

CHALLENGES IN THE WASTE MANAGEMENT SYSTEM IN THE TRANSITION PROCESS TOWARDS THE CIRCULAR ECONOMY IN BOSNIA AND HERZEGOVINA

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Abstract: Large production of waste has become one of the world's environmental problems. Inadequate treatment of residential, commercial and industrial waste damages people's health and creates significant pressure on the environment, and valuable resources are irretrievably lost. A circular economy in which materials circulate and where the so-called zero waste has numerous advantages over the linear model, which is wasteful of natural resources. Policy makers and society in every country are called upon to face these challenges and develop solutions that are both technically appropriate and economically viable. Case studies in many countries show that an advanced waste management sector is able to meet these challenges. However, in Bosnia and Herzegovina (BiH), the linear model of the economy is dominant compared to the circular model, and the development policy has not yet sufficiently recognized the circular economy as a possibility for future development. By signing the Sofia Declaration on the Green Agenda for the Western Balkans, Bosnia and Herzegovina committed to achieving climate neutrality by 2050, and accepted development and cooperation items that include circular economy. In the waste management system, as a key pillar of the circular economy concept, the linear approach of collection and disposal still dominates in BiH, instead of an integrated sustainable waste management system based on circularity. Most of the waste accumulates in landfills (over 90%) or ends up being burned in the open. The paper analyzes the main problems of establishing a sustainable waste management system in Bosnia and Herzegovina, and includes the identification of problematic issues and the setting of future goals in the process of transition to a circular economy, with special reference to the issues of adapting human capital. Finally, we have provided some effective measures to further improve the waste management system in accordance with the principles of the circular economy.

Keywords: waste management, circular economy, environment, sustainable development, human capital

INTRODUCTION

The problem of waste is a global issue that affects all countries of the world, both developed and developing countries. Waste is produced as a consequence of numerous human activities, and the increase in waste production is associated with the development of the economy, increased consumption, population growth and an increase in the standard of living. It is created from several sources such as commercial, agricultural, communal, industrial and other

activities. Since the industrial revolution, economic activities have developed a growth model based on the principle of "take, make, consume, throw away" — ie. a linear model that is based on the assumption that resources are abundant, available, and can be easily extracted and cheaply disposed of. In circular economy systems, resources are retained in the economy after the end of the product's useful life in order to be productively used multiple times and thus create new value. If the linear economy uses resources indefinitely to produce products that will be discarded after use, the circular economy, in contrast, follows the "reduce, reuse and recycle" model, encouraging the reuse of products and raw materials and preventing the release of waste into the environment as much as possible. (Preston, 2012). More efficient use of resources in the circular economy concept can bring great economic benefits.

Implementing a circular economy in developing countries can help promote sustainable economic growth and development, reduce poverty and inequality, and conserve natural resources. However, the scientific component of the circular economy concept, as well as the possibility of its application, is largely unexplored in Bosnia and Herzegovina. The contribution of this paper is that this is the first study that points to the analysis of the challenges of implementing the CE concept in Bosnia and Herzegovina. The most urgent challenge for Bosnia and Herzegovina lies in waste management, which requires radical changes - that is, abandoning old practices and focusing on separate waste collection. For this reason, the paper analyzes the main problems of establishing a sustainable waste management system, and includes the identification of controversial issues and the setting of future goals in the process of transition towards circular economy.

Ever since the publication of *The Limits to Growth* (Meadows et al., 1972) by the Club of Rome in 1972, there has been a global debate about the extent to which global population growth, increasing wealth and associated consumption behavior are compatible with the Earth's limited resources. Since 1980, consumption of natural resources worldwide has more than doubled, and has increased tenfold since 1900 (McCarthy et al., 2018). According to the International Panel on Resources, which was launched by the United Nations Environment Program (UNEP) in 2007 to encourage more sustainable use of natural resources, due to continued population growth and the economic emancipation of least developed countries, total resource use is expected to double again by 2050. (UNEP, 2017).

Waste is a significant problem if not managed effectively (Wilson et al., 2015). Case studies in many countries show that an advanced waste management sector is able to meet these challenges. So, for example, Germany, China and many other developed countries, especially in the EU, have embarked on the path to a modern circular economy. The circular economy represents a new approach to resource management that aims to reduce the amount of waste generated and ensure the sustainability of the economy. Nothing is thrown away, because the product is designed so that it can be repaired, disassembled and reused. In circular economy systems, the value of the product is retained as long as possible and no waste is created. This idea refers to an economic system that prioritizes environmental friendliness and resilience and tends to preserve the value of products so that they can be reused by reducing waste to a minimum. The idea of a circular economy aims to minimize waste, production and consumption and increase resource efficiency (Ogunmakinde, 2019).

LITERATURE REVIEW

Circular economy as a concept has been around for several decades and comes from different schools of thought. Environmental economists Pearce and Turner (1989) primarily introduced the concept of a circular economic system that is built on some previous studies by an environmental economist Boulding (1966). Boulding's idea of the economy as a circular system is considered a precondition for sustaining human life on Earth (a closed system without practical exchange of matter with the external environment).

A Swedish architect named Walter R. Stahel (1982) also influenced CE by questioning the sustainability of the existing linear economic model in the face of increasing amounts of waste and limited resources. This author discussed the extension of the useful life of goods to transition to a sustainable society and proposed a 'performance economy' based on a system of spiral loops that "minimizes matter, energy flow and environmental degradation without limiting economic growth or social and technological progress".

The concept "cradle to cradle" (C2C for short) developed by the German chemist and visionary Michael Braungart and the American architect Bill McDonough (2002) has a great impact on CE. Instead of the traditional linear cradle-to-grave model where products are produced, used and then end up as waste, the cradle-to-cradle concept promotes the idea that materials and resources should be continuously recycled and reused. According to this concept, products are designed to be composed of materials that can be easily separated and recycled, without qualitative loss. Today, it is applied in various industries, including product design, construction and waste management, with the aim of creating a more sustainable and environmentally friendly world.

Although the concept of CE initially used to focus on the problems of waste recycling, scientists have begun to think about reconsidering the strategic goals of production and consumption at multiple levels (Kirchherr et al., 2017) and evaluate the effectiveness of progress in achieving circularity through various indicators. Recycling is only the last stage in the life cycle of a product, and the CE concept implies the prevention of waste and pollution in all stages of its life cycle. The term "circular economy" has been associated with a range of meanings and associations by different authors, but what they generally have in common is the concept of a closed-loop cyclical system. In practice, this means that the circular economy turns end-of-life goods into resources for other goods, closing loops in industrial ecosystems and minimizing waste (following the logic that dictates: reuse what you can, recycle what can't be reused, fix what's broken, remake what can't be fixed).

The Ellen Macarthur Foundation (EMAF), i.e., a business development agency, founded in 2010, with the aim of accelerating the transition to a circular economy, has made the biggest contribution to promotion, theoretical and applied research related to the circular economy so far. Since it was established, this organization has been raising awareness of this idea among producers and policy makers around the world.

The concept of circular economy is based on three principles (EMAF):

- (1) abolition of waste generation and pollution,
- (2) using products and materials in a circular way and
- (3) restoration of nature and its resources.

Meyer (2011) estimated that resource efficiency improvements in different value chains could provide raw material savings in Europe of 17–24% and cost savings of around €630 million. Based on product-based modelling, EMAF (2012) suggested that strengthening circular

economy business models could increase EU GDP by 3.9% by 2030. The transition to a circular economy requires changes in the entire value chain, from product design to new business and market models, from new ways of converting waste into resources to new ways of a consumer's behavior. According to the findings of Plastinin et al. (2019), the government must formulate industrial waste management policies using the LCA (life cycle analysis) method to assess the economic efficiency of production activities at different stages of waste recycling, taking into account the externalities of waste generated. The application of the concept of circular economy with indicators of municipal solid waste per capita, municipal waste recycling rate, packaging waste recycling rate by type of packaging, organic waste recycling rate and e-waste recycling rate can stimulate inclusive economic growth, reducing the consumption of natural resources and strengthening environmental protection (Grđić et al., 2020).

The idea is to create a regenerative system in which products, components and materials are maintained at their highest value for as long as possible, and resources can be productively recovered and reintegrated into the economy or provide nutrients to natural systems (Webster, 2015).

As it is known, it refers to the separation of economic growth from the extraction and consumption of limited natural resources, i.e. scarce resources with negative prints, such as fossil fuels or metals and minerals that are difficult to recycle, where dependence creates a competitive disadvantage. Instead, circular approaches keep resources in productive use in the economy for as long as possible. According to Lacy & Rutqvist (2015), the transition to a circular economy can be the biggest revolution in the way of organizing production and consumption in global economy. According to them, it is about a radical change in the relationship between markets, customers and resources, changing the way we produce and consume through innovative business models, technologies and engineering.

This study is a continuation of research in the field of waste management in Bosnia and Herzegovina (Pešević & Crnogorac, 2008; Pešević & Marković, 2018; Topić et al., 2013; Pešević, 2018).

TRANSITION TO CIRCULAR ECONOMY IN EU AND IMPACT ON HUMAN CAPITAL

The EU's efforts towards a sustainable, low-carbon, competitive and resource-efficient economy are closely linked to the concept of a circular economy. In 2015, the European Commission adopted the Circular Economy Package, which contains an action plan and proposals for adapting the legislation to this concept. The first action plan of the circular economy deals with the production, consumption and recirculation of materials that are at the end of the life of products in the economy, emphasizing the need for design that enables repairs, upgrades, durability and the possibility of recycling products, parts and materials, which are addressed in other EU directives. With the first action plan for the circular economy in 2015, the European Commission adopted measures related to the improvement of waste management: reducing waste disposal in landfills and increasing preparation for reuse and recycling of key waste streams, such as municipal waste and packaging waste, encouraging the necessary investments in waste management, promoting economic incentives and improving the extended producer responsibility scheme. In March 2020, the Second Circular Economy Action Plan was adopted as one of the main blocks of the European Green Deal, the new European agenda for sustainable growth. The new circular economy action plan highlights waste prevention measures as a top priority. The introduction of a sustainable products policy and its translation into specific legislation will be the key to achieving

progress in the prevention of waste generation, while in the following period, new goals related to waste reduction for certain streams will be presented, as part of a wider set of waste prevention measures, as well as specific targets for reducing food waste and residual waste streams.

The establishment of circular economy should increase the competitiveness of the EU on the global scene, encourage sustainable economic growth and enable the opening of new vacancies. The idea behind the circular economy concept is to keep the value of the materials and products as long as possible. The circular economy introduces the concept of "closing the loop" of the life cycle of materials and products from extraction, production and use through disposal and waste management to the market for secondary raw materials and reuse. The emphasis is placed on avoiding waste production through better product design (eco-design), which leads to a more durable product that is easier to disassemble, repair and, ultimately, recycle. The aforementioned measures are complemented by measures in the area of energy efficiency, and through the improvement of production processes, the production of waste and the use of resources are reduced.

Transition to a circular economy has significant economic impacts – previous research shows that there is a positive impact on GDP and employment, but also on other macroeconomic variables (Laubinger, Lanzi & Chateau, 2020; Cambridge Econometrics; Trinomics; ICF, 2018; ILO, 2018). For example, quantitative estimates show that the effect of wider acceptance of the circular economy principles could have a positive impact on employment in EU countries, whereby the increase in employment would amount to about 2% by 2030, with an average increase of about 700,000 jobs (0.3%) (Cambridge Econometrics; Trinomics; ICF, 2018). However, since this impact is not the same for all economic sectors, the final effect of the transition to the circular economy on the labour market will largely depend on the economic structure of a particular country. For example, while employment in mining and extraction of coal, petroleum and natural gas is expected to decrease, on the other hand, employment in activities in waste management and some services sectors (repair, rent) should rise due to wider implementation of circular economy principles (Mitrović Jandrić, 2021, ILO, 2018). Impact on employment is most evident in activities such as collection, treatment and disposal of waste; reuse of waste materials; sanitation, recultivation and other services in the field of waste management. Besides, other economic sectors are also directly or indirectly affected (construction, manufacturing, retail trade, etc.).

In addition to the impact on the number of employees, there are also qualitative aspects of the impact on the labour market. First, since the structure of the economy changes, there is also a significant redistribution of employment between different sectors of the economy. At the same time, there are qualitative changes in the working processes, which implies the need for adjustment of knowledge and skills of the workforce. An additional aspect is the potential occurrence of precarious work which is often a characteristic of some activities related to circular economy, such as waste management.

The estimated effects on employment also depend on the degree of automation of jobs that are affected by the transition to circular economy principles. The transition to a wider acceptance of circular economy principles is not an independent phenomenon - it takes place together with other macro trends, such as digitization and automation and demographic changes (ageing of the population and strong migration flows).

It is expected that the joint influence of these interconnected processes will lead to an increase in the gap between required and available knowledge and skills in the labour market if there are no appropriate adjustments in the education and training system. This calls for a strong policy action, in domains such as lifelong learning, general education systems and active labour market policies. Having in mind the existence of precarious work in activities related

to waste management in some countries, labour market institutions' response is also needed. Due to diverse drivers of labour market changes and the complex impact on human capital, there is a need for a coherent response from policymakers, since a lack of labour force adaptability could be a bottleneck in the transition to the circular economy.

A large number of developed countries have begun active consolidated work on the transition to circularity: laws are adopted, government programs are developed, roadmaps are approved and platforms are created at the international level. Although the circular economy goes beyond waste management, the European Commission recognizes that waste infrastructure is a key element to reduce linear patterns of production and consumption. The circular economy is based on the idea that waste, in the classical sense of the word, does not exist but only raw material that can be reused for the same or other production processes. In the circular economy narrative, environmental "problems" become "opportunities", waste is turned into a resource of recycled primary materials, rare earth metals and fuel for energy production. The legislative proposals on waste in the EU include long-term goals for reducing waste disposal in landfills and increasing preparation for reuse and recycling of key waste streams such as municipal waste and packaging waste. With the help of these goals, member states should gradually equalize the levels of best practice and encourage the necessary investments in waste management.

EXISTING SITUATION IN THE WASTE MANAGEMENT SYSTEM IN BIH

Bosnia and Herzegovina is a country with a small number of inhabitants, where about 3.5 million inhabitants inhabit an area of 51,200 km². According to the Constitution, BiH administratively consists of two entities - the Federation of BiH (FBiH) and Republika Srpska (RS) and one district - Brčko District (BD). With four administrative levels (BiH, entities, cantons, municipalities), administration in the environmental sector, and thus in the field of waste management, is very complex, especially considering that it is a country with a small population. Entity governments of FBiH and RS and the government of BD are responsible for drafting and passing their own laws on waste. In this sense, there are no umbrella laws on waste at the state level. From this it is clear that management structures are complex and that there is not always a clear demarcation of responsibilities between organizations operating at the state, entity and local levels.

The absence of a coordination mechanism with clear powers, and a clear demarcation of responsibilities and obligations between the state, entities, cantons and municipalities, the absence of a harmonized methodology for data collection and processing, i.e. domestic standards in accordance with EU norms, the lack of by-laws and the lack of funding for some important measures for the implementation of environmental protection policy, can be recognized as basic obstacles that can slow down the implementation of environmental reforms (MVTEO, 2012). Environmental management and waste management services are inefficient and uneconomical, even at the entity level, despite the fact that responsibilities and functions are fairly well defined.

The Federation of Bosnia and Herzegovina is administratively divided into 10 cantons and 79 municipalities. At the cantonal level, there is no sole form of organization of ministries that deal with environmental protection issues, so in some cantons the area of environmental protection, and thus waste management, is under the responsibility of the Ministry of Spatial Planning, while in some cantons this area is under the responsibility of the Ministry of Trade and tourism or Traffic and Communications. Republika Srpska is territorially organized into 10 cities and 54 municipalities. Municipalities are responsible for the development of

municipal waste management plans and the organization of waste collection and disposal activities.

In order to approach the policies of the European Union (EU), BiH started the reform of the municipal waste management sector in 2000. As part of the Reform, the Waste Management Strategy in Bosnia and Herzegovina was drafted, but was never formally adopted at the state level (although that Strategy established the basis for planning at the entity level). After that, both entities, as well as Brčko District, prepared Waste Management Strategies, and the entities also adopted Waste Management Plans as its implementation documents. Through the municipal services for spatial planning and communal affairs, the municipality hires utility companies to perform certain tasks in waste management at the municipal level. Although efforts have been made to collect data in the past few years, the data are still mostly based on estimates made using indirect measurement methods, such as surveys.

Figures from the Agency for Statistics should be taken with some caution because:

1. approximately 35% of the population is not covered by regular waste collection services and these quantities are estimated by the Agency and
2. only regional landfills have weighbridges and volumes at remaining landfills are estimated based on truck size and number of daily disposals.

The dominant method of final disposal of waste in Bosnia and Herzegovina is land filling. Currently, there are 7 active regional sanitary landfills in Bosnia and Herzegovina that cover a certain geographical area. A total of 53 out of 143 municipalities in Bosnia and Herzegovina are currently included in the concept of regional disposal, of which 28 in FBiH and 25 in RS (Figure 1), while all others use municipal landfills for which no disposal fee is paid. Municipal landfills generally do not comply with the most important environmental criteria in the sense that they do not have an impermeable bottom, systems for gas collection and leachate treatment. Therefore, despite the agreements, only 37% of municipalities use regional landfills due to the additional costs of transportation and disposal at sanitary landfills. There are also 4 active inter-municipal landfills that are not of a sanitary nature.

Figure 1. Current status of waste disposal in each region in Bosnia and Herzegovina



Waste collection, transport and management of landfills are carried out by utility companies that mostly use old equipment. Urban parts of municipalities and suburban settlements, unlike rural parts of the municipality, are very well covered by the waste collection system despite the lack of modern vehicles for waste collection and insufficient capacity of containers, as well as problems with financing (Topić et al., 2013). There is no additional funding from the state, entity or cantonal level, except for some grant funds from the Environmental Protection Fund for specific investment projects.

Data on waste from production activities were collected by the BiH Statistics Agency (ASBiH) and published in the Annual Report on waste generated in production activities. These data on the amount, type and flow of waste generated in the "production process in industry, trade and other processes" still do not give a full picture of the generation and flow of waste in Bosnia and Herzegovina. There is a lack of information on other industrial waste or waste originating from sources other than households. Waste collection, transport and management of landfills are carried out by utility companies. Waste collection is mainly done using 1,100 liter containers, while some municipalities also use 120/240 liter containers for door-to-door collection and large containers (5-8m³) for non-hazardous industrial waste collection. The percentage of the population of Bosnia and Herzegovina covered by public

waste collection services has slightly increased in the last 10 years, from 65% to 74% (BHAS, 2021). Collection coverage in urban areas is over 90%, and in rural areas it is 40% on average. Waste that is not collected contributes to the occurrence of illegal landfills and a negative impact on the environment. According to some estimates, around 1,200 locations are covered by illegally dumped waste, which does not include smaller locations that can be seen in numerous places. According to the data of the BiH Agency for Statistics (BHAS, 2022), the estimated amount of municipal waste produced in 2021 is 1,228,915.9 tons, i.e. 356 kg per inhabitant per year, or 0.98 kg per inhabitant per day, which is significantly less compared to the EU (530 kg per inhabitant in 2021)¹. According to these data, in 2021, 940,405 tons of municipal waste were collected by public collection, of which 81% came from households, 16% came from production and service activities, and less than 3% came from communal services (BHAS, 2022). According to EU statistics, 95% of municipal waste is disposed of in landfills in Bosnia and Herzegovina. By comparison, in the EU in 2021, 49% of municipal waste was recycled or composted.

There are no reliable data on the composition of the municipal waste stream, because data on waste generation are not based on actual measurements.

As already mentioned, municipalities in Bosnia and Herzegovina are responsible for the organization of waste collection and disposal activities. For the existing waste management system, there is no additional funding from the state, entity or cantonal level, except for some grant funds from the Environmental Protection Fund for specific investment projects. The distribution of these funds is based on a public call for project submissions. Otherwise, municipalities must pay for their investments.

In BiH, there are no facilities for mechanical-biological treatment (MBO) of waste or for thermal treatment of waste.

The process of joining BiH to the European Union is one of the main drivers of reforms in the field of the environment, which mostly refers to the harmonization of domestic legislation with EU law.

BOSNIA AND HERZEGOVINA IN THE TRANSITION PROCESS TO CE

The basis for developing the future circular economy policy in Bosnia and Herzegovina is the Green Deal for the Western Balkans, which requires action regarding the introduction of a circular economy (sustainable production and consumption). The circular economy is one of the five key areas in the European Green Plan, which have been transferred to the Green Agenda for the Western Balkans, with special reference to waste, recycling, sustainable production and efficient use of resources.

By signing the Sofia Declaration on the Green Agenda for the Western Balkans², Bosnia and Herzegovina committed to achieving climate neutrality by 2050, and accepted development and cooperation items that include the circular economy, aware of the need for the research and innovation system to support this transition (Declaration, 2020). With the aim of

¹https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Municipal_waste_statistics

⁴Regional Cooperation Council: Action plan for the implementation of the Sofia Declaration on the Green Program for the Western Balkans <https://www.rcc.int/files/user/docs/cb61b1e081ff4b568618c6ff799e67c5.pdf> Accessed 04.05.2023

⁵ Council, R. C. (2021). Action Plan for the Implementation of the Sofia Declaration on the Green Agenda for the Western Balkans 2021-2030. Sarajevo, Bosnia and Herzegovina.

contributing to environmental protection and minimizing the amount of waste generated in the region, the following actions are planned:

1. Integrating the Western Balkans, and thus BiH, into the industrial supply chains of the EU through:
 - Taking decisive actions to improve the sustainability of the primary production of raw materials;
 - Applications of the industrial ecosystem approach to achieve ecologically sustainable, balanced economic recovery, especially for key industrial ecosystems, such as renewable energy, digital energy, mobility;
2. Development of circular economy strategies by taking into account product life cycle, waste prevention, modern waste management and recycling, reuse, repair and remanufacturing;
3. Improvement of waste management infrastructure;
4. Raising citizens' awareness of waste, separate collection and sustainable consumption;
5. Reaching an agreement on preventing plastic pollution.

These commitments emphasize the need to create clear guidelines that will show what changes are needed to achieve these ambitious goals.

Waste management and recycling, as key pillars of the CE concept, are still dominating over the linear approach of collection and disposal instead of an integral sustainable waste management system based on circularity. Introducing the concept of integral waste management implies the development and implementation of technologies that have a minimal negative impact on the environment.

Progress in compliance with waste management legislation, including recycling, plastics, chemicals, eco-design and other provisions related to the circular economy, is rather slow and limited, while full implementation of existing legal and policy frameworks is an even greater challenge⁵. The European Green Deal and the new Circular Economy Action Plan bring greater demands that will need to be incorporated into national legislation. In addition to the creation of institutional and political-legal assumptions, the practical application of the adopted mechanisms of control and monitoring of implemented activities on these issues is also necessary.

The introduction of the extended producer responsibility system for packaging and packaging waste in FBiH and RS, as well as electronic and electronic waste in FBiH, represents the first step in the transition to a circular economy in BiH.

Although there is no systematic approach to CE in Bosnia and Herzegovina, recently there has been an evident increase in initiatives to promote and encourage CE, including the creation of a strategic-regulatory framework. The Environmental Protection Strategy of the Republika Srpska and the Federal Environmental Protection Strategy (for the period 2022 - 2032) aim to integrate the concept of circular economy, primarily focusing on waste management - waste selection and recycling.

This will enable sufficient quantities of recyclable materials for sustainable production in various sectors (industry, agriculture, etc.) and efficient use of resources. The goals of waste management are listed in the waste management strategies of various entities in Bosnia and Herzegovina. However, in the Federation of Bosnia and Herzegovina and the Brčko District, CE principles have not yet been introduced into the strategic framework of waste management. Existing strategies in the waste sector in FBiH, RS and BD contain quantitative

goals related to increasing recycling and reuse for specific categories of waste, as well as reducing the amount of waste for final disposal with more efficient use of resources.

Table 1. Overview of the most significant documents adopted in Bosnia and Herzegovina to encourage CE

Institution	Document
Government of Republika Srpska	Waste Management Strategy for the period 2017–2026
Ministry of Spatial Planning, Construction and Ecology of the Republika Srpska	Republic Waste Management Plan in the Republika Srpska
Government of Republika Srpska	Environmental Protection Strategy of Republika Srpska for the period 2022-2032
Government of Republika Srpska	Industry Development Strategy of Republika Srpska for the period 2021-2027
Government of Republika Srpska	Program of economic reforms of the Republika Srpska for the period 2022-2024
Government of the Federation of Bosnia and Herzegovina	Development Strategy of the Federation of Bosnia and Herzegovina 2021-2027
Government of the Federation of Bosnia and Herzegovina	Federal Environmental Protection Strategy 2022 - 2032.

In the Republic of Srpska, the strategic framework areas of action include the integration of the circular economy concept, and the promotion of eco-design rules in accordance with the Rulebook on Eco-design of products that use energy in the Republic of Srpska ("Official Gazette of the Republic of Srpska", number 74/16). It is necessary to implement the promotion of eco-design measures and rules towards the business sector. The need to introduce a circular economy is also recognized by the Republican Waste Management Plan in the Republika Srpska, in which one of the goals is the achievement of ecologically sustainable use and preservation of natural resources, the reduction of the total amount of waste that is disposed of, the reduction of emissions and the reduction of threats to human health and lithe environment through:

- prevention of construction waste, packaging waste, various waste streams (EEO, tires, plastic bags, etc.);
- development of food waste management, household composting, "green" public procurement, public awareness;
- promotion of sustainable construction, eco-design, environmental protection.

In the strategic document entitled "Industrial Development Strategy of the Republika Srpska for the period 2021-2027. year" within the strategic goal "Reduce harmful effects on the environment" the following priorities are defined:

- Application of ecological standards in industry (transition to the green economy), and the following measures are mentioned: support for the construction of infrastructure for environmental protection and support for the introduction of ecological standards;
- Efficient use of resources in industry (transition to a circular economy) and within the same measure: development of an efficient system of using raw materials and waste management and increasing energy efficiency in industry.

Activities for the realization of this strategic goal, priorities and measures are elaborated in detail in the Action Plan for the implementation of the Industry Development Strategy of the Republic of Srpska for the period 2021-2027.

In the Program of Economic Reforms of the Republic of Srpska for the period 2022-2024, it is stated that a new reform measure will be implemented in the following period, i.e. transition of industry towards green and circular economy. The measure includes the provision of appropriate financial support for the implementation of projects in industry that have an impact on environmental protection, and are related to the reconstruction/innovation of existing technological processes, more efficient use of raw materials and energy in the production process, development of products with reduced harmful impact on the environment, introduction of standards for management of environmental protection, reduction of waste generation, recycling, energy efficiency and use of renewable energy sources in industry and the like, as well as the implementation of activities to promote the production and use of products with a reduced harmful impact on the environment.

The above-mentioned documents are important for the preparation of a clear policy for the implementation of the circular economy. However, many of the goals in the existing strategies and plans are very ambitious and do not take into account the current situation and achievements so far. In the planning and strategic documents of Bosnia and Herzegovina, there are no clearly defined activities that would prevent the generation of waste. The introduction of the extended producer responsibility system for packaging and packaging waste in the Republika Srpska represents the first step in the transition to a circular economy. Composting in households has been identified in some municipal PUOs as a measure to prevent waste generation, and in this direction it is proposed to carry out campaigns to raise public awareness about composting in households as well as training in local communities (especially in rural areas).

Current estimates of the European Commission are that the process of transition from a linear to a circular economy in the countries of the Western Balkans, which includes Bosnia and Herzegovina, is taking place slowly. BiH has not yet adopted the Circular Economy Roadmap as a necessary framework for a rapid transition to a circular economy. The roadmap should identify key drivers, opportunities and obstacles, priority sectors and necessary administrative capacities, as well as bodies for coordinating their implementation.

The framework areas for creating assumptions for the transition to the circular economy include the development and adoption of the Roadmap and the Action Plan for the introduction of the circular economy at the entity level (matched with the Roadmap at the BiH level), the removal of legal obstacles and the introduction of stimulating instruments for green business, encouraging the application of green public procurement in public institutions and in the private sector, drafting regulations for eco-design products, and ensuring financial support for strengthening voluntary instruments for the introduction of green business.

A national strategy for waste management, especially taking into account the context of the circular economy, the EU Plastics Strategy and the Single-Use Plastics Directive, has yet to be prepared. In order to comply with the Landfill Directive, the country needs to close or remediate non-compliant landfills. Awareness raising measures are needed to reduce waste generation and promote reuse and recycling. Furthermore, alignment with the EU acquis on sewage sludge, batteries, packaging, polychlorinated biphenyls/polychlorinated terphenyls and waste vehicles is needed.

According to German experts for the circular economy, based on the long-term experience of Western European countries, five phases have been defined in the introduction of the circular economy from the aspect of improving the waste management system (BMUB, 2016).

Phase 1: Disposal of waste in uncontrolled landfills

Phase 2: Systematic waste collection and improvement of the landfill

Phase 3: Separate collection and sorting of waste

Phase 4: Expansion of the recycling industry

Phase 5: Circular economy - waste as a resource

Phases 3 - 5 represent the transition from waste disposal to a circular economy. In these stages, the goal of resource efficiency, through the use of waste as a material and energy resource, increasingly becomes a priority (Figure 2).

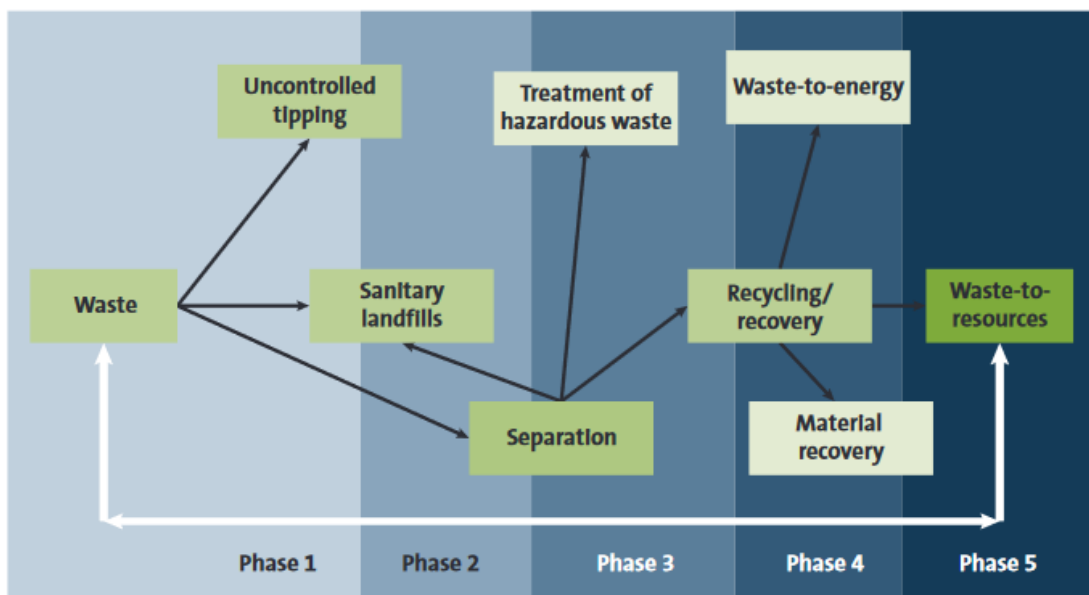


Figure 2. Five stages for the introduction of circular economy (BMUB, 2016)

In accordance with the aforementioned division, the waste management system in BiH is currently between the first and second stage, depending on the geographical location, but in general, the introduction of separate waste collection and sorting is not yet widespread. There are legal entities that deal with the purchase of certain types of waste such as cardboard and plastic, but the system of separating waste by household has not yet taken root. Elements of the circular economy can be implemented even at this early stage, for example with separate collection and manual sorting of recyclable materials. Separation and collection in several containers form the basis of high-quality sorting and high-quality recycling processes (Pešević, 2022). Simple facilities for composting waste from parks and markets, using mobile equipment, mark the beginning of organic waste recycling.

The introduction of systematic, regulated and reliable collection and establishment of sanitary landfills is the first step in the development of the waste management sector. In the system of regional waste management, as represented in Bosnia and Herzegovina, conveniently located transfer stations facilitate the cost-effective transport of waste. It is of crucial importance that collection is done efficiently because it is the most expensive element of waste management. However, along with sorting processes, it also offers the greatest potential for employment. It is important to identify the "right" collection system for each city or community and its particular circumstances.

In phase 5 (Circular Economy - waste as a resource) waste is predominantly recycled or subjected to energy recovery; untreated household waste no longer goes to landfill. The high recycling rates achieved result in a functional circular economy. Only small amounts of residual waste are disposed of in landfills and do not harm the environment. Preventing waste and looking at the life cycle are fundamental principles in all production processes and many consumer choices. That is the goal we should work towards.

Bosnia and Herzegovina will have to implement efficient separation and collection of waste, at least paper, then metal, plastic, glass and bio-waste, which are key to quality recycling and the establishment of economic incentives for reducing waste generation and better waste treatment (e.g. fees for land filling/incineration), as well as effective extended producer responsibility schemes.

All in all, technological solutions already exist; they simply need to be adapted to specific local circumstances. Recyclable materials can be recovered from waste by separate collection or by using sorting and separation technologies. Experience shows that the best results for recycling and the environment are achieved through separate collection. Keeping waste fractions separate at source and collecting them separately is the first step towards recovering secondary resources. Plastics, glass, paper, metals, organic waste and minerals can best be reused if they are clean and unmixed. The processing of mixed municipal waste is much more complex.

We should bear in mind that the introduction of circular economy is neither simple nor cheap. Not only are investments required to purchase the appropriate technology and build management facilities, but ongoing costs are primarily incurred in the collection of waste and recyclable materials and in the operation of the facilities. Compared to them, the costs of raising social awareness and further education and training of technical staff are small. Building an advanced waste management sector must not represent an excessive financial burden for the poorer sectors of society. The products of advanced waste management systems generate income in the form of secondary resources, energy and soil improvers. Calculations show that revenues from these products can cover a third or more of total costs. With the right policy framework, an advanced waste management sector is far cheaper than a conventional sanitary landfill (BMUB, 2016).

Separately collected organic waste is treated with biological treatment and is suitable for material recovery. Depending on the composition, it can be composted or used to produce biogas in fermentation plants. Proper processing turns fermentation residues into a valuable soil conditioner and fertilizer, similar to compost, for agricultural and horticultural use. Liquid fermentation residues can be used as agricultural fertilizer in a similar way to liquid fertilizer. In FBiH and RS, there is a limited number of financial mechanisms that support the transition to a circular economy. Among those mechanisms may be fees paid for not achieving recycling and reuse targets for some specific waste categories.

In order to introduce a circular economy, it is necessary to improve the legal and strategic framework in the area of waste management with EU principles, as well as to introduce economic and financial instruments and mechanisms that will affect the reduction of the amount and increase of the degree of utilization of all categories of waste.

CONCLUSION

The circular economy represents a model of an economic system in which the amount of waste and pollution is minimized, and instead the reuse and recycling of resources is promoted. In Bosnia and Herzegovina, the circular economy is still not sufficiently developed, but there are initiatives that deal with this topic. However, there is a need for further development of the circular economy in Bosnia and Herzegovina, which would imply greater cooperation between the government, the economy and the civil sector. One of the key challenges in the implementation of the circular economy in Bosnia and Herzegovina is the lack of infrastructure and technology for efficient recycling and reuse of resources. Also, it is necessary to improve the legal frameworks that regulate waste management and to provide adequate resources for its efficient processing and recycling.

The circular economy as a topic is particularly important for developing countries because it can help solve many of the economic, environmental and social challenges these countries face. The application of the circular economy model affects the reduction of the negative impacts of beer industry and society on the environment by reducing the exploitation of limited natural resources, as well as by reducing the amount of waste. The concept of circular economy is relatively new in Bosnia and Herzegovina, and therefore still abstract for many citizens, business owners, and decision makers. Neither the Road Map nor the Action Plan was adopted, nor was financial support provided for the strengthening of voluntary instruments for the introduction of green business. In order to protect the environment and enable the transition of industry to a circular and green economy, it is necessary to improve the waste management system, especially the management system for special categories of waste, in order to build the infrastructure for recycling and the use of useful components of waste, and to promote the use of secondary raw materials. BiH is faced with a great challenge in terms of developing the appropriate infrastructure for waste management according to modern European standards. The existing waste management system in terms of waste collection and disposal is inadequate in most municipalities. Separate collection of recyclable waste from households, including packaging waste, is practically not implemented in Bosnia and Herzegovina. It is necessary to introduce economic and financial instruments and mechanisms that will affect the reduction of the amount of waste and the increase in the degree of utilization of all categories of waste.

In order to improve integrated waste management and the system of circular economy, it is necessary to improve the system of records and reporting on waste, to improve the system of municipal waste management, as well as special categories of waste. In order to establish advanced systems for waste management, it is necessary to take into consideration elements such as legal regulations, social factors, available technologies, then financial aspects and market conditions. It is necessary to emphasize the role of citizens when it comes to reducing waste generation, separating and recycling waste, changing consumption patterns, which can have a significant effect on reducing the impact on the environment of Bosnia and Herzegovina.

The aforementioned organizational challenges point to the need to think about a more efficient way of managing waste in an ineffective system such as is in place in Bosnia and Herzegovina due to the fragmentation of institutions. In the coming period, it is necessary to significantly change the waste management system and establish measures to achieve the goals of reuse and recycling of waste in accordance with EU Directives and recommendations for the establishment of a circular economy

It is important to emphasize that the application of the circular economy in Bosnia and Herzegovina is important not only because of environmental protection, but also because of the potential economic benefit it can bring, including the creation of new vacancies and increasing the competitiveness of the economy. In this sense, it is necessary to consider the need for adapting the education system, both formal and informal, which would not only help in reinforcing the adaptability of the workforce but also strengthen awareness of the importance of the circular economy concept.

From all of the above, we can conclude that BiH has the potential for inclusion and progress towards the circular economy, but this will only be possible by integrating circular economy practices into all sectors of the economy and at all levels, while simultaneously raising general awareness of this concept and the advantages it can bring.

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