

THE CIRCULAR ECONOMY IN CENTRAL AND SOUTH-EASTERN EUROPE - THE NEED FOR ACTION

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Abstract. *This paper provides an introduction to some of the principles and approaches related to the concept of a circular economy which is relatively new at the European level especially in Central and South-Eastern Europe. In essence, a circular economy represents an alternative to the currently predominant linear take-make-consume-dispose economic model, which is not sustainable and in many cases is causing the wasting of natural resources. The circular economy according to the Ellen MacArthur Foundation aims to maintain the utility of products, components and materials and retain their value. It thus minimizes the need for new inputs of materials and energy, while reducing environmental pressures linked to resource extraction, emissions and waste. In the article there are presented main schools of thought in which circular economy has its origins. Among analyzed concepts are: cradle to cradle, industrial ecology, biomimicry, dematerialization and performance economy. The concept of circular economy is essential for whole Europe, however Central and South-Eastern Europe is in a specific situation because on one hand, some indicators, for example recycling rate and the amount of waste going into landfills without treatment are much higher than in Western European countries, but on the other hand, in the countries of Central and South-Eastern Europe, the amount of waste generated per capita is many times lower than in Western Europe. Wise implementation of circular economy programs can cause that in these countries waste management systems will be significantly improved in a relatively short time. In the article the comprehensive assessment of the European waste management systems and circular economy programs - which aim to manage all natural resources more efficiently and sustainably - are analyzed. European Commission Circular Economy Package which is going to stimulate Europe's transition towards a circular economy has been also analyzed. In the paper benefits related to the implementation of circular economy programs have been analyzed: environmental benefits which bring less environmental impact; economic benefits which bring opportunities for economic growth and innovation and social benefits which bring sustainable consumer behavior and job opportunities. Moreover, new business models which play an important role in the circular economy and have significant potential for increased economic, social and environmental benefits are presented. Among analyzed models are: remanufacturing and reuse; selling services rather than goods and sharing economy business model.*

Keywords: *circular economy; recycling; resource recovery; waste management; remanufacturing.*

Introduction

Among the important challenges in today's economy, one of the most important is the availability of resources. That is why the idea according to which today's goods are tomorrow's resources becomes very promising and worth deepening knowledge and further analysis. Nowadays in the EU, each person consumes 16 tons of materials annually, of which 6 tons are wasted, with half going to landfill. Trends show, however, that the era of plentiful and cheap resources is over (European Commission 2011). Businesses are facing rising costs for essential raw materials and minerals, their scarcity and price volatility are having a damaging effect on the economy. Thus, the transition to this new circular economy is inevitable, however, the question is how and how fast the countries will develop and implement the relevant new business models.

Nowadays it is possible to observe many cases of unsustainable overuse of resources and also increasing environmental degradation. That is why the developing of the concept of circular economy can contribute to decoupling economic growth from environmental degradation. Clean cycles of resources could radically decrease the amount of pollutions which are released to the environment and at the same time can foster prosperity of societies.

Most of the world economies in the XXI-st century remain locked into a system where everything from production economics to contracts, and from regulation to mind-sets, favors the linear model of production and consumption. Replacing this linear world with new circular business models seems to be a challenge for decades not only for European Union countries but also for all countries in the world. The greatest resistance associated with the transition to the new model is related to the fear that revenue and profits of companies will be decreased due to the lower demand for incremental sales.

In the article there are presented principles and approaches related to the concept of a circular economy and the selected aspects of the transition path to a circular economy in the region of Central and South-eastern Europe.

The genesis of the concept of circular economy

The concept of circular economy has its origins in a few schools of thought such as cradle to cradle; industrial ecology, biomimicry, dematerialization or performance economy.

- Cradle to Cradle concept as a design philosophy was developed by Michael Braungart and Bill McDonough. It is built on three principles: 'Waste equals food'— 'Use current solar income'— 'Celebrate diversity'. They consider all material involved in industrial and commercial processes to be nutrients, of which there are two main categories: technical and biological. According to this design philosophy, the flow of industrial materials could be guided in a way similar to biological materials - „biological metabolism” as a model for „technical metabolism”. For such an effective recycling system precisely defining the molecular composition of materials is needed. (McDonough & Braungart, 2002)
- Industrial Ecology concept is focusing on the restoration of natural capital and social wellbeing. In practice, it concentrates on connections between operators within the „industrial ecosystem”. The aim of this concept is to create closed-loop processes in which waste serves as a raw material. It adopts a systemic point of view and assumes designing production processes in accordance with local ecological constraints. This

- approach is enabling the elimination of an undesired by-products. Moreover, its principles can also be applied in the services sector.
- Biomimicry concept it was created by Janine Benyus, author of „Biomimicry: Innovation Inspired by Nature“. She defines her approach as „new discipline that studies nature’s best ideas and then imitates these designs and processes to solve human problems“. Biomimicry relies on three key principles: Nature as model: Study nature’s models and emulate these forms, processes, systems, and strategies to solve human problems; Nature as measure: Use an ecological standard to judge the sustainability of our innovations; Nature as mentor: View and value nature not based on what we can extract from the natural world, but what we can learn from it.
 - Dematerialization and ephemeralization - there are two similar concepts of which first refers to reduction in the quantity of materials required to supply needs of societies and serve economic functions in society and the second refers to increase in the efficiency of achieving the same products and services while requiring less resources, time and effort (Bailey, 2001)
 - Performance Economy is the vision from the 70’s presented in the report to the European Commission „The Potential for Substituting Manpower for Energy“. In the vision there was presented an impact of economy in loops on job creation, economic competitiveness, resource savings, and waste prevention. Moreover, the author of the report - professor Walter Stahel who founded in 1982, the Product-Life Institute - Europe’s oldest sustainability consultancy - pursues four main goals: product-life extension, long-life goods, reconditioning activities, and waste prevention. The institute also promote the importance of selling services rather than products, and the concept of ‘performance economy’ and circular economy which is perceived as a coherent model ensuring further development in conditions of limited resources and high prices of natural resources.

Above schools of thought contributed to the creation of the concept of circular economy, which is the most often characterized as an „industrial system that is restorative or regenerative by intention and design It replaces the ‘end-of-life’ concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models” (Towards the Circular Economy, 2013, p.8)

As Daly and Farley says waste is just a resource we have not yet learned to use (Daly & Farley, 2004, p.41). Nowadays, not only in Europe but also in another developed country in the world most of the production-consumption processes are still traditional linear patterns, which in short can be describe as take-make-dispose approach. In this model raw materials are extracted from the environment, transformed into products and eventually disposed of. It is leading to scarcity, and higher levels of pricing. One of the threshold condition for the transition towards this new circular economy is also the change of consumer behaviors. Unfortunately, very often consumption does not follow real needs, but it is wasting consumption. Using the figures of World Bank Indicators, it follows that the wealthiest 20% of the world accounted for 76.6% of total private consumption; the middle 60% consume 21,0 % and the poorest 20% just 1.5% (Shah, 2014) Moreover the United Nations organization for many years alerts that: „the dynamics of the consumption-poverty-inequality-environment nexus are accelerating. If the trends continue without change — not redistributing from high-income to low-income consumers, not shifting from polluting to cleaner goods and production

technologies, not promoting goods that empower poor producers, not shifting priority from consumption for conspicuous display to meeting basic needs — today's problems of consumption and human development will worsen." (UNDP, 1998, p.1), according to what UN presents the real issue is not consumption itself but its patterns and effects.

The core principles of circular economy were outlined in the report of Ellen Macarthur Foundation „Towards the Circular Economy” and there are as follow:

- Waste are „design out” from processes. It determines that component and product have to circulate in economy. Reusing and recycling for the large scale prevent from disposal of materials.
- Demarcation between consumable and durable components of a product is introduced. Consumables component/products are made of biological renewable ingredients and durables one such as metals and most plastics are designed for reuse.
- Energy for production processes should come from renewable sources.

Moreover, in circular economy, in case of durable technical products the concept of consumer is assumed to be replaced with the concept of user. Such a shift from consumer to user means that instead of buy-and-consume approach the new solutions are promoted such as: leasing, renting or sharing. And for the consumer who are buying products there are incentives ensuring the return of the product, which could be reuse or could be recycled.

The „Towards the Circular Economy” report also indicates four sources of value creation by circular economy:

- The ‘power of the inner circle’ refers to minimizing comparative material usage vis-à-vis the linear production system.
- The ‘power of circling longer’ refers to maximizing the number of consecutive cycles
- The ‘power of cascaded use’ refers to diversifying reuse across the value chain,
- The ‘power of pure circles’, finally, lies in the fact that uncontaminated material streams increase collection and redistribution efficiency while maintaining quality (Towards the Circular Economy, 2013, p.30)

The concept of circular economy has a potential to create multifaceted economic, social and environmental benefits for economies, companies and customers. Benefits for Economies include substantial net material savings, mitigation of price volatility and supply risks. According to OECD, positive economic effects can arise from the availability of cheaper materials diverted from waste as an alternative to virgin materials, moreover costs of waste disposal can be reduced and residual economic value of existing material streams can be captured (OECD, 2013) Economies may also benefit from reducing the dependence on imported resources and providing new economic opportunities and contributing to long-term competitiveness. Benefits expected for companies include both short-term benefits, consisting mainly of cost reduction and some longer-term strategic opportunities. Key benefits include reduced material bills and warranty risks and improved customer interaction and loyalty. Benefits for customers consist of shortening the premature aging of ready-to-use products or reusable products. For the customer, this will mean a reduction in the cost of ownership. Benefits also include increasing the choice and convenience of customers because manufacturers can adjust the duration, type of application and ingredients of the product to a specific customer, offering a wider set of contractual options

Among the environmental and social benefits of the transition towards circular economy there are preserving and improving the quality of the environment, especially natural resources and better human health.

Policy supporting circular economy

In the face of challenges and opportunities related the transition from linear into circular model of economy, the EU aims to evolve its economic and social systems. Through the strategy for Europe 2020 – the EU has already expressed its belief in necessity to move to a more restorative economic system that drives substantial and lasting improvements of our resource productivity. The transition is supported by the EU Directives such as Waste Framework Directive 2008/98/EC, in which EU's five-step waste hierarchy prioritizing the prevention of waste generation was established, and another Directives such as: Directive 1999/31/EC on the landfill of waste; Directive 94/62/EC on packaging and packaging waste; Directives 2000/53/EC on end-of-life vehicles; Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators, and Directive 2012/19/EU on waste electrical and electronic equipment.

Even though, the waste prevention programs were established in all EU member states, the problem of waste is still a big challenge. In Europe, 2.7 billion tons of waste were generated in 2010, but only about 40% of that was reused, recycled, or composted and digested. Current recycling rate are significant for only a handful of waste types, mostly those that occur in large, fairly homogeneous volumes. A recent UNEP report, for example, notes that only around one-third of the 60 metals it studied showed a global end-of-life recycling rate of 25% or more (UNEP, 2011).

The waste management systems in most of European countries are inefficient. In these systems, most recyclable waste ends in landfills or is incinerated, with potentially harmful environmental impacts and significant economic losses. Over the past two decades many Member States have gradually improved their waste management. In 1995, on average 64% of municipal waste was landfilled in the EU. In 2000, the average had been reduced to 55% while the average recycling rate stood at 25%. In 2016, landfilling of household waste in the EU as a whole dropped to 24%, with recycling having increased to 46%. In 2016, ten Member States still landfilled over 50 % of their household waste and six of them incinerated 40% or more. However, there are huge variation in landfilling between Member States, with rates from 80% to 5% (European Commission, 2018). Municipal waste treatment methods and waste per capita is presented in the Figure 1.

Most of the countries with the highest landfilling rates are states from Central and South-eastern Europe. This is the biggest weakness of the waste management systems in these countries. However, the amount of municipal waste per capita is the lowest in the Central and South-eastern Europe countries and this is the biggest strength. In six countries: Romania, Slovakia, Latvia, Estonia, Czech Republic and Poland the amount of waste is smaller than 300 kg per capita which is much less than EU average: 481 kg per capita. Among the countries that produce the most waste per capita are Western European Countries: Denmark, Germany, Austria, Ireland and the Netherlands.

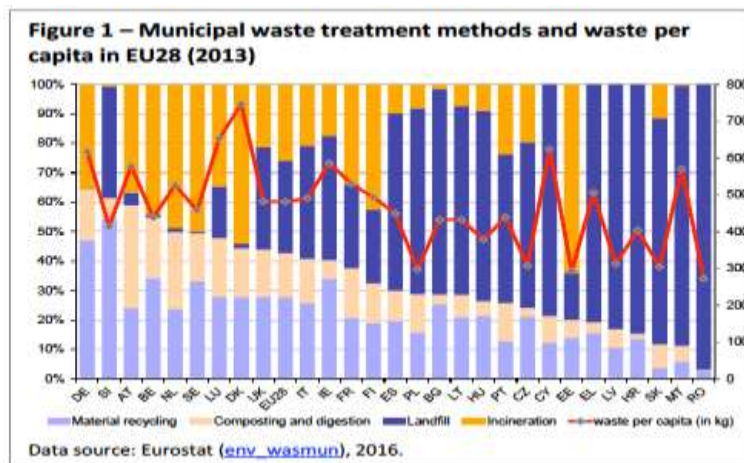


Figure 1. Municipal waste treatment methods and waste per capita in EU28 (Bourguignon, 2016, p. 2)

New business models and circular economy programs

When looking for new business models, which are possible to implementation in Central and South-eastern Europe it is necessary to focus on the specific business sectors especially the resource-intense one and the mainstream products reflecting the specificity of the economies of those countries. Nowadays economy is locked into a system where everything favors the linear model of production and consumption. Among the trends which support the transition from linear take-make-dispose into circular businesses there are following:

- Resource scarcity and tighter environmental standards;
- Advanced information technology enabling to trace materials through the supply chain, identify products and material fractions, and track product status during use. Furthermore, social media platforms exist that can be used to mobilize millions of customers around new products and services instantaneously.;
- New behaviors of consumers that prefer access over ownership (Bourguignon, 2016, p.2)

Among the mainstream products or waste categories with the highest rate of recovery, recycling or reuse are end-of-life vehicles, packaging waste and electrical and electronic waste

In case of end-of-life vehicles (ELV) it is estimated that every year, 8-9 million tons of ELV are generated in the EU and in all Member States. 80% to 100% of materials from ELVs are recovered or recycled. Apart from generating huge amount of waste from ELV, there are significant emissions of pollutants to the air caused by the use of vehicles. That is why in some European countries electromobility programs have been adopted. They have a large potential for improving air quality. The biggest impact on the quality of air in European cities is transport, thus development of electromobility creates real prospects for improving air quality. It will therefore affect not only the improvement of public health but also the reduction of damage to the environment and to the substance of buildings.

One of the first countries in Central-Eastern Europe in which Electromobility Development Plan was adopted is Poland. The government adopted the document in March 2017. The Plan forms the foundation for the development of a completely new and competitive market and it aims to create conditions for the development of electromobility, the development of industry associated with this new sector and the stabilization of the power grid. It is worth noting that among companies producing electric vehicles in Europe, one of the leader is Solaris Bus & Coach company from Bolechowo near Poznań in Poland, in which series production of electric buses began in 2013. Solaris Urbino bus has won a prestigious „Bus of The Year” title in 2017, awarded by Association of Commercial Vehicle Editors.

In case of packaging waste, which are made up of paper and cardboard (40%), glass (20%), plastic (19%), wood (15%) and metal (6%), average rate of recycling in EU is 65%, however material-specific recycling rates varied a great amount: 84% for paper and cardboard packaging; 72% for glass and metallic packaging; 38% for wooden packaging and 36% for plastic packaging. In this category there are wide variations in recycling rates for specific packaging materials across Member States. It is worth noting that among the countries with the highest rates of packaging waste recycling are countries from Central and South-Eastern Europe: Czech Republic, Slovakia, Slovenia and Bulgaria. The recycling rates in packaging waste by materials in EU28 was illustrated in Figure 2.

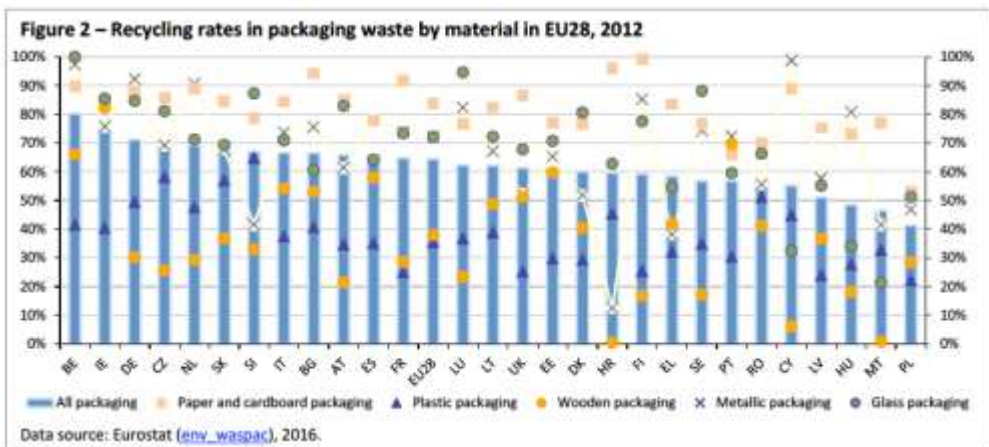


Figure 1. Recycling rates in packaging waste by material in EU28 (Bourguignon, 2016, p.2)

The third category of waste with high rate of recycling is electrical and electronic waste, also referred to as ‚e-waste’. The average rate of recycling and reusing for this category EU-28 is 71%. However, e-waste is one of the fastest growing waste streams, increasing at 3-5% per year (Bourguignon, 2016, p.3).

There are also other diverse products for which circular model works and they are not always small niche segments. To analyze this issue, it is useful to divide all products into three categories:

- Long lived products - this category includes products such as buildings, roads, bridges

- Medium-lived complex products - This category generally includes products which contain multiple parts and are subject to frequent technological innovation. The eight sectors, as categorized by Eurostat, which belongs to this category: machinery and equipment; office machinery and computers; electrical machinery and apparatus; radio, television, and communication equipment and apparatus; medical, precision and optical instruments, watches and clocks; motor vehicles, trailers, and semi-trailers; other transport equipment; furniture and other manufactured goods.
- Short-lived products and consumables — This category include products with a short usage period which are often consumed within days to months of initial production. It includes textiles, food, beverages and other agricultural products

For each of above categories there should be undertaken different steps towards a more circular economy. In case of long lived products, the key approach is eco-design which enable the products for a longer life, enabling refurbishment and remanufacturing. Moreover, such products should be based on the sustainable and minimal use of resources and enabling high-quality recycling of materials at the end of a product's life. Additionally, substitution of hazardous substances in products should enable cleaner material cycles. Circularity for long-lived has a great potential for value retention. The pilot initiatives from USA and Japan demonstrated that replacing demolishing with deconstructing approach may divert huge part of rubble from going to landfill and thus preserve valuable building components and materials for recycling and reuse. Moreover, deconstruction approach creates many additional jobs, which is of great social importance.

In case of medium-lived products repair, refurbishment and remanufacture should be given priority, enabling reuse of products and components. Moreover, in this category high-quality recycling of as much waste as possible should be applied. Enabling factors for this category will include not only development of well-functioning markets for secondary raw materials but also focus on offering product–service systems rather than product ownership; collaborative consumption; collaboration and transparency along the value chain and collaboration between companies whereby the wastes or by-products of one become a resource for another (industrial symbiosis).

In case of short-lived products, the transition should include the shift from technical nutrients to biological one whenever it is possible. Closing the loops for short-lived products will definitely help to build a restorative model that decouples economic growth from natural resource use. Key approach for this category should be innovative design of daily materials and products like biodegradable packaging or easy to disassemble office equipment. In addition, actions may be taken regarding the extension of the use of products or the cascading use of products.

Implementation of new circular business models for all above product categories will require leading corporations and municipal authorities to develop a new set of tools which could reinforce circular economy. It may include developments in resource markets, technology and information systems, and consumer preferences. Some examples of such tools were presented in the report: Towards the Circular Economy: Opportunities for the Consumer Goods Sector: urbanization that centralizes flows of consumer goods and waste streams; new technologies that enables dramatic improvements in the way value is extracted from today's biological waste streams; new

IT capabilities that support more precise management and tracking and tracing of biological flows in the system; new business models that improve control over scarce resources; a new models of collaborative consumerism; new packaging technologies and systems that extend food life and minimize packaging waste (Towards the Circular Economy, 2013, p.10).

An example of well-functioning recovery and recycling market is the market of used tires in Poland. As far as the legal obligations for recovery and recycling are defined for certain types of waste, for used tires it is 75% for recovery and 15% for recycling. The obligations in recovery and recycling of tires can be realized by the tires manufacturers and importers independently or through recovery organizations and the economic instrument to ensure a required level of recovery and recycling of waste is product payment. In Poland, the amount of new tires placed on the market is systematically growing and it has already reached the level of more than 200 thousand tones, few years ago. The required levels of recovery and recycling of waste tires are achieved every year and according to the Ministry of Environment record 36.6% level of recycling was reached in 2010 and a record 96.6% level of recovery was reached in 2013. The data shows that despite relatively low legal obligations the market mechanism are encouraging the entrepreneurs to reach higher levels of recovery and recycling than required.

In Poland, the recovery of used tires takes place primarily through energy recovery, where about 60% of the collected tonnage of used tires goes to cement kilns. The processes of material recycling are much more complicated. The tires should be cut, crushed and subjected to heat treatment. The different size rubber particles which are obtained in these processes, after adding the appropriate binders are used as surfaces of playgrounds and sports fields, and also as a material for sound absorbing and shock-absorbing coverings. Rubber dust is usually used for production of rubber mats. In addition, in recycling process steel and textile waste are also obtained. It is important to be aware that the process of recycling is very energy-intensive - about 125 kWh / 1 ton of tires and that it is accompanied by a large emissions of noise.

There are also research on using rubber as an admixture in a new type of asphalt surface. Some studies shown that such a new asphalt has better parameters than the asphalt produced by traditional methods. The vehicles moving on it, have shorter braking distance and emit less noise. Moreover, in the rain, the cars have better grip and the surface itself has great durability.

Taking into account all weaknesses of linear economy on one hand and opportunities of circular economy on other hands, there can be a few new business model identified. Such business models emerging in the market can somehow jeopardize the fundamentals of the linear economy and somehow they are worrying some of competing companies. There are three key new business model in circular economy:

- 1) **Remanufacturing and reuse** - it is based on a series of manufacturing steps acting on an end-of-life part or product in order to return it to „like-new” functional state and possibly better performance. Such remanufacturing processes are organized by start-up companies who are building their whole business around this approach and also global companies are using remanufacturing as part of their overall product. This model contributes to preserving energy embodied in products and to reducing production of new waste. The main benefits for companies are: reduction

of costs of raw materials, improved product lifecycle knowledge, improved profits, reduced negative environmental impact and also closer relationship with customers. Among industries in which remanufacturing, refurbishment or other reuse strategies are the most developed are: aerospace, automotive, ICT equipment, ink and toner cartridges, and textiles. Development of remanufacturing businesses is also connected with the organization of a reverse logistics system with different levels of renovation or refurbishment.

- 2) **Selling services rather than goods** - this model focus on the shift in business thinking from selling products to providing service solutions to customer needs - selling the function that the products provide not the product itself. This model as it becomes more popular, bring the changes in product design such as modular construction, use of biodegradable components and reduction of the number of different raw materials used in one product. It will also cause the necessary changes in the supply chains. The model provides customers with a high quality of products for the period they need it and moreover customers can avoid transaction costs of having to sell the products on the second-hand market. This model can be used for both brand new product but also for remanufactured products.
- 3) One interesting example is the Romanian company Getpony. It is a small company, started it 2015, that has developed an app which can be downloaded on smartphone. One can book a car, use it, pay 1 leu per minute, leave it whenever she or he finishes the job, the next citizen can use it, and the cycle resumes. The rate of payment varies depending on the model of the car and the duration of renting; the payment is made exclusively with the card. The investors started with an investment of 100,000 euros; in two years they have reached an investment of one million euros, and now they are trying to change the culture of urban transport in Cluj and Bucharest
- 4) **Sharing economy business model** - often called as a peer-to-peer (P2P) economy business model is a decentralized model whereby individuals interact to buy or sell goods and services directly with each other, without an intermediary third party. What is characteristic for this model is that acquiring and sharing access to goods and services are facilitated by a community based on-line platforms. The sharing economy business model utilizes already existing assets, whereas traditional businesses own the assets they use to provide services or goods. There are already many well-known platforms such as platform connecting drivers with passengers: Uber or BlaBlaCar or platform for renting private apartments: Airbnb; but there are constantly new players appearing on the market - also in Central and Eastern European countries. Very interesting and innovative examples are platforms created in Poland: Skilltrade platform for exchanging skills or Trejdoo - the money exchange platform. What drives this business model the most are economic benefits for consumers, thus societies can expect new community based on-line platforms in the coming years.

All of above models have a significant potential for increased economic, social and environmental benefits also in Central and Eastern European countries, however, further researches on a specific groups of products are needed.

The future of circular economy in Europe

More than ten years after the EU Waste Directive was approved, and two years after the adoption of EU Circular Economy Action Plan and creating the European Circular

Economy Stakeholder Platform which is a virtual open space aiming to promote Europe's transition to a circular economy by facilitating policy dialogue among stakeholders, European Union continue effort to transform Europe's economy into a more sustainable and restorative economy. In January 2018 the European Commission adopted a new set of measures, including:

- 1) EU Strategy for Plastics in the Circular Economy and annex to transform the way plastics and plastics products are designed, produced, used and recycled. By 2030, all plastics packaging should be recyclable. A Communication on options to address the interface between chemical, product and waste legislation that assesses how the rules o
- 2) n waste, products and chemicals relate to each other. A Monitoring Framework on progress towards a circular economy at EU and national level.
- 3) A Report on Critical Raw Materials and the circular economy that highlights the potential to make the use of the 27 critical materials in our economy more circular.

In April 2018, the European Parliament and in May 2018, The Council of Europe approved the EU's landmark Circular Economy Package (CEP). It is expected that new rules will make EU the global front-runner in waste management and recycling. The new waste rules include the key target for reduction of landfilled waste which must be 10% or less of the total amount of municipal waste generated, by 2035. It also includes more ambitious recycling targets as shown below in Table 1 and Table 2.

Table 1. EU CEP: Recycling targets for municipal waste (Directive of the European Parliament and of the Council, amending Directive 2008/98/EC on waste; PE-CONS 11/2/18 REV 2 Strasbourg, 30 May 2018)

By 2025	By 2030	By 2035
55%	60%	65%

According to new Circular Economy Package EU member states will be obliged to reach higher targets also for packaging waste:

Table 2. New recycling targets for packaging waste (Directive of the European Parliament and of the Council, amending Directive 2008/98/EC on waste; PE-CONS 11/2/18 REV 2 Strasbourg, 30 May 2018)

	By 2025	By 2030
All packaging	65%	70%
Plastic	50%	55%
Wood	25%	30%
Ferrous metals	70%	80%
Aluminum	50%	60%
Glass	70%	75%
Paper and cardboard	75%	85%

In addition, the Circular Economy Package encourages separate collection of hazardous household waste by 2022, bio-waste by 2023 and textiles by 2025. Moreover 30% reduction in food waste by 2025, and a 50% reduction by 2030 is expected. This equals the sustainable development goals set by the United Nations, however, other than the recycling and landfilling targets, these goals are not legally binding.

Furthermore, new legislation package determines stricter rules for calculating recycling rates and foresees more use of effective economic instruments and other measures in support of the waste hierarchy. Producers to a greater extent will be responsible for

their products when they become waste. In addition, mandatory extended producer responsibility schemes will have to be established for all packaging by 2024.

Despite determining higher and higher indicators regarding waste recycling - which are in fact late for decades - shifting to a circular economy is not a straight forward process. Circular economy is the approach which goes far beyond waste management, recycling and reuse of products. It takes a systemic approach to the vast flow of resources and waste through societies. It also requires substantial changes in the value chain, such as; adapted design of products, better water management, minimization of waste, reduction of consumption and creating products in a way they can be reused, repaired or recycled back into nature or the marketplace. Possibilities related to circular economy are recognized by many companies from the smallest SMEs to the biggest multinational companies and also by many other stakeholders. What is the most needed now and in the future is the shifting of attitude among the citizens and customers who can boost circular economy by their decisions and choices.

Conclusions

Current dominant linear economic systems result from existing educational system and in order to pursue the transition towards circular economy should be preceded by a change of the educational system. Due to the fact that circular opportunities may be lost at various stages in the lifecycle of a product, consumer education becomes particularly important because in developed countries losses are concentrated at the consumer level, whereas in developing countries, more circular opportunities are lost at the manufacturing stage.

The new the Circular Economy Package adopted by European Union represent the most modern waste legislation in the world. Now the move is on the side of the Member States, which have to implement new rules into their legal systems. However, a special challenge is therefore for the countries of Central and South-eastern Europe. Western European countries which are leaders in the field of waste management in can be examples for the countries of Central and South-eastern Europe. Circular economy in CEE countries has a chance to move from the side-lines into the mainstream, however there are some obstacles for circular economy and they include current product design patterns and cultural resistance.

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