



SIGNIFICANCE AND ROLE OF RECYCLING TEXTILE PRODUCTS IN THE CONCEPT OF CIRCULAR ECONOMY

Review paper
DOI: 10.5937/CT_ITI25042M

Jovanović Marina¹, Snežana Urošević²

¹ Phd student, University of Belgrade, Technical Faculty in Bor, Bor, Serbia
e-mail: jovanovicmarina84@gmail.com, ORCID ID: 0009-0008-0044-9779

²University of Belgrade, Technical Faculty in Bor, Bor, Serbia
e-mail: surosevic@tfbor.bg.ac.rs, ORCID ID: 0000-0002-6647-0449

ABSTRACT: *The recycling of textile products is a topic that is very current in modern society, primarily because of the extremely large amounts of this type of waste that are disposed of in landfills. Due to the changes that are taking place in it and the shorter period of use of clothing, the textile industry has become one of the activities that have a high share in the total amount of generated waste on a global level. This paper investigates the importance and role of recycling textile products in the concept of circular economy, which aims to ensure the sustainable development of all segments of modern society. The subject of the research carried out in the paper should indicate the need for a much greater application of recycling in the textile industry and the positive effects it can lead to. The goal of the research is to point out the importance of recycling textile products and the role it plays within the framework of the circular economy concept. The results of this research can serve as a basis for further discussions regarding the importance and role of recycling textile products in the circular economy.*

Keywords: *Recycling, textile products, textile industry, circular economy, waste.*

ZNAČAJ I ULOGA RECIKLAŽE TEKSTILNIH PROIZVODA U KONCEPTU CIRKULARNE EKONOMIJE

APSTRAKT: *Reciklaža tekstilnih proizvoda predstavlja temu koja je veoma aktuelna u savremenom društvu, pre svega zbog izuzetno velikih količina ove vrste otpada koje se odlažu na deponije. Zbog promena koje se u njoj dešavaju i sve kraćeg perioda korišćenja odeće, tekstilna industrija je postala jedna od delatnosti koje imaju visoko učešće u ukupnim količinama generisanog otpada na globalnom nivou. Ovaj rad istražuje značaj i ulogu reciklaže tekstilnih proizvoda u konceptu cirkularne ekonomije, koja ima za cilj da obezbedi održivi razvoj svih segmenata savremenog društva. Predmet istraživanja koje je obavljeno u radu treba da ukaže na potrebu za mnogo većom primenom reciklaže u tekstilnoj industriji i pozitivne efekte do kojih ona može dovesti. Cilj istraživanja je da*



8. Međunarodna naučna konferencija
„Savremeni trendovi i inovacije u tekstilnoj industriji“
19-20. septembar 2025. Beograd, Srbija

ukaže na važnost reciklaže tekstilnih proizvoda i ulogu koju ona ima u okvirima koncepta cirkularne ekonomije. Rezultati ovog istraživanja mogu poslužiti kao osnova za dalje diskusije u vezi sa značajem i ulogom reciklaže tekstilnih proizvoda u cirkularnoj ekonomiji.

Ključne reči: *Reciklaža, tekstilni proizvodi, tekstilna industrija, cirkularna ekonomija, otpad.*

1. INTRODUCTION

The recycling of textile products is of great importance in the circular economy, which is reflected above all in the minimisation of waste after the end of use of these products, the reduction of the use of raw materials that come from nature and the extension of the product's lifespan. The concept of the circular economy is based on maximizing the use of textile materials through their reuse, repair, or recycling. The goal of all these activities is the maximum possible reduction of the negative impacts of the textile industry on the environment, which are currently very large. The importance of applying the concept of circular economy is additionally increased by the fact that the textile industry is classified as one of the activities that have the greatest negative impact on the environment.

The quantities of textile waste that are generated represent a significant threat to the environment. The degree of recycling of textile products that are no longer used is very low, which is why it is essential to increase their use in the textile industry. The negative effects that arise as a result of textile waste are further increased due to its ever-increasing amount, which is a consequence of the application of the concept of fast fashion, which implies a short lifespan of clothes and the cessation of use of products that are still functionally and aesthetically completely correct. Given this fact, it is necessary to emphasise the application of the circular economy concept in order to increase the proportion of textile products that are recycled or reused at the end of their life cycle.

2. CIRCULAR ECONOMY

The circular economy mainly focuses on lengthening product lifespans to lessen environmental damage [1]. The practical application of this concept is based on sharing, borrowing, reusing, repairing, and recycling existing materials and products as much as possible. After the end of the life of the product, the materials from which it is made are recycled, and their use continues, most often for the production of new products. This process of recycling products and reusing materials continues continuously, in order to ensure the minimization of the amount of waste that is disposed of [2].

The concept of the circular economy is based on approaches that are completely different from the traditional linear model, in which raw materials are used for the production of various products, which are used and at the end of their life cycle are thrown away, i.e., disposed of in landfills. The traditional linear model is based on the use of large quantities

of cheap and readily available materials and energy sources. The textile industry is one of the economic sectors that generates extremely large amounts of waste, which is why the application of the circular economy concept can have a significant positive economic and environmental impact. The UN Sustainable Development Agenda 2030 defines the basic goals of the development of modern society. Within this agenda, the transition to a circular economy is defined as one of the most important goals in the area of environmental protection and climate change prevention [3]. The circular economy is an instrument for achieving the goals of sustainable development. It includes various long-term investments in raw materials, energy efficiency, pollution reduction, use of renewable energy sources, and implementation of sustainable production and trade models [4]. The functioning of the circular economy concept is shown in Figure 1.

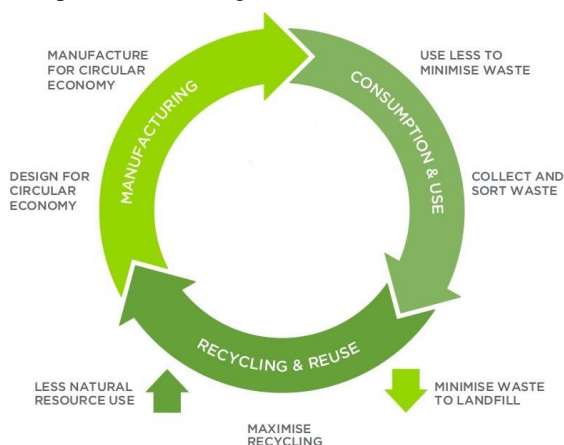


Figure 1: Conceptual model of the circular economy [5]

The circular economy is a modern concept that is much narrower in scope than sustainable development. The most significant similarities between the circular economy and sustainable development can be singled out as commitment to long-term goals that are passed on to future generations, the application of global models, multidisciplinary research areas, innovative business models, and the use of modern digital technologies [4]. The main difference between these two concepts is that the circular economy is a newer and narrower concept, focussing on economic and environmental benefits, as opposed to sustainable development, which has a much broader scope and encompasses all areas of society's functioning.

3. IMPACTS OF THE TEXTILE INDUSTRY ON THE ENVIRONMENT

The textile industry, in modern society, has extremely large negative effects on the environment. These negative effects are constantly increasing, as a consequence of the development of fast fashion, which is based on the sale of products of lower quality and



8. Međunarodna naučna konferencija
„Savremeni trendovi i inovacije u tekstilnoj industriji“
19-20. septembar 2025. Beograd, Srbija

price. Fast fashion products are meant to be used for only one season, after which they are discarded and become waste, despite the fact that most of them are still fully functional and usable. The emphasis on fast fashion products allows manufacturers to significantly increase the amount of products sold and the profits made, while at the same time having a major negative impact on the environment.

The negative impact of the textile industry is best illustrated by the data that more than 100 billion garments are produced worldwide every year, emitting more than 1.2 billion tonnes of carbon dioxide into the atmosphere and dumping more than 500 thousand tonnes of microplastic fibres into the oceans [6]. In 2024, around 92 million tonnes of textile waste were generated worldwide at various stages of its life cycle, with more than half of this waste consisting of products that have reached the end of their life cycle and can still be used [7].

The negative impacts of the textile industry and the potential of applying the concept of circular economy in it can best be seen based on the data that only between 15 and 20% of fashion products whose life cycle is over are collected for reuse and recycling. More than 80% of clothes that are no longer used are disposed of in landfills or burned, which results in greater atmospheric pollution, as well as unnecessary losses of energy and raw materials [8]. The negative impacts that arise in the textile industry make it necessary to apply the concept of the circular economy and focus on recycling clothing after end of use.

During the last three decades, companies operating in the textile industry have been implementing various activities aimed at increasing business sustainability and reducing negative environmental and economic effects. The goal of these activities is to create an image of companies that care about the environment in the public, considering that the sustainability of fashion products and the way they are produced are factors that increasingly influence customers when making purchasing decisions.

The main actions that manufacturers are taking to fulfil the requirements for environmentally friendly products and sustainable business are the production of environmentally friendly products, the use of transparent supply chains, the reduction of negative impacts on the natural environment, reuse, recycling and the manufacture of new products made from products that have reached the end of their useful life [9].

4. APPLICATION OF RECYCLING AND CIRCULAR ECONOMY IN THE TEXTILE INDUSTRY

The application of the circular economy in the textile industry aims to maximise the lifespan of the textile products [10]. Maximizing product life can be achieved by using product design that eliminates waste, product reuse, repair, resource sharing, and recycling. The degree of need for the application of the circular economy in the textile industry can best be seen based on the fact that more than 50% of waste in it is generated in the phase after the end of product use [11]. An effective and widely implemented clothing recycling policy can significantly reduce the negative effects on the environment that arise as a result of this type of waste.



In addition to reducing negative impacts on the environment, the application of recycling textile products, as part of the circular economy concept, can lead to numerous additional positive effects. The recycling of textile products can lead to significant employment opportunities and the development of companies engaged in these activities, thereby generating significant benefits for local communities. One of the arguments against recycling in the textile industry is that it will lead to the loss of jobs in its parts that deal with fiber production. This reduction cannot be seen as a negative consequence due to the fact that it will be offset by the creation of new jobs in recycling and the collection of textile waste.

The insufficient level of application of the circular economy in the textile industry is largely a consequence of the absence of strategic plans to increase business sustainability at the global and national levels. These plans, and the legal regulations that would ensure their effective implementation, would place before the manufacturers of textile products the obligation to put more emphasis on the sustainability of their business and the negative effects on the environment that it leads to. A major problem in the application of recycling in the textile industry is the socio-economic and behavioural aspects, which have a highly negative impact on its practical implementation [8].

The circular economy provides a model that enables the transformation of the way the textile industry operates and the transition from the application of a linear model to a circular model, which ensures the sustainable operation of this economic branch in the future [12]. The implementation of the circular economy requires governments, businesses, and customers to abandon the classic extractive model of industrial production, which is based on the concept of "take, make, throw away". The circular economy aims to redefine business models and growth by focussing on achieving positive effects for the whole community, not just for its individual members.

The main goal of the circular economy is to ensure the preservation of the value of materials at the maximum possible levels during their movement through value chains. The circular economy should enable the value of materials and raw materials used in the textile industry to be preserved as long as possible. Recycling represents an approach that enables the achievement of circular economy goals through the reuse of materials from which textile products are made. The importance of recycling is demonstrated by the fact that it reduces the consumption of natural resources and the negative impact on the environment resulting from economic activities, while at the same time improving well-being and quality of life [12].

The activities carried out in the circular value chain of the textile industry are shown in Figure 2. By analyzing the activities shown in the figure, it can be concluded that a large part of them is, in a direct or indirect way, connected with recycling. The importance of recycling in the textile industry is further increased due to changes in the ways of consumption of fashion products, which result in an increase in their sales, a shortening of their life span, and the rejection of clothes that can be used functionally and aesthetically [13].

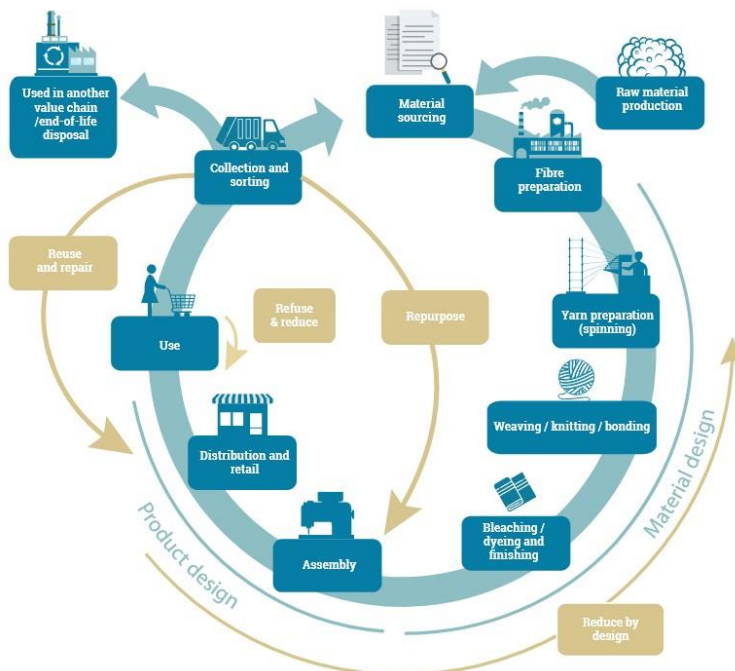


Figure 2: Activities carried out in the circular value chain of the textile industry [12]

Within the framework of the United Nations Sustainable Development Agenda 2030, the goal is defined that by the end of 2025, 45% of the polyester found in textile products must be recycled. For the year 2030, this document defines the goal that even 90% of these products must go through the recycling process [12]. Based on the actual status of the recycling of textile products whose use has been discontinued, it can be concluded that the stated targets are too optimistic and cannot be achieved

5. POSSIBILITIES FOR IMPROVING THE APPLICATION OF RECYCLING IN THE TEXTILE INDUSTRY

Despite the increasing attention being paid to the recycling of clothing that is no longer used, there is still considerable opportunities for implementing various improvements in this segment of the application of the circular economy concept. In addition to clothing, recycling must include numerous other types of textile products, such as medical textiles, textiles used in cars, pieces of furniture, etc. The increasing production of so-called smart textiles presents numerous challenges related to the recycling of products made from these materials. A large number of different composite materials are used in these products, the recycling of which represents a great challenge and is very complex [14]. Managing textile



8th International scientific conference
„Contemporary trends and innovations in the textile industry“
19-20th September, 2025, Belgrade, Serbia

products containing composite materials at the end of their life is a significant challenge. The methods used today, based on their disposal in landfills and different types of recycling, have numerous limitations, which must be overcome. Innovative approaches must ensure the integration of this type of textile products into the circular economy, in order to maximize their value and minimize negative impacts on the environment.

Within the framework of the circular economy, the greatest attention is paid to recycling, reuse and repurposing of natural and synthetic textile waste, using mechanical and chemical methods of recycling [7]. In the case of natural materials, mechanical recycling is suitable for textile products made from cotton fibers, while chemical recycling is suitable for products made from silk and wool fibers. Textile products made from synthetic materials are suitable for both types of recycling, with mechanical recycling being more suitable for products made from polyester fibres. An increasing number of textile companies are using materials obtained by recycling plastic bottles in their production, thereby reducing environmental pollution and dependence on polyester fibers.

The development of the concept of fast fashion, which enables manufacturers to make high profits and increase the number of products sold, has resulted in extremely significant negative impacts on the environment. In the period from 2010 to 2020, the production of fashion products increased by more than 100%, which led to a significant increase in the consumption of raw materials and the creation of large amounts of waste. This negative trend is additionally contributed by the fact that over 50% of fast fashion products cease to be used within a maximum period of one year after their purchase [15]. The concept of fast fashion, which emphasises the purchase of new products and the abandonment of fully functional products, has an extremely negative economic and environmental impact, the reduction of which must be one of the most important goals of the circular economy.

About 90 million tons of clothing are produced annually on a global scale and are discarded for various reasons. Almost 70% of this clothing can be reused, with the percentage of its recycling in 2021 being less than 10% [16]. Based on the above data, the importance and role of textile recycling in the concept of circular economy and the functioning of modern society can best be seen. In addition to extending the life of textile products, their recycling at the end of the period of use is an element that can significantly reduce the negative consequences for the environment.

The quantity of recycled textile products is influenced by a variety of different factors, the most important of which are the type, quality and quantity of waste as well as the legal requirements for the management of textile waste and its recycling. The lack of legal regulation is one of the basic and most important factors affecting the low recycling rates of textile products. There are a large number of factors that negatively affect the application of the circular economy in the management of textile waste and its recycling. Technological development, recycling costs, understanding of market dynamics, business models, public awareness, and the lack of standardized policies and regulations can be singled out as factors that have the greatest negative impact on the application of the circular economy concept in this area [15].

Increasing the percentage of textile products that are recycled at the end of their life is one of the elements that can significantly reduce numerous negative consequences for the environment. The amount of textile waste that is disposed of in landfills represents a



significant burden on the environment, while a large part of this waste can be recycled and reused at relatively low costs. Innovations in materials from which textile products are made, as well as the development of new techniques for recycling and reuse, which are based on the use of modern technologies, can have a significant impact on the increase in the amount of textile waste that is recycled [17]. Scientific research and the development of new knowledge can significantly influence the application of the circular economy in all segments of the textile industry. The recycling and reuse of materials after the disposal of textile products must be the subject of further scientific research in order to ensure appropriate improvements and innovations in this area. Research in the field of textile recycling in the circular economy must be aimed at reducing negative impacts on the environment and encouraging sustainable and environmentally friendly practices.

6. CONCLUSION

The recycling and reuse of materials after the disposal of textile products must be the subject of further scientific research in order to ensure appropriate improvements and innovations in this area. Recycling and reuse of textile products enable a significant reduction in the amount of textile waste disposed of in landfills. In this way, numerous positive effects are achieved, such as reducing the amount of waste disposed of in landfills, reducing the amount of raw materials used for the production of textile fibers from which materials are made, and reducing the costs associated with waste management.

The circular economy represents an approach in which emphasis is placed on all segments of the life cycle of textile products, from the production of the raw materials from which they are made to the end of their use. Within this concept, special emphasis is placed on different ways of recycling and reusing textile products and the materials from which they are made. The application of the circular economy enables a significant reduction of the waste disposed of in landfills. Due to the large negative consequences associated with the disposal of end-of-life products, textile recycling plays an extremely important role in the circular economy concept. As one of the basic prerequisites for greater use of recycling of textile products, the definition of global standards and national laws, with the help of which the obligation to recycle these products would be imposed on manufacturers, is highlighted.

ACKNOWLEDGEMENT

This paper was prepared with the financial support of the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, within the funding of scientific research work at the Technical Faculty in Bor, University of Belgrade, according to contract no. 451-03-137/2025-03/ 200131.

REFERENCES

- [1] Radev, R., Marinova, V. (2023). Textile waste in the context of the circular economy, *E3S Web of Conferences - TransSiberia 2023*, 402, 08048.



8th International scientific conference
„Contemporary trends and innovations in the textile industry“
19-20th September, 2025, Belgrade, Serbia

- [2] European Parliament (2015). *The circular economy: what it is and why it matters*, European Parliament, Strasbourg.
- [3] Radukić, S., Kostić, Z. (2019). Ciljevi održivog razvoja u Republici Srbiji u svetlu Agende 2030, In D. Kostić & S. Vasilev Stattev (Eds.), *Regionalni razvoj i prekogranična saradnja*, pp. 431-440, Srpska akademija nauke i umetnosti - ogranak u Nišu, Niš.
- [4] Radukić, S., Petrović-Randelović, M., Kostić, Z. (2023). Implementation of the circular economy principles in the textile industry, *Economics of Sustainable Development*, 7(1), 1-14.
- [5] Retrieved from <https://futurerecycling.com.au/sustainability/circular-economy/>, accessed 1.7.2025.
- [6] Gazzola, P., Pavione, E., Pezzetti, R., Grechi, D. (2020). Trends in the fashion industry - The perception of sustainability and circular economy: A gender/generation quantitative approach, *Sustainability*, 12, 2809.
- [7] Shamsuzzaman, M., Mazed, I., Mamun, A., Rayyaan, R., Sowrov, K., Islam, S., Abu Sadat, M. (2025). Fashion and textile waste management in the circular economy: A systematic review, *Cleaner Waste Systems*, 11, 100268.
- [8] Rahman, M. Mashud, M., Rahman, M. M. (2023). *Advanced Technology in Textiles - Textile Science and Clothing Technology*, Springer, Singapore.
- [9] Kim, I., Jung, H. J., Lee, Y. (2021). Consumers' value and risk perceptions of circular fashion: Comparison between secondhand, upcycled, and recycled clothing, *Sustainability*, 13, 1208.
- [10] Chen, X., Memon, H. A., Wang, Y. (2021). Circular Economy and Sustainability of the Clothing and Textile Industry, *Materials Circular Economy*, 3, 12.
- [11] DeVoy, J. E., Congiusta, E., Lundberg, D. J., Findeisen, S., Bhattacharya, S. (2021). Post-consumer textile waste and disposal: differences by socioeconomic, demographic, and retail factors, *Waste Management*, 136, 303-309.
- [12] Petrie, L. (2023). *Sustainability and Circularity in the Textile Value Chain*, United Nations Environment Programme, Nairobi.
- [13] United Nations Environment Programme (2023). *UNEP Circularity Platform*, United Nations Environment Programme, Nairobi.
- [14] Pakdel, E., Kashi, S., Varley, R., Wang, X. (2021). Recent progress in recycling carbon fibre reinforced composites and dry carbon fibre wastes, *Resources, Conservation & Recycling*, 166, 105340.
- [15] Dissanayake, D. G. K., Weerasinghe, D. (2021). Fabric Waste Recycling: a Systematic Review of Methods, Applications, and Challenges, *Materials Circular Economy*, 3, 24.
- [16] Fan, W., Wang, Q., Rong, K., Shi, Y., Peng, W., Li, H., Guo, Z., Xu, B., Hou, H., Algadi, H., Ge, S. (2024). MXene enhanced 3D needled waste denim felt for high-performance flexible supercapacitors, *Nano-Micro Letters*, 16, 36.
- [17] Kazancoglu, I., Kazancoglu, Y., Yarımoğlu, E., Kahraman, A. (2020). A conceptual framework for barriers of circular supply chains for sustainability in the textile industry, *Sustainable Development*, 28(5), 1477-1492.