Social and economic importance of textile reuse and recycling in Brazil

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Abstract. Brazil is an important world producer of textiles. However, this industrial activity, combined with additional import and trade, generates millions of tons of textile scraps, unsold clothing and discarded post-consumption garments. There is a great potential for the recycling and reuse industry in the context of solidarity and circular economy. The present study aimed to present examples in Brazil related to waste reduction, reuse and recycling of textiles in the context of solidary economy. In this way, some representative initiatives, from Sao Paulo, Minas Gerais and Rio de Janeiro states are presented and discussed based on these principles and approaching responsible lifestyles and environmental awareness and the refusal to waste resources in general. The main socioenvironmental benefits are related to the training of labor and local income generation, the population's awareness of consumption patterns, saving of natural resources and raw materials, and mitigation of environmental impacts.

Keywords: textile reuse and recycling, solidarity economy, social project, fashion.

1. Introduction

In the process of transformation towards sustainability there is the need to understand the consumption aspect more deeply [1]. Despite the efforts, the general perspective of industrial production in terms of sustainability is worse than ever, mainly due to the increase in production and consumption volumes [2] [3]. The overall volume of textile consumption at the global level is estimated at more than 30 million tons per year and the environmental impacts of this industry are remarkable [4]. Although it is estimated that the consumption of textiles by the population accounts for 5% of the carbon emissions for the total amount of goods acquired by an individual, the purchase of clothes is increasing and the shortening of the useful life of these articles increases the environmental load of the industry [5] [6].

Today, textiles and clothing are much cheaper compared to household income than a few decades ago. These articles had lower prices, causing individuals to have more pieces and of lower quality. In the United Kingdom in 1950, 30% of a family's income was used to purchase clothes. Currently, this number corresponds to 12%, with a greater number of consumed items. It is also estimated that, progressively, clothing will form a decreasing proportion of total household expenditures due to falling prices and household enrichment [7].

Environmental and ethical issues in the textile and clothing industry are complex, and traditionally they have been viewed through a very limited lens, focusing on "eco-materials" or ethical principles of production, for example. A more holistic approach is needed in this area. Therefore, it is essential to
produce more knowledge not only about materials and production processes, but also about consumer relations with products discarded in the context of sustainable development [2] [3].

Even the reuse of post-consumption clothing is difficult because the huge amount of textile articles. Charity shops get more donations than they can actually manage. Thus, while retail markets are crowded with cheap clothes, second-hand clothing markets are also saturated. In Finland, a second-hand charity shop received more than eight million kilograms of old clothing in 2010, an increase of 3.5% over the previous year [2] [3].

In Brazil, the reuse and recycling of textiles has no due importance, unlike some European countries and the United States [8] [9] [10] [11], where laws on the disposal of solid wastes and studies about industrial and domestic scraps of textiles have relevance. Countries such as China, Bangladesh and India, among others, are major exporters of clothing products, mainly to developed countries of the European Union and the United States, which do not have to deal strongly with the environmental problems arising from industrial textile production, but with the problems related to the disposal of post-consumption.

Brazil, one of the largest textile and confection manufacturer [12] [13] [14] [15] should be more concerned on issues related to leftovers and discards of these two industrial areas as well as post-consumption. In numbers, the country is the 5th world producer of textiles (about 1.8 million tons of articles made per year) [15]. Also, the 7th in the production of yarns and flat fabrics and the 3rd in the production of knitted fabrics [16], in addition to generating millions of direct and indirect jobs. Brazil produces 170,000 tons of textile scraps per year. About 80% of this material is destined to irregular discard and landfills. A waste that could generate income and promote the establishment of sustainable businesses [17].

Only in relation to the disposal of post-consumption garments, near 5.5 billion of pieces per year are produced from 32,000 Brazilian companies, and it is estimated that more than 150 million have no definite destination and end up stockpiled, destroyed or moldy. On average, the collections have sales from 50% to 75%, when exposed in retail. The leftovers go to sales off or bazaars. At the end, the loss can reach 7% not sold, which can be donated, shredded, deposited in landfills or incinerated [18]. Still, in 2011, Brazil had 1,200 industrial companies, exclusively manufacturing professional clothes, with a production of 267 million of uniforms per year. Besides, the country also imports textiles and clothing. These data highlight the potential that this segment can generate for the recycling industry in the context of circular economy [15].

The textile reuse can be done by industrial or artisan ways. The manual process is simple and consists of the reutilization of the fabric scraps to make upcycling or/and handicrafts in an infinity of objects that depend exclusively on the craftsman’s abilities and creativity [19].

Including different stakeholders from civil society, such as NGOs - Non-Governmental Organizations, universities and community groups, it is crucial for companies to create recycling and waste recovery strategies through new policies. South America is an example for organizations involved in the construction and adaptation of programs and policies related to solid waste management [20].

The increasing of production and disposal of textile articles is a global fact. Despite the large amount of textile wastes, mainly from the confectionary industry, in Brazil they are still not properly availed and are currently disposed of in landfills. At the same time, in this country there are examples about the concept based on the principles of solidarity economy [21] [22] aiming to valorize and train the involved workers, as well as objectifying waste reduction, reuse and recycling, approaching responsible lifestyles and the refusal to waste resources in general [20].

In this way, the present study aimed to present examples in Brazil related to associations and actions linked to the management activity of textile waste.

2. Methods
The methodology was based in visitations and application of questionnaires and conducting semi-structured interviews with representatives of different agencies and institutions in the Brazilian textile
sector, as well as representatives of associations and cooperatives linked to the management activity of textile waste.

The semi-structured interview favors not only the description of social phenomena, but also their explanation and understanding of their totality, besides maintaining the conscious and active presence of the researcher in the process of collecting information [23][24].

3. Results
The waste transformation into new products could help to mitigate environmental impacts, but it could also drive income generation for the population and the local creative industry. On the other hand, informal selective collection is quite commonplace. Part of this activity happens in cooperatives or organized associations with or without municipal support. Sometimes these groups add value to the collected materials, which are separated for creating new products. In Brazil, about 800,000 people are involved in the informal work of reuse and recycling of materials, and often also in cooperative recycling. Most of these individuals live in poverty and work in dangerous conditions [22].

Although the activity of selective waste collectors is recognized according to the Brazilian Classification of Occupations, this work remains in the field of informality. Not all cooperatives or associations are formalized and not all have access to labor rights as provided by law. Recently, regional cooperation networks have emerged to promote collective marketing and engage themselves in other collective actions [25].

The resource recovery rate per recycler and cooperative varies according to the quality of separation of materials at source, mode of transport, equipment, infrastructure at the processing center (where separation, baling and storage take place), level of training, among others. On average, a recycler carries up to 200 kilograms of material per day, which amounts to about 4 tonnes per month. The working journey is long, often 12 hours a day, traveling an average distance of 20 km/day on the search for recyclable materials. Informal and organized recyclers are estimated to recover 60% of the paper and paperboard that are recycled in Brazil and up to 90% of all materials that feed the recycling industry in the country. It is still estimated that formal and informal recyclers recover up to 20% of urban solid waste produced in Brazil [26].

The recyclable waste collectors that are integrated into a cooperative or association, and supported by local government, often experience previously unknown opportunities for other workers in this sector. These practices further empower waste collectors and open new ways for social development [27]. In this way, waste collectors contribute to the neighborhood improvement, waste cleaning, demonstrating resource recovery behaviors, and thus create opportunities for greater community cohesion. This detail has been widely observed in the case of Brazil and other countries [28], as also discussed by Zapata-Campos and Zapata [29] for the Nicaragua case.

The National Solid Waste Policy (Brazilian Federal Law 12,305, Aug. 2, 2010) [30] provides guidelines for municipalities to collaborate with solid waste reuse and recycling groups. It supports the participation of waste collectors in actions of shared responsibility for the product life cycle and prioritizes recycling cooperatives in formal recycling programs [30][31].

In a study published in 2011, about data covering the year 2010, the Brazilian Institute of Geography and Statistics (IBGE) recorded the existence of more than 11,000 non-profit organizations in Brazil, which covers the social development, culture and art, and a total of 507 non-profit organizations exclusively for employment and training activities [32].

In the South and Southeast Brazilian regions, notably in São Paulo state, there are some chemical and mechanical textile waste recycling companies [33][34][35]. However closer to the principles of solidarity and circular economy, several institutions and NGOs are already working with the reuse of textile wastes, such as the Ecotece Institute [36] and the Retalhar company [37]. These residues are transformed into corporate gifts, such as cases, ecobags and rubbish bins for cars produced by inclusive labor and resold to the origin companies.
There are numerous initiatives, brands and stylists who work with upcycling in fashion. One of them is the Brazilian brand COMAS, which produces cloths using as main raw material discarded men's shirts. The products have classic style, simplicity and timeless design (Figure 1a) [38].

![Cloths made from discarded men's shirts (COMAS, Sao Paulo – Brazil)](Image)

**Figure 1.** (a) Cloths made from discarded men's shirts (COMAS, Sao Paulo – Brazil) [38]. (b) “Viver de Costura” social project (“Living Sewing”, Minas Gerais – Brazil) [39]

The “Viver de Costura” (“Living Sewing”) social project (Figure 1b) provides sewing training for women in the Sabara region (state of Minas Gerais). It is linked to the Center for Design and Social Responsibility of Design School (State University of Minas Gerais), and aims, besides to teach sewing, to realize product development with innovative solutions and design. This project was born as part of the 'Minas Raizes' mother project, which received the “Citizens without Borders” award in 2011 in the 'Culture' category [39].

In the metropolitan area of Rio de Janeiro (“Baixada Fluminense”, Rio de Janeiro State) composed by cities such as Belford Roxo and Duque de Caxias, for example, there is a Local Productive Footwear Arrangement [40]. Despite its enormous economic potential, it is worth mentioning the generation and discarding of the textile scraps from this sector. The work of the Superintendence of Women of the municipality of Belford Roxo, which currently develops the “Feirart de Bel” (“Art Bel Fair”) project, is observed. It brings together at least 30 artisans every week to exhibit and market, in squares, parking lots and malls, the handicraft produced through the reuse of discarded raw materials, among them the textile ones [41].

The EcoModa Project (http://culturantorix.com.br/ecocultural/), established in Niteroi city (Rio de Janeiro State) since 2006, reuses textile wastes donated by various companies to create new garments. Based on the principles of solidarity economy, it aims to value and empower the involved workers and students, as well as to reduce waste by reusing and recycling [42]. In this way, it also contributes to debate about the reduction of urban waste, since fashion has been a fundamental tool for dialogue between the State and the socio-cultural foundations [43]. In addition to promoting the culture of sustainability, income generation is one of its goals. Subsequently, the group of graduates can multiply their knowledge in the communities, where they reside, working with the recycling and reuse of materials. The project aims, above all, to formally structure cooperatives with each group of graduate students who will then manage their products/brands independently of the project [43]. In addition to the remarkably social character, it is a laboratory for creations and experimentations in the area of design (Figure 2), besides to give subsidies to its students in the management / pricing of fashion pieces, as well as assists in the final parade of course graduation.
The pieces of EcoModa students have had space in the Brazilian fashion market. In the "Fashion Business", one of the sector's largest business event, held in late 2015, EcoModa showed the students' autumn-in-2016 collection produced with banners, hoses, fabric wastes, post-consumption jeans and other materials, which commonly would be discarded. In this same event, renowned Brazilian brands such as Blue Man, Mara Mac, Mary Zaide, Marcos & Rudy, Rosana Bernardes, Totem and Victor Dzenk were also present [43].

The Association of Brazilian Women Entrepreneurs - AMEBRAS (Rio de Janeiro city, RJ) (http://www.amebras.org.br/) carries out reuse activities of textile materials from the Rio carnival, since 1998. It has approximately 886 associates from different classes and business segments, and has professionally qualified about 22,000 people, young people and adults, living in different communities in Rio de Janeiro.

The main raw materials for reuse are fabrics, feathers, feathers, sequins and various trims. They are obtained in the moments known as "dispersion" of the samba schools, that is, when each of them finishes their presentation in “sambodromo da Marques de Sapucai”. During the parade of each school, many items of the floats and samba dancers' costumes fall off to the floor.

AMEBRAS is an official seller of the products of Rio carnival. Some of its products are also marketed by “Camisa de Bamba” (http://www.camisadebamba.com.br/). These are notebooks, calendars, mobile covers, kits with bath towels, slippers, mugs, flags, dolls, among others. Part of these items are industrialized, produced with virgin raw material, approximately 25% of the total. The other 75% of the items, such as headgear, masks, costumes and dolls, are handcrafted with reuse raw materials through the professional training courses that AMEBRAS performs. Moreover, since the ornaments are made with reuse material available at that time, it should be emphasized that there is no way to control the acquired raw material, which can vary (from colors and compositions) from time to time - unlike what happens with the industrialized products and / or produced with virgin raw material, but generating exclusive creations (Figure 3).

Figure 2. Creative process in EcoModa project: (a) discarded clothes as raw material; (b) accessories made of fabrics, purses and bags produced by the students; (c) the designer and stylist Almir França (left) explains the process of construction of the new pieces; (d) detail of the new fabric created through the reused raw materials [Source: Authors’ files].

Figure 3. Examples of costumes and carnival ornaments made with reuse material by AMEBRAS students [Source: Authors’ files].
The brand "Acorda" follows firmly in the initial proposal to create products from discarded fabrics, maintaining the contemporary tendency, but moving in the opposite direction to fast fashion through sustainability and creativity. Each piece is handcrafted by means of an assembly process, where the fabrics and their combinations are highly selected to guarantee exclusive and loving products to their customers” [44].

Acorda brand (http://www.useacorda.com/) exists since 2013 and arose from the interest of founders for fashion, carnival and the taste of producing unique pieces. For the summer / 2017 collection titled "Afrofuturism," the brand aims to "tell stories" through their creations. The target audience is composed mostly of Afro culture and history fans and foreigners from different countries who visit Rio de Janeiro. The partners of Acorda are also photographic models in the advertising campaigns of their products because they believe transmit greater visual identification with their target audience. Currently, Acorda has an assortment of products of approximately 270 pieces, among ecobags, clutches, pockets, among others (Figure 2), which are sold on its own site, in fashion fairs and in multi-brand stores.

![Figure 4. (a) The partners Luana Maria (left) and Michelle Andrade (right) pose for the current brand campaign, titled "Little Africa"; Pieces produced by Acorda: (b) ecobags, (c) clutches, (d) and (e) pockets, Source: Acorda [44]](image)

Acorda has a strong concern with environmental and social sustainability. Therefore, it makes commercially fair partnerships with productive groups. The brand uses mainly discarded fabrics as raw material for its creations. It also uses trims from carnival costumes, animal food bags, bank bags and even carpentry waste, all discarded by their sources. Majorly, the material used in the production comes from donations. It seeks to awaken a greater awareness of the individuals in relation to the discards of solid residues. Thus, the creation of the pieces occurs, basically, through the material available for that moment or collection, not being able to choose / define colors or types of fabric, previously.

In addition, it tries to minimize the generation of residues in its production - here understood as the "residues of residues", using, practically, 100% of the material received so as not to generate leftovers. In this way, one must be able to create pieces with all available material and adjust their size to the size of the flaps received as donation.

In all visited institutions, many problems related to management of textile waste were pointed. Among them, the principal are: i) inexistence of legal and / or tax incentives for companies that use reuse raw materials in their production; ii) lack of a well-established network of contacts for the procurement of raw materials; iii) difficulties in transportation of the donated material; iv) mixed composition or/and color/pattern of textile wastes, demanding time-consuming work for the trial and separation; v) hygienization of the donated raw material, since many donated are dirty and require pre-treatment and / or cleaning to be used in the production; vi) space for storage of inputs and consequent increase in the production of pieces.

In the State of Rio de Janeiro and in other Brazilian regions (excepted Sao Paulo State), industries that recycle textile discards have not yet been found, only reuse activities employing this material. In
this way, Local Productive Arrangements can provide actions related to these activities. Reuse of the textile material is performed with discarded material by confections, as well as on articles of clothing discarded by industries and individuals. These residues are often reused in projects and social projects that have a concern with the socio-environmental area, since they aim to train vulnerable workers, generate income and minimize environmental impacts. It is also observed that the reuse of textile waste through public policy or company actions is a fertile field for creative experimentation and production of new fashionable pieces and accessories with sustainable appeal, as well as contributing to the preservation of the environment.

Some projects that reuse textiles or participate indirectly in this activity receive financial assistance in their actions from State or Municipality. However, there is no legal incentive at Federal, State or Municipal level regarding the reuse/recycling of materials by private companies of any segment. In addition, there are problems related to the lack of a Reverse Logistics, as well as onerous transportation, unhygienic raw material, no adequate storage space, and the low number of recycling companies installed in the Brazil. The main socioenvironmental benefits are related to the training of labor and local income generation, the population's awareness of consumption patterns, saving of natural resources and raw materials, and mitigation of environmental impacts.

Thus, although Brazil is on the right way in promoting the recycling and reuse of wastes, including textiles, there is still much to be done in terms of a solidary and circular economy approaches in terms of benefiting the people and the society.

4. Conclusion

Despite of the huge waste of textile residues that could be profitable in a context of circular and solidarity economy in Brazil, several institutions and NGOs are already working with the reuse of textile wastes in order to valorize and train the involved workers, generating income and increasing the environmental awareness. Some of these examples are presented and discussed in this study, in the belief of seeking sustainable alternatives for textile and fashion sectors. Furthermore, textile reuse and recycling activities are a positive contribution to the disposal of solid waste from industries, garments or even domestic waste, given the significant volume of these and also given their incorrect destination, commonly disposed in rivers, bays and landfills.

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