









Circular Economy as a New Concept for Sustainable Building Development in Serbia

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Abstract. The concept of circular economy has become an important topic nowadays. This paper provides a brief literature review that introduces sustainability and the circular economy by presenting their origins and their conceptual definitions. In accordance with the above-mentioned, the standards applied in Serbia are enumerated. In April 2020, the Roadmap for Circular Economy in Serbia, the first document that initiated a dialogue between decisionmakers, industry representatives, academia and civil society in order to define the goals, future steps and a time frame for the transition from a traditional linear model to the circular economy, was adopted. In November 2020, Serbia accepted the conditions of the European Union for linking the European Green Deal with the strategic development of the region by signing the Green Agenda for the Western Balkans. Furthermore, Serbia has a Digital Platform for the Circular Economy that provides support to companies through business models, examples of good practice and tools, in order to more easily apply the circular business model, and reduce the carbon footprint in production processes and products. Although the implementation of the circular economy is at the very beginning, there are already several examples of good practice in Serbia, in terms of sustainable building materials.

Keywords: Circular Economy · Sustainability · Regulations · Green Agenda · Digital Platform

1 Introduction

Over the last 150 years, the worldwide industrial economies have been dominated by a linear economy (Fig. 1) – a traditional model of production and consumption in which goods are manufactured from raw materials, sold, used and then incinerated or discarded as waste [1]. Its application was mainly motivated by achieving profit regardless of the negative impact on the environment and natural resources. In this model of economy, after the end of the “lifetime” of the product, the same was disposed of in landfills for a long time, while with the increase in the exploitation of natural resources, there was also an increase in the amount of generated waste. More than 2.2 billion tons of waste are produced annually in the European Union. Therefore, its legislation on waste management promotes a shift to a more sustainable model known as the circular economy

[2, 3]. In Serbia, the sectors of agriculture, forestry and fishing, mining, manufacturing, electricity, gas and steam supply, water supply and wastewater management, construction and service activities generated 56.3 million tons of waste just during 2020 [0]. Of the total amount of waste, even 20.1% was hazardous, while the rest was non-hazardous waste [0]. According to the Agency for Environmental Protection reports, the recycling of debris has not yet been established in Serbia, although 80% of construction waste can be recycled [4].



Fig. 1. Linear economy [5].

The concept of a circular economy is based on the assumption of using resources in the production and use in a way that maximizes the consumption period of the product, reduces the process of production and the amount of waste that cannot be reused, maximizes the utilization of resources, while, at the end of the cycle the product is returned to the production process in order to create new value [6]. The application of the circular economy requires greater investment in research to encourage the development of technologies that enable the application of this concept. In recent years, the concepts of circular economy and sustainability have increasingly gained traction in academia and industry, as well as among policymakers [7].

This paper presents a brief literature review that introduces sustainability and the circular economy by presenting their origins and their conceptual definitions. In accordance with the above-mentioned, the standards applied in Serbia are enumerated as well as several examples of good practice in the circular economy, in term of sustainable building materials. Furthermore, the existence of the Digital Platform for the Circular Economy [8] in Serbia is pointed out.

2 Sustainability

The term sustainability originates from the French verb *soutenir* which means “to hold up or support” [9]. Its modern conception has its origins in forestry because it is based on the silvicultural principle that was written down in the early 18th century in *Sylvicultura oeconomica* [10] and it states that the amount of wood harvesting should not exceed the volume that grows again. Afterward, the term sustainability (Fig. 2) was relocated to the context of ecology as a principle of respecting the ability of nature to regenerate itself [7, 11]. In the Oxford Dictionary of English [12] sustainable is defined as “able to be maintained at a certain rate or level”.



Fig. 2. An example of a sustainability sign [13].

In 1987, when the World Commission on Environment and Development published its report “Our Common Future” (the Brundtland Report), the most commonly accepted definition of sustainability was given as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” [7].

In 2017, after an extensive literature review, Geissdoerfer et al. [7] defined sustainability as a balanced integration of economic performance, social inclusiveness and environmental resilience for the benefit of current and future generations.

3 Circular Economy

The fundamental need for an alternative to the traditional linear economy led to the creation and development of the circular economy. The concept of the circular economy has been discussed since the late 1970s [7]. Its origins are mainly rooted in ecological [14] and environmental economics [15], and industrial ecology [16]. Based on the Boulding’s idea [14], environmental economists Pearce and Turner [15] primarily introduced the concept of a circular economic system. With the enactment of the “Closed Substance Cycle and Waste Management Act” in 1996, Germany became a pioneer in integrating the circular economy into national laws [17], followed by Japan’s 2002 “Basic Law for Establishing a Recycling-Based Society” [18], and China’s 2009 “Circular Economy Promotion Law of the People’s Republic of China” [19]. Even supranational bodies have also incorporated circular economy concerns, e.g. via the EU’s 2015 Circular Economy Strategy [20].

There is not just one, but many definitions that are used in parallel for circular economy. According to Ellen MacArthur Foundation, recent theories related to the circular economy are constantly evolving the concept itself. One of the most recognized definitions of the circular economy was proved by the Ellen MacArthur Foundation and that is: “A circular economy is one that is restorative and regenerative by design and aims to keep products, components, and materials at their highest utility and value at all times, distinguishing between technical and biological cycles.” [21].

At the international standardization level, the circular economy is defined as “An economy that is restorative and regenerative by design, and aims to keep products,

components and materials at their highest utility and value at all times, distinguishing between technical and biological cycles.” [22].

In 2017, after an extensive literature review, Geissdoerfer et al. [7] defined the circular economy as a regenerative system in which resource input and waste, emission as well as energy leakage are minimized by slowing, closing, and narrowing material and energy loops. The above-mentioned can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing and recycling. Therefore, the circular economy is viewed as a condition for sustainability, a beneficial relation or a trade-off.

In practice, the application of the circular economy extends the life cycle of products, while the amount of waste is reduced to a minimum, (Fig. 3).



Fig. 3. A circular economy model that implies less consumption of raw materials, less residual waste and less emissions [2, 3].

4 Law in Serbia

The Ministry of Environmental Protection and the Circular Economy United Nations Development Program participated in the drafting of the document Roadmap for Circular Economy in Serbia [4] that was adopted back in April 2020 [0]. The Roadmap represents the first document that initiated a dialogue between decisionmakers, industry representatives, academia and civil society in order to define the goals, future steps and time frame for the transition from the traditional linear model to the circular economy [0].

In November 2020 [0], Serbia accepted the conditions of the European Union for linking the European Green Deal with the strategic development of the region by signing the Green Agenda for the Western Balkans [23]. The Agenda represents the blueprint for a 2050 future of climate neutrality and environmental sustainability. Furthermore, it

is aligned with the ambitions of the European Green Deal and relies on urgent regulatory reforms and significant investments. The five main pillars of the Agenda [24] are:

- Decarbonization and climate resilience,
- Circular economy,
- Depollution: air, water and soil,
- Sustainable food systems and rural areas,
- Biodiversity: protection and restoration of ecosystems.

The Economic and Investment Plan promotes the implementation of the Agenda through the following four flagships (that extend over one or more pillars):

- Environment and climate,
- Clean energy,
- Sustainable transport,
- Private sector development.

This Plan represents a financial mechanism for accelerating the Green Agenda for the Western Balkans through green and digital transition, as well as fostering regional cooperation and convergence with the European Union [0]. Furthermore, the following ten flagships are identified as key indicators of a successful transition by this Plan: Connecting East to West, Connecting North to South, Connecting the coastal region, Renewable energy, Transition from coal, Renovation wave, Waste and waste water management, Digital infrastructure, Investing in the competitiveness of the private sector, and Youth guarantee.

Although Serbia adopted the Law on Waste Management [25] in 2009, the Regulation on the Manner and Procedure of Waste Management from Construction and Demolition [26] was adopted a few months ago, in October 2023. The ISO 20887 [27] which deals with sustainability in buildings and civil engineering works in terms of the design for disassembly and adaptability was published back in January 2020.

Given that the European Union has set a recycling goal of 55% by 2025 [0], it is necessary to point out the lack of recycling capacity and adequate waste disposal in Serbia. Therefore, Serbia has committed itself to supporting the construction sector in the development of construction and demolition waste management systems, as well as the recycling sector to improve recycling processes for certain waste streams in relation to substances that cause concern [28]. The following standards relating to recycled aggregate are applied in Serbia:

SRPS EN 206:2021 Concrete - Specification, performance, production and conformity [29],

- SRPS EN 12620:2010 Aggregates for concrete. [30],
- SRPS EN 13055:2017 Lightweight aggregates. [31],
- SRPS EN 933 series of standards: Tests for geometrical properties of aggregates. Part 1 (2013) [32], Part 2 (2021) [33], Part 3 (2013) [34], Part 4 (2010) [35], Part 5 (2023) [36], Part 6 (2023) [37], Part 7 (2007) [38], Part 8 (2016) [39], Part 9 (2023) [40] and Part 10 (2009) [41], while Part 11 (2020) [42] is deleted from the standards committee's work plan.

On September, 29, 2023, SRPS EN 197-6:2023 Cement - Part 6: Cement with recycled building materials was published [43].

Serbia also has Regulations on Energy Efficiency of Buildings [44], and Regulations on Conditions Content and Method of Issuing Certificates on the Energy Performance of Buildings [45].

While the standards referred to the circular economy are in the phase of consideration and adoption of suggestions and comments of interested parties, intending to improve their content, the following International Standards in Circular Economy are applied in Serbia:

- ISO/FDIS 59004:2023 Circular Economy - Terminology, Principles and Guidance for Implementation. [46] Effective date: December 13, 2023,
- ISO/DIS 59010:2023 Circular Economy - Guidance on the transition of business models and value networks. [47] Effective date: October 4, 2023,
- ISO/FDIS 59020 Circular Economy - Measuring and assessing circularity performance. [48] Effective date: December 11, 2023.

Furthermore, Serbian Chamber of Commerce, United Nations Development Programme and the German Organization for International Cooperation founded the Digital Platform for the Circular Economy [8] that provides support to companies through business models, examples of good practice and tools in order to more easily apply the circular business model, and reduce the carbon footprint in production processes and products.

5 Examples of Good Practice in Serbia

Construction is one of the preliminarily identified priority sectors in Serbia, besides the manufacturing industry, agriculture and food, and plastics and packaging, that is selected based on the possibility of fast and adequate implementation of the concept of circular economy business models, by efficient use of the raw materials, increasing the value of used materials, mobilizing the use of circular economy business models for products and services, promoting energy efficiency, closing the loop in the use of materials, preventing waste generation, implementing green public procurement, and developing the circular culture in the general society [4].

An example of the good practice from the construction sector in Serbia comes from Company FEPLo, which produces waterproof eco-panels using carton packaging from municipal and packaging waste with a 10% addition of mouldable polymers instead of glue [4]. The panels are used as construction material for rooftops and floor structures, and can be used as an alternative to wooden products that fulfill the same role. Furthermore, new buildings have energy passports as well as existing buildings that are being reconstructed, extended, restored, adapted, rehabilitated, sold, leased, or energetically rehabilitated. Also, the cement industry (e.g. Lafarge BFC, located in Beočin) uses by-products (e.g. ground granulated blast-furnace slag and fly ash) from other industries for the production of certain types of cement. Ground-granulated blast furnace slag represents a by-product of iron and steel production. There is only one steel production conglomerate in Serbia - HBIS GROUP Serbia Iron & Steel, located in Smederevo. Fly

ash is a by-product created in thermal power plants that utilize pulverized coal as a fuel source. Annually, about 40 million tons of low-calorie lignite (from the Kolubara and Kostolac coal basins) are burned in thermal power plants in Serbia, resulting in about 6 million tons of fly ash and slag. Up to now, around 200 million tons of the mentioned by-products have been disposed of in landfills with an area of 1,500 hectares [49, 50]. Ground-granulated blast furnace slag and fly ash are also used as a partial replacement of ordinary Portland cement in mortar or concrete production, i.e. as type II addition in accordance with standard SRPS EN 206:2021 [51].

6 Conclusion

Based on a brief review of the literature in terms of circular economy and sustainability, as well as the laws in force in Serbia, and examples from practice, the following conclusions can be drawn:

- Recently, both the circular economy and sustainability have increasingly gained traction among academia, industry and policymakers.
- In April 2020, the Roadmap for Circular Economy in Serbia was adopted, while in November 2020, Serbia accepted the conditions of the European Union for linking the European Green Deal with the strategic development of the region by signing the Green Agenda for the Western Balkans.
- While the standards referred to the circular economy are in the phase of consideration and adoption of suggestions and comments of interested parties, intending to improve their content, the International Standards in Circular Economy are applied in Serbia.
- Serbia is at the very beginning when it comes to the application of the circular economy, but there are already several examples of good practice in the construction sector.
- The establishment of the Digital Platform for the Circular Economy has a significant role in raising awareness of the circular economy importance among industries and companies through the Serbian Chamber of Commerce, which is one of its co-founder.

In general, Serbia should considerably step up its ambitions towards a green transition and focus on ensuring strict compliance with environmental impact assessment rules, increasing investment in waste reduction, as well as separation and recycling.

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