brings some benefits. Without shipping, products could not be purchased and therefore be useful.

There is a competition in the transport market like any other. Both individual modes of transport and carriers operating in the same mode of transport compete with each other. But the general substitutability and interchangeability of individual modes of transport do not apply here. The choice of means of transport and carrier subsequently affects the price of the goods, the accuracy of delivery and the condition of the goods at delivery. These factors are crucial for customer satisfaction. The choice of mode of transport depends on criteria that transport companies can often only partially influence. These criteria include legal criteria where, for example, the legislator prohibits driving at certain times, sets various environmental standards or issues regulations for the transport of dangerous goods, cost criteria such as freight, ancillary costs (tunnel tolls, tolls, customs duties etc.) and other logistical costs, infrastructure (road network, railways, storage and production sites, climate, population behavior, etc.) and performance criteria such as transport time, transport frequency, technical characteristics, flexibility, reliability and abi-

lity to connect with other modes of transport (see combined and multimodal transport). The choice between individual carriers is up to the customer, ie also the subjects doing business within the circular economy.

4.4 DECENTRALIZATION AS A CHALLENGE TO THE INTEGRATION TENDENCY OF THE CIRCULAR AND ECONOMY IN THE DEVELOPMENT OF TRANSPORT SYSTEMS

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 affiliation of the circular and social economy of territorial units, an innovative response to its ecological and social needs can be ensured. 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.

When we talk about decentralization, we can mean various areas of life, such as the decentralization of political power, the decentralization of production and economic processes, and the decentralization of institutions. The idea of decentralization dynamics in society is contained in technology-based ones (eg Toffler, 1980; Naisbitt, 1992). Many of environmentalists' arguments for decentralization relate to the pattern that the organization of biological systems represents for the organization of a promising human society. Spatial decentralization would weaken, in a radical point of view, the elimination of the control center, whose function would be replaced by spontaneous, uncontrolled cooperation between otherwise separate social units, as according to some authors corresponds to perfect natural functional principles in nature. They do not base their existence on centralization, but rather on territoriality. Perhaps the most common argument of those who refer to biological analogies is the principle of species diversity, diversity. Diversity in farming is often pointed out, but also other forms of cultural diversity of areas and small settlements. One of the basic features of decentralized forms of life is the greatest possible production and consumption self-sufficiency of the community. The radical notion of decentralization is often associated with the revitalization and reemergence of agricultural communities based on a large proportion of manual labor (Schumacher, 1975). Sometimes you can find the "horticultural type" of agricultural activity and the renaissance of local crafts. It is hard to deny that striving for more or less local self - sufficiency means a direct and highly rational benefit: reducing the burden of transport and the whole environmentally risky cultural configuration associated with it (roads, oil extraction, petrol stations, motels, car ma-

nufacturing, etc.). Small-scale local pollution can be more easily eliminated in natural cycles; Examples are composting, self-purification of water in domestic organic treatment plants, but also in small natural streams. Energy can be obtained from local sources. Losses from its long-distance transmission are eliminated. The same applies to the use of local raw material supplies for construction and other community needs. Illustrative are T. Wrench's words, which are formulated as guiding principles for a decentralized life: *"I will build and live on this piece of land. I will not speculate with the land. I will not leave this place. I will save energy and protect nature. I will grow more than twenty trees per acre. I will work with my neighbors on transport, with them in infrastructure, energy production, waste management, water use and the care of common land. I will build a house of my choice, but without water, electricity, sewerage, and a road system"* (Wrench, 1993).

It should 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). At the same time, small settlements lead to an increased sense of citizenship. It is easier to fulfill in them than in cities the idea of direct participatory democracy, which will guarantee the promotion of the interests of the inhabitants of the municipality, including interests of an ecological nature (Bookchin, 1992). A higher level of participation can be expected in the territorial unit, when it is not allowed for the municipality, city, region to be forced from the outside by decisions that would damage the regional natural environment and social climate. 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, so that 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.

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 in the context of transport systems, which from the "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 and social sphere. or an issue that system dynamics would not be able to capture and that could not be modeled and explored in this way.

4.5 CIRCULAR ECONOMY IN THE CONTEXT OF TRANSPORT SYSTEM TO SUPPORT THE TERRITORIAL UNIT

At the same time, the daily commuting of employees to work over long distances is not sustainable in the long run, and is in direct conflict with the principles of sustainable development of the territory. Everyday commuting, no matter what the distance, always increases the demands on transport services. Especially problematic is the daily commuting by car, with disproportionately higher demands on the capacity of roads and parking at the destination. The division of transport work between individual modes of transport to work can be different, it differs mainly according to the nature of the territory in which it takes place (urban space, rural space) and also according to the structure of employment. Daily commuting of employees to industrial zones or warehouses thus almost always increases the intensity of traffic, especially individual car traffic, and thus burdens the road network in the wider region and near its own industrial or warehouse zone (with all negative consequences such as traffic congestion on unsuitable capacity. sections of roads and intersections, noise and emissions from traffic, etc.), causes extraordinary demands on the capacity and organization of parking, increases the risk of traffic accidents. Daily commuting to industrial and warehousing zones also means a loss of time for commuters and increases the longer transport costs, but also employee fatigue, stress from the obligation to start a shift early and other negative psychosocial effects. In view of the above, it is appropriate to ask whether there are any thresholds for the daily commute, the exceeding of which can no longer be considered a long-term sustainable situation, which needs to be systematically addressed.

If the population within an acceptable commuting distance is not enough to satisfy the demand for employees, the option of moving employees to the immediate vicinity of the workplace is offered. It is necessary to enable such relocation with spatial planning tools by defining sufficient capacities of living areas. The risks associated with the spontaneous development of hostels can be reduced by regulating their construction, their coordinated construction or administration. In addition, however, another possible strategy is the purpose-built construction of employee housing, whether financed by the state, municipalities or the employer. In this context, another problem currently facing cultural sociology is growing in importance, and that is the depopulation of the countryside as a result of insufficient job opportunities in the place of residence.

Moreover, in the context of the theory of human capital and opportunity costs, it is clear that people with lower qualifications or disabilities, whose assessment on the labor market is at the minimum wage level, will prefer the social role of the unemployed to commuting. This can be seen as a potential risk of rising unemployment in some cities, towns and regions. Therefore, support for passenger transport from public sources to ensure the employment of these disadvantaged people would be completely ineffective.

Due to the important role of urban transport, energy consumption and greenhouse gas emissions play a crucial role in solving the effective so-called last-mile. "Bulk" delivery as a shared economy initiative is proving to be a possible tool for efficient "last mile" logistics, linking the conventional supply network with "bulk" delivery, as "last mile" logistics is the least efficient part of the supply chain and accounts for more than a quarter of costs deliveries, resp. delivery. The growing share of e-commerce thus makes it necessary to focus on supporting a large number of small supplies that require flexibility and a high level of service in both urban and rural areas (Guo, X., Jaramillo, YJL, Bloemhof-Ruwaard, J., & Claassen, GDH, 2019, Ranieri, L., Digiesi, S., Silvestri, B., & Roccotelli, M., 2018, Kin, B., Spoor, J., Verlinde, S., Macharis, C., & Van Woensel, T .; 2018).

For the above reasons, from the point of view of the economic, ecological and social effect, the development of integration tendencies of the circular and social economy appears. This 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). Energy intensity, in connection with the transport of goods and services, is not identical in the sub-segments of these processes. It is possible to find out different demands in terms of waste generation, infrastructure construction, packaging, passenger transport and freight transport. (Pålsson, H., Pettersson, F., & Hiselius, L. W.; 2017) found that higher energy consumption in transport was in conventional supply chains, just as the energy intensity of passenger transport generally outweighed the increase in energy intensity of freight transport following e-commerce.

For transport, the production of biomethane (biogas), which is identical in its properties to natural gas, can be ensured through applied technologies. A wide range of biodegradable materials can serve as a source for biogas production, ie anything that can be easily broken down by bacteria. Biogas can thus also be produced from expired food, livestock excrement, wastewater or from purposefully grown crops. The paradox is that biowaste is a very available raw material, which today is usually not processed in any way and ends up in landfills or incinerators, which can be considered a waste of valuable energy potential.

The principle of the technology consists in the fact that biogas is produced with the help of bacteria from food, leftover food or wastewater, which is, thanks to a special

technology, converted into so-called biomethane, which is identical in its properties to natural gas. 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 expired food, livestock excrement or from purposefully grown crops. The paradox is that biowaste is a very available raw material, which today is usually not processed in any way and ends up in landfills or incinerators, which we consider a waste of valuable potential.

Within the European Union, biomethane accounts for approximately 17% of the total volume of gas refueled in transport. Compared to conventional fuels, this saves on carbon dioxide emissions, and according to analyzes performed so far, biomethane is a fuel that has one of the lowest environmental impacts and therefore has an irreplaceable place in the future decarbonisation of transport. Biomethane produced from waste in a biogas plant thus solves the management of biowaste in municipalities and cities, which it transforms into renewable energy and clean fuel for transport.

Thanks to local production, it thus contributes to the circular economy and saves emissions both at the place of production and on transport routes. For example, from the annual production of 100,000 tons of biowaste, biomethane with a volume of 7.8 million m3 can be produced in the biomethane station, which will provide up to 78 gigawatt-hours of energy. The supply of this energy to the transport systems will ensure the year-round operation of a fleet of 147 cars and 573 trucks and the propulsion of 63 city buses. To develop the use of biomethane, it is only necessary to expand the network of existing natural gas filling stations, with approximately 1.3 million natural gas vehicles running in Europe in 2020.

4.6 CONCLUSION

Based on the above reasons, it can be stated that ecological arguments for decentralization of settlements are based on the idea of a higher degree of cooperation in practical human activities with ecological processes. In some cases, decentralization will bring with it a generally favorable change in values in various areas of life, especially through a conscious focus on the prosperity of nature. This is a bold statement, although there is no doubt that a closer coexistence with nature, dependence on it, greatly affects both human behavior and overall optics. The environmental benefits of decentralization are also associated with the belief in positive social and economic changes. A high proportion of manual agricultural and handcraft work means the creation of job opportunities on site. Accordingly, decentralization should fundamentally reduce or even eliminate unemployment. Few economists who have joined decentralization ideas are trying to find concrete ways to run self-sufficient small communities. They are considering a non-monetary exchange. In 1983, M. Linton designed the so-called local exchange trade (then the phenomenon of Local Exchange Trading System became common) and the first attempts were made to apply it, especially in Canada, Great Britain, Australia and

New Zealand. On this basis, there were 200 small groups around the world 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. 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.

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5 CIRCULAR ECONOMY IN TOURISM AND TRANSPORT SERVICES

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5.1 INTRODUCTION

Tourism is considered as one of the fastest developing industries in the world, and it is one of the most extraordinary socio-economic phenomena. Tourism belongs between the four largest world economic sectors, following fuels, chemicals and automobiles production.
Tourism, as an industry, approached significant importance in terms of generating income and jobs. (Arbulú, 2015). Tourism creates jobs, stimulates economic investment, increases foreign travel demand, increases security in the country, and makes it a reliable source of income for local people. An ill-conceived and poorly planned tourism development can erode the very qualities of the natural and human environments that attract visitors in the first place (Inskeep, 1991).

It is difficult, if not impossible, to formulate policies that guarantee that tourism can be maintained for a long time without severely impacting on the environment (Casagrandi & Rinaldi, 2002). According to Baros & Dávid (2007), with an increasing number of people participating in tourism, negative environmental consequences of tourism arise, such as resource usage, human behaviour in the visited destination, and pollution. It is clear that tourism depends on its environment and also has an impact on it, that it is very important to pay attention to sustainable tourism from environmental aspects. Tourism and environment can correspond to each other, and sustainable management of tourism can produce externalities on the environment (Patti & Messina 2020).

One of the challenges facing tourism development is to take care that tourism is available to all and ensure non-discrimination in this sector (Wysokińska, 2016). Tourism sustainability became an increasing concern in 1990s not only among practitioners (Martin, 1995, Hughes, 2004) but also among scholars and researchers – particularly as a follow to the so-called Brundtland report and the definition of the sustainable development in 1987 (e.g., Høyer, 2000; Tyrrell, & Johnston, 2008). The circular economy is intended as a model that is able to contribute to the tourism sustainability (Girard & Nocca 2017).

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5.2 SUISTAINABLE TOURISM

The concept of sustainability is defined, interpreted, and implemented differently according to different interest groups (individuals, stakeholders, and social groups). The term sustainable tourism has different significance for these interest groups. Meanings vary according to individual characteristics of interest groups (e.g., culture, education, organisation, etc.).

There are many definitions of sustainable tourism, but it looks like they are all connected to the definition of UNWTO (Lu & Nepal, 2009). The United Nations World Tourism Organization (UNWTO, 2005) defines term sustainable tourism as „*Tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment, and host communities*".

Sustainable tourism is increasingly widespread; not only customers´ demand for this sort of tourism is growing, but even suppliers are interested in developing the new green program. Governments are more and more trying to create policies with the goal to encourage sustainable tourism practices (Pamfilie et al., 2018).

UNWTO´s long term forecast expects 3.3% increase of international tourist arrivals worldwide from 2010 to 2030 and reaches 1.8 billion arrivals by 2030 (UNWTO, 2015a). This increase will be followed by several negative impacts, such as:

- increasing energy, water, disposable products consumption and CO_2 production rates,
- reduction of collaborators motivation and morality,
- commodisation of local culture instead of keeping its authenticity,
- local economic systems disruption.

For achieving sustainable tourism, it is essential to:

- identify dynamic attributes of planning processes and evaluation of components, agents and impacts that form its scope of operation,
- spread holistic and participative values across the organisational structure and culture,
- intensify interdisciplinary efforts of academics, managers, public institutions, and experts (Santos et al., 2016).

In 2015 was adopted the 2030 Agenda for Sustainable Development and there were set several Sustainable Development Goals:

- No poverty;
- Zero hunger;
- Good health and well-being;
- Quality education;
- Gender equality;

- Clean water and sanitation;
- Affordable and clean energy;
- Decent work and economic growth;
- Industry, innovation, and infrastructure;
- Reduced inequalities;
- Sustainable cities and communities;
- Responsible consumption and production;
- Climate action;
- Life below water;
- Life on land;
- Peace and justice;
- Partnership for the goals.

Tourism can directly or indirectly contribute to all of these goals. In particular, it has been included as targets in three of these goals:

1. Sustainable economic growth – tourism is one of the main forces of economic growth. In the present day, it provides for 1 in 11 jobs worldwide.
2. Sustainable production and consumption – a tourism sector adopting sustainable consumption and production practices may play an important role in accelerating the global change towards sustainability.
3. Sustainable use of ocean and marine resources – coastal and maritime tourism depends on healthy marine ecosystem. For tourism development is crucial that tourism is a part of Integrated Coastal Zone Management with aim to help conserve and preserve marine ecosystems and serve as a vehicle to promote a blue economy (UNWTO, 2015b).

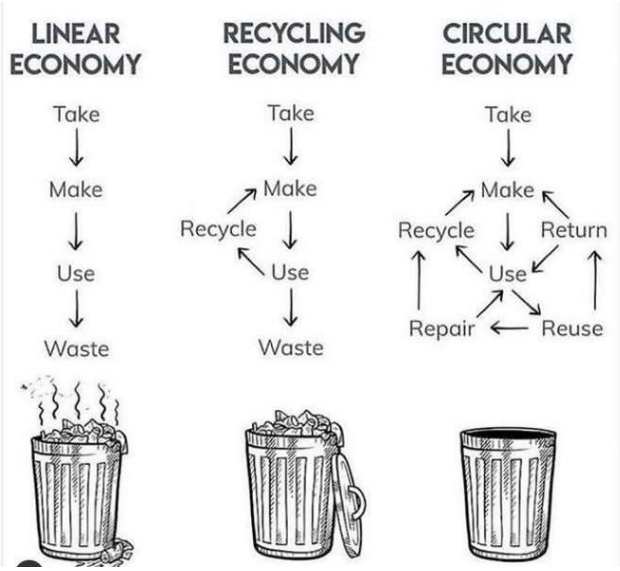
It is evident that customers' environmental consciousness is growing, and the increasing attention for sustainability is a clear trend in tourism product policy. The conscientious attitude is crucial for the dissemination of circular tourism (Vargas-Sánchez, 2018). Currently, there is still little enforcement or regulation, but looking forward to the tourism economy will be increasingly circular, there is no viable option (Nedyalkova, 2016).

5.3 CIRCULAR ECONOMY IN TOURISM

Circular economy is a relatively new, but inescapable, way to contribute to a more sustainable tourism industry (Vargas-Sánchez, 2018). Lopez (2019) claim that to survive the change in the tourism sector, companies need to adopt the new trends and consumers' desires caused by the emergence of sharing companies. Until recently, the economy was seen as linear. There was a trend to satisfy the need of customer with brand new products to give customers a feeling of exclusivity. Nevertheless, environmental, socio-demographic, and economic indicators raised the need to chase people's consumption and production habits. To solve this problem,

the new ways of thinking about the economy appeared, and the circular economy embodies most of them (see picture below).

Picture No. 1: Difference between linear, recycling, and circular economy.



Source: Lopez, 2019

Until now, it has not been given much attention in the tourism area to a possible connection to circular economy initiative and analysis. Sørensen, Bærenholdt, & Greve (2019) pointed out the circular economy research focuses primarily on how companies may apply circular economy production principles. Naydenov (2018) consider the connection with sustainable development that circular tourism can adjust tourism and sustainable resource management. It aims to produce goods and tourist services and at the same time to limit negative impacts on the environment, involving the consumption and waste of non-renewable energy resources.

In the next picture (picture No. 2) is summarized differences in main characteristics between the linear economy, the green (or sustainable) economy and the circular economy. The circular economy is split into two phases – the first phase is the circular economy 1.0, where are use basic circular elements and innovations. The circular economy 2.0 is a more systemic transition.

Picture No. 2: The linear, the green and 1

	Paradigm			
	Linear economy	**Sustainable/ green economy**	**The circular economy 1.0**	**The circular economy 2.0**
Motto	Take-make-use-dispose	Cradle-to-grave	Cradle-to-cradle	Spaceship earth
Economic value creation	Growth through extensive or intensive use of resources	Investments and innovations in sustainable technologies	Innovation of circular resource design at niche level	Competitive/Right positioning in an emerging circular resource regime
Tourism production economy	Increase number of tourists or the profit per guest	Strive to make business activities (environmentally, socially and economically) sustainable	Perceive all resource flows through tourism as opportunity for creating profitable circularised flows and value chains	Systemic transition and adaptation to a circular resource regime
Tourism consumption economy	Hedonistic, luxury experiences	Luxury 'backpack' experiences of sustainable places and communities.	Hotels and tourism services are 'living CE labs' for exploring relations between culture/daily life and environment	To be seen
Energy technologies	Fossils-based. Continuous improvement of technological capacity and efficiency.	Shift to sustainable, non-carbon-based energy sources. Optimise energy use and minimise consumption.	Shift to sustainable, non-carbon-based energy sources. Optimise energy use and minimise consumption.	Transition of all energy systems through regeneration into perpetually circular energy sources.
Waste	Dispose as quickly and cheaply as possible	Create as little waste as possible and dispose it as environmentally friendly as possible	Waste is a 'resource out of place'	Use systems of all natural resources are designed to be circular (perpetually reusable).
Water	Extract-use-clean-dispose in streams and oceans and let eco-system regenerate 'naturally'	Extract-use-clean as much as possible through water treatment plants. Dispose of rest in streams and oceans and let eco-system regenerate 'naturally'	In-house grey-water systems	Circular water systems installed in all regions, designed with separate black, grey and potable water systems.
Dominant business models	Production/supply of goods and services	Development and delivery of high-tech green solutions and advices	Maintenance, repair and design for durability in current technology products	Integration of circular technologies and flows of material and immaterial resources

Source: Manniche et al., 2018

Further explicit academic focus on the circular economy, particularly in the hospital industry, is required to be developed. Anyway, in connection to the circular economy in tourism and hospitality area, it is obvious that water and waste management as energy monitoring are more and more considered as main activities in an emerging strategy for sustainability management.

It takes suitable systems support for capture, processing analysis, and reporting of data and information (Joness &Winn, 2019). Tourism also denotes a significant determinant of waste generation (Arbulú et al. 2015). From the perspective of a circular economy, waste created by using this industry can be part of the urban processes in order to optimise the source utilisation rate. The concept of circular economy associated to tourism sector is essentially related to goods and services production without wasting and to the using of sharing platforms, like Airbnb (Girard & Nocca 2017).

5.4 CIRCULAR TOURISM

Rodríguez-Antón (2020) see the circular tourism as "an economic system that tries to make the tourism sector, in all its manifestations, capable of supporting the economic development of tourist destinations without putting the sustainability of the planet at risk by reducing the use of energy factors and natural resources, reusing the waste generated in the activities carried out, either as products directly or as components of other products, and using waste as direct raw material after of a recycling process". Both the circular economy and circular tourism are material flows on different levels that establish the circulation of materials in the life cycle of products. In terms of tourism, we consider similar consumption of resources and materials and generation of waste compared to those in households, but remember that this sort of resource consumption including also infrastructure and integrated services. Resource management takes into consideration that consumption in tourism is influenced by the various elements of the tourist destination, stakeholders, infrastructure, and environmental support. Considering and taking into account the possible role of municipalities (power of local communities) and Tourism 4.0 trends, the circular tourism model opportunities are seen in connection with sustainable:

- mobility,
- food,
- community and diverse types of tourist accommodation (see picture No. 3) (CircE, 2020).

Picture No. 3: Sector priorities – circu 1

1.	Mobility: sustainable forms and sharing economy	Digitalisation and new tech - Tourism 4.0	Role of municipalities
2.	Food reduction of food waste and short food-supply chains		
3.	Accommodation: efficient consumption of resources, energy and space, other types of consumption, diffused hotel		
4.	Waste: re-use of items/objects/equipment, new business models (rent-a-service, re-use centres)		

Source: CircE, 2020

Wolde (2016) comes with few suggestions for circular tourism:

- use sharing platforms (Vehicle ride sparing, short term accommodation rentals available labour and expertise, tools and equipment),
- circular procurement: use and buy products, materials and services that are sustainable, recycled, renewable, recyclable, biodegradable,
- circular construction,
- use performance based contracting (e.g. laundry),
- work together with your suppliers and clients,
- produce on demand.

5.5 CIRCULAR ECONOMY IN ACCOMMODATION

Tourism, in association with the circular economy, is basically related to goods and services production without wasting. It is also connected with using sharing platforms such as Airbnb or Uber. These platforms are part of the sharing economy, which differs from the circular economy. The sharing economy is based on exchange and sharing material goods and services (Naydenov, 2018).

The circular economy in connection with tourism accommodation covers many aspects, including the material flows:

Building and construction - circular models for this sector of building and construction within tourism are highly significant, and it is necessary to take it into account. This sector hides many opportunities within several areas such as industrialised production and 3D printing of building models, recycling of material or sharing, and multi-purposing buildings. Some of the opportunities are realised by today (Manniche et al., 2018). Unfortunately, according to Rizos et al. (2016) there are many barriers which enable the small and medium-sized business to utilise these opportunities. The barriers issue from a lack of:

- company environmental culture,

- capital,
- government support/effective legislation,
- information, administrative burden,
- technical and technological know-how,
- and lack of support from the supply and demand network.

Refurbishing and decorating – this sector contains material flows in furnishing (carpets, wallpapers, electric appliances and devices, sanitary facilities in hotels). It is suitable that the hospitality business considers buying remanufactured furniture, fixtures, and equipment (Manniche et al., 2018). One of the options is also eco-design business models, that are based on products from recycled and renewable resources, products using components that last longer or that are made with fewer resources. The products should be also easier to maintain, repair, upgrade, and recycle (EEA, 2006). There are also many reuse options, which need to be explored. Reusing is more effective than recycling because reusing keeps the material in its original form. The product can be used over and over again in the same way or for different purposes. Here are some examples of reusing:

- Reusing textiles - reuse damaged textiles as torn bedsheets, towels, aprons, children's linens, small covers, etc. Or replace single-use items with reusable items.
- Reusing containers - implementing reusable container systems for reducing freight costs.
- Reusing bottles and glasses - beverages can be in reused bottles rather than bottles made of material, which must be recycled. (Legrand et al., 2016).

Circular hotel operation services - in everyday hotels operating, the main material flows are energy, which is mainly for heating and electrical equipment, and water for cleaning, sanitation, and so on.

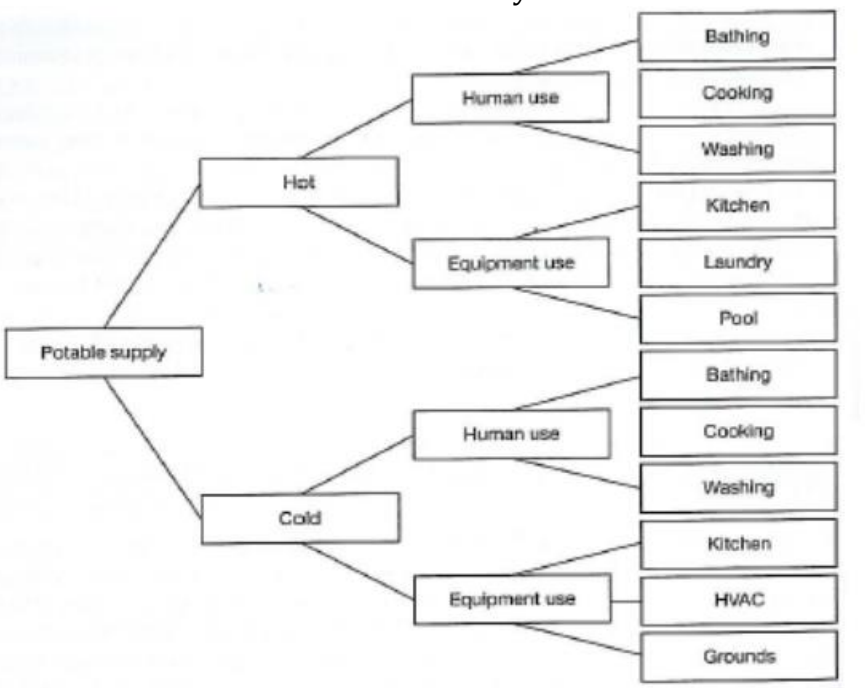
Energy – in different types of hotel is also the different use of energy. It depends on size, number of rooms, class and category, location, and on the services and activities offered to guests. According to the energy efficiency authorities in the United States, half of the electrical energy is usually used for air conditioning. About 20% energy is for lighting and 15% for hot water.
A hotel can be divided into three distinct zones for different purposes:

- The guest room area (bedrooms, bathrooms and showers, toilets) – individual spaces with different amount of energy.
- The public area (reception hall, lobby, bars, restaurants, meeting rooms, gyms, spas) – spaces with a high heat exchange with the outdoor (great loses).
- The service area (kitchens, offices, stores, laundry, staff facilities, machine rooms, other technical areas) – energy-intensive spaces, which require air handling as ventilation, cooling, or heating. (Sloan et al., 2013).

Energy can be saved by intelligent rooms, which are equipped with modern technologies and devices, which reduce power consumption. The next and more effective option is focused on the energy management program, which includes changing the approach to energy consumption and energy audit.

Water – the hotels often use potable water even in systems that do not require it (for example, for the heating, ventilation, air-conditioning). In the picture below, we can see different options, where hotels use potable water. In this area, we can see also many opportunities to save water.

Picture No. 4: Linear water system in a hotel



Source: Sloan et al., 2013

Circular practices in accommodation – accommodation providers should also avoid waste of time and resources, which arise by inefficient working space or task process (Manniche et al., 2018).
Circular systems are not working on 100% yet, so the environmental management system (EMS) also exists for reducing negative impacts caused by a company´s operations. The EMS has five principal objectives, which are to:

- identify and control the impact,
- respect regulations and the company´s environmental policy,
- implement a systematic approach,
- continually improve environmental performance,
- ensure transparent communication. (Sloan et al., 2013).

A completely new system must be carefully planned in individual parts, the change should be executed in stages, and it must be taken seriously. It is also useful to create teams and suggest specific approaches, such as how to make decisions and solve problems in a cradle-to-cradle approach (Legrand et al., 2016).

It is also important how guests perceive environmentally friendly accommodation and generally the circular economy in tourism. As shows studies of customer satisfaction with this problém (environmental sustainability), about 79-88% of surveyed guests evaluate the most widespread environmentally sustainable reuse program positively. Guests also appreciate hotels with a programme for saving water and energy. According to the study, management must choose between the best practices, which are already used and the new pro-environmental programmes that guests prefer. The current initiatives are mainly focused on reductions, but as has been said, green programs are well-rated by guests, and many of the green investments are now taken as the norm (Bruns-Smith et al., 2015).

Circular economy in hotel food services and spa & wellness – in the field of food services, it is possible to focus on biological material flow into food and beverages, material flows associated with food and food packaging, energy used in relation to transport, water and energy consumed for food preparation, washing and storage, technological kitchen appliances, cutlery, plates, and glasses. A big chapter that also needs to be improved is food waste, which also has an impact on the environment, for example, through greenhouse gases, landfill emissions or pressure on agricultural land due to high food production.
The primary material resources used in the spa sector pertain to the use of potable water for water-based wellness and therapeutic treatments. Spas also use different types of chemicals in water therapies treatments as well as a large number of creams, hair treatments, and cosmetics. Water consumption should be measured, sources indicated, and measures taken to reduce the total consumption. Spas can contribute to the more circular use of water by intervening in the water treatment cycle – concerning both the spa's use and reuse of potable and greywater as well as through redesigning laundry treatment and practices (Manniche et al., 2018).

5.6 CIRCULAR ECONOMY IN TRANSPORT

The transport is also a very important sector of the economy. For this reason, it should not be neglected. The transport and communications sector accounts for more than 10% of the European Union's GDP and employs around 8.8 million people. In developed countries, the share of transport and communications in total employment is between 6-8% (Maryáš, Vystoupil 2004).

Different approaches to studying the economic impact of transport on regional development have in common that they deal with transport as a process of passenger and freight transport. They pay attention to, for example, transport accessibility,

mobility, capacity and quality of infrastructure, or the characteristics of the vehicle fleet. Transport as an economic sector can be examined from two perspectives – macroeconomic (the impact of transport on the economy as a whole; emphasis on the share of transport in GDP and job creation) and microeconomic (the relationship of transport to other economic sectors) (Rodriguez et al., 2013).

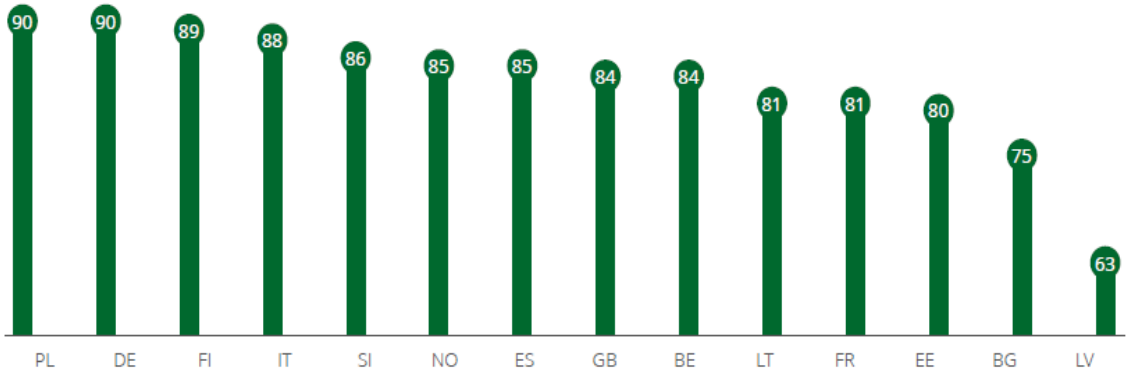
In tourism, transport is an inseparable component in which there are many opportunities for improvement and efficiency (Manniche et al., 2018). Tourism depends on the transport sector, and the demand referred to the tourism sector contributes to an increase in the transport sector (Girard & Nocca 2017). The transport can serve for a necessary transfer to the destination and back again, but also the movement in the city or a specific area. Tourism is still growing and is associated with high CO2 emissions and pollution, as travel is most often made by car or plane due to the greater distance to the destination. The travel component represents a challenge to the ecological sustainability of tourism. Reducing the negative impacts of tourism on the environment would mean the following basic options:

- fewer trips per year
- shorter distances travelled
- longer stays per trip
- travel with transport systems, which are not using fossil energy (Manniche et al., 2018).

In recent years, there has also been a general trend to travel shorter distances, supported by the rapid growth of low-cost international airlines connecting a growing number of (urban) destinations. In the destination, managers are to deal with the transport within the selected area/city. Cohen and Kietzmann describe business models for the sharing economy in transport, such as car sharing, bike sharing, or ridesharing. Peer-to-peer transport platforms offer an affordable, safe, and convenient alternative to traditional transport options. This type of transport is the best example of the impact of a shared economy. Users of these platforms can easily use mobile applications that connect drivers with customers. This makes it easy for consumers to meet their transport requirements, which is why this mode of transport is a great competitor. Some of the most important sharing economy transportation brands are Uber, Grab, Blablacar, Car2Go, Didi, and Lyft (Cohen & Kietzmann, 2014).

At present is produced a large amount of cars, which are little used. As can be seen in picture No. 5, their under-utilization is high in many EU countries.

Picture No. 5: Car underuse rates in the 1



Source: Goudin, 2016

In addition to car sharing, bicycle sharing, or "bikesharing", is also becoming increasingly popular. This type of sharing is already traditional and established in most large and developed cities. Still, it has had to be gradually refined into its current form, which in most respects fully corresponds to the most characteristic features of the shared economy. The essence of the new bikesharing is a bike with a GPS locator, thanks to which it is possible to monitor the position of the bikes in real time and perform online diagnostics of their use. Thanks to GPS technology, it is also possible to lock the bike after using it anywhere in the city, because another user can easily find it using a mobile application with an interactive map. This approach makes bicycles available throughout an entire city, and it minimizes the amount of infrastructure needed to operate a program. The bike-sharing has many benefits, especially ecological operation (Shaheen & Guzman, 2011).
The indicators to measure the degree of circularity in transport could be a number/share of zero-emission vehicles (Fufa, Wiik, Mellegård, & Andresen, 2019), the share of private/public vehicles trip in the tourist destinations or the number of car sharing rentals (Bonato, & Orsini, 2018).
The above-mentioned options are classified mainly in a shared economy. To use the circular economy, the transport system needs to be further developed. At present, the principles of the circular economy are not yet widely used in transport. This area is therefore open to new ideas and knowledge. A great opportunity is, for example, ecological fuel, the method of production of means of transport, a new transport system and more.

5.7 CONCLUSIONS

The concept of the circular economy appears in research and studies concerning tourism. This concept has still to develop in both a theoretical and practical way. Optimisation of resources in tourism is frequently studied in hospitality and transport. Yet, the area of the new transport systems or other areas bring a research opportunity. Resources management in other activities on the supply side

of tourism is to study in the context of the circular economy. Shared accommodation and shared transport studies within the circular economy remain underdeveloped. The main contribution of the tourists as the demand side in the tourism market to the implementation and success of the circular economy recently focused the attention of some researchers. The tourists' attitudes and behaviour show another field of study in circular tourism.

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6 CONTROLLING IN COMPANIES AFFECTED BY THE CIRCULAR ECONOMY

Miroslava Vlčková, Ing., Ph.D.[15], Barbora Jakubcová, Bc.[16]

ABSTRACT: The basic principles of circular economy include closing material flows in functional and endless cycles, drawing energy from renewable sources and producing such outputs that do not have a negative impact on natural ecosystems and human resources. This results in a very close link to controlling, within which there is not only short-term but also long-term planning of produced outputs, the need for resources and methods of performing outputs. This paper deals primarily with the analysis of controlling activities in companies that are closely related to the circular economy. The survey found that the circular economy and the implementation of controlling is in the relation. It was also found that these companies show significant differences in the cash flow indicator and also in the implementation of elements of both operational and strategic controlling.

6.1 INTRODUCTION

Circular economy is a system of material circulation for storing products in an industrial system and obtaining their maximum usability (Zink & Geyer, 2017). Indeed, economic growth is not only associated with increasing use of resources, but also with the use of non-renewable resources (Krausmann, 2009). The circular economy is thus beginning to be inflected not only in ecological but also in economic contexts, due to the fact that resources are drawn at the expense of future generations (Direct people, 2019). The aim is to innovate the whole chain of production, consumption, distribution and use of materials and energy. The first document in the Czech Republic, which creates a strategic framework for the effective use of secondary raw materials, is called "The Secondary Raw Materials Policy of the Czech Republic". The growing interest in the secondary raw materials industry is due to the ever-increasing prices of primary resources, their availability within

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the EU and especially to the fact that their use leads to significant material and energy savings (MPO, 2015).
On the other hand, controlling ensures that the organization's resources are used efficiently and effectively to achieve predetermined goals. Controlling verifies that everything is in the line with the organization's plans, guidelines and established policies. This coordination ensures effective using of organizational resources to achieve organizational plans. It measures the variations of actual power from the standard. It also identifies the causes of these variations and helps in taking corrective action (Cornel, & Lavinia-Maria, 2012). Controlling proposes systematic monitoring of enterprise resource potential not only in real time, but it is also included in the overall management system through strategic (predictive) management. It is used to identify potential business capabilities and to manage the potential of business resources (Čebukina, et al. 2013) and of course also in relation to the circular economy.

6.2 LITERATURE REVIEW

Indeed, the circular economy relies on the creation of closed production systems, where resources are reused and kept in a loop of production and utilization, which makes it possible to generate more value over the time (Urbinati et al., 2017). The analysis of production, production systems, degrees of automation and robotization are directly linked to controlling, where the controlling department first calculates the profitability and effectiveness of the investments made. The concept of accounting and controlling in relation to the circular economy has already been addressed by several authors. For example, Fischer-Kowalski et al. (2011) deal with the most modern ways of accounting for material flows in the whole economy and at the same time examine the reliability and uncertainty of data in the accounting for material flows. Cleveland et al. (2000), on the other hand, examine energy flow accounting, so-called energy accounting, and discuss suitable indicators for the analysis of ecological systems and the amount of energy put into the production. They found that companies with high environmental performance tend to be profitable. King & Lenox (2008) found evidence of a link between lower environmental pollution and higher financial value.
Wouterszoon Jasen et al. (2020) developed a life-cycle costing model that builds on the existing life-cycle costing techniques while being tailored to meet the requirements of circular economy products. This model should serve as a comprehensive method of assessing individual investments and projects and the benefits of their involvement in the system of circular economy. Franklin-Johnson, Figge & Cannig (2016) are also working on creating new indicators for assessing the environmental impacts associated with a cyclical economy. Their work analyses a new performance metric in the area of controlling, a lifetime indicator that measures the contribution to material retention based on the amount of time the resource is renewed and reused.

These performance indicators provide a tool that can be used at the managerial and organizational level in controlling. Janik & Ryszko (2019) analyse selected indicators in terms of controlling and evaluate their role in decision-making processes. They present a comprehensive analysis and comparison of circular economy indicators available at the micro level. The comparison of the circular economy indicators in their work should facilitate the selection of specific metrics depending on the needs of society and the possibilities of its use in controlling. Södersten, Wood & Wiedmann (2020) also present a new material utilization indicator, CAMF (capital-augmented material footprint), which includes all material embedded in capital assets. The results of their work support the need for comprehensive indicators in assessing the possibilities of reducing the impacts of material and goods consumption. Due to the constant reduction in the availability of resources, as well as the growing demand for access to well-being by consumers and all social groups, new economic models capable of improving resource efficiency and effectiveness are needed (Ghisellini, Ripa, & Ulgiati, 2018).

Vegter, van Hillegersberg & Olthaar (2020) analyse supply chain processes and performance goals in circular business models. They point out that when evaluating sustainable business strategies, it is important to be able to measure the actual performance of all supply chain processes. They also point to the fact that in order to measure actual performance in a circular business model, it is necessary to define what performance targets are pursued for all supply chain processes.

Khan et al. (2020) examine the behavior of organizations and obstacles to the introduction of a circular system, specifically in the production and consumption of plastics. The study shows that most organizations have an effort to participate in the circular system of production and consumables, but their efforts, often due to obstacles such as excessive costs and convenience of the established process, fail. The work therefore proposes some measures that try to overcome these obstacles and motivate organizations to participate in the system of circular economy.

Urbinati et al. (2020) examine and characterize special controlling procedures for creating and capturing value in circular business models and emphasize the need for the creation of data and recommendations for the implementation of these procedures. They show to managers who are willing to participate in the system of circular economy, the principles they can support in controlling in the field of the circulation of production and processing material of manufacturing companies.

Garcés-Ayerbe et al. (2019) are concerned with the transition to the circular economy system of European SMEs. They examine the practices of circular economy and analyse in detail the approach of European companies to the system of circular economy. It was found that the involvement of companies in the system of circular economy is a gradual process where individual measures must be implemented in companies gradually, from the initial control measures to the final preventive procedures. Furthermore, it was found that there are numerous obstacles that prevent even the most active companies in the system of circular economy from increasing their activities in this direction, such as various administrative processes, regulations etc. The companies that refuse to participate in the system perceive financing,

investment and cost-benefit barriers as the most important. When involving companies in the system of circular economy, therefore, a great deal of effort is needed on the part of companies. Last but not least, the regulation of the circular economy should also be improved, because many companies perceive as one of the biggest obstacles, and would therefore facilitate the implementation of their strategies.

6.3 CIRCULAR ECONOMY AND CONTROLLING IN THE CZECH REPUBLIC

Several authors deal with the topic of circular economy and controlling directly in the Czech Republic. For example, Seresova & Kaci (2020) deal with this issue and they point out that the possibilities of the environment in the production process of products are not infinite, and that in addition to profitability, companies should also monitor the impact of packaging materials on the environment. Therefore, they developed a new indicator, PtP (Packege-to-Product), which they subsequently tested. They used this indicator for four product groups and confirmed the fact that the values of the indicator differ significantly for different products, which points to the need to establish a uniform methodology for each product group. Vilamova et al. (2019) deal with the conditions for the introduction of a circular economy in the Czech Republic. In 2018, the European Commission issued a measure concerning the circular economy package. Within two years, by 2020, all EU Member States must transpose these measures into their national legislation. The authors deal with the evaluation of current conditions in the Czech Republic and in the areas affected by the already mentioned legislation. Slavik, Remr & Vejchodska (2018) also deals with problems with obstacles to the transition to a system of circular economy in the Czech Republic. The authors look at the topic of the Czech Republic's transition to a circular economy from a slightly different perspective. They mention the fact that people who have recycled in the past do so even after the changeover, but at the same time there are no significant positive changes for people who have ignored recycling. Thus, they focus more on the psychological aspect of the issue and the impact of social norms and the social environment in an effort to clarify the recycling behavior of the population. Šebestová and Sroka (2020) focus on small and medium-sized enterprises, which have a very important position in the economy and a positive attitude towards the goals of sustainable development. According to this, it is important to involve these companies in the goals of sustainable development, because they would convince customers that the purchase of their product is not only necessary to meet their needs, but it is necessary also for the environment. This would reduce waste and at the same time promote recycling.

6.4 CIRCULAR ECONOMY AND CONTROLLING IN THE EU

The Czech Republic, as a part of the circular economy, is also mentioned in articles that analyse the topic in the locality of Europe and the European Union, not only in the Czech Republic. Here, individual states are often compared when participating in the system of circular economy. Moreover, this is exactly the topic analysed by Marina & Parisa (2020), which compares the rate of transition of the 28 member states of the European Union to the circular economy. It also assesses the state of the circular economy in Europe. The main indicators here are the correlations between GDP and strategic elements, which the European Union has identified as obstacles for countries in the transition to a circular economy. It is these indicators that are indicative of the achieved level of transition to the circular economy system by the Member States of the European Union. The analysis identifies strategies that can be considered effective in engaging in the circular economy, and vice versa, which according to the authors have no significant influence in this process. Fitch-Roy, Benson & Monciardini (2020) also consider the transition of European countries to the system of circular economy. In their opinion, the circular economy cannot be applied to all countries out of nowhere. Thus, the point is that some of the measures that are included in the European Union's package for the transition to the circular system cannot be applied simply in all countries, but must already have some basis.

In the past, many policies have been highlighted that have sought to intervene in the environment, but only few of them have succeeded. It was considered the possibilities and consequences of circular economy policy and its effectiveness in the countries of the European Union. Halkos & Petrou (2019) examine the energy sector and the possibility of energy recovery from waste in the 28 countries of the European Union. There is evaluated individual countries based on effectiveness scores. Efficiency is expressed through data envelopment analysis (DEA), which works with the given inputs and outputs obtained through controlling. The results of the work point to the fact that in the first years included in the analysis, most of the surveyed countries have a stable efficiency score, only a few countries record improving scores, on the contrary, after 2012 the score gradually deteriorates in most of the surveyed countries. Tausova et al. (2019) focus on municipal waste and their subsequent recycling in the countries of the European Union. They mention the fact that ever-increasing resource consumption is too burdensome for the environment. Thanks to this fact, it is necessary to pay more attention to the circular economy. With regard to municipal waste, which is an eternally debated issue and we are all increasingly feeling the need to do something about it, the European Union is trying to tackle these problems precisely through the circular economy and the mandatory involvement of the member states in this process.

6.5 METHODOLOGY

The aim of the chapter is to analyse controlling data obtained from 245 companies from the Czech Republic and their relationship to 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, subsequently, in 2020, data from 245 companies were obtained with a return of almost 2 %.

The enterprises were divided according to implementation of controlling and implementation of elements of circular economy for research purposes. Subsequently, the individual relationships of these factors 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. We test 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 $U_1 + U_2 = n_1 n_2$.

At the same time, Fisher´s exact test was used to evaluate individual relationships between factors. The tested statistics, where there are two independent selections from alternative distributions, the first has the range n1= a+c and comes from the distribution A (ϑ1), the second has the range n2= b+d and comes from the distribution A (ϑ2). We test the hypothesis H0: ϑ1 - ϑ2 = 0 against the bilateral alternative. Tested statistics (Devore, 2015) are asymptotically driven by the distribution of N (0, 1). M* represents the weighted average of the sample averages. The critical field has a shape (Walker, 2010):

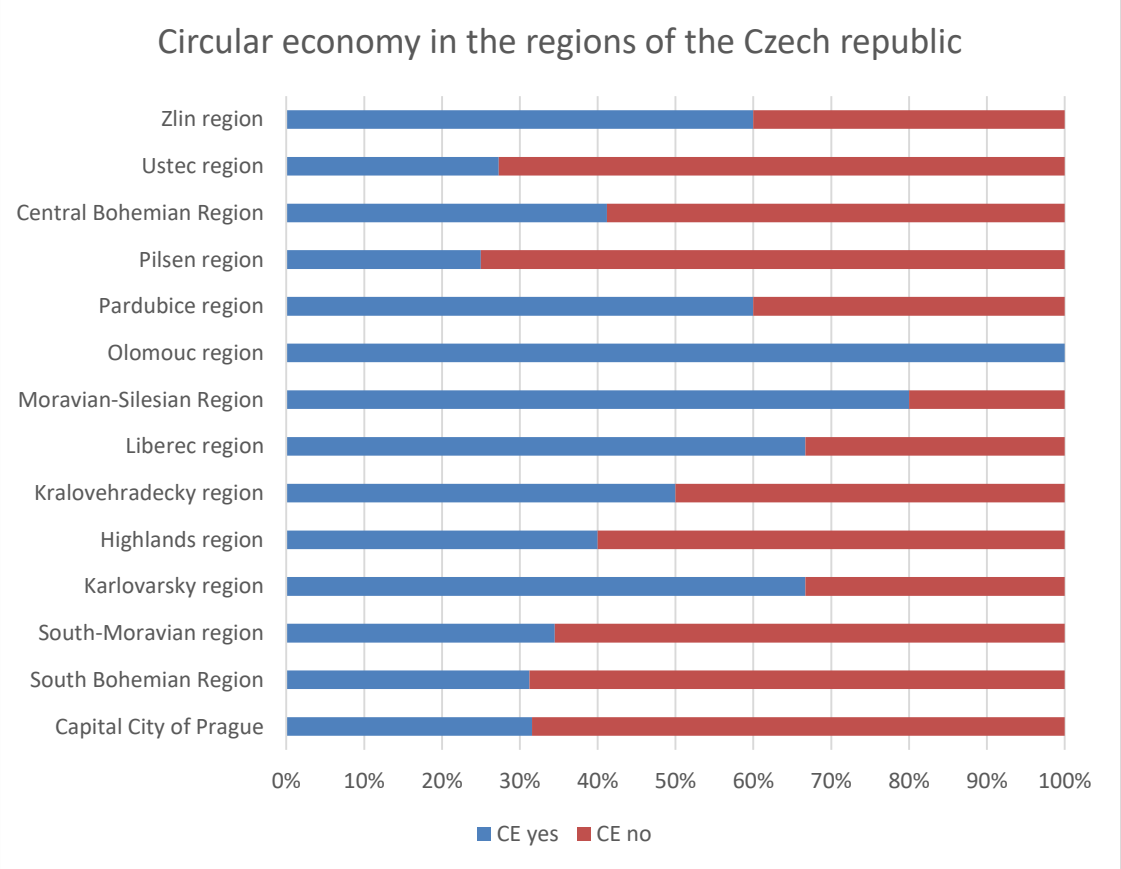
$$W = (-\infty, u_{1-\frac{\alpha}{2}}) \cup \langle u_{1-\frac{\alpha}{2}}, \infty) \quad (4)$$

$$T_0 = \frac{M_1 - M_2}{\sqrt{M_*(1-M_*)(\frac{1}{n_1}+\frac{1}{n_2})}} \quad (5)$$

6.6 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 and according to the implementation of controlling. The following graph shows the percentage distribution of enterprises by individual regions and their relationship to the circular economy. It is clear that in most regions there is rather less involvement of companies in the circular economy. Exceptions are the Karlovy Vary region, Liberec region, Moravian-Silesian region, Olomouc region, Pardubice region and Zlin region. However, there was no statistically significant difference in the individual regions in relation to the circular economy, and if so, the results are not significant due to the small number of respondents in the region (eg Olomouc region).

Figure 1: Circular economy in the region 1



Source: Own research

As mentioned above, the circular economy is gradually replacing the linear economy, which has resources at one end and products and waste at the other end. In contrast to the linear economy, the circular economy seeks to make waste as a source for further use by converting waste material back to sources, increasing

product life or changing consumer behavior. These two questions were asked as key questions in the questionnaire, which were then further subdivided. The first question concerned whether companies have elements of the circular economy in place and the second question whether companies have controlling in place as a management tool. Out of the total number of responses, it was found that 102 companies have elements of the circular economy in place and 143 companies do not. Furthermore, enterprises that have introduced elements of the circular economy were found to be implemented mainly in the following areas:

- backup of plastic packaging, increasing the life of packaging - 32 answers,
- recycling and re-use of waste - 36 answers,
- use of renewable resources - 20 answers,
- others – 14 answers.

Controlling is known as a dynamic activity that evaluates the past and purposefully prepares, influences and creates the future. It is a continuous process of planning, analysing, measuring, evaluating goals and eliminating weaknesses. Its usability is also in the field of circular economy, because it really relies on the creation of closed production systems, where resources are reused and kept in the loop of production and use, which allows to generate more value for longer period (Urbinati et al., 2017). Out of the total number of 245 respondents, it was found that 142 companies have established controlling (regardless of its scope) and 103 companies do not have implemented controlling. The basic division of companies according to these two criteria is shown in the following table.

Table 1: Division of companies according to the relation to the circular economy and controlling

Areas of circular economy	***Controlling YES (number of enterprises)***	***Controlling YES (in %)***	***Controlling NO (number of enterprises)***	***Controlling NO (in %)***
Backup of plastic packaging, increasing the life of packaging	23	9.39 %	8	3.27 %
Recycling and re-use of waste	28	11.43 %	7	2.86 %
Use of renewable resources	11	4.49 %	11	4.49 %
Others	8	3.27 %	6	2.45 %
Without elements of circular economy	72	29.39 %	71	28.98 %
Total	142	57.96 %	103	42.04 %

Source: Own research

Subsequently, the companies were compared using the Firsher's exact two-tailed test to determine whether the elements of circular economy and implementation of controlling were not related as a null hypothesis. The results show that the p-value for Firsher's exact two-tailed test is 0.0031, so we can reject H0 at the chosen significance level α=0.05 and it can still be assumed that the circular economy and the implementation of controlling is in relation. It can be said that in these companies the circular economy and the implementation of controlling is statistically significant.

The transition to a system of circular economy is not a simple process, but it is very important, and requires unprecedented cooperation. At present, only 8.6 % of the world belongs to the circular economy. According to our survey of companies in the Czech Republic, almost 42 % of companies surveyed belong to the world of circular economy. The World Economic Forum addresses three basic pillars that bring together private, public, civil society and professionals to accelerate the transition to a circular economy. In the private sector, the position of controlling also plays an important role, which plans and subsequently evaluates the profitability and effectiveness of involvement in this process (WEF, 2020).

Controlling ensures that the organization's resources are used efficiently and effectively to achieve predetermined goals. Many factors will affect the implementation of controlling elements such as size of the enterprise, number of employees, sector in which the enterprises do the business, financial indicators such as for e. g. amount of assets and liabilities, value of liquidity, profitability, ways of financing (Vlčková, 2020). The next step, therefore, was to find out which companies have and which companies do not have implemented elements of the circular economy in place. The indicators total amount of assets, total profit and cash flow were analysed as key criteria. For this analysis, the data obtained from the questionnaire were first linked to the data obtained from the Albertina Gold Edition database. The values of the total amount of assets, EBIT and cash flow for the last known period, which was 2018, were determined from this database. 160 companies were analysed because financial data were not available for other companies. Of these enterprises, 84 enterprises do not have implemented elements of the circular economy in place and 76 enterprises have. To analyse these indicators, a two-sample Mann-Whitney U test was subsequently performed to determine whether the elements of circular economy and selected financial data were not related as a null hypothesis. The results are shown in the next table.

Table 2: Mann-Whitney U test analysis of the elements of circular economy and selected financial data

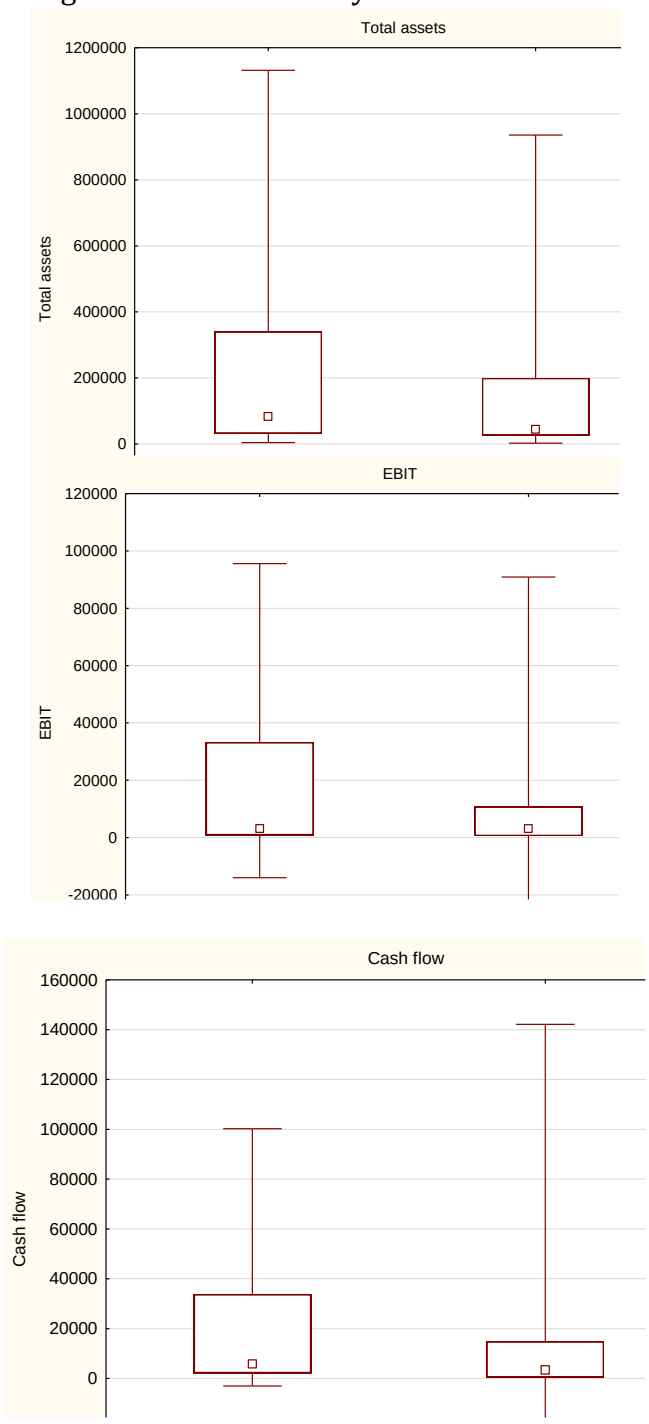
Financial indicator	**Circular econ. YES**	**Circular econ. NO**	**U**	**Z**	**P-value**	**Z edited**	**P-value edited**
Total assets	7074	5806	2880	1,064	0,2872	1,0644	0,2871

EBIT	5746	4407	2196	1,274	0,2026	1,2742	0,2026
Cash Flow	7374	5506	2580	2,089	0,0367	2,0910	0,0365

Source: Own research

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 and the hypothesis HA= x0,50 > y0,50, which assumes that the financial indicators in these enterprises are different. For the indicators total assets and EBIT, the value of p-value is higher than the set level of significance α = 0.05, so we can not reject the null hypothesis. In the cash flow indicator the null hypothesis in favour of the alternative hypothesis was rejected based on a p-value very close to zero and we can argue that companies unrelated to the circular economy have a higher indicator cash flow. Although there was no statistically significant difference in the total assets and EBIT indicators, it is possible to read from Figure 2 the direction in which the values are moving. For the indicator total assets (figure 2 on the top left) we can see that companies unrelated to the circular economy have a higher level of total assets for the indicator EBIT (figure 2 on the top right) we can see that companies unrelated to the circular economy have a higher level of EBIT.

Figure 2: Mann-Whitney U test – circular 1



Source: Own research

In the next step, the controlling tools used in companies affected and not affected by the circular economy were determined. Both operational and strategic management tools are important because managers need an information system that will identify and solve problems, such as the possibility of cost overruns or the inability to implement the plans for future (Drury, 2015) such as circular economy elements.

The companies were analysed in terms of the implementation of elements of operational controlling and strategic controlling. As can be seen from Table 3, in the area of operational controlling, we can reject the null hypothesis that there is no relationship between the implementation of elements of circular economy and operational controlling, because the p-value is lower than the significance level $\alpha = 0.05$. Similarly, in the area of strategic controlling, we reject the null hypothesis that there is no relationship between the implementation of elements of the circular economy and strategic controlling, as the p-value is close to zero.

Table 3: Fisher´s test analysis of the controlling in companies affected by circular economy

Circular economy	**Operational controlling YES**	**Operational controlling NO**	**Total**
Circular economy YES	72	30	102
Percentage of total	29.39 %	12.25 %	41.63 %
Circular economy NO	79	64	143
Percentage of total	32.25 %	26.12 %	58.37 %
Fisher´s p-value	0.0103		
Circular economy	**Strategic controlling YES**	**Strategic controlling NO**	**Total**
Circular economy YES	80	22	102
Percentage of total	32.65 %	8.98 %	41.63 %
Circular economy NO	70	73	143
Percentage of total	28.57 %	29.80 %	58.37 %
Fisher´s p-value	0.0000		

Source: Own research

Effectiveness is an ability to evaluate the resources put into the business. The best advantages of established controlling as well as circular economy elements are saving materials, time or energy and even save the money. So basically it is just a measure which helps to do the work correctly, properly and with a minimum waste. Relative savings can be achieved by the utilization when there is a focus on maximization of the products volume with constant exploitation of economic resources, reducing them and returning the waste back to production. The biggest benefit of circular economy for companies in terms of controlling is added efficiency of the cost and productivity; but at the beginning there may be an increase in the cost associated with new technologies and machines, production and social costs.

6.7 CONCLUSION

The circular economy and sustainable business should become the norm and opportunities for many companies. As the paper shows, most companies still do not have implemented elements of the circular economy. The circular economy is most integrated in the Pilsen region, Usti region, South Bohemia region and in the Capital City of Prague. These companies focus primarily on backup of plastic packaging, increasing the life of packaging and recycling and re-use of waste. The survey also found that there is a positive relationship between the implementation of elements of the circular economy in companies and controlling. Companies that have established controlling have more often implemented elements of the circular economy. After the analysis of basic financial indicators were evaluated (total assets, EBIT and cash flow); differences were found between the indicators for companies affected and not affected by the circular economy, however, a statistically significant difference was reflected only in the cash flow indicator. In the final step, the operational and strategic controlling tools and their connection to companies affected and unaffected by the circular economy were analysed. According to the performed statistical tests, it was found that the use of both operational and strategic controlling tools in companies positively correlates with the implementation of elements of the circular economy.

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7 THE CONCEPT OF CIRCULAR ECONOMY IN AGRICULTURE - OPPORTUNITIES AND CHALLENGES

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7.1 INTRODUCTION

The circular economy is considered an effective way to achieve harmonious development between the economy and the environment, to achieve sustainable development. The goal of the circular economy is to reduce unsustainable resource consumption, overproduction, waste, and pollution. Closed-loop resource systems that focus on rethinking and recirculating materials and wastes have gained renewed popularity and momentum under the title of the circular economy (Desing et al., 2020; Gregson et al., 2015; Korhonen et al., 2018; Sauvé et al., 2016), which is defined by two governing principles: maximise the service provided by the materials embedded in products; and minimise the loss of service with time (Clark et al., 2016).

A systemic change towards a circular economy should be based on regional characteristics depending on geographic, environmental, economic and social factors. Renewable resources, which are key elements of the bioeconomy, play an important role in implementing circular economy principles (Birner, 2018). In other words, a circular economy's renewable segment is based on the bioeconomy, which makes the closing of biological loops one of the most essential aspects of a circular economy. The recently updated European Union (EU) Bioeconomy Strategy also underlines this fact (EC, 2018). Successful transition to the circular economy needs mechanisms to enable balancing of industrial and economic development, environmental conservation and protection, with strategies for efficient use of resources. The search for knowledge of the practices of the circular economy in the agricultural sector motivates the development of scientific research in this area. It can be used in actions to close material and energy cycles. The literature on circular economy practices in agriculture presents research gaps and opportunities for new research (Barros et al., 2020). Rural farming communities can play a crucial role in efficient use of natural capital as they understand it more closely than any other community (Blades et al., 2017).

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This chapter aims to identify terminology related to the waste of agricultural production, the main techniques for the use of this waste, and the growing importance of this topic in recent years because it is an essential part of the new model of sustainable development. The form of this chapter is a review and the purpose is to gather aspects that are important for farmers and other stakeholders in agricultural systems as they are in the process of transitioning to this new economic model.

7.2 CIRCULAR ECONOMY IN AGRICULTURE

It is estimated that agricultural and food production must increase by two thirds by 2050 to feed an additional 2 billion people. Yet around one-third of the food produced — approximately 1.3 billion tonnes each year — gets lost or wasted. Within Europe alone, approximately 700 million tonnes of agricultural waste is generated annually. Agriculture is closely linked to the natural environment and agricultural production is constantly confronted with the protection of the environment and maximizing the use of biological residues and achieving a circular flow between matter and energy. Agricultural crop waste, known as biomass, has significant potential for the production of sustainable energy from renewable fuels. Agriculture is one of the largest biological sectors with the highest biomass production (EC, 2015), which is becoming a necessary input for the bioeconomy (Bracco et al., 2018; European Commission, 2012). This represents a great opportunity not only because its use and prioritization favor fossil fuel consumption and greenhouse gas emissions (McCormick and Kautto, 2013), but also because it contributes to the development of new green markets and jobs by promoting the conversion of plant waste into products with added value (by-products), such as food, feed, bioproducts and bioenergy (Scarlat et al., 2015; Mohanty et al., 2002; Duque-Acevedo et al. 2020).

The term 'bio-economy' includes all activities, sectors, services and processes that are based on biological resources (Filho, 2018). Bio circular economy is based on the zero waste concept where the resource is not only converted into value added products, but also the waste streams generated during the process are utilized in a sustainable way. There are three prerequisites for a sustainable bio-economy i.e. sustainable resource base, sustainable production/consumption processes/products, and circular flux of materials (Kumar et al., 2019). Practices described as "more sustainable" are not sustainable in themselves but represent an improvement that can be measured against agreed criteria. The underlying aim of any circular economy action is to reduce waste, making the ultimate goal less ambiguous than for a 'sustainable' practice, but the means of achieving circularity are more open to interpretation than sustainability actions. This is reflected by European policies (Sherwood, 2020).

For example, the Project Circular Agronomics (https://www.circularagronomics.eu) is based on the fact that N, P, K use throughout the whole European agri-food chain is inefficient. These low nutrient use efficiencies, together with poor soil management practices are leading to a loss of organic carbon in soils. This is in turn leading to large losses of nutrients and carbon into the environment with significant negative impacts on soils, water and air resulting in unacceptable health and environmental costs. The objective of the Project Circular Agronomics has increased the understanding of C, N, P flows and the related potential to reduce environmental impacts at the farm and regional level under different bio-geographical conditions. Closing loops within cropland farming, from livestock to cropland farming and to increase the reuse of waste/wastewater from food-industry to improve soil fertility and to increase nutrient use efficiency, increase the sustainability of food production in the EU and to contribute to the improvement of the European Agricultural Policies.

7.3 WASTES IN AGRICULTURE

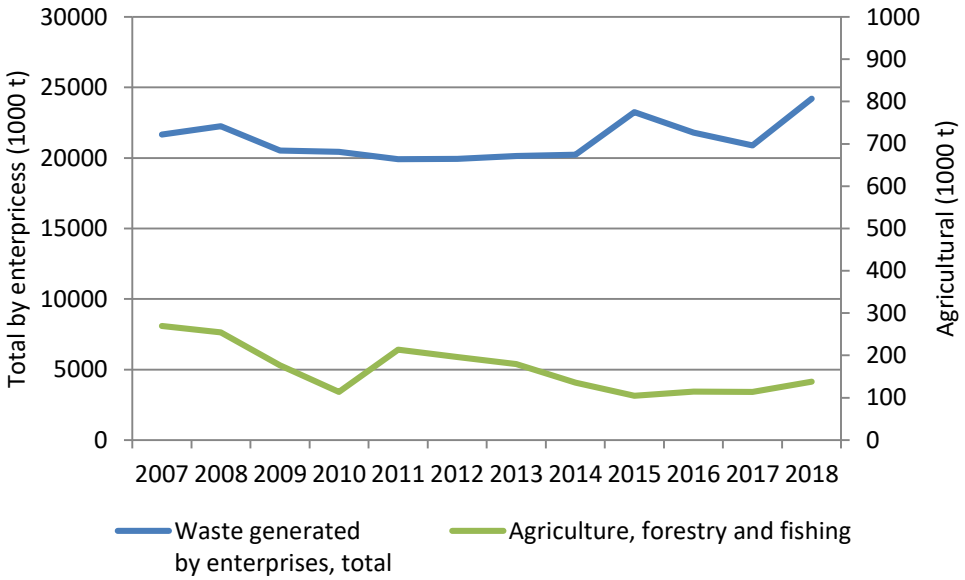
Due to the origin of the materials used, it is necessary to separate them into two independently circulating circuits. The first circuit operates with substances of organic origin that are easily degradable and don´t problem return them to the biosphere. The second circuit works with synthetic substances that should be incorporated into products in such a way that they can be subsequently extracted and reused.

The flows of materials and energy in the agricultural sector are of particular relevance to the circular economy. The actions directed to the circular economy must find ways to enhance the positive effects and relieve the negative ones in agricultural properties. Inputs and outputs of materials and energy in agriculture refer to a range of alternatives, depending on the farm structure. In a farm that contains swine breeding, e. g., inputs include water, energy, animal food, vitamins, medicine, and others. In farms with wheat, corn, and soybean crops, inputs include, among others, water, fuel, seeds, fertilizers, and pesticides.

Agricultural production was naturally circular in the past. Animal feces and plant residues were not considered as waste, because they were usable as fertilizer or feed. Without these materials, soil fertility cannot be maintained and improved. The share of agriculture (including forestry and fishing) in the production of business waste in the Czech Republic is less than 1% (figure 1). However, it is necessary to take into account the waste of the entire agri-food vertical up to the final consumer as logistics chains, their structure and implementation, including production logistics, transport and storage, and logistics cycles, including recycling, plays a fundamental function in the circular economy. With the rapid development of intensive agricultural production, especially in the last century, the agri-food sector has become a linear economy. Even today, some agricultural farms function as waste-

free farms with a closed cycle of substances according to the scheme: soil -> feed -> animal -> excrement -> soil. However, even in agriculture, waste is produced that is not further processed.

Figure 1: Waste generated by enterprises by selected activity in thousands of tones



Source: CZSO

Wastes from agricultural production are classified as:

- Animal feces, urine, and manure (including contaminated straw), liquid waste collected separately and treated off-site;
- Animal tissue waste;
- Plant tissue wastes;
- Sludges from washing and cleaning;
- Waste plastics (excluding packaging);
- Agrochemical wastes and agrochemical wastes containing dangerous substances;
- Waste metals;
- Wastes not otherwise specified.

Shifting from a linear to a circular economy in the agrifood domain requires innovative business models, including reverse logistics, new visions on customer-supplier relationships, and new forms of organization and marketing strategies at the crossroads of various value chains (Donner et al. 2020).

7.4 BIOLOGICAL WASTE

In large-scale animal farms without a link to the soil, animal excrement is often regarded as waste (figure 2), but even in these cases it may not be waste, but an organic fertilizer or raw material suitable for the production of organic fertilizers, as long as it does not exceed the content of hazardous elements or hazardous substances (decree no. 474/2000 Coll.). Animal excrement and plant residues must be stored, handled only on authorized facilities, and treated in such a way that they do not endanger the natural and environment (manure, manure storage, composters, slurry tanks, slurry, and silage juices). The ecologically and agronomical efficient way is composting of agricultural waste, fertilizer municipal and industrial waste. By composting, it is possible to prepare ready-made humic substances for the soil. An option for ecological processing and the use of animal excrement and other organic waste is their anaerobic methanogenic fermentation, accompanied by the formation of biogas.

Figure 2: Technological procedures for the utilization of agricultural waste

Organic waste processing technology	Input raw material	The final product
• Anaerobic fermentation	• Manure	• Manure
• Storage, anaerobic stabilization, homogenization or separation	• Slurry	• Stabilized homogenized slurry, or separated slurry
• Aerobic composting	• Organic waste, slurry, manure	• Compost, growing medium
• Production of artificial manure (aerobic and anaerobic fermentation)	• Slurry, straw	• Artificial manure
• Vermicomposting (use of earthworms)	• Slurry, straw, manure, plant residues	• Biohumus protein from worms
• Methanogenic fermentation	• Slurry, manure	• Biogas, organic fertilizer
• Biological aerobic treatment	• Slurry	• Purified water, org. Fertilizer, granular fertilizer crude proteins (for possible feeds)
• Drying	• Poultry slurry, poultry litter	• Feed, feed component, commercial fertilizer
• Acid catalyzed hydrolysis	• Slurry, manure from litter	• Feed, feed component
• Temperature and pressure treatment	• Dead animals, slaughter waste, infectious manure, poultry litter	• Bone, meat and bone, feather meal, granulated feed, feed paste
• Enzymatically or chemically catalyzed hydrolysis	• Straw, vegetable waste	• Bioethanol, fural, lignin, protein feed
• Disintegration and pressing	• Straw, vegetable residues	• Heating briquettes
• Disintegration and pressing with binder	• Straw	• Building materials, furniture, composite material
• Alcoholic fermentation	• Poultry manure	• Bioethanol production

Source: Váňa (2002)

In the context of the circular economy model, the biogas production has been highlighted as a versatile renewable energy source that could be used to replace fossil fuels and heat by reducing greenhouse gases emissions (Potting et al., 2016). Large-

scale biogas generation is a well-established technology in developed countries. For example study (Soares et al., 2020) shows a high potential of biogas production using co-digestion of swine manure and placenta or swine manure with automated agitation system. The bioenergy prices are fixed by national policies, and although the feed-in tariffs are in general still high in Europe, they are limited in running time and progressively decrease. The economic viability of this type of initiative is thus highly impacted by external political, legal and market factors (Donner et al., 2020).

Biogas plants are devices for controlled anaerobic fermentation of organic substances. They can be divided according to the processed substrate into agricultural (manure and agricultural biomass), treatment (sludge from wastewater treatment plants), others - processing biowaste and animal by-products, or biocomponent mechanically sorted from mixed municipal waste. Biogas production, including landfill gas, in the Czech Republic, has developed mainly towards the degassing of municipal waste landfills and the stabilization of sewage sludge at wastewater treatment plants. This potential is used to 80% (Váňa, 2010). The highest potential is in the processing of agricultural renewable raw materials, i.e. animal faeces and plant biomass. There are currently 574 biogas plants in operation in the Czech Republic, with biogas accounting for 22.9% of energy production from renewable sources (www.czba.cz).

New regulations concerning the operation of biogas plants favour biogas plants specializing in the treatment of biodegradable waste. In particular, the processing of kitchen waste, including frying oils, green maintenance grass, distillery waste, biodiesel and solid waste from the food industry, including gastro and inedible food products, meat-and-bone meal, rendering fat and slaughterhouse waste. Some of this waste disappears in mixed municipal waste or in wastewater (via kitchen shredders) and green waste and separated household biowaste are often more advantageous to use by composting.

In agriculture, it is possible to use the waste from other sectors, as long as they contain organic matter, or can serve as an improving material, on agricultural land. These are mainly treated sludges from wastewater treatment plants, sediments from ponds and reservoirs, meat and meat bone meal, digestates formed during anaerobic digestion with biogas production. In the Czech Republic, the use of bone and meat-and-bone meal for feeding livestock is prohibited, but the use of meat-and-bone meal on agricultural land for fertilization is not excluded if the conditions of Act No. 156/1998 Coll., on fertilizers, are met. It is recommended to use meat and bone meal, especially for the production of compost or biogas.

However, the operation of agricultural biogas plants also has negatives: high construction and operating costs, large storage areas for raw materials, significant load on roads and vehicles during the collection of raw materials, machinery noise and especially the increase in maize areas, increasing the risk of soil erosion. Quality

organic fertilizers, which are the basis of the sorption complex, do not get into the soil, which can negatively affect the fertility of the soil. The ability of digestate to replace manure and slurry is debatable. Opponents of biogas plants also say that using agricultural crops for things other than food is an ethical issue (e. g. Balussou, et al., 2018; Barros et. al. 2020). On the one hand, the pressure to use renewable energy sources is increasing, on the other hand, the rapidly growing population of the planet will necessarily need food, and the area of agricultural land and its fertility is declining. Problems may also arise, for example, with odor leaks, poor operation due to insufficient knowledge of the fermentation process and operator inexperience, consequences of errors in technology selection with regard to processed substrates, design and construction errors caused by efforts to save investment and operating costs. The economic efficiency of biogas plants is affected not only by investment parameters, especially investment costs, capital costs, the amount of non-repayable subsidies, but also operating indicators, especially revenues from waste treatment, sale of electricity, heat and digestate.

7.5 PLASTIC WASTES

A problem is particularly to plastic waste management, from which the contamination of terrestrial, marine and air environments with severe consequences on food security and human health also derive. Despite its all positive qualities, nowadays plastic represents a major public concern calling for the identification of urgent solutions. The increasing diffusion of intensive and semi-intensive agricultural practices involves the generation of large amounts of plastic waste that need to be properly managed in order to limit environmental and economic damages. The way it is produced, consumed and disposed of still fails to capture the socio-economic and environmental benefits of a circular approach. The highest percentage of plastic waste in Europe is produced by the packaging industry (59%), while agriculture accounts for about 5% of plastic waste production (Pazienza, & De Lucia, 2020).

Disposal of plastic waste in agriculture is most often carried out as a landfill, physical recycling, and pyrolysis. In addition, plastic waste from agricultural activities is almost always contaminated with various impurities (e. g. soil and agrochemical particles). Some countries still find landfill an economically viable option to dispose of plastic waste (Zhao et al., 2007). Physical recycling is also used to separate and reuse plastic material (Aznar et al., 2006; Zhao et al., 2018) and pyrolysis options are nowadays widely investigated to obtain feedstock and other liquid fuels (Al-Salem et al., 2017).

There are different ways to take advantage of waste plastics. Thermoplastics, the material from which the substrate bags are made, have a high calorific value and for this reason, it could be considered the energy recovery. Another form of material valorization using the same mechanical processes is the development of composite materials or composites. It involves mixing the plastic with other products

to improve the physical characteristics of the by-products (Amigó et al., 2008). For example, the agrochemical containers are generally declared as hazardous waste due to the presence of chemical residues after application. This represents a technical limitation of recycling processes, resulting in inefficient use of resources, lower production efficiency and higher associated costs. The processes of decontamination, polymer type sorting, cleaning and reprocessing of Agrochemical Plastic Packaging Waste may enable a large amount of these materials to be returned to the production cycle and the recycled material is suitable for reutilization in typical agricultural practices, such as low-tunnel and greenhouse covers (Picuno et al., 2020). Despite these plastic waste disposal methods, impurities are still present in soils and these may cause soil fertility or yield productivity to worsen.

The economic analysis reveals that the use of recycled plastics obtained from agricultural plastic waste can lead to significant savings in material costs. Urreaga et al. (2020) found that significant amounts of recycled agricultural plastics could be used in the manufacture of tube shelters, as well as in other similar applications, thus contributing to the development of a circular economy. In the last decades, several environmental-friendly novel materials have been produced and experimentally tested in order to limit the use of fossil-based plastics. Innovative biodegradable in soil or compostable materials have been manufactured using raw materials from renewable origin and having mechanical and physical properties analogous to plastics derived from petrochemicals (Blanco, 2018).

7.6 AGROCHEMICAL RESIDUES

Extensive use of pesticides in agriculture poses a major hazard toward the environment and human health. Huge areas of arable land are being subjected to chemical contamination owing to the intense use of agrochemicals in the farming lands. Hence, remediation approaches for agrochemical pollution must be a holistic approach, including environment and crop produces. Economically feasible, environmentally sustainable, and socially acceptable technology is vermitechnology. Earthworms possess the ability to disperse the toxins and reduce the overall concentration of pesticides. Earthworms are tolerant and can help in the removal of an extensive range of organic and inorganic agrochemicals. Earthworm participation enhances natural biodegradation of harmful agrochemicals, thus converting them into a useful stabilized resource (Usmani et al., 2020).

Another popular agent in agrochemical remediation is nanoparticles. The advent of nanotechnology helped to formulate highly efficient methods for the remediation of agrochemicals. Growing interests in surface-engineered nanoparticles promise complete removal of agrochemicals from the environment. However, many of the agrochemicals are persistent, and hence complete removal of these residues practice via photocatalysis. Photocatalytic degradation of persistent agrochemicals using bimetallic nanocomposites widely adopted (Sebastian et al., 2020).

Díez et al., (2019) indicate a growing interest among researchers in the usage of UV-irradiation processes for the treatment of agrochemicals, but the photolysis processes are usually not sufficient for degrading agrochemicals and even so the mineralization degree is very poor. Even though the radiation itself is not enough for degrading a given pollutant, its combination with other well-known processes can synergistically enhance their performance. For instance, the radiation application can debug the drawbacks of the electro-Fenton process by decomposing the iron complexes formed.

7.7 CHALLENGES FOR FURTHER RESEARCH

According to Giampietro and Funtowicz (2020) the uncontested adoption of the concept of the circular economy points at two worrying misconceptions in the 'official' narratives about sustainability: (1) interacting with nature is an inconvenient feature of the economy that must be revised as soon as possible; and (2) the economy can operate independently of natural processes under the guidance of the market simply by using more and better technology. The authors point out many questions that the concept of the circular economy raises: Can perpetual global economic growth be achieved by keeping products, components, and materials—operating in the biosphere outside of human control—at their highest utility and value? Are economic narratives capable of assessing the value of processes beyond human control that we do not even fully understand? Can technology replace these processes when they do not live up to the expected services? If the answer to these questions is no, why are we framing sustainability problems using economic narratives?

Buchmann-Duck and Beazley (2020) appeal to the importance of critically exploring the theories and practices of the circular economy. Their work is based on key examples that point to some shortcomings and the need for cooperation between the fields of circular economy and biodiversity protection in identifying and addressing shortcomings. They found that biodiversity is an important yet underrepresented aspect of the circular economy and little evidence presents how to ensure positive outcomes for biodiversity in a circular economy. Secco et al., (2020) found in their analysis that in the identification of existing circularity metrics, it is consider isolated aspects such as indicators based on material flow, indicators based on energy consumption, indicators related to land use and consumption, and own life cycle assessment indicators. In the literature is missing circular economy measurement models that consider several aspects simultaneously including environmental, economic, and social.

Agriculture has the potential to help reduce food loss and waste. Food loss and waste forfeits time, effort, energy, and resources by decreasing food supply as products move from production towards consumption, reducing effective yield, and leaving less food available for consumption. Globally, the majority of food loss

and waste occurs during the early stages of the value chain, including production, harvesting and storage (Porter and Reay, 2015; Sims et al., 2015). As reported by Galford et al., (2020) food loss and waste prevention projects address interventions losses on production and harvesting, storage and processing stages. Many projects mentioned the potential for improvements in the transportation stage. Interventions to reduce food loss through improved production are based on input choices, most often through crop varieties that have a longer shelf life or higher disease resistance. In the case of livestock is it selecting breeds with disease resistance, acquiring healthy animals, or animals that could be slaughtered at a younger age.

The actions stated in the EU bioeconomy strategy are more concerned with promoting, supporting and monitoring a bioeconomy than establishing the conditions to sustain it (EC, 2018). There is no legislated limit to the amount of biomass that can be considered sustainable but it is clear that in the future more intensive farming and less food waste must go hand-in-hand with greater utilisation of whole biomass for additional non-food purposes (Philp and Winickoff, 2018). The EU has an overall target for renewable energy to provide 20% of energy demand by 2020. The use of biomass to meet such a large demand for energy can create issues with sustainable land use, water supply (Schyns and Vanham, 2019), and the protection of biodiversity (Fingerman et al., 2019; Hansson et al., 2019). The fossil fuel supply chain uses orders of magnitude less land space than renewable energy provision (van Zalk and Behrens, 2018). Biomass is the worst performing option in this regard, but it does reduce greenhouse gas emissions more than other renewable energy sources (Baležentis et al., 2019).

Soil quality is a major issue, as is a competitive energy market. Biomass production brings energy and material costs (fertilizers). It is clear that the current reduction in fertilizer production is important, but alternative sources of nitrogen and phosphorus are insufficient. There is also the inevitable link between fertilizers and fossil fuels, which means that the bioeconomy depends on the petrochemical industry. Even if we put energy arguments aside, the production of nitrogen fertilizers requires methane, which is used as a source of hydrogen. This methane comes almost exclusively from natural gas. Isolation of phosphorus from mineral ores requires sulfuric acid, produced by oxidation of sulfur isolated from natural gas exploration. In connection with the significant planned increase in biomass production (for food, energy, and biomass-based products), the rate of nutrient recycling needs to be increased (Sherwood, 2020). The direct and indirect implications of land and crop management such as the carbon stock that is maintained in the soil must be considered and acted upon appropriately over relevant time periods, which can take decades to replenish for forestry products (Searchinger et al., 2018).

According to Barros et al. (2020), there are three pathways for circular economy practices in the agro-industrial sector: (1) increasing scientific awareness on the theme; (2) indicating the potential routes for agricultural wastes; (3) showing the true relevance of the circular economy.

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8 TRANSITION TO CIRCULAR ECONOMY - EVIDENCE FROM CASE STUDIES

Lucie Karafiátová, Ing.[19]

Abstract: Currently, most of the world's manufacturing processes still follow the linear framework, also known as the "take-make-dispose" model. This model, is rapidly becoming unsustainable, not only financially but also environmentally. The circular model, on the other hand, allows us to restore the resources that have been already used in manufactured products (Rietveld, Tukker, Keijzer, Hauck, 2019).
The Ellen MacArthur Foundation recognizes cities as a focal point in the transition to a circular economy. Cities are where most materials are exploited and where buildings, vehicles, and products are consistently under-used (Ellen MacArthur Foundation, 2020). Although, there is a lack of research on CE in smart cities, therefore, this paper's main purpose is to shed light on CE "R" principles (reduction, reuse, recycle, redesign, replace, repurpose and rethink) which ultimately lead to product life extension. CE initiatives are conducted by means of a business case analysis. The bioenergy case study provides a glimpse and possible solution for CE application in cities, as well as for tourist destinations. The energy consumption is growing, but yet, humanity still didn't figure out all of the energy sources available. Therefore, this research emphasizes the need to promote CE awareness as an alternative perspective on the current consumer lifestyle.

Keywords: Circular Economy (CE), Business Case Study, CE Tourism, Smart Cities, Sustainable Energy, Bio-products, Biogas

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8.1 INTRODUCTION

The increasing awareness of the need to transform the current economic system to ensure it does not exceed the ecological limits of our planet is giving rise to numerous efforts to address the sustainability issues it generates. The entire economy is in a process of transition from a linear to a circular model (Rietveld, Tukker, Keijzer, Hauck, 2019).
Circular Economy (CE) is an economic system that closes material and energy loops in production and consumption systems. CE is considered a possible solution to problems, such as the increasing global demand for resources, climate change and worldwide pollution (Rodríguez, Alonso-Almeida, 2019, UNWTO, 2008). Change requires actions ranging from upstream product innovation to downstream waste and recycling infrastructure, as well as engagement by governments, businesses and citizens, that is, a greater collaboration able to lead to the creation of a circular ecosystem (Vargas-Sánchez, 2019).
In CE, material flows are restored through closed-loop processes, due to which valuable resources are not lost, but reused, resulting in less waste (Mugge, 2018).
Ellen MacArthur Foundation proposes that stimulating closed-loop processes goes far beyond recycling, and that more attention should be paid to the so-called inner loops of the CE. These inner loops suggest that products keep their initial value for a longer period of time, before eventually being recycled (Ellen MacArthur Foundation, 2020).
The biorefinery concept is vital for the realization of integrated industrial production and local economic development. Biorefineries have the potential to address energy demands, economic growth, and waste management, to convert the waste in a cyclical, restorative, and reproductive manner in a closed-loop, and to support sustainable development (Awasthi, M.K., Sarsaiya, Patel, Juneja, Singh, Yan, Awasthi, Jain, Liu, Duan, Pandey, Zhang, Taherzadeh, 2020).
We all have the opportunity to rethink our approach to material use in cities, around housing, mobility, and economic development. The implementation of a CE vision in cities can bring tremendous economic, social, and environmental benefits (Ellen MacArthur Foundation, 2020).

8.2 METHODS

CE initiatives are conducted by means of a business case analysis method.
The cases are selected according to following criteria:
1 The case should represent one of the R-principles.
2 Each case should represent different examples from various sectors.

The case analysis representatives are based on a conducted worldwide empirical investigation with the use of a direct and indirect observation and experience methods. In this research the inductive method had been applied, followed by the

deductive reasoning. Areas of investigation included: cities, tourist destinations, bioenergy analysis, and overall energy consumption.
This research does not provide an exhaustive review of every CE solution, it rather provides a sampling of current CE projects and a scan of the variety of approaches and solutions being pursued. It is important to note that while the term Circular Economy has only entered the mainstream in the last decade, many organizations and businesses have been successfully implementing CE principals for years without labeling them as such.
This qualitative multi-case analysis allows us to comprehend the CE practices deployed by large and small businesses, thus identifying the CE strategies and best practices.

8.3 RESEARCH RESULTS

8.3.1 TOURIST DESTINATIONS

Since the beginning of the 21st century the hospitality industry adopts eco-friendly practices. The main reason for this behavior is accusations of the negative impacts of tourism such as the high use of resources like water, energy and creation of enormous waste. Tourism is responsible for approximately 5 % of global CO2 emissions, mainly due to transportation, followed by the hospitality industry.
Another problem derived from tourism is over-tourism, it produces negative impacts on biodiversity, cultural and historical heritage (Stukalo, Krasnikova, Krupskyi, Redko, 2018).
The World Economic Forum defined in 2016 three supporting CE principles: (1) conservation and improvement of natural resources; *(2)* optimization of resource efficiency; and *(3)* promotion of system effectiveness (Vargas-Sánchez, 2019).
Some circular initiatives to reduce and prevent food waste could represent redesigning and planning menus, reuse leftover food, reduce the number or size of platters and/or using food distribution networks or sharing platforms (Rodríguez, Alonso-Almeida, 2019). Many hotels ask their customers to reuse their towels, which represents great savings on water and energy (Vargas-Sánchez, 2019). Walt Disney World Resort in Florida introduced the "Service Your Way" program. Where guests have the option to eliminate or skip housekeeping during their stay. Refurbished rooms offer eco-designed interiors and hotel cosmetic is custom made and environmentally-friendly. Disney serves fruits and vegetable grown in their gardens and greenhouses, as well as local products; reducing food waste, transportation and banning the use of overfished species in its restaurants. These steps mark the beginning of cultural shift towards CE.

8.3.2 CITIES

The Ellen MacArthur Foundation recognizes cities as a focal point in the transition to a circular economy. It is well documented that 75 % of natural resource consumption occurs in cities. Cities produce 50 % of global waste and 60-80 % of greenhouse gas emissions. These are symptoms of the "take, make, dispose" linear economic model (Ellen MacArthur Foundation, 2020).
Today, the EU generates over 1.8 t of waste per capita (excluding mineral wastes), 27 % of which is Municipal Solid
Waste. These problems are especially highlighted in urban areas with a high population density. With around 75 % of its population and GDP generating activities located in the urban areas, Europe can be called "a union of cities and towns" where urbanization impacts and associated problems extend beyond city borders, on the EU as a whole (European Environment Agency, 2017). EU has recognized problems of energy supply and climate change as one of the key challenges. In order to tackle these issues, the European Commission adopted the 2020 Climate and Energy Package.
This path includes a reduction of GHG (greenhouse gas) emissions by 80 % by 2050, in which all sectors need to contribute. To achieve these goals, the power sector should become almost carbon neutral and heating should be based on renewable electricity (including biowaste) or other low-emission sources. Transport emissions should be reduced by more than 60 % by 2050 using biofuels (Tomic, Schneider, 2018).

Cities are complex socio-ecological-technical systems with nested subsystems such as neighborhoods, organizations, and infrastructure networks (Nogueira, Ashton, Teixeira, Lyon, Pereira, 2020).
When modern urban infrastructures were built, they did not anticipate the multitude of resources that would flow through them, the speed at which these flows would travel, and the complex inter-linked ramifications they would promote across social, ecological, and technical subsystems. Most of them were predicated on the goals of economic growth and progress, designed for safety, and based on principles of functionality and efficiency (Carpenter, DeFries, Dietz, Mooney, Polasky, Reid, Scholes, 2006, Nogueira, Ashton, Teixeira, Lyon, Pereira, 2020).

Urban food distribution infrastructure in the United States, for example, was designed to aggregate commodities produced on large-scale, industrial farms, and distribute them to populations across the nation. While these infrastructures enabled economies to scale and reduced the prices paid by consumers, they supported the generation of significant amounts of waste and accelerated environmental degradation along the entire value chain at unprecedented speed. They also privileged economic growth and profitability of large producers over the development of local economies.

Environmental challenges promoted by the use of modern infrastructures include high energy and water use during production, large carbon footprints in transportation, and large volumes of waste throughout its stages. The food distribution infrastructure is representative of how modern infrastructures became the pathways for the circulation of many types of resources (e.g., money, knowledge, power, etc.) that were disconnected from the dynamic needs and interactions of local populations (Nogueira, Ashton, Teixeira, Lyon, Pereira, 2020).

Principles of the CE are adopted in many fields to achieve sustainable ecosystems and to mitigate GHG.
Industry 4.0 technologies can significantly assist in applying circular economy principles to save energy and reduce greenhouse gases to an extent (Mukhopadhyay, B.K., Mukhopadhyay B.R.2020, Ellen MacArthur Foundation, 2020).
In this context, Digital Technologies such as Inter- net of Things (IoT), Big Data Analytics and Artificial Intelligence (AI) are seen as the main supporters for CE transition because they are facilitating and initiating the implementation of end-of-life strategies (Uçar, Le Dain, Joly, 2020).

Thanks to the advances in technology; over the years, Waste-to-Energy (W2E) technologies have evolved to become more affordable and efficient.
Plastic blending with concrete for building construction and with tar for paving the roads are proven efficient, long lasting and environmentally friendly; as the plastic, itself is not easily biodegradable.
Lean manufacturing principles are actively being used to reduce the use of materials and resources such as water and energy. It is estimated that commercial opportunities in the implementation of circular economy may reach USD 4.5 trillion by the year 2030 (World Economic Forum, 2016).
Electrical power is an essential and expensive commodity. Typically, the fossil fuels such as coal and gas are used in large quantities in energy production. The process of coal-based energy production using fossil fuels leads in high volumes of greenhouse gas carbon dioxide and fly ash; and thus, polluting the environment.
Renewable energy sources are now becoming the norm across the globe due to increased awareness of both economic and environmental impacts of using fossil fuels (Ellen MacArthur Foundation, 2020, Mukhopadhyay, B.K., Mukhopadhyay B.R.2020, Tomic, Schneider, 2018).

Smart cities are the best candidates for considering the use of CE principles, due to the facts that they, use lot of energy, have niche technologies such industry 4.0 and produce lot of waste.
Smart cities essentially will have modern and sustainable infrastructure in-built environment, energy systems, transportation, bio-systems and local resource production. To manage such modern infrastructure, smart cities are expected to have effective waste collection/treatment/disposal and/or effective resources for monitoring and management. In other words, smart cities are expected to be self-sufficient in managing the vital resources e.g. energy, water and waste. Therefore, they

will be circular in nature and can be called circular cities. Typically, smart cities are expected to use fully automated systems to measure, monitor and control use of water, electrical power and other forms of energy and waste. As the number of smart cities grows the number of IoT devices that operate online will grow into billions. Mukhopadhyay, B.K., Mukhopadhyay B.R.2020, Mutani, Todeschi, 2019).

Interaction of diverse representatives can bring various perspectives to framing problems and developing solutions to CE challenges in cities. Medium representative can be human or non-human, including components of technology (e.g., portable machines, digital platforms, organizations, products humans, etc.) (Nogueira, Ashton, Teixeira, Lyon, Pereira, 2020).
Cyber-security in IoT device ecosystem could represent a possible thread. For instance, a simple, unexpected cyber-attack can throw the life of a smart city out of gear and most of its services will go out of function; since it operates on digital platforms. Naturally, these challenges pave path for new range of jobs (Uçar, Le Dain, Joly, 2020).
Smart cities are an excellent example, where smart infrastructure can be seen in use from the planning and development stages. The operating environment in smart cities with industry 4.0 will move common public forward into digital space (Ellen MacArthur Foundation, 2020, Mutani, Todeschi, 2019, Uçar, Le Dain, Joly, 2020).

8.3.3 CASE ANALYSIS

Philips CityTouch model provides intelligent public lighting services to extend the use phase of streetlights, to remanufacture (refurbish) specific lighting components at the end of the first use cycle and to increase efficiency in public energy consumption for cities all around the world. They provide an IoT platform called lighting management and connect each lighting fixture to this platform network. The platform is used via web applications to manage streetlights and to analyze lighting data stored in the cloud.
Philips, city authorities and the intelligent lightings can communicate via lighting management software. As all the lightings are connected to the platform, therefore with this control mechanism, the stakeholders can save energy and material by optimizing energy consumption of the lightings and generate more revenue from the retrieved value of remanufactured resources (Philips CityTouch, 2020).

ZenRobotics is a leader from Helsinki in waste sorting robots and proposes intelligent solutions for recycling activities by combining AI and Robotics. Their main task is to achieve a high rate of recyclables recovery from waste and to improve performance and efficiency of waste sorting. In this technology, waste is monitored by cameras and sensors and the visual data is send to the AI software that analyses real-time data of the waste stream. Then, the heavy-duty robots make autonomous decisions based on this analysis. They decide which components or materials to pick, in order to enter them to the recycling phase (Zenrobotics, 2020).

DyeCoo, the textiles industry uses vast quantities of water and chemicals and produces huge amounts of toxic waste, which is a major problem in countries like China, India, Bangladesh, Vietnam and Thailand. Dutch company DyeCoo has developed a process of dyeing cloth that uses no water at all, and no chemicals other than the dyes themselves. It uses highly pressurized "supercritical" carbon dioxide, halfway between a liquid and a gas, that dissolves the dye and carries it deep into the fabric. The carbon dioxide then evaporates, and is in turn recycled and used again. 98 % of the dye is absorbed by the cloth, giving vibrant colors. And because the cloth doesn't need to dry, the process takes half the time, uses less energy, and even costs less. The company partnered with major brands like Nike and IKEA (DyeCoo, (2020).

Close the Loop, this Australian company has spent more than a decade turning old toner from printer cartridges and soft plastics into roads. Their products are mixed in with asphalt and recycled glass to produce a higher-quality road surface that lasts up to 65 % longer than traditional asphalt. In every kilometer of road laid, the equivalent of 530,000 plastic bags, 168,000 glass bottles and the waste toner from 12,500 printer cartridges is used in the mix. So instead of ending up in landfill, all that waste is given a new life, getting us where we need to go (Close the Loop, 2020).

Enerkem, is using trash to run your car. Which may sound like something from Back to the Future, but Canadian firm Enerkem has turned it into reality. Their technology extracts the carbon from trash that can't be recycled. It then takes five minutes to turn the carbon into a gas that can be used to make biofuels like methanol and ethanol, as well as chemicals which can be used in thousands of everyday products. The city of Edmonton, for example, now reuses 90 % of its waste, saving more than 100,000 metric tons of landfill every year (Enerkem, 2020).

Cambrian, this US firm's *EcoVolt* technology treats wastewater contaminated by industrial processes, not just turning it into clean water, but even producing biogas that can be used to generate clean energy. Cambrian has nine plants across the US, which have treated an estimated 300 million liters of wastewater (Cambrian Innovation, 2020).

Lehigh Technologies, the Atlanta firm turns old tires and other rubber waste into a something called micronized rubber powder, which can then be used in a wide variety of applications from tires to plastics, asphalt and construction material. Five hundred million new tires have been made using its products, earning it the Award for Circular Economy SME (Lehigh Technologies, 2020).

Caterpillar (CAT), rather than just aiming to use less material, Caterpillar employs a design-for-remanufacturing process to ensure that new parts and components

are able to be remanufactured for multiple service lives. All of Caterpillar's remanufactured parts and components are also held to the same strict engineering standards to ensure that performance and reliability meet the same as-when-new guideline (CATerpillar, 2020)

8.3.4 BIOENERGY

According to EPA, the US generates 35m tons of food waste yearly, with only 5 % diverted from landfills and incinerators. *Disney World's CE biogas facility* by *Harvest Power* is a model for converting food waste into energy. Millions of people visit Walt Disney World theme parks every year. Since 2014, food scraps and grease have been collected from the restaurants and hotels in Disney World, and sent to a biogas plant, a few kilometers from the park. Anaerobic digestion process produces a biogas consisting of 50 to 70 % methane and 20-50 % carbon dioxide. The biogas is then burned to produce electricity and heat. This reaction residue rich in organic matter known as the digestate, is a valuable fertilizer used throughout theme parks gardens.
The biogas plant therefore reduces the amount of organic waste, limits greenhouse gas emissions and produces renewable energy, which is then sold back to Disney World to run its theme parks and hotels.
The Florida plant process about 120,000 tons of organic material per year and produce 5.4 megawatts of combined heat and electricity, which is enough to fuel 2,000 Florida homes. But that meets only a fraction of the energy needs of Disney World, which has more than 30,000 hotel rooms.
The process of turning organic waste into energy, could turn out to be the best way to extract value from food scraps and treated sewage that would otherwise wind up in a landfill (Walt Disney World Biogas Technology for Food Waste, 2018).
Integrated waste management system can close the loop, not only material-wise, through material recovery, but also energy-wise, by using energy from waste to drive whole waste management and recovery chain (Tomić, Schneider, 2018).

The limitations and drawbacks of fossil resources and the focus on greenhouse gas emission reductions have driven researchers toward bio-based sources. Biomass is considered the primary emerging alternative to fossil fuel and can deliver energy and multiple products. Biorefineries are considered promising for the effective conversion of biomass into a variety of bioproducts as well as bioenergy (Awasthi, Sarsaiya, Patel, Juneja, Singh, Yan, Awasthi, Jain, Liu, Duan, Pandey, A., Zhang, Taherzadeh, 2020).

Products may include both intermediates and ultimate products, for example, foods, feeds, materials (fibers, starch and wood), chemicals, oil, heat, gas, electricity, minerals, and water. The provision of energy includes fuels, power, and heat. Moreover, throughout the value chain, sustainability is the main focus in the establishment of biorefineries.

The bio-economy has a tremendous capacity to substitute traditional energy production on a large scale and to offer biochemical and biomaterial applications. The bio-economy can accommodate a variety of bioresources, including earthbound and aquatic resources, and biomaterials, including plant, animal, and microbial constituents (Pratap, Sharma, Panday, Sen, 2015).

Various technologies yield a range of products from specific biomass at various stages of the process, such as thermochemical or biochemical pretreatment, enzymatic or chemical hydrolysis, fermentation, anaerobic digestion, pyrolysis, and gasification. The development of anaerobic digestion offers the greatest variety in terms of nutrient recovery and the use of digestate for fertilization. Anaerobic digestion, along with peripheral techniques, such as biochar technology, offers the best scope for integrated recovery of nutrients and energy from abundantly available organic biomass or waste streams. Biochar technology has tremendous potential to support nutrient cycle in agriculture (Awasthi, Sarsaiya, Patel, Juneja, Singh, Yan, Awasthi, Jain, Liu, Duan, Pandey, A., Zhang, Taherzadeh, 2020, Pratap, Sharma, Panday, Sen, 2015).
Biomass is bulky but high in organic matter and other nutrients. Conveyance of the biomass requires storage sites and handling and transportation facilities. Biomass logistics involve gathering, accumulation, preservation, pre-refining, and extradition. The high costs of the logistics chain could limit the broader application of biomass for energy and fuel generation (Awasthi, Sarsaiya, Patel, Juneja, Singh, Yan, Awasthi, Jain, Liu, Duan, Pandey, A., Zhang, Taherzadeh, 2020).
The current biomass logistics models are centered on achieving monetary targets and may neglect environmental concerns, such as reducing emissions. Further on, biorefineries are complex processes and require relatively high capital investments. Therefore, many experimental validations are done at the laboratory scale (Xu, Liao, Ray, Nazari, Mahmood, Tushar, Dutta, 2018).

The Food and Agricultural Organization (FDA) of the United States estimated that 1.4 billion tons of food waste is produced per year, which is one-third of the total food originated for human consumption. The major causes of pre-processing losses are mainly due to the agricultural activities; preservation in warehouse and deportation losses, connected to technical, administrative, and financial limitations in harvesting techniques, and inadequate storage facilities.
Food waste, it is generally discarded based on its low economic value, which is a major environmental concern, triggering research into the use of these wastes via a biorefinery to produce value-added products. Food waste is one of the resources with significant potential and can be an ideal substrate for producing functional compounds and high-value products.
The organic content and biodegradability of food wastes make them an ideal feedstock for anaerobic digestion to produce biogas and for the use of the digestion residues as soil conditioners or nutrient sources.

Currently municipal solid waste (MSW), is causing a major environmental crisis, especially in developing countries, mainly due to open dumping and open burning. MSW is increasing in developing countries at an alarming rate of 3-7 % per year, given the lack of appropriate technology and equipment, and long-term planning in addition to an increasing population (Sztangret, Reformat, 2020). From this side, the energy recovery of waste really helps to "close the loop" in the whole waste recovery mindset.
Zero waste goal, represents critical challenges for biorefineries in terms of feedstock diversity, feedstock collection, and transportation logistics, seasonal variation, economic viability, sustainability, and consistent research funding (Stasiek, Szkodo, 2020). Among the renewable energy sources, biomass energy is a stable and the dominant energy source for future demand and supply (Awasthi, Sarsaiya, Patel, Juneja, Singh, Yan, Awasthi, Jain, Liu, Duan, Pandey, A., Zhang, Taherzadeh, 2020).

8.3.5 ENERGY CONSUMPTION

The goal of European energy policies is to achieve energy and climate targets through an improvement in energy efficiency and a greater use of renewable energy sources in order to make cities more resilient. In European countries, almost 50 % of the final energy consumption is used for space heating and cooling, of which 80 % is for buildings. For this reason, the optimization of building efficiency is one of the goals to promote the low-carbon and resilient urban development of cities (Mutani, G., Todeschi, Beltramino, 2020).
To achieve energy and climate targets, it is necessary to:
• improve the resilience of the city (which is frequently affected by climate change and weather extremes) in order to guarantee an affordable, reliable, sustainable and modern energy system from various points of view: energy, economic, environmental and social
• promote energy efficiency measures (i.e. building energy codes)
• exploit the renewable energy sources that are available locally (Mutani, Todeschi, 2019).
Based on the Kardashev scale, we can measure a civilization's level of technological advancement based on the amount of energy we are able to use.

- A Type I civilization, called a planetary civilization—can use and store all of the energy available on its planet.
- A Type II can use energy at the scale of its planetary system.
- A Type III can control energy at the scale of its entire host galaxy.

At the current time, humanity has not yet reached Type 1 civilization status. If humans increase their energy consumption at an average rate of 3 percent each year, they may attain Type I status in 100–200 years.

Carl Sagan suggested defining intermediate values wh $K = \frac{\log_{10} P - 6}{10}$ a civilization's

Kardashev rating and *P* is the power it uses, in watts:

In 2018, the total world energy consumption was 13864.9 Mtoe (161,249 TWh), equivalent to an average power consumption of 18.40 TW or 0.73 on Sagan's interpolated Kardashev scale.

In order to achievement the Type I civilization, it will be necessary to use a large-scale application of fusion power and renewable energy through sunlight—either by using solar cells and concentrating solar power or indirectly through bio-fuel, wind and hydroelectric power (Grey, 2020).

8.4 DISCUSSION

Case studies provided us with various examples of CE in practice. They proved, that achieving "R" principles requires "out of the box" thinking. The Ellen MacArthur Foundation focuses on CE in the cities. But there is still a missing link in between city and countryside and mainly, their mutual cooperation. One cannot exist without the other, therefore CE principles have to be designed/adopted at both sides at once. Governments and multinational corporations are going to play a key role in the CE transition, but changes will occur on global level. It's only their decision how fast the transition will be and to what degree.
Based on the Kardashev scale, we're still developing civilization and as such we are not able to use our planetary resources.
Many scientists and experts argue the need to use reusable resources and scale back from fossil fuels.
Yet, there is a vast amount of unused atmospheric energy as well as untapped inner energy of our planet's core, not to mentioned dark matter of the universe.

8.5 CONCLUSION

Circular Economy is mentioned in the literature as a strategy that opposes the traditional open-ended system, aiming to face the challenge of resource deficiency and waste disposal. It's an economic system that is based on business models, which replace the 'end-of-life' concept. Therefore, the R-principles are seen as operational principles of CE (Uçar, Le Dain, Joly, 2020). This study provides an insight into major areas of energy conservation in smart cities, tourist destinations and related opportunities for CE. There are several issues, that need to be examined and researched in the future. Those areas include – infrastructure, AI intelligence, IoT connectivity, cyber security, connection and collaboration in between local official authorities, businesses and government, to name a few. All the areas are linked to

niche technologies, circular economy and energy. Hence, energizing smart cities through circular economy principles, naturally offers many opportunities.
There are already promising signs of a shift taking place; however, reaching this goal will require pioneering ambition combined with various collaboration to deliver the benefits of a truly circular system that rebuilds economic, social, and natural capital. Such a transition obviously cannot happen overnight, and setting milestones along the way is essential for companies that would wish to build on existing efficiency-driven strategies and upgrade to circular practices (Rodríguez, Alonso-Almeida, 2019).
The CE heavily relies on consumers' full participation. Inducing behavior change through campaigning techniques and strict implementation of relevant policies can encourage them to reuse and recycle more, and to adopt a "wise buyer" kind of thinking.

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9 POSSIBILITIES OF USING CIRCULAR ECONOMY IN A SCHOOL CONTRIBUTORY ORGANIZATION

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Abstract: The basic aim of this chapter is to analyse the possibilities of using circular economy in the school contributory organization with regard to specific sources of financing for this type of a non-profit organization. The chapter also points the current system of financing used in the so-called regional education in the Czech Republic.

9.1 INTRODUCTION TO SCHOOL CONTRIBUTORY ORGANIZATIONS IN THE CZECH REPUBLIC

In the national economy, there are entities that are classified into the non-profit sector according to the so-called Pestoff triangular model of the national economy. According to this criterion, these organizations are referred as "non-profit organizations" (Frič & Goulli, 2001).

Non-profit organizations have key characteristics that separate them from business entities. The basic key features include, for example, obtaining contributions from providers without the expected considerations, operating an activity for a purpose other than making a profit, the absence of ownership interests (McCarthy, et al., 2012).

The term "non-profit organizations" or "non-governmental organizations" ("NGO") is widely used but in the Czech Republic it is not defined by current legislation. However, Merlíčková Růžičková (2013) stated, a special law was considered, which would uniformly specify the non-profit organization, its subject of activity, the method of establishment, management and possibly also the method of taxation of the organization. At present, non-profit organizations are still mentioned separately in various legal regulations. Act No. 563/1991 Coll., On Accounting, as amended, lists the so-called selected accounting units which are state (public) non-profit organizations. These organizations include for example organizational units

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of the state, territorial self-government units, contributory organizations, etc. Furthermore, Act No. 583/1992 Coll., On Income Taxes, as amended, defines so-called public benefit taxpayer who performs as his main activity an activity that is not a business. In this sense, the public benefit taxpayer is already a wide group of organizations, such as foundations, political parties, institutions, registered associations, public research institutions, public benefit society, but also contributory organizations or territorial self-government units and many others. The recodification of private law of Act No. 89/2012 Coll., The Civil Code, as amended, was a major change which regulates some legal form of non-profit organizations (e.g. registered associations, foundations and endowment funds, public benefit society, institute) in a single legal regulation.

The contributory organizations are established for the purpose of providing public services and goods. The contributory organizations are usually unprofitable and require legal personality. The reason for the establishment of the contributory organizations is the unattractiveness for the private sector, the absence of the competitive environment in the private sector and the requirement for absolute quality and efficiency (Peková, et al., 2008).

The contributory organizations are most often established in the field of health care, culture or education. The establishment of the contributory organization for the purpose of activities in the field of the education is a special form of the establishment. These are schools that previously existed as organizational units without legal personality and were connected directly to the founder budget. However, this was changed by Act No. 250/2000 Coll., On Budgetary Rules of Territorial Budgets, as amended. Thanks to this, the contributory organizations have their own legal personality now (Škarabelová, 2014).

According to the current legislation in the Czech Republic, the school contributory organizations can be established by a public founder or a non-public founder (i.e. registered churches and religious societies). But the state, the territorial self-government units or voluntary associations of municipalities are the public founders. The territorial self-government units in establishing schools are governed by Act No. 250/2000 Coll., On Budgetary Rules of Territorial Budgets, as amended and Act No. 562/2004 Coll., amending certain laws in connection with the adoption of the Education Act. The territorial self-government units can then establish schools in the legal form of the contributory organization or school legal entities. The school contributory organizations are obliged to register in the Commercial Register and in the Register of Schools and Schools Facilities (Škarabelová, 2014).

9.2 PRINCIPLES OF FINANCING THE SCHOOL CONTRIBUTORY ORGANIZATIONS

In recent years, the field of education has undergone significant changes every year not only in the area of financing and management rules but also in others area. It is possible to name, for example, the compulsory last year of pre-school education, inclusion of disadvantaged pupils in regular school education, as one of the most

media monitored topics in 2016, uniform entrance examinations, state school leaving examinations, lack of pedagogical staff or the currently discussed area of increasing the salaries of pedagogic and non-pedagogic staff and many others.

So-called "regional education" has special importance in the system of financing education in the Czech Republic. It is an education system including pre-school, primary, secondary, higher vocational and special education. The region education is distinguished from other education institutions operating in the Czech Republic – i.e. universities and research institutes. The financing of the regional education from the state budget is regulated primary by Act No. 561/2004 Coll., On Pre-school, Primary, Secondary, Higher Vocational and Other Education, as amended, and supplementary decrees and regulations (Valenta, 2004).

The organizations in regional education operate mainly as so-called the contributory organizations which are established by organizational units of the state or territorial self-government units. The contributory organizations must be registered in the Register of Schools and Schools Facilities in order to be provided a subsidy from the state budget. The contributory organization are obliged to follow the laws and decrees on the management of budgetary funds of the state budget and territorial budgets of the Czech Republic (Peková, et al., 2008).

The contributory organizations draw up a budget which is always draw up as balanced. The budget captures the facts about the financial resources necessary for the performance of the main activity and the sources of financing are indicated here too. The budget is connected to the founder by a net method of financing. This means that the incomes generated by the contributory organization are also the incomes of the organization. At the same time, the founder provides a contribution to the organization for investments or for operation. On the other hand, the founder may require the payment of part of the operating incomes to its own budget or the payment from depreciations. Furthermore, the founder may determine the economic result of the organization and may decide on the distribution of the improved economic result (i.e. profit) into the funds of the organization (Provazníková, 2015).

Peková, et al. (2008) state that the quality in the education depends on the amounts of the financial sources that the school or the school facility has available at the moment and place. Merlíčková Růžičková (2013) adds that the contributory organizations, including regional education organizations, are characterised by so-called multi-sources financing where the funds received from the public budgets have predominated. Really important incomes of the schools and school facilities are subsidies. The incomes from the founder´s budget are important too as schools and school facilities are connected to the state budget through the budget of their founders. Other sources include, for example, financial resources obtained through own activities, whether in the fields of the main or additional activities, financial resources from its funds and received donations (Act No. 561/2004 Coll.; Valenta, 2004).

9.2.1 FINANCING FROM THE STATE BUDGET

The distribution of the finances from the state budget is connected with the administrations of the schools where directly managed and funded schools (i.e. universities), the organizations in regional education and other organizations are distinguished. Indicators and limits are set as salary limits, number of employees and limits for other payments. The Ministry of Education, Youth and Sports determines the average salary in the education, regulates employment, sets limits on salary funds and guarantees year-one-year salary growth (Peková, et al., 2008).

The financing from the state budget is governed by Act No. 561/2004 Coll. The finances are provided from the state budget for the activities of the schools and school facilities established by the Ministry of Education Youth and Sports, territorial self-government units, or by voluntary associations of municipalities. Specifically, the finances are provided for:

- salaries, wages and their compensations, rewards, social and health insurance including the allocation to the cultural and social needs fund and other related costs,
- expenses on school supplies and textbooks,
- expenses related to the education of disabled children,
- and other expenses related to the development and quality of the education (Act No. 561/2004 Coll.).

The financing in the field of the education is provided from the state budget through Chapter 333 which is administrated by the Ministry of Education, Youth and Sports. Most of the finances of this chapter flow to the organizations in regional education (MŠMT, 2019a). In additional to Chapter 333, the finances are provided regional education organizations also from General Treasury Administration Chapter where these finances are used to cover non-investment expenditures (Valenta, 2004).

The financing of the regional education proceeds according to the Act. No. 561/2004 Coll. through norms. The state redistributes the finances of the Ministry of Education, Youth and Sports to the regional budget through the republican norms. The Act No. 561/2004 Coll. sets the republican norms as a contribution per pupil for a calendar year in a certain age category. In accordance with these norm, a limit of the number of the employees per 1000 pupils is set. The finances are then allocated to the budget of regional education organizations through regional norms. The creation of the regional norms is based on the long term intention of education (MŠMT, 2019b).

9.2.2 CONTRIBUTION FROM THE FOUNDER

Expenditures of the school contributory organization which are not provided from the state budget or other sources are provided from the founder. The operating contribution is used to a supplement missing sources in the organization´s budget. It is therefore a very important item in the whole budget. The amount of the operating contribution is determined on the basis of the performance or other criteria

of the organization´s needs (e.g. as the difference between budgeted costs and revenues of the organization). The contribution can be approved either as purposeful or as non-purposeful or as a combination of the previous ones. The founder may provide **the contribution to operating expenses** or the contribution to investments. The operating expenses include non-investment expenditures that are not covered from the state budget. These are expenses associated with the operating of the school building, as well as expenditures for the acquisition, repair and maintenance of fixed assets that school uses in its main activities. **The investment contribution** has the character of an investment, capital subsidy. It serves the organization to make investments. However, this type of the contribution is an irregular source for the organization (Otrusinová & Kubíčková, 2011).

This source is also associated with a negative item, namely payment to the founder´s budget. The obligation to pay arises the contribution organization if:

- the planned revenues exceed the planned costs (then it is a binding budget indicator),
- the investment sources are higher than their need to use according to the decision of the founder,
- the contributory organization violates budgetary discipline, for example in the case of using the finances from the fund for other than the intended purpose (Otrusinová & Kubíčková, 2011).

9.2.3 MAIN AND ADDITIONAL (BUSINESS) ACTIVITIES

The founder issues the charter of the establishment of his contributory organization, which must contain, among other things, the definition of the main purpose and the corresponding subject of the activities – i.e. **the main activities** for which the contributory organization was established (Act No. 250/2000 Coll.). The definition of the main activities of the contributory organization is always within the competence of each founder. In the case of contributory organizations established by territorial self-government units, there are no uniform criteria for what is or what is no longer the main activity in the Czech Republic (Nejezchleb, 2017). The main activities of the contributory organization are operated in a non-profit manner. The costs of these activities are always higher than the revenues that the organization received from the main activities. In the case of the school contributor organization, these may be, for example, the following main activities – provision of the basic education, provision of meals for the pupils and the staff, provision of the school group operation, etc.

The school contributory organization may also perform so-called **additional (business) activities** but only with the consent of the founder. The areas of the additional activities must follow the main purpose of the contributory organization and must also be defined in the charter of the establishment of the contributory organization. The founder enables the contributory organization to make better use of all its economic possibilities and the expertise of its employee according to the par. 27 article 2 letter g) of Act No. 250/2000 Coll.

The contributory organizations behave as business entities in these additional activities and they are taxpayer of the corporate income tax. The profit generated from the additional activities must be used to improve the main activities. The additional activities make it possible to obtain extra budgetary finances (Katzová, 2008). The additional activities must not be financed with finances provided from the state budget and should not be loss. If the loss arises, it must be offset by the end of the following calendar year, or these activities must be finished (Act No. 561/2004 Coll.). In the case of the school contributor organization, these may be, for example, the following additional activities – rental for sport purpose, organising professional courses, training for the publish, etc.

The additional activities are often and important form of the financing of the contributory organizations. There is a growing pressure on these organizations to participate in self-financing, or even pre-financing from larger sources of the projects (Otrusinová & Kubíčková, 2011). The additional activities bring additional free finances, greater financial flexibility and visibility. But they also have negatives, such as just a supplement of the financial sources, unsuitability for any organization, risks arising from the business and the obligation of the corporate tax payer (Boukal, 2013).

9.2.4 TRANSFERS

The transfers are regulated by Decree No. 410/2009 Coll., as amended and by Czech Accounting Standard No. 703 – Transfers. The transfers mean receipt or provision of the finances by the public budget according to the Czech Accounting Standard, for example, grants, financial supports, subsidies, cash benefits, non-repayable funds, etc. The standard also determines what is not subsidy, such as the provision or receipt of money within the supplier-customer relationship, payment of money to the founder, etc. (Decree No. 410/2009 Coll., Czech Accounting Standard No. 703 – Transfers). In some cases, it is difficult to determine whether or not it is the transfer. Therefore, it is good to follow International Public Sector Accounting Standard (IPSAS) No. 23 – Revenue from Non-Exchange Transactions (Taxes and Transfers), according to which the transfer is an inflow of future economic benefits or potential from non-exchange transactions, except taxes (Sluka & Kortanová, 2017).

Significant revenues of the transfers flow to the contribution organizations also within the foreign transactions. According to the conditions, financing is allowed to the non-profit organizations of the Czech Republic from the European Union (EU) and Norwegian funds, also on the basis of Swiss-Czech cooperation, the sources are entrusted to the Czech Republic from the financial mechanism of the European Economic Area. In the case of unused finances from the EU budget and other international agreements by the end of the calendar year, these finances are transferred to the reserve fund where they are monitored separately and they are used to finance the intended purposes in the following years (Otrusinová & Kubíčková, 2011).

The transfers from the European Union can be drawn under national or community programs. The national programs specially use the Structural funds which

serve as a tool for achievement social and economic cohesion in the countries of the European Union. These are, for example, the European Regional Development Fund or the European Social Fund. The community programs focus on the financing problematic areas, such as education, research, environment, etc. Currently, the financial framework for period 2014-2020 is applied where growth, employment and suitable development are key points (Boukal, 2013; Multiannual EU budget (2014-2020), 2013).

9.2.5 MONEY FUNDS

Par. 29 of Act. No. 250/2000 Coll. determines which money funds are obligatory created by the school contributory organizations in their activities. The management of these funds intervenes with the relationship between the founder and the organization and is regulated by Act. No. 250/2000 Coll. However, within the definition of rights, the founder may impose the conditions for the creation and drawing of the funds to the organization in excess of the conditions stipulated by law. These conditions must not be in conflict with the law because the finances in the funds of the organization are again the property of the founder (Maderová Voltnerová & Tégl, 2011). In practice, there may be a differentiation of the conditions of the creation and the use of the funds among contributory organizations and may lead to artificially disturbing the economy of the contributory organizations (Vejsadová Dryjová, 2018). The school contributory organizations form the following funds:

- **Reserve fund** is formed of the improved economic result on the basic of the approval of its amount by the founder after the end of the year, financial donations, or received transfers (or unused balances of the operating subsidies provided from the EU). The sources of the fund are used, for example, to further develop activities of the organization, to pay sanctions for the budgetary discipline, or to cover losses. It is possible to finance the investment fund from the reserve fund with the consent of the founder (Maderová Voltnerová, 2018).
- **Investment fund** is intended exclusively to finance the investments needs of the organization. The finances in the amount of the depreciation, investment contribution received from the founder, investment subsidies, incomes from the sale of the assets (only with the consent of the founder), transfer from the reserve fund and other received donations and contributions for investment purpose, these are the sources of the fund (Maderová Voltnerová, 2018).
- **Cultural and social needs fund** is formed of a basic allocation, i.e. 2 % of the annual volume of costs earmarked for salaries, including compensations and bonuses. The finances of the fund are intended to provide for the cultural, social and other needs of the employees and must be deposited on the separate bank account. In accordance with Decree No. 357/2019 Coll., On the Fund of Cultural and Social Needs, as amended, the organization must compile the fund´s budget and must determine the methods of the drawing.

The fund is formed by the advances in accordance with the budget. The fund must be recorded in the financial statements (Decree No. 357/2019 Coll.).

- **Rewards fund** is the only voluntary fund. The fund is formed of the improved economic result from the previous accounting period (i.e. a maximum of the 80 % of the improved economic result according to the Act No. 563/1991 Coll.) after the compensations any losses from the previous years. The fund is used only for employee remuneration (Morávek & Prokůpková, 2016).

9.2.6 DONATIONS

The school contributory organization may accept monetary and non-monetary donations, in accordance with the par. 27 of Act No. 250/2000 Coll., only with the prior written consent of its founder. According to the par. 37b of the Act, the contributory organizations must have the written consent for each legal act separately. The acceptance of the non-monetary donation is an exception where only one written consent is sufficient for several legal acts. Special purpose donations are transferred to the relevant fund where the drawing for the given purpose which the donation was provided must be observed.

9.2.7 OTHER SOURCES OF FINANCING

The possibilities to use other sources of financing strongly depend on the conditions set out in the charter of the establishment and the specifics of each contributory organization. The contributory organizations can use, for example, cooperation with companies in order to increase their social responsibility and visibility. The companies have the opportunity to offer financial support in the form of one-time donation or sponsorship contribution, purchase of goods or services of the organization, or support in the form of renting equipment, etc. Unlike donations, the contributory organization provides the visibility of the company as consideration (Boukal, 2013).

9.3 PRINCIPLES OF CIRCULAR ECONOMY AND PRACTICAL APPLICATION

The circular economy is an alternative industrial model where industrial processes are not seen as the inevitable cause of natural resources exploitation, but rather as a means to contribute to sustainable development. Circular economy framework builds upon novel approaches that allow to continually circulate flows of components, materials and products at their highest utility into production system. The mail aim of the circular economy is to maximize the utilization of the materials, components and products that would otherwise be quickly disposed of, not used or obsolete (Lacy & Long & Spindler, 2020). Ghosh (2020) adds that the materials,

components and products must be designed with life cycles that are safe for the environment and human health. Further, Ghosh (2020) states that the circular economy approach can be achieved through sharing, leasing, reusing, repairing, refurbishing, and recycling in a closed loop in order to minimize leakage of resources. The circular economy is based on system focused on the treatment of waste as a resource. This means that whenever a product reaches the end of its useful life, companies or public institutions should try to keep the materials within the production boundary and use them productively. The purpose of the circular economic is to design goods so that they could be repaired rather than replaced, and biological materials would be managed so that they could be returned to the biosphere without contamination.

Tonelli & Cristoni (2019) state that the circular economy is such pragmatic approach that can take us away from the downward spiral of natural exploitation. The authors further add that the circular economy is realistic and rationale thanks to its economic foundations based on reducing costs, identifying new opportunities and maximizing efficiency. And these are the same objectives of any company or public institutions out there, regardless of whether it is about to enter a new market, or seeks to increase profits and expand its market share, or aims to survive. Even in the circular economy the focus is still making business operations profitable. This is achieved by embracing a number of regenerative and closed-loop strategies like switching to bio-based materials and green energy sources, prolonged used, utilization rate maximization, refurbishment, remanufacturing, and components recovery.

In the actual era of the international trade, global warming and depletion of Earth's natural resources, the willingness to generate sustainable and competitive benefits determines us to stop thinking linearly (produce, consume and dispose) and to shift towards a circular approach by closing material loops (Suzanne & Absi & Borodin, 2020). The transition towards a circular economy is an increasingly key issue in the political and business fields. The aim of this economic transition is to retain "the highest utility and value of products, components, and materials at all times" by reducing the negative externalities on the natural environment (EU Commission, 2015). The transition to a circular economy is, therefore, a key issue for achieving more sustainable development. Consumers' understanding and commitment are in this transition necessary points that will lead them to more environmentally friendly purchases (Testa & Iovino & Iraldo, 2020). The aim of the "New Circular Economy Action Plan", released in March 2020 by the European Commission, is to accelerate this transition, identifying also key sectors that use the most resources and where the potential for circularity is high (EU Commission, 2020).

Ghosh (2020) states that the circular economy and sustainable development goals have a close relationship in many aspects. Ghosh (2020) describes that the circular economy will definitely help in implementation of sustainable development goals 2030 in the world and that the circular economy practises can help achieve several of the sustainable development goals´ targets.

The EU Commission states in "New Circular Economy Action Plan" released in March 2020 that it is necessary to identify key sectors that use the most resources

and where the potential for circularity is high. One of the sectors that can use the circular economy is the public sector. Tonelli & Cristoni (2019) state that the circular economy can be used by public institutions too. Using of the circular economy in the public sector may not be as widespread as in manufacturing companies but it is used.

9.4 CASE STUDY – SCHOOL CONTRIBUTORY ORGANIZATION

The casy study is created using data obtained from the school contributory organization called „3. Základní škola Rakovník".

9.4.1 BUDGET OF THE CONTRIBUTORY ORGANIZATION

The financing of the contributory organization is based on the budget and the medium-term which provide an initial insight into the financing processes. They are an important prerequisite for deciding on the further progression of financial resources. The compiled budget of the contributory organization is approved by the Rakovník City Council where the City of Rakovník is in the position of the founder of the contributory organization. The approval of the budget for the following year takes place at the beginning of December. The budget contains an overview of the founder´s contribution, operating subsidies from other resources, financing through funds and the use of these funds on the other hand. The budget is compiled according to the methodology issued by the founder, the prescribed form is observed. During the compilation itself, the contributory organization is based on previous periods, financial data from previous periods are adjusted for expected changes. In the prescribed form, the finances and their use are displayed in the range of full planned costs and revenues (including additional activities). However, the school considers only financial resources in the budgets depending on the founder´s budget (operational and special-purpose) and no other resources of financing that the organization draws are mentioned, such as financing through the Ministry of Education, Youth and Sports projects, which form a significant part of financing. This way of drawing up budgets can have a very distorted impression from the user´s point of view. The budget manager agrees that the way the budget is established at the level of total revenues and costs is more transparent, however, they do not consider the change to be effective from the point of view of management. There are fears of greater complexity of processing and this method is not important for streamlining management in budget master´s opinion as they work with individual budget breakdowns, the rules of operating programmes. They approach the management of individual resources individually.

After approval of the budget, the contributory organization will receive a breakdown of the approved budget which contains the volume of financial contributions provided to the contributory organization by the founder. The organization has not set any binding indicators by the founder. Based on changes during the year, the

operating contribution can be moved between individual items according to the needs of the organization. Only unspent earmarked contributions are returned to the founder. The organization thus follows the rule of approving the budget so that the binding indicator is aggregate amounts, in this way the founder regularly checks the drawing of the provided contributions. The organization later uses the unspent money for innovations, modernizations and repairs. Adjustments to the budget are in the competence of the organization principal, the budget is updated and submitted to the founder during the quarterly analysis of management including the justification of the changes made.

On the other hand, the organization is obliged to follow the set binding indicators of the breakdown of the approved budget of finances flowing from the Ministry of Education, Youth and Sports. Binding indicators are employment, salaries, agreements on the performance of work and agreements on the performance of activities, direct other non-capital expenditures. The organization may use the reserve fund or the reward fund if it is necessary to exceed the budgeted finances (Kašparová, 2020).

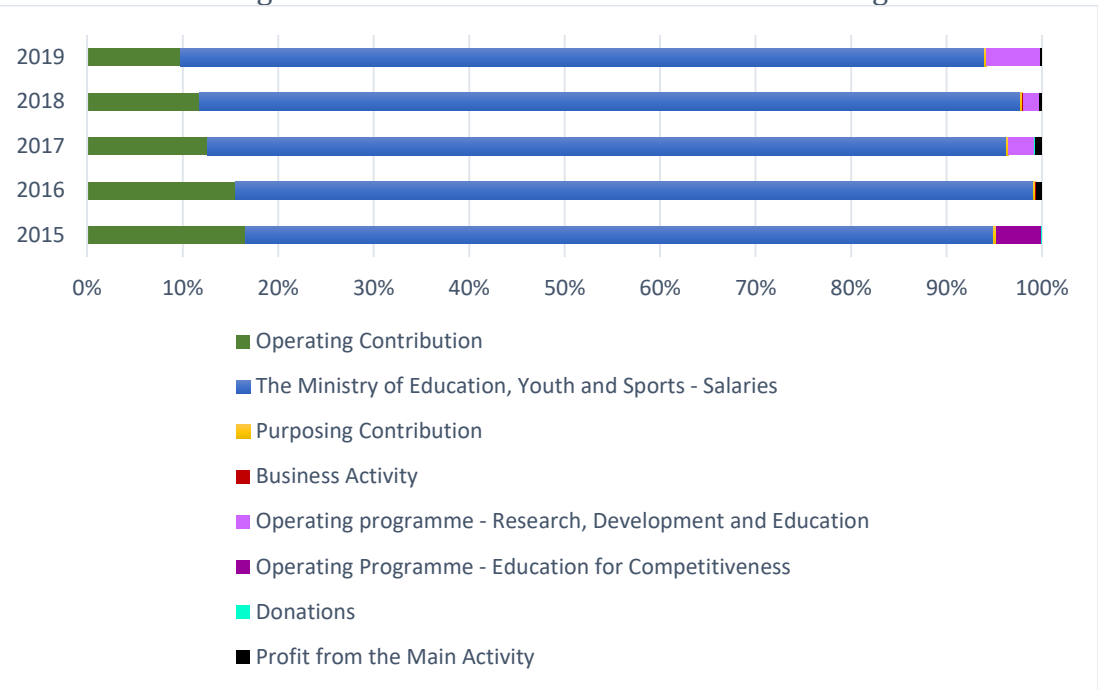
9.4.2 FINANCIAL SOURCES

3. Základní škola Rakovník uses the most transfers from the Ministry of Education, Youth and Sports and the operating contributions of the founder. Other sources of financing are less represented. The representation of each source of financing is shown in Figure 1. The used financial sources are enough to cover costs. So, the revenues are sufficient (Kašparová, 2020).

The school has sufficient finances in the reserve fund from the improved economic result. The state of the reserve fund amounted to 994,000 CZK in 2015. Finances in the amount of 807,000 CZK were drawn up from the reserve fund in 2016. In 2017 the fund increased to 1,041,000 CZK. Subsequently, the reserve fund was drawn up to the amount of 245,000 CZK. The balance of finances in the reserve fund was 386,000 CZK in the last year.

The property of the 3. Základní škola Rakovník consists mainly of current assets. Current assets are on average 83 % of total assets. Based on the performed financial analysis, the contributory organization is assessed as in an investment slowdown. The investment, development rate indicator reached the highest value of 5.5 % in 2016. In other years, it is around 1 %. The contributory organization invested mainly in small tangible fixed assets.

Figure 1: Overview of Used Sources of Financing



The founder´s operating contribution is provided for all operating expenses related to ensuring the main activities of the school, such as energy consumption, repairs, purchase of consumables, travel expenses of employees, or the purchase of small fixed assets. Contribution are paid in instalments every month; the promise of the contribution arises before the beginning of the current period by approving the founder´s budget. During the monitored period, the contributory organization received an operating contribution of 5,800,000 CZK. In the first two years (2017-2019) the contribution was reduced to 5,300,000 CZK.

The founder also provides ***special-purpose contributions*** to contributory organizations. They are set only for a defined purpose and the contributory organization is obliged to return unspent finances. This organization draws up special-purpose contributions mainly to finance pupils´ courses, sports activities, competitions, social education, adaptation courses, competitions, etc. The costs incurred are documented by the founder. The organization received a purposed contribution in the amount of 101,000 CZK during the monitored period.

The main source of financing is the ***subsidy of the Ministry of Education, Youth and Sports*** limited to financing salaries, statutory contributions, financing of cultural and social needs and direct other non-investment expenditures. Other uses include expenditure on teaching assistant, aids and support measures. The contributory organization received finances in the amount of 33,659,000 CZK on average over 5 years. The largest amount was received in 2019 (45,698,000 CZK) while the lowest amount was 27,341,000 CZK in 2015.

Advances on salaries are paid monthly, on other expenses quarterly. The transfer is billed twice a year; the unspent finances are returned to the founder. The settlement of the transfer is checked by the founder.

3. Základní škola Rakovník operates ***additional (business) activities*** (hospitality and specialized retail). The prices of lunches of additional activities are based on the total number of lunches when a proportional part of the costs for additional activities is calculated. Revenues from additional activities cover only a small part of the costs. The lowest profit was achieved in 2016, the profit from additional activity was only 7,982,000 CZK. The highest improved economic result was generated by additional activities in the amount of 22,782,000 CZ in 2019. In other years the value ranged from 11,000 CZK to 20,000 CZK.

Operating programmes are one of the variants of non-investment subsidies provided by the Ministry of Education, Youth and Sports. The organization always receives finances within the project for a specified period which is generally called "Šablony". Šablony I. were drawn up in order to increase the quality of education in the years 2017-2019. The organization has been drawing on Šablony II. since 2019. Projects are used to finance further education of pedagogical staff, the activities of a special pedagogue, meetings with parents, mentoring, tandem teaching, etc. The school received a subsidy of 3,002,000 CZK as part of this operating programmes in 2019. The subsidy is settled by documenting the outputs from drawing transfers. The projects are co-financed by European Union funds. Similar projects were the Operating Programme Education for Competitiveness, "Learning Digital", Teaching Foreign Languages and Innovation in Technical Education. The contributory organization received a total of 3,524,000 CZK from the operating programmes for the above purposes in the years 2015-2018.

The contributory organization uses a few ***other resources*** which are rather additional due to the relative level of profitability. The organization uses the funds of the Parent´s Council for small expenses. Private entities provide donations to the school, unfortunately rather irregular ones. E. g. in 2019 donations amounted to only 2 000 CZK, but the incomes from donations reached 47,000 CZK in 2017. Donations are usually purposefully related. Furthermore, the organization collaborates closely with local entities, such as the Police of the Czech Republic, the T. G. M. Rakovník Museum, and the Municipal Library. It is not a financial resource, but the school gets another opportunity to improve its main activity (Kašparová, 2020).

It is evident from the above figure 1 that the result of management from the main activity generated by the contributory organization forms only a small part of the total incomes of the organization. The highest profit from the main activity was achieved in 2017 (292,000 CZK), the reason of the increase in profit was the growth in the volume of sold canteen meals and the increase in rental incomes. The profit from the main activity decreased on 121,000 CZK in 2018 and 2019, compared to the previous period due to the reduction of the operating contribution from the founder. The profit from the main activity was a loss in the amount of 17,000 CZK in 2015, the loss was covered by finances from the reserve fund. (Kašparová, 2020).

In the case of the improved economic result, the profit is transferred to the reserve fund (on the contrary, in the case of a loss). According to the Act no. 250/2000 Coll., the economic result must be divided into funds. The distribution of the im-

proved economic result is approved by the founder. The organization has not specified what part of the profit must be transferred to the reserve fund and what part to the rewards fund. As a rule, the greater part of the profit goes to the reserve fund, the fund of rewards accounts for about 15 % of the improved economic results. The last time the fund of rewards was created was in 2015, but only in the same amount as it was drawn. If the intention was to increase the investment fund from the reserve fund, this would be possible only with the prior consent of the founder. The advantage for the monitored contributory organization is the fact that the reserve fund forms from other titles too where the organization can monitor purposed funds separately (Kašparová, 2020).

9.4.3 USAGE OF CIRCULAR ECONOMY IN THE SCHOOL CONTRIBUTORY ORGANIZATION

It was mentioned that the circular economy is not applied in the public sector as often as in the private sector. However, the public sector is an important part of the economy and therefore the application of the circular economy should not be omitted either.

The selected contributory organization 3. Základní škola Rakovník is depend on its founder, for this reason it is limited in the application of major projects in the circular economy and is obligated to resolve issues with the founder and apply for his consent. For example, it is not possible for the organization to implement energy projects without the consent of the founder. The analysis of the financial sources of the school contributory organization shows that the contributory organization is not able to finance the entire renewable energy project from its own financial resources. For this purpose, the organization must again use public finances in the form of investment subsidies, such as the Operating Programme Environment with the consent of the founder. Or it can finance the project in multiple sources, e.g. partly with the help of the subsidy from the Operating Programme Environment, partly from the investment contribution from the founder and partly using its own resources from the investment fund. In addition, the situation is aggravated by the fact that the buildings are not the property of the school contributory organization but the founder who allows the organization to use the building for operating the main activity. The contributory organization may apply the circular economy itself in other areas which may seem insignificant at first but the actions can also greatly contribute to the functioning of the circular economy. In particular, the school can contribute to the responsible production, consumption and processing of food, as can operate the school canteen as part of its main and business activities. One of the main activities of the contributory organization is the education of pupils where the organization can fundamentally influence the circular economy if the organization educates pupils about a responsible way of life and sustainability in all aspects of circular economics. The buildings used by the contributory organization include the adjacent school grounds where there is a space for using of the garden for its activities and the education of pupils. Currently, the school is already seeking a grant to build and modify outdoor areas and land to

support outdoor education. The subsidy is paid from the National Environmental Programme. It is possible to involve within education not only pupils, but also the general public through the public educational events, joint events of pupils and the public, or cooperation with other institutions and entities in the area.

On the positive side, the representatives of territorial self-governing units are acquainted with the circular economy, various workshops are organized, most often in the field of waste management and their further usability. The founder of the monitored school contributory organization also actively participates in education in this area thus creating more space and a good precondition for the application of the circular economy.

Another starting point could be a specific fund that could be established for this purpose by the founder, because according to the provisions of par. 5 of Act No. 250/2000 Coll., the local government unit may establish funds for specific purposes or without purpose. The founder could set up the special purpose fund dedicated exclusively to financing investments in renewable energy source area in order to achieve new savings. Various investment measures, such as complete or partial insulation of building facades, floors, roofs, replacement of windows, modernization of building interiors, equipping buildings with new LED lights, etc. could be financed from this specific fund. According to the law, the sources of this specific fund may be, in particular, the surpluses of previous years, the income of the current year, which is not intended for use in the current year, or transfers of finances from the budget to the funds during the year. These sources defined by the law would be the initial sources of this fund. In addition, over the life of the investment, the energy savings and the installation of renewable energy sources would also be the source of this special fund. This special purpose fund would serve not only the founder, but also its contributory organizations for the long-term reduction of operating expenses for energy and also to the using of renewable energy sources. Subsequently, there would be a reduction in the amount of the budget not only of the school contributory organization but also of the budget of the founder himself. In addition, finances reinvested in energy savings and using of renewable energy sources will have a long-term multiplier effect in the sense that finances will remain in the region of the local government unit and will not go away irreversibly to energy suppliers. At the same time, this specific fund motivates both the founder and the school contributory organization to consciously behave. The result would be strengthening the energy self-sufficiency of entities and especially more efficient use of public funds.

9.5 CONCLUSIONS

The principle of the financing regional education is completely dependent on the political decisions of the given country and on the decisions of public administration bodies in education. The financing of school contributory organizations is multi-source where the dominant resources are precisely purposeful finances from public resources, specifically from the Ministry of Education, Youth and Sports, to

cover wage costs and other related costs. In the case of this contributory organization this dominant resources participated for an average of 83 % of the total sources in the evaluated years. Change in the financing of regional education valid from 2020 on the basis of Act No. 101/2017 Coll., as amended, and Act No. 167/2018 Coll., as amended, on the so-called normative cost system of financing once again confirmed that the Ministry of Education, Youth and Sports will influence the financing of regional education through interventions into the system. Other important sources of financing are transfers, either in the form of the contribution from the founder or in the form of the Operating Programs. Transfers occupy a significant volume of cash flows between public budgets. This is a much-discussed topic due to the ambiguity of the legislation and the ambiguity of the definition of cash flows in legislation. This is accompanied by doubts about sound accounting practices and, consequently, budgetary reporting.

As the dominant sources of financing are purposeful, further, the school contributory organization can strengthen its budget through sources obtained from additional activities and non-purposeful donations which are collected irregularly and they are rather exceptional because the majority of donations are purposeful. Nevertheless, these resources are not high enough for the organization to be able to partially finance the renewable energy source project. However, the finances may be sufficient, for example, to improvement of pupils´ education in the area of the circular economy, use of the school garden, efficient usage of food in the school canteen, and sustainability in general.

Act No. 250/2000 Coll. allows to set up to local government unit extra-budgetary funds for a specific purpose, or non-purpose to support the financing of its own activities. These funds of the local government unit differ from the funds of the contributory organizations where the law precisely defines the creation and management of funds. These funds differ mainly in the absence of a closer characteristic, purpose, rules of creation or drawing. For this reason, the conditions for the creation and management of the local government unit´s funds may also differ among individual local government units and their established contributory organizations. The advantage of funds established by the local government unit is in the possibility of creating another source of financing for established contributory organizations that can be used to develop the organization for specific purposes which can be, for example, the provision of renewable energy sources. In this case, the main benefit of the special fund would be a stable source of financing for projects to reduce operating energy costs where savings in operating energy costs area would become another source of financing for this fund and the founder of the organization would generate additional revenue in the budget. This would ensure a multiplier effect. Subsequently, the burden on the budget of the founder and established school contributory organization would be reduced thanks to more efficient operation.

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ZÁKON Č. 250/2000 SB., o rozpočtových pravidlech územních rozpočtů, ve znění pozdějších předpisů

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ZÁKON Č. 583/1992 SB., o daních z příjmů, ve znění pozdějších předpisů
ZÁKON Č. 89/2012 SB., občanský zákoník, ve znění pozdějších předpisů

Conclusion

On the basis of previous chapters, we can summarize that the circular economy is an artificial thought construct based on environmental ideas and the development of ecology as a scientific discipline. It is based on the task of adapting production mechanisms and processes as quickly and thoroughly as possible to the human will, which is defined as a social, public or global interest, regardless of or only with reasonable regard to the opinion and will of economic operators. This task is to reduce the side effects of production processes as much as possible, while the main side effects are the generation of waste both in the production itself and in the logistics belonging to it, and at the end of the product's life.

As can be seen at first glance, the circular economy is a response to a paradigm shift, which can be formulated as a fundamental difference from any previous state and from most earlier economic theories, at least from all theories that have become the predominant attitudes of the main mind. Current Economy becomes a tool and helper for the enforcement of political will, and this political will is based on the social paradigm. We could now discuss for quite some time the extent to which this political will is indeed a reflection of the majority convictions of the peoples of individual countries, and the extent to which this political will passes the test of the democratic majority. In essence, we would get into the field of discussions about the democratic nature of political decision-making, for example within the European Union or possibly in other developed countries, where circular economics is promoted through political decisions (for example through taxes, regulations and the like). However, this discussion is very extensive, very specific and, above all, it is not a very economic issue, nor is it even a question of political economy, but rather of political science, sociology and other disciplines.

If we talked about the social paradigm shift and its reflection in political decisions, which are reflected in the setting of conditions for the functioning of economic entities, it is necessary to define what we mean by that. Obviously, it is primarily a matter of prioritizing a certain type of accompanying feature of the production activity (waste) over other circumstances of this activity, to which we can count, for example, profit, employment and many others. It is possible to discuss at length the extent of this preference, its concrete manifestations and the setting of priorities, but undoubtedly there must be changes compared to the previous situation - which is crucial in this context.

From the point of view of economics, a higher-order question arises here, which then touches on the basic principles of theoretical thinking. The purpose of economic activities has always been and is, at least always applied to all the main theoretical directions, to satisfy the needs of participants in economic events, ie particular people. This satisfaction occurs through profit or profit sharing or remuneration (most often wages). It is clear that if costs (the cost of waste) are a means of enforcing circular economics, then it is more than likely that this necessarily affects both profits and rewards. Again, the decision on the extent of the impact on one or the other area is ultimately a political decision, but it must necessarily have an economic basis. These bases must be very complex and must examine not only the mechanisms of influence within the system (say national economies or continental economies, for example), but must also include mechanisms for applying these costs to imported goods (and of course services), as the imposition higher costs of domestic or continental production must be compensated, otherwise it will lead to unsolvable results.

Thus, regardless of the complexity of the problem, which is obviously aware of the circular economy, the question arises as to whether in economic practice it is possible to at least partially replace the profit function in a sufficiently effective way and replace it in a sufficiently effective way at least partially within the social paradigm.

As can be seen from the previous list of problems, the new paradigm raises a number of questions, some of which we can even consider to be largely new not only in their form and wording, but also in principle. The purpose of a theoretical reflection on the need to implement the paradigm in real life is how to achieve this at acceptable national economic costs and how to protect the economic environment from the aggressive environment of others, which would like to spare such costs. Although this may seem like a relatively basic problem at first glance, it is in fact a complexly structured and very complex issue.

Circular economy is obviously a direction in the development of economic thinking, which brings so far either unknown at all or only marginally known specifics. The main thing is that it is not a response to some economic events (such as a crisis) or technological change, but a theoretical evaluation and analysis of how some ideas from the social sphere could be introduced into the real economy and how it could be done. There is the necessary political decisions to promote these ideas at an acceptable economic cost. Logically, the next task must be to define these costs, describe them and point out their existence. The creation of individual practical solutions as they form or will form circular economics is then more the task of technologists and scientists or technicians from other fields, it is not an economic question in the true sense of the word.

However, it is clear that if the new social paradigm, the existence of which we took as a fact in this work and whose support we have not questioned, persists, then the economic theory of the coming years or decades will have to cope with

this task quite fundamentally. These may include, for example, whether the market environment is able to enforce the social paradigm in real life and, if not, how strongly will elements of the planned economy need to be added through regulations and possibly planning institutions to enforce the paradigms? Another such question (out of many potentials) is: To what extent is it possible to achieve the implementation of the paradigm in parallel with the fact that profitability indicators remain key indicators for investment decisions? And is it possible to enforce a change in the view of profitability other than through extensive regulations or directive decisions? – There are many fields of research opened and unexplored yet.

However, can it be assumed whether a circular economy can generate sustainable economic growth? Because the circular economy, like any other subsystem on our planet, cannot grow forever.

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