

<sup>1</sup>Eleonora DESNICA, <sup>1</sup>Milan NIKOLIĆ, <sup>2</sup>Lozica IVANOVIĆ, <sup>3</sup>Miroslav VULIĆ

## COLLECTING ELV RECYCLING CENTERS FOR CIRCULAR ECONOMY REQUIREMENTS

<sup>1</sup>University of Novi Sad, Technical Faculty “Mihajlo Pupin”, Zrenjanin, SERBIA

<sup>2</sup>University of Kragujevac, Faculty of Engineering, Kragujevac, SERBIA

<sup>3</sup>University Business Academy in Novi Sad, Faculty of Economics and Engineering Management, Novi Sad, SERBIA

**Abstract:** The circular economy is extremely important for achieving sustainable development, to which the international community has agreed and committed itself. In EU countries and other developed countries, the struggle for the reuse of resources is taking a long time since the need to change the concept of a global economy has become a necessity. This paper aims to analyze and briefly describe the functioning and organization of recycling centers in some EU countries that represent examples of good practice in the field of waste recycling, with the aim to illustrate the positive practices of the countries of the European Union that are one of the leaders in this field, the basis for the development of a more efficient and sustainable recycling system in the Republic of Serbia.

**Keywords:** recycling centers, recycling, circular economy, waste management, End of Life Vehicles (ELVs)

### INTRODUCTION

The principle of circulation of matter in nature has long been known, and today it has become necessary to introduce the principle of circulation and production in order to minimize the production of waste, and the previously obtained products have a new purpose after rebuilding or a completely new form and purpose after recycling.

In contrast to linear, the tendency is towards a sustainable development in the form of a circular economy that represents a closed system in which it is reused and recycled. The circular economy provides a reduction in the use of raw materials to optimize the use of by-products, waste and recycling of rejected products as the primary source of materials for the production and reduction of pollution at all stages of the cycle (Figure 1). [1]



Figure 1. Circular Economy Model [2]

Recycling and treatment of waste represents the first major step in changing the way of thinking of businessmen and the overall cultural orientation of the society. Linear economy received it opposing the

concept that, instead of the movement of matter and energy in one direction is represented by the rotation of the energy and materials - a concept known as the circular economy. [3]

### CIRCULAR ECONOMY - INSTRUMENT FOR SUSTAINING SUSTAINABLE DEVELOPMENT

The term "sustainable development" entered the general term in the 80s of the 20th century with the aim of indicating the connection between environmental protection and development.

The circular economy represents a new, more sustainable economic approach that should replace the widely represented and worn-out linear model. Traditionally, the current concept of life has been based on the policy of taking, exploitation and rejection, while the circular model advocates return to nature and the reuse of already used products. Drawing attention to energy efficiency and ecological sustainability is the basis of this way of thinking and can be applied to all aspects of life. According to the World Economic Forum, Switzerland is the country with the best attitude towards the natural environment and the significant extent of the use of renewable energy sources. [3]

The circular economy is extremely important for achieving sustainable development, to which the international community has agreed and committed itself. In EU countries and other developed countries, the struggle for re-use of resources is taking a long time since the need to change the concept of a global economy has become a necessity. [4,5]

Recycling is at the base of the changes that are needed in the fight against climate change. It leads to reduction of carbon dioxide emissions, reduces the exploitation of natural resources, is a valuable source of secondary raw materials for the industry, but it also has great economic potential. The EU counts that if the

goal of recycling 70% of waste is achieved, about half a million new jobs could be created [6].

### THE SITUATION IN SERBIA AND POTENTIAL OPPORTUNITIES FOR THE DEVELOPMENT OF THE CIRCULAR ECONOMY

#### — EU Action Plan for the circular economy

Circular economic package gives a clear signal to EU businessmen using all the tools that are available to transform their economies, opening the way for new business opportunities and increasing competitiveness.

Broader measures to change the entire life cycle of the product beyond a narrow focus on the completion stage of life and emphasize the clear ambition of the Commission to transform the EU economy and bring adequate results. Innovative and more efficient ways of production and consumption should be increasingly occurring as a result of incentives being put in place. Application of the principle of circular economy has the potential to establish a significant number of new jobs in Europe, while preserving valuable and dwindling natural resources, reducing the impact of resource use on the environment and add value, notably economic, social and social, waste materials. Were determined and sectoral measures, as well as key activities include:

- ≡ Funding in the amount of over 650 million euros under the program Horizon 2020 and the 5.5 billion under the Structural Funds;
- ≡ Development of quality standards of secondary raw materials to increase the confidence of operators in the single market;
- ≡ Measures in the Work Plan of the Eco-design promote increased possibilities of repair of waste products, increasing their endurance and the possibility of a greater level of recycling, increasing the energy efficiency of these products;
- ≡ The revised Regulation on fertilizers, in order to facilitate the identification of organic fertilizers and fertilizers based on waste in the single EU market and support the role of biological nutrients;
- ≡ The strategy of plastics in a circular economy, which addresses the issues recyclability, biodegradability, presence of hazardous materials in plastic in order to achieve the goals of sustainable development with a significant reduction in the amount of waste ending up in the seas;
- ≡ Several other activities in the re-use of water, including the legislative proposal on the minimum requirements for the reuse of wastewater. [7]

#### — Waste recycling

Waste is any material or object which is formed in the course of their production, service or other activities, the objects taken out of operation, as well as waste materials generated in the consumer and which, from

the producer, or the consumer are not for further use and must be discarded.

Inadequate waste management is one of the biggest problems in terms of environmental protection of the Republic of Serbia and exclusively the result of inadequate attitude of the society towards waste. It was first reported in the period of rapid industrialization of the country, which followed the real danger of depletion of some strategic resources in a very short period and the progressive increase in the total amount of all types of solid waste. These developments were not accompanied by appropriate environmental policies. [7]

#### — National Waste Management Strategy

National Waste Management Strategy is a basic document which provides conditions for the rational and sustainable waste management at the national level (in Serbia).

In order to overcome these problems in the National Strategy shows the solution involving the formation of a network of five types of infrastructure in Serbia in the function of efficient waste management, which are shown in the table 1.

Table 1. Network of five types of infrastructure in Serbia [7]

Type of Property	Objects
Regional landfill	29
Transfer stations	44
Recycling centers*	17
Centers for composting	7
Municipal solid waste incinerators	4

\* Recycling centers - The place of recycling of the waste materials in the production process for the original purpose, organic or recycling purposes other than for energy

The development of recycling of waste is one of the key preconditions for successful coping with the challenges of today's environmental protection. The socio-economic benefits that are reflected in the development of the recycling industry and the creation of new jobs have contributed to the strengthening of the competitiveness of cities and local communities. [7]

#### — Waste recycling in EU countries

Slovenia, as one of the smallest countries in the European Union (about 2 million inhabitants) managed to quickly adopt European standards in the field of waste management and to approach the European level.

When we look at other countries in the region, Slovenia is a good example of positive practice when it comes to waste recycling and generally waste management. Ljubljana is one of the first European cities to adopt the "Zero Waste Europe" model (the EU program dealing with the design and management of production processes to reduce the amount and

toxicity of waste, while promoting recycling to save resources). [8]

Germany is one of the world's leaders in the field of waste management. The waste management system is regulated by numerous laws, regulations and regulations that are in line with European directives in this field. The efficiency of the waste management system in Germany is not the result of the adoption of laws and their application, but also a high level of public awareness of the importance of environmental protection. The promotion of recycling has led to the fact that the citizens of Germany actively participate in the recycling process not only in habits, but also in need. Waste is considered as raw material and the inhabitants of Germany are aware that inadequate waste disposal is a waste of money. The increase in standards has led to an increase in waste quantities and citizens have been faced with the great problem of its accumulation, and then as an effective solution, recycling, which in this country reaches an extremely high level, is imposing. [8]

The biggest problem of every country is waste. There are many landfills to which no one pays attention, but everyone wants to remove and clean them as soon as possible. In highly developed countries, such as Sweden and Norway, recycling is at an enviable level. More than 50% of waste is recycled in the European Union. France, Germany, Austria and Switzerland are unrivaled leaders in the recycling of packaging waste. Although only 15% of waste is recycled in Serbia, this industrial branch goes upward. There are over 2000 companies dealing with the collection of secondary raw materials and recycling of waste.

#### **RECYCLING CENTERS**

An important part of the recycling system of waste is recycling centers. Recycling center is a functional environment, that is, an object / space equipped with appropriate equipment and machines, and as such is a place intended for separation and temporary storage of recyclable and bulky waste. These facilities play a very important role in the waste collection system, connecting citizens, collectors and operators, and in providing enough quantities of recyclable raw materials for the development of the recycling industry. The operation and functioning of recycling centers proved to be very cost-effective in European countries such as: Austria, Germany and Belgium where recycling rates exceed 50%, followed by Great Britain, Finland, Slovenia at the very top. Among the latter in this area are less developed countries such as Latvia, Lithuania, Slovakia and others. [8]

The Ministry of Environmental Protection plans to open several recycling centers for plastics and other waste in Serbia recently, which would create not only a good waste recycling system, but also through which employment will find more unemployed persons across Serbia.

From the above text it can be concluded that private sector participation, which is largely represented in EU countries, can additionally contribute to better organization, functioning and efficiency of recycling of waste within the framework of recycling centers, i.e. the experience of public-private partnerships has shown good results. The recycling industry in the Republic of Serbia is at the very beginning, the challenges we are facing in the field of waste management are big, but not insurmountable. The next period will show whether we are ready to properly use the proven European experiences.

#### **END OF LIFE VEHICLES (ELVs) ASPECT IN SERBIA**

At the beginning of mass car production and creating a car waste that have completed their life cycle, the idea emerged that certain parts of such cars can be reused (e.g. as spare parts). The car is a complex product and its life cycle should be in accordance with the cycle of circulation of raw materials. It should be recyclable as much as possible, and thus becomes an environmentally friendly product. [9, 10, 11].

Examining the legislation, primarily by considering the current general situation in the field of ELV (End of Life Vehicles) recycling in our country, the following can be concluded: ELV generally cannot act in a manner that ensures the environmental protection; ELV recycling system is not established because there is no globally organized management of such waste.

The overall aim of the Waste Management Plan is to establish an effective system for the management of waste vehicles in Serbia, including Legal, Institutional and Technical aspects. To achieve this goal, it was assessed the current situation regarding ELVs and it were identified deficiencies in the legal framework and implementation in practice. The main objective of EU Directive about ELV is synchronization of different national measures about ELV in order to minimize the ELV impact on the environment thereby contributing to the protection, conservation and improvement of environmental quality and conservation of energy. [12]

ELV dismantling centers are becoming a very topical issue in Serbia since efforts are being made to bring closer the standards in the EU countries. Like all other organizations, ELV dismantling centers face various risks and uncertainties in business. Bearing in mind that the network of ELV dismantling centers in Serbia is developing, it can be clearly seen that their business should be thoroughly studied as well as the interactions of the environment and the environment. Given the need to invest a lot in the development of the network of centers, the assessment of all the risks in their business becomes inevitable, and the definition of recovery capacity metrics becomes imperative. [13]

Vehicle manufacturers across Europe have their own concept of recycling ELV and a developed network of recycling centers. The goal of the manufacturer is to minimize unwanted environmental impacts throughout the vehicle's life cycle. For this reason, even at the design stage of the vehicle, the requirements for recycling are considered - the time required for the dismantling of the ELV, the selection of recyclable materials, the calculation of the time that will be foreseen for exploitation.

Based on the presented state, it can be concluded that the recycling centers are very necessary for Serbia and that their construction and sustainable development will significantly improve the domestic industry. In order to ensure their smooth operation and existence in stable but also crisis situations, it is necessary to provide guidelines on assessing their recovery capacity in case of any performance decline during work. [13]

### CONCLUSION

Natural raw materials are limited and their availability and benefits in creating a new value can be extended using a circular economy. The concept of transition implies processes through which we strive to achieve economic growth and development.

The transition in terms of the improvement process represents the need to abandon the existing linear economy and find a better concept. For the abandonment of the concept of linear economy and the transition to the concept of a circular economy, changes in the system of values are necessary: education; defining and publishing new policy changes; changing consumer preferences and habits and developing new forms of behavior; organization of society; innovation in technology and other activities: new product design and business processes; designing, implementing and developing new business and market models; creating an appropriate institutional framework; creating appropriate material infrastructure; development of new methods for managing integrated systems; development of new financial products that support the concept of circular economy; development of a waste management system.

The car industry has greatly progressed in reducing the amount of ELV waste going to landfill and significantly increased the level of recycling and recovery. In this paper, we reviewed the current situation in Serbia and some EU countries. The main recommendations are to develop a shared vision and increase collaboration between stakeholders.

Recycling centers in EU countries are examples of good practice, models that should be used as a starting point in the field of recycling of waste in the Republic of Serbia. Recycling, recycling centers and transfer stations in our country are defined by legal and planning documents based on European experience.

But this alone is not enough to achieve the high standards that these Member States have set before us. The construction of recycling centers will make sense only with the education of the public and the promotion of recycling as a socially responsible behavior.

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