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## THE INITIATIVES TO IMPLEMENT THE CIRCULAR ECONOMY IN THE GARMENT INDUSTRY (REPUBLIC OF MOLDOVA CASE)

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**Abstract.** This paper reflects some initiatives to implement the circular economy in the textile and clothing industry in the Republic of Moldova with a focus on recycling textile waste and identifying opportunities to increase the sustainability of the industry and to align with the practice of the European textile industry. The garment industry is among the most developed industries of the Moldavian economy. It is in the top five largest branches of industry and a major job generator. The disadvantage of this industry, as well as of the European textile industry, is that it is a large waste generator both in the pre-consumption phase, but especially in the post-consumption phase, which mostly end up in landfills and pollute groundwater, soil and air due to greenhouse gas emissions. Textile waste that is formed in the pre-consumption phase is not sorted, therefore it is not recycled. However, there are some initiatives in Moldova to implement circular economy models. In practice there are certain initiatives to implement circular business models for the collection and recycling of post-consumer waste, which aim to extend the life cycle of articles. Young designers are also trying to find solutions for recycling garments. In order to multiply the existing practices of waste collection and recycling in the Moldovan garment industry, there is a need for education and a broad involvement of both businesses and consumers.

**Keywords:** *garment industry, circular economy, circular business models, circular business ecosystem, waste hierarchy.*

**Rezumat.** Această lucrare reflectă câteva inițiative de implementare a economiei circulare în industria textilă și de îmbrăcăminte din Republica Moldova, cu accent pe reciclarea deșeurilor textile și identificarea oportunităților de creștere a durabilității industriei și de a se alinia la practica industriei textile europene. Industria confecțiilor este printre cele mai dezvoltate industrii ale economiei moldovenești, aflându-se în primele cinci cele mai mari ramuri ale industriei și un generator important de locuri de muncă. Dezavantajul acestei industrii, ca și al industriei textile europene, constă în faptul că este un mare generator de deșeuri atât în faza de pre-consum, dar mai ales în faza de post-consum, care ajung în gropile de gunoi și poluează apele subterane, sol și aer din cauza emisiilor de gaze cu efect de seră. Deșeurile textile care se formează în faza de pre-consum nu sunt sortate, prin urmare, nu sunt reciclate.

Cu toate acestea, în Moldova există unele inițiative pentru implementarea modelelor de economie circulară. În practică, există anumite inițiative de implementare a modelelor de afaceri circulare pentru colectarea și reciclarea deșeurilor post-consum, care urmăresc extinderea ciclului de viață al articolelor. Tinerii designeri încearcă, de asemenea, să găsească soluții pentru reciclarea articolelor de îmbrăcăminte. Pentru a multiplica practicile existente de colectare și reciclare a deșeurilor în industria confecțiilor din Moldova, este nevoie de educație și de o implicare largă atât a afacerilor, cât și a consumatorilor.

**Cuvinte-cheie:** *industria confecțiilor, economie circulară, modele de afaceri circulare, ecosistem de afaceri circular, ierarhia deșeurilor.*

### **Introduction**

The linear economy is a model still widely used nowadays, that involves the use of fabulous resources on the one hand, and on the other hand generates a huge amount of waste. According to data presented by the European Parliament, the European Union generates approx. 2.5 billion tons of waste [1], most of which ends up in landfills, which, in addition to occupying large amount of land, pollute the groundwater, soil and air [2]. Also, the decomposition of waste that ends up in landfills generates a huge quantity of methane which is a huge risk for global heating. The method waste of incinerating determines more harmless and generates huge emissions of air pollutants.

According to some statistics, over 10% of the total amount of waste is generated by the production of goods, among which the production of textiles and clothing can be ranked in the top of waste generation industries. Analyzing some data presented by the European Environment Agency, every consumer in the European Union throws away about 11 kilograms of textiles waste annually, the essential part ends up in the landfills. In a report of the European Parliament published in 2020, approx. 10% of global greenhouse gas emissions come from the clothing industry. It exceeds the greenhouse gas emissions generated by air transport and maritime transport taken together [3].

The generation of such a large amount of waste and negative effects has occurred as a result of the implementation of fast fashion, which has been promoted by major clothing manufacturers over the last ten years and seems to continue. The following data confirm that: the famous Swedish group H&M polluted air with 72,580 tons of CO<sup>2</sup> in 2020, a year marked by blockages related to the Covid-19 pandemic, which was 18% more than in 2019. One of the major producers the Spanish clothing company Inditex, the owner of the Zara brand, have had emission of 120,992 tons of CO<sup>2</sup> in 2020 [3].

The apparel industry of Moldova also is a big generator of waste. Due to the business models that have emerged for many years in the garment industry over 80% of the total number of companies provide manufacturing services for European customers, who deliver the inputs to Moldavian factories. In the practice all garment companies involved in the outsourcing deliver to foreign customers only the finished products, and the waste that is formed in the pre-consumption phase remains with the company, although they de facto belong to the international customer. Only a very small number of companies that provide services to international customers deliver waste to international customers. The other 20% of the total number of enterprises produce garments under their own brand, using materials purchased independently. In this case the waste that is formed in the pre-consumption phase belongs to the local company.

According to some preventive calculations, it was found out that annually in the Republic of Moldova the apparel industry generates a quantity of around 10 thousand tons of textile waste and approx. 3,000-5,000 tons of other waste (cardboard, plastic and others).

In order to identify how this waste is managed, 25 garment companies were interviewed. Among the companies interviewed were both large, small and medium-sized enterprises, companies providing services to international customers and / or companies that own their brand, specializing in the manufacture of a wide range of clothing for men, women and children of natural, synthetic or mixed fabrics.

Analyzing data presented by interviews, the following practice of waste management in Moldovan apparel companies was identified:

- Over 90% of companies mentioned that plastic and cardboard are collected separately. They are collected by companies specializing in recycling of this type of waste.
- A very small number of companies (approx. 10%) that provide services to international customers, collect textile waste and return it to customers at their request, once the manufacturing order is delivered.
- A small quantity of Jersey-type waste is offered to vine growers for tying vines or sold to car repair centers for use for hand hygiene.
- Most of the textile waste obtained in the pre-consumption/manufacturing phase are collected by the Moldovan companies without being sorted. In order to evacuate them the Moldovan apparel companies have concluded contracts with the sanitation companies which pick up this waste from the enterprise and transport it to landfills.

Thus, the interviews showed that in the Republic of Moldova the textile waste from the pre-consumption/manufacturing phase in the garment factories goes directly to the landfills. Disposing of textile waste in landfills causes a lot of problems, namely:

- Large landfill capacities are needed because textile waste goes to landfills along with other types of waste;
- Landfills are a major threat for drinking water supply. When it rains, water drains through stored waste / garbage and picks up chemicals (dyes and bleaches etc.) from textile waste stored in landfills. The water accumulated at the bottom of the landfill could be very toxic, often more toxic than sewage water;
- For textile waste to decompose it takes quite a long time and depends a lot on the composition of the textiles.
- Due to the lack of oxygen, even textiles made of biodegradable natural fibers do not decompose in a short time.
- Greenhouse gases, which occur as a result of textile waste decompose, pollute the environment enormously;
- Waste from natural wool fabrics decomposes fairly quickly. However, during decomposition, methane, a greenhouse gas, is eliminated;
- Waste from synthetic fabrics does not decompose. Thus, they are a long-term source of soil and water pollution.

During discussions with the garment companies, it was found out that a relatively small share of enterprises (about 12%) use the method of incineration of textile waste that appeared in the pre-consumption phase. The incineration is a method of disposing of textile waste in industrial specialized plants. Incineration can be used as a method of disposing of textile waste. But it is necessary to mention that this process needs installations with quite

high technical performances. In fact, incineration installations with low technical performance can generate the elimination in the atmosphere of some rather dangerous chemicals [4]. According to European Union law, incineration is not considered a form of recycling, it is either a form of energy recovery or a form of disposal of textile waste. In the Republic of Moldova, although incineration as a method of waste disposal is allowed, a regulation for the incineration of textile waste is still missing.

An enormous problem is the waste from the post-consumer phase, which has a high growth trend. So, the current situation requires the implementation of the circular economy in the garment industry both at European Union and Republic of Moldova.

### **European and Local Context on the Implementation of the Circular Economy in the Textile Industry**

The linear production model is a resource intensive consumption one, characterized by increasing consumption, climate change and huge environmental pollution, has generate global challenges that are severely affecting society [5]. Taking into consideration this, the European Union has launched a series of activities to implement the circular economy. Well-coordinated actions between business, society and the Member States have led to policies to stimulate the implementation of a series of sustainable actions. The European Commission has adopted in 2019 the policy guide that addresses global environmental challenges and concept of circularity.

The European Textile and Garment Confederation (EURATEX) has aligned with the ambitious objectives of the EU institutions to change the traditional linear manufacturing and in 2020 approved the Textile Strategy “Circular Textiles. Prosperity-in-the-circular-economy”, which stimulates the widespread implementation of the circular economy, as an opportunity to reconcile the environmental-socio-economic aspects of sustainability in the textile sector [6].

In this document EURATEX presented the concept of circular economy developed by the European Commission in 2015 which define the circular economy as a system of production and consumption in which “the value of products, materials and resources is maintained in the economy for as long as possible, minimizing waste that contribute to the EU's efforts to develop a sustainable, low-carbon, resource-efficient and competitive economy. Such a transition (to a more circular economy) is an opportunity to transform the economy and generate new and sustainable competitive advantages for Europe” [6].

The EURATEX concept was included in the Strategy “Circular Textiles. Prosperity in the circular economy” with twelve directions for achievement of the circular economy of textiles in the EU, which cover three main areas such as building partnerships, increasing demand and consumer education [6].

The established partnerships between fashion brands, which have the role of buyer, and manufacturers, from the production of fibers to the manufacture of consumer goods will play a decisive role in implementing an efficient circular economy.

It is well known that the increase in demand generates the increase in supply, and the latter due to the scale effect contributes to the reduction of cost. This dependency is very important for recycled materials. Although the cost of recycled materials has a declining trend, it is still quite high and exceeds the cost of virgin materials, because it is needed to use new machines, perform various tests, train staff, etc. The high cost is a critical issue that block the widespread market adoption of the circular economy. Increasing demand from this

type of business will generate certain partnerships and investments in specific technologies and equipment, using solutions that are already available, but also creation new one.

A very important domain is the education of the consumer, so that he is responsible for the decisions he makes and be able to choose what is best for both him and the environment.

The strategy also highlights the importance of product design, standardization of recycled products, collection and sorting, new services, updating legislation and more [6].

The strategy also describes six conditions that would allow the implementation of the circular economy:

- The health and safety of recycled products must be at the same level as that of products made from virgin raw materials;
- Respecting the waste hierarchy (repair, reuse and recycling);
- The need to provide different solutions according to specifics of product and markets;
- The changes in the sector will take place differently, however it is necessary to understand that the changes will take time and a concrete action plan will be needed;
- Strict compliance with the law, strict supervision of the implementation of the law;
- Ensure the growth of European industry and its role globally through a European action plan that will contribute to strategic investment, employment, especially for SMEs [6].

The textile / clothing industry in the Republic of Moldova, even if it is quite small compared to other European countries, promotes the implementation of the circular economy in the sector. Thus, in 2020, the Strategic Roadmap “Rebuilding a Sustainable Light Industry in Moldova” was adopted, a policy that represents a roadmap for transforming the Moldovan textile /apparel industry in line with EU market expectations. This document includes strategic recommendations on five key areas, the first being Sustainability and Circularity [7].

The document sets out six strategic objectives and initiatives in the area of sustainability and circularity, such as:

- Creating a public-private partnership in order to define a plan to decarbonize the industry and promote renewable energy and waste management;
- Introduction of topics on sustainable development and circularity in higher education for textiles and design programs;
- Encourage investment in green technologies, including waterless technologies for painting etc.;
- Adapting a national program to stimulate and support enterprises that will develop new, sustainable and circular business models;
- Building a strong relationship with international organizations in the field of recycling, as well as with innovative companies that are experienced in recycling;
- Develop a national strategy for research, development and innovation, focused on circularity [7].

Strategic documents on the implementation of the circular economy to be implemented have been adopted at both European Union and national level using the best and most efficient circular economy models.

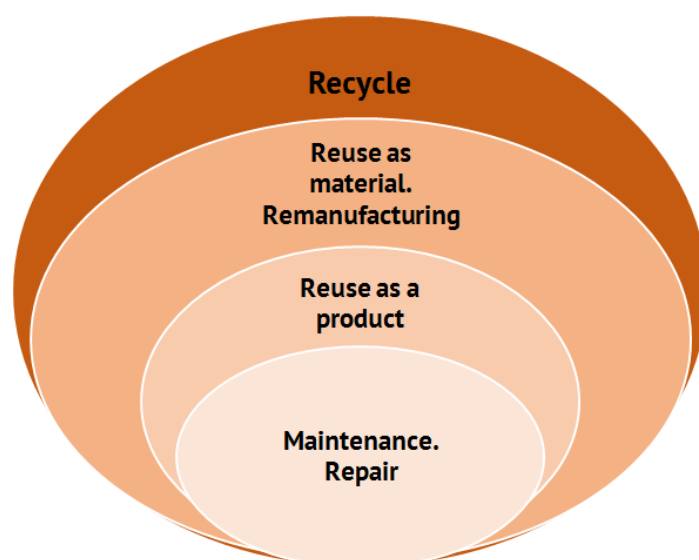
### **Circular Economy Models in the European Textile Industry**

Circular business models can be presented in different types of operation in order to contribute to the transition to a circular economy. In 2014, the global management, technology services and outsourcing consulting company Accenture presented the list of circular business models. This list includes five key circular business models [8]:

- Circular utilities - involves the supply of renewable energy, bio-materials or fully recyclable materials that would replace the inputs throughout the life cycle of the product;
- Recovery of resources - involves the recovery of resources and energy from reused products;
- Extending the life of the product - involves extending the life cycle of products and components through repair, modernization and resale;
- Sharing platforms - involves increasing the utilization rate of products, raw materials, accessories;
- Product as a service - which would mean providing wider access to the product and retaining ownership in order to internalize the productivity benefits using circularity of resources.

Circular innovations in business models are defined by complex networks in which the actors involved need collaboration, communication and coordination. The actors of these networks are interdependent, but remain independent. Redesigning business ecosystems means creating a “win-win” model, which would mean finding a balance between the interests of the actors involved in order to facilitate their actions and develop the circular business model [9].

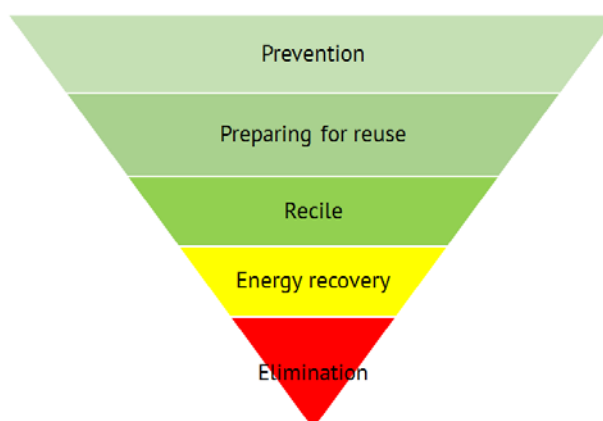
A model of the circular business ecosystem for textiles was developed at the Finnish ATV Technical Research Center in collaboration with the Finnish circular economy consulting firm Ethica [10]. The model of the circular business ecosystem for textiles is based on the principles of the circular economy developed by the Ellen MacArthur Foundation [11], with four value cycles as its backbone: Maintenance, Repair; Reuse as a product; Material reuse, remanufacturing and recycling (Figure 1).



**Figure 1.** Four value (technical) cycles of a simplified circular economy [11].

The successful circular economy in the textile industry depends on the efficient implementation of the circular business model at each stage.

Based on the waste management hierarchy shown in Figure 2, waste prevention becomes a priority.



**Figure 2.** Waste management hierarchy [10].

The circular design of the product and service (development of sustainable models) plays a decisive role. No less important is the role of the consumer in preventing the excessive formation of textile waste. The consumer behavior will require a major especially under the influence of Fast Fashion culture that is prevalent at the current stage [10]. All these concepts are reflected in both the European and Moldovan strategy.

At the current stage, due to the fast fashion model of business in the garment industry, an enormous amount of waste is formed in the post-consumption stage. The circular business ecosystem for textiles aims to maximize the preservation of post-consumer textiles either in reuse cycles or to be recycled instead of incinerating textile waste or landfill. The key objective should be to use recycled textiles to ensure maximum value [10].

Currently, in the European Union, post-consumer textiles that can no longer be reused are incinerated for energy recovery, which is not the best solution or go to landfill. In the Republic of Moldova, they go directly to landfills and are sources of environmental pollution. This method does not contradict the legislative provisions [12].

We have to mention that only 12% of the material used for clothing ends up being recycled. If compared to glass and PET plastic which have recycling rates of 27% and 29% respectively, then it is clear that the textile lags behind. And most of the recycled polyester that is currently used by top fashion brands comes from recycled PET plastic and not from recycling old clothes [13].

The key issue within textile industry regarding recycling is about how many fabrics are used for production and how many accessories are added. Fabrics can be complex combinations of fibers that can present problematic mixtures of natural yarns, artificial filaments, plastics and metals. Even clothes made from pure natural yarns may contain labels and yarns that could be made of another material, such as polyester. This is huge problem for recycling [13].

That is why, as result the research activities are being carried out with the aim of recycling post-consumer textiles and obtaining new products with a higher value, instead of being used for energy generation or being deposited in landfills. Thus, options for energy

recovery and waste disposal are not efficient and excluded from the modeling of the circular ecosystem for textiles.

Practice already shows that the circular business ecosystem in the textile industry is beginning to be implemented and this is much more than recycling. Circular economy models include the efficient use of materials in product design, product life cycle extension services, and directing products for reuse. Some of companies have already invested in launching circular business models. However, most of the solutions already delivered are usually relatively small portions of the company's business model and face barriers that no company could address on its own. That is why it is necessary to create partnerships, complex networks in which there is an efficient collaboration, communication and coordination for the achievement of the proposed goals.

### **Opportunities and Initiatives for the Implementation of the Circular Economy in the Garment Industry in the Republic of Moldova**

Due to the fact that in garment factories fabrics with different compositions are processed, the separate collection of textile waste at the pre-consumption stage is quite complicated and requires a lot of effort. Therefore, textile waste at the pre-consumption / manufacturing stage is not collected separately by garment factories which leads to their disposal in landfills along with other types of waste.

Despite the fact that currently the Ministry of Environment of the Republic of Moldova has issued 41 permits to enterprises carrying out waste collecting activities, only a few companies indicated in their type of activity the collection and recycling of textile waste, including textile waste from the pre-consumption phase. Many of these companies collect plastic, paper and cardboard from garment companies. The post-consumer textile waste is also not collected separately from the mentioned enterprises, also population lacks the culture to separate it from other waste. Only one company carries out services of collection, sorting and temporary storage and processing (composting and packaging) of textile waste in the pre-consumption and post-consumption phase [14].

However, there are several initiatives in the Republic of Moldova for the collection and recycling of textile waste. These initiatives belong to different non-profit organizations that contribute to improving the state of the environment. Existing initiatives contribute to the collection and recycling of textile waste both from the pre-consumption phase, but especially from the post-consumption phase, among which the following could be mentioned [15]:

#### ***Initiatives for Waste Collection and Recycling at the Pre-consumption Stage***

In this direction we can mention the Ra Planet store with products for arts and crafts, which is part of the EcoLocal Association - an association of consumers and producers, which allows direct connections between them and leads to the development of the local market of handicrafts, including recycled materials. Thanks to the Torbesc project, Ra Planet has demonstrated that any type of fabric can be transformed into cute rugs and bags of all beauty. The rugs are produced from textile waste collected from some garment factories, which appear in the pre-consumption phase. But the amount of waste collected and recycled / used from this phase is still very small, but it is still an opportunity for the collection and recycling / use of textile waste, which occurs at this stage in garment factories. The use of fabric waste for the production of hand-made rugs is quite interesting and does not require huge investments. These goods are sold, including for export, through the online store "From the



heard shop" [16]. This practice should be encouraged and developed in order to identify other directions for the use of textile waste that are forming at the pre-consumption stage.

### **Post-consumer Waste Collection**

There are several initiatives in this area, including the following:

- Shop-MESTO - an initiative to collect clothes, shoes, accessories that the owner no longer needs, but which are in good condition and could be worn by other people. Thus, this initiative is aimed at extending the life cycle of clothing and footwear. Thanks to this initiative, the clothes come to life and are sold, and the money collected is used for charity. Clothes that are not in good condition are redistributed to animal shelters [17].
- Clothes bank - social program established in 2016 and carried out by the Social Mission "Diaconia". During this program, special boxes were installed for collecting clothes, shoes, bed linen, etc. The collected goods are distributed by the network of parishes, but also the other partner organizations of the Diaconia. At present, 23 social boxes are organized and arranged for 45 villages, which were supplied with over 235 tons of goods donated within the project. Following the collection, the goods are sorted and redistributed to the socially vulnerable, the elderly, the homeless, thus prolonging the life cycle of clothing and footwear [18].
- FreeShop - an eco-market organized periodically by EcoVisio where you can exchange clothes, accessories, bags, bags, etc. This event is also aimed at extending the life cycle of clothing, footwear and fashion accessories [19].
- Various NGOs have also started collecting clothes in street containers, as well as collecting them in clothing stores through "recovery" programs. This practice has both advantages and disadvantages. Disadvantages include the fact that street collection methods could affect the quality of clothes and subsequently limit the possibilities for reuse and / or recycling.

It can be concluded that in the Republic of Moldova there are certain initiatives aimed at capitalizing on opportunities to implement circular business models and extending the life of the product. However, these initiatives are quite few and are at a fairly early stage and require further development. The amount of textile waste from the post-consumer stage is very high and has a tendency to increase. These trends are dictated by the growing consumption, which come in very large quantities basically from imports, but also from second-hand products.

Another circular economy model initiated by the Light Industry Association of Employers (APIUS) in Moldova is related to the attempt to implement sharing platforms in order to increase the utilization rate of raw materials and accessories.

As mentioned before, in the light industry in Moldova (textiles, clothing, footwear and fashion accessories) about 20% of the number of enterprises operate under their own brand. Basically, all of these businesses are SMEs. At the same time in the country is not produced fabrics and accessories, and all of them are imported. These companies often have stocks of unused fabrics and accessories in various quantities, which in addition to requiring storage space, also represent frozen financial resources. On the other hand, some companies need small quantities of fabrics or accessories to complete contracted orders for which the supplies made were insufficient. Also, that could be interested for homemade businesses and the students from the design faculties that need fabrics in small quantities to carry out the works

provided by the curriculum. To solve these problems, the “Stocktextil” platform was created, an online platform facilitating the management of fabric and accessory stocks [20].

The online platform is a very advantageous and convenient option for establishing and maintaining business-to-business communication, as it provides an internal business-to-business chat box. In this way, the communication, data exchange and services certainly allow for an improvement in business relations. Thanks to the online platform, both companies and suppliers have access to a single database. The purpose of this database is to systematize the data of as many suppliers and beneficiaries as possible. By registering on the platform, companies can benefit from a list of suppliers and other partners willing to collaborate.

We can underline that in the Republic of Moldova efforts are being made to implement different models of circular economy in the garment industry. Both young designers and future designers studying at the Technical University are involved in development these initiatives. They are involved by with proposing a new design for recycled stuff. The ZIPHOUSE Center of Excellence of the Technical University organizes Hackathon where the young designers present to the jury, which consists of the representatives of the companies, the idea of recycling the articles of garments that failed to be sold in the previous season.

### **Conclusions**

The linear production model, which is still widely applied in the garment industry, has created global challenges that are severely affecting society due to the large amount of waste. Taking into account these challenges, the European Union has launched a series of activities to implement the circular economy. The policies provided by member states promote well-coordinated actions between business and society to stimulate the implementation of a series of sustainable actions. The European Textile and Garment Confederation EURATEX has aligned with the ambitious provisions of the EU institutions to change the linear manufacturing mode and approved in 2020 the Textile Strategy “Circular Textiles. Prosperity-in-the-circular-economy”, which stimulates the widespread implementation of the circular economy. The strategy for achieving the circular economy of textiles in the EU include 12 issues that form three main areas: building partnerships, increasing demand and consumer education. The garment industry in the Republic of Moldova is also oriented to implementation of the circular business model. Thus the Strategic Roadmap “Rebuilding a Sustainable Light Industry in Moldova” was adopted in 2020, a policy document that represents a roadmap for transforming the Moldovan textile / garment industry according with EU market prospects. This document includes strategic recommendations on the implementation of sustainability and circular models.

The modeling of a circular business ecosystem for textiles must be based on the principles of the circular economy with four value cycles as its backbone: Maintenance, Repair; Reuse as a product; Material reuse, re-manufacturing and recycling. Based on the waste management hierarchy, the prevention of waste formation is a priority. So the circular design of the product and service plays a decisive role.

The circular business ecosystem in the textile industry in the European Union is beginning to be implemented and includes both efficient use of materials in product design, product life extension services and directing products for reuse. Some companies have already invested in launching circular business models. But most of the solutions already delivered face barriers that no company could address on its own. That is why it is necessary

to create partnerships for an efficient collaboration, communication and coordination for the achievement of the proposed goals.

In the Republic of Moldova there are several initiatives for the collection and recycling of textiles. These initiatives belong to various non-profit organizations that act to improve the environment. Existing initiatives contribute to the collection and recycling of textile waste from both the pre-consumption stage and the post-consumption stage. The initiatives aimed to implement the circular business models that exist in the Republic of Moldova are mainly oriented to extend the life of the product. However, these initiatives are quite few and are at an early stage and need further development. A more recent initiative launched by the APIUS association is to try to implement sharing platforms in order to increase the utilization rate of raw materials and accessories. As result the Stocktextil online platform has been launched, which is a very advantageous and convenient option for establishing and maintaining collaboration between companies, offering an internal chat box for communication between companies. The designers are interested in implementing circular economy business models. They develop design for durable products using renewable, sustainable and recyclable organic fabrics.

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