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ORIGINAL

Responsible consumption and production in textile industry: a critical analysis

Consumo y producción sostenible en la industria textil: un análisis crítico

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ABSTRACT

Throughout this article, the Sustainable Development Goal twelve: Responsible Consumption and Production is related to the textile sector. A critical analysis is made of this correlation, using qualitative analysis techniques to identify and select relevant studies, research, and sources from various academic databases, government entities, and international organizations. The context is established by giving a description of this sustainable development goal, the textile sector is discussed where the countries that produce and export the most products from the textile industry are mentioned. The analysis of the relationship between these two, mainly focused on environmental impact. It is concluded that the sector in question has a fairly significant negative environmental impact, and that it is important to confront these negative impacts by implementing the Sustainable Development Goals (SDGs). It is crucial to take immediate measures to counteract this situation, as it affects the world in general.

Keywords: Sustainability; Textile Industry; Production; Environmental Impact.

RESUMEN

A lo largo del presente artículo se relaciona el Objetivo de Desarrollo Sostenible doce: producción y consumo responsable con el sector textil, realizando un análisis crítico sobre esta relación; para esto se utilizan técnicas de análisis cualitativo para identificar y seleccionar estudios, investigaciones y fuentes relevantes de diversas bases de datos académicas, entidades gubernamentales y organizaciones internacionales. Se contextualiza dando una descripción de este objetivo de desarrollo sostenible, para seguidamente hablar del sector textil donde se mencionan los países que más producen y exportan los productos provenientes de este sector y la relación que existe entre estos dos, enfocado principalmente al impacto ambiental. Se concluye que el sector en cuestión tiene un impacto ambiental negativo significativo, y que es de suma importancia abordar y enfrentarlos implementando los Objetivos de Desarrollo Sostenible (ODS). Es importante tomar medidas inmediatas para contrarrestar esta situación, ya que afecta al mundo en general y aún hay tiempo para hacerlo.

Palabras clave: Sostenibilidad; Industria Textil; Producción; Impacto Ambiental.

INTRODUCTION

The following pages critically analyze the relationship between Sustainable Development Goal 12, Sustainable Consumption and Production, and the textile sector. This sector manufactures textile products

such as fabrics, fibres, yarns, clothing, and other materials. It should be noted that the sector is considered one of the oldest and most prominent in industry, having experienced significant global growth due to its contributions to job creation, modernisation, technology, and the economy of countries.[1] A prominent feature of the textile industry is its complexity, which involves and relates to agricultural, energy, manufacturing, chemical, and other industries, likewise, as its processes advance, distributors, supply personnel, and third parties who act as intermediaries facilitating the sale and purchase become involved.[2]

According to the German media outlet Deutsche Welle[3], from 2000 onwards, the fashion industry has experienced a significant increase in revenue, doubling globally. This growth has been driven by the impact of the phenomenon known as 'fast fashion', which focuses on large-scale production and consumption, accelerated by changing trends. This phenomenon results in a very short lifespan for each garment produced and a lower quality.[4] This is where we link this sector to Sustainable Development Goal 12, which focuses on promoting responsible consumption and production. Its purpose is to produce goods using fewer resources and adopting sustainable strategies. The goal is to generate economic benefits while minimising resource use, environmental degradation, and pollution and improving quality of life.[5]

This relationship between the SDG and the sector is reflected in how companies produce and how sustainable their production practices are, as we find that the textile industry is one of the main contributors to global pollution. According to the United Nations Conference on Trade and Development, the fashion sector ranks second among the most polluting industries worldwide. According to annual data, 93 billion cubic metres of water are used to produce clothing, enough to meet the needs of five million people. In addition, an estimated half a million tonnes of microfibres are dumped into the sea, equivalent to 126 million gallons of oil. Another worrying aspect is that the fashion industry generates higher carbon emissions than the entire international shipping and aviation sector combined, which has profound implications for climate change.[6]

METHOD

In developing this article, we analysed existing information related to Sustainable Development Goal (SDG) number twelve, which focuses on responsible production in the textile sector. Qualitative analysis techniques were used to identify and select relevant studies, research, and sources from various academic, government, and international organisation databases.

Through this methodological approach, we seek to provide a comprehensive and enriching perspective on the subject under study. Similarly, this literature review allows for an in-depth exploration of the arguments and theoretical approaches present in the reviewed literature. In addition, special attention is paid to interpreting the authors' perspectives and identifying possible disagreements or controversies in the field.

By reviewing the existing literature, the current situation and opportunities for this industry to become more sustainable are better understood. This information can be helpful for future research and for making decisions that promote more sustainable and ethical development in the textile industry.

DEVELOPMENT

In 2015, the United Nations General Assembly approved the 2030 Agenda, which focused on sustainable development and establishing a programme to benefit society, nations, and the planet. According to the United Nations, the agenda sets out seventeen goals with one hundred and sixty-nine (169) sub-goals or targets focusing on the environmental, economic, and social sectors. This strategy guides the development plans of the United Nations member states and seeks their commitment to achieve each of the goals. Countries have sovereignty over their economies, finances, resources, and populations, so the methods for achieving the goals are different and, for some, more complicated.[7]

The main objective of the sustainable development plan is to end poverty, as stipulated in the first goal. However, there are also other relevant goals such as zero hunger (SDG two), quality education (SDG four), sustainable cities and communities, and sustainable consumption and production (SDG twelve), which is the focus of this research.

Sustainable consumption and production encourage the proper management of natural and social resources and energy, improve access to necessary services, increase fair and green jobs, and promote the construction of sustainable infrastructure. Among the most relevant targets of goal number 12 are TARGET 12.2. Efficient management and appropriate use of natural resources and the environment. TARGET 12.4. Rational and environmentally sound management of chemicals and waste. TARGET 12.5. Reduce waste generation.[7] All of this leads to improving the way of life for the entire population and achieving sustainable development, reducing environmental and socio-economic costs for businesses and, consequently, increasing economic competitiveness.

As stated by the United Nations, the reason for this goal lies in the need to find mechanisms to counteract the incredible environmental degradation caused by progressive economic, social, and commercial development in recent decades, which endangers the ecosystem on which we live and depend. Consumerism and unsustainable

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production threaten to exceed the planet's capacity to support these activities. They point out that 20 % of the world's poor account for only 6 % of these practices, meaning that the responsibility for implementing sustainable consumption and production models lies mainly with industrialised countries and consumers with greater purchasing power.[6] Society is evolving without analysing the consequences of this, exploiting and wasting natural resources without consideration.

After a global event, plans must be implemented to transform current consumption and production trends to promote sustainability. However, implementing these programmes and strategies requires investment, policies, and responsibility on the part of states.

The United Nations states that companies can help by understanding the importance of creating sustainable processes and changing their production. Consumers can contribute to sustainability by avoiding consumerism, which is based on buying or accumulating goods and services that are not essential for survival. It is also ideal for consumers to avoid using plastics, as they are one of the pollutants that significantly impact the ocean.

It is vitally important that consumers are knowledgeable and selective in their purchases; the textile industry currently ranks second in terms of water pollution, and many companies exploit their workers to acquire the product. That is why consumers are encouraged to buy textiles from local shops and quality, durable garments to bring about change.[8]

In this way, by changing its production model, the textile industry contributes to achieving the SDGs.

In recent decades, a phenomenon called 'fast fashion' has emerged, based on the faster use and disposal of styles, increasing the supply of garments, and offering low prices. Accordingly, fast fashion is a wasteful and polluting industry, operating linearly from production to sale. Clothing production involves the extraction of large quantities of non-renewable natural resources, which in most cases are used for a shorter period and ultimately end up in incinerators or landfills.[9]

For example, growing cotton requires fertilisers, pesticides, and water; dyeing and spinning require coal, dyes, water, and electricity. This process is carried out with every order placed, so that consumers can use the item a couple of times and then throw it away, and producers can dispose of the leftover parts. As a result, the entire life cycle, energy, chemicals, and water used have a significant environmental impact on the textile and manufacturing industry.

Source: XLsemanal magazine[10]

Figure 1. Data to consider regarding textile production

Twenty percent of the toxic waste and inputs in rivers and oceans come from the textile industry, as two billion tonnes of chemicals are needed to produce the dyes used to dye garments. On the other hand, clothing is being used less and less; worldwide, the number of times consumers use a garment before discarding it has decreased by thirty-six percent in the last fifteen years. As we can see in the image, around 1400 T-shirts are discarded every minute in Hong Kong, reinforcing the above statement.

The linear system of the textile industry puts pressure on resources, pollutes, exploits, degrades the ecosystem, and hurts regional, national, and global society.

RESULTS

The central textile-producing countries for 2021

China continues to lead global textile production with a wide range of products, including clothing, technical fabrics, and household items. India is another major textile producer renowned for its cotton, silk, and handcrafted textiles, such as saris and handwoven fabrics. Thanks to its low-cost labor and specialization in garment manufacturing, Bangladesh has emerged as a major player in the textile industry. Vietnam is experiencing significant textile production growth and is becoming one of the world's leading exporters of textiles and clothing. Turkey is known for its high-quality textile production, especially home textiles and technical fabrics. Finally, Italy is famous for its excellence in design and quality in the textile industry, excelling in producing luxury fashion and accessories.

Top textile exporting countries

Textiles and textile products ranked seventh among the world's most traded products. In 2021, the leading countries in textile and clothing exports to date are:

Table 1. Main exporters of textiles and clothing in 2021

Countries	Value in billions
China	$286
Bangladesh	$46,2
Vietnam	$43,7
India	$41,4
Alemania	$40,4

Source: Economic Complexity Observatory[11]

The production of textiles requires a large amount of water, as well as land to grow cotton and other fibres. According to estimates, in 2015, the global textile and clothing industry consumed 79 billion cubic metres of water, while in 2017, the European Union required 266 billion cubic metres of water to meet its water needs. Manufacturing a cotton shirt requires 2700 litres of fresh water, equivalent to one person's consumption in two and a half years. In 2020, the textile industry was the third largest contributor to land and water degradation, requiring an average of 400 square metres of land, nine cubic metres of water, and 391 kilograms of raw materials to provide footwear and clothing to every EU citizen.[12]

Amount of raw materials required for textile production

Several types of inputs are needed for textile production, such as:

Textile fibres are threads or filaments used to create fabrics and are classified according to their origin. Plant fibres, such as linen and cotton, come from seeds, the husks, and the stems of plants. Cotton is the most common plant fibre, combined with other natural or synthetic fibres. Animal fibres, such as alpaca and silk, create high-quality garments. Finally, synthetic fibres, such as polyester and Lycra, are obtained through polymer manufacturing processes and are used in fabrics, clothing, and footwear.

Accessories are items that can be made from either metal or plastic and are available in different colours. Their primary function is to fasten garments such as trousers, jackets, and other similar items. Snap fasteners are usually made from metal or polymers. These accessories act as fasteners by joining the garment together using a buttonhole. They are typically made of plastic in a variety of designs and colours. These accessories provide a temporary fastening system using pressure between two fabrics. They are also used as reinforcements for textiles, such as eyelets, rings, and rivets, especially in denim garments.

Chemicals play a vital role in the textile industry

Substances such as mineral oils, silicones, and aromatic hydrocarbons are used in the spinning process to facilitate the subsequent stages of the yarn manufacturing process. Chemicals are also used in various textile processes. One is sizing, in which chemicals bind the fibres together and increase their mechanical strength.

In addition, bleaching, dyeing, and refining are other processes in which chemicals are used to prepare yarns, fabrics, or knitwear. For textile printing, chemicals are also used in techniques such as spot dyeing to obtain specific patterns, flat, rotary, spray, fixation, drying, and washing.

Impacts

The main concerns regarding the impacts of the manufacturing industry relate to the use of chemical and

toxic elements, dependence on carbon-containing inputs, and water consumption. Fashion Revolution indicates that the textile industry is responsible for between 2 % and 3 % of global greenhouse gas emissions, which is predicted to rise to 26 % by 2030. On the other hand, approximately sixty-three per cent of garments are made from petroleum-derived synthetic fibres, and textile production uses a considerable amount of water, around ninety-three million cubic metres.[2]

China has been the country most affected by these impacts globally, but in recent years, it has implemented regulations to mitigate them. Despite this, the industry has migrated to other countries such as Bangladesh, India, and Vietnam, where environmental laws are less strict or, in some cases, less efficient.

Consumerism and textile production have significant consequences for the environment. These environmental effects during the production stage come from both the cultivation and processing of natural fibres such as cotton, linen and hemp (in terms of land use, water, fertilisers and pesticides), and the manufacture of artificial fibres such as polyester and elastane (in terms of energy consumption and chemical raw materials).

Table 2. Environmental impact of producing four types of textile fibres

Fibres	Energy consumption kWh/kg de fibre	Water consumption L/kg de fibre	CO2 emissions Kg/ kg de fibre
Cotton	48	1559	2,2
Lana	120	530	17
Polyamide	160	40	8,3
Poliéster	108	21	3,3

Source: Pastran[13]

Textile manufacturing requires vast amounts of energy and water, and also uses a variety of chemicals in different areas of production. Trade and retail distribution are responsible for transport emissions and packaging waste.

This industry uses various materials to produce natural and synthetic fibres, fossil fuels, chemicals, fertilisers, and construction materials. It also includes minerals and metals, and the transport and retail sale of textile products. Only 20 % of these raw materials are produced in Europe, with the remainder imported from other regions, demonstrating the global nature of the textile value chain and European consumption's dependence on imports. This means that 80 % of the environmental impact generated by European textile consumption originates in non-European countries. An example is the production of cotton and fibres and the manufacture of clothing, mainly in Asia.

As mentioned above, the textile and fashion sectors are considered among the most significant sources of pollution worldwide. In the city of Bogotá, for example, it is estimated that in 2021, nearly 147 000 tonnes of textile materials and products ended up in the 'Doña Juana' landfill, which is considered an alarming amount, according to data provided by the Special Administrative Unit of Public Services.

Sustainable countries

The leading countries in sustainable fashion are in Europe: Denmark, Belgium, Ireland, Finland, and Scotland. Copenhagen, Denmark, tops the ranking as the textile industry does not cause significant waste, and thousands of tonnes of textiles are recycled yearly. In Antwerp, Belgium, 97 % of the annual textile waste is recycled. Dublin, Ireland, stands out for transforming textile manufacturing waste into energy, eliminating fashion waste in landfills. Helsinki, Finland, is a highly sustainable city in terms of fashion, producing no textile waste. In Scotland, especially in Edinburgh, large amounts of textile waste are recycled, and Scots show a greater interest in sustainable fashion.

Consumer consumption

However, according to Fernández et al.[14], a derivative of the textile sector is fashion, which ranks third among the priorities of the new European generations; Spain and the United Kingdom lead the list with the highest number of young people investing money each month in fashion garments. For this reason, it is essential to educate and raise awareness among young people to identify alternatives and ways to reuse, recycle, and reduce the use of the goods they consume, thereby influencing textile production as demand for their products is reduced and production becomes more complicated.

According to Larios[9], his study identifies that ninety (90) percent of Generation Z consumers believe that companies have a responsibility to address environmental and social issues responsibly and sustainably. Gen Z will represent forty percent (40 %) of global consumers by 2020.

Green labels

To promote sustainable production and consumption, national and international entities have created labels and certifications that allow producers to demonstrate to consumers that their products have been designed with standards that guarantee sustainability. These labels focus on different segments of the sector's supply chain.[15]

Table 3. International Sustainable Labels for the textile sector

Seal	Logo	Definition
GOTS: Global Organic Textiles Standard		It is the world's leading standard for organic fibre certification, including ecological and social criteria, certifying the entire textile supply chain. The products they certify range from fibre, yarn, fabric, clothing, home textiles, mattresses, personal hygiene products, to textiles in contact with food.[16]
OCS 100: Organic Content Standard		Certifies that the material used to make the garments is grown using organic fibres. This standard is used to verify that the materials grown are maintained from production to the final product.[17]
Recycled 100 Claim Standard (RCS) y Global Recycled Standard (GRS)		Both standards verify that the materials needed for production are recycled, from raw materials to the final product. They also have strict requirements for chemicals that are harmful to consumers and the environment.[18]
ISO 14001		Certifies that organisations are committed to protecting and preserving the environment. They incorporate environmental strategies to improve production and organisational processes aimed at reducing their ecological footprint.[19]
Fairtrade		Certifies that the products have been obtained under fair conditions throughout the supply chain; that is, protection of natural resources, competition, fair wages and working hours, adequate resource management; complying with ecological, economic and social criteria.[20]

Source: Global Organic Textile Standard[16], OCS[17], Textile Exchange[18], Grupo Esginnova[19], Fairtrade[20]

DISCUSSION

As has been shown, it is important to identify and implement strategies or methods that counteract the sector's negative impacts, and this is where the term sustainable fashion comes in. For Larios[9], this term is defined as the extraction, manufacture, marketing, and use of the most sustainable material possible to make clothing and other products, linking environmental, economic, and social aspects. Similarly, these garments are made with materials that allow for durability to reduce waste.

While it is true that some of the obstacles to sustainable production are consumer ignorance, costs, and low credibility, current communication channels and technologies can be leveraged to advance sustainable production. Social media is now a necessity for modern humans, as it greatly influences many people's purchasing decisions and other issues such as ideals, goals, opinions, and, sometimes, the consumer's personality. For this reason, using social media to reach consumers and promote producers is a good strategy.

Hernandez[15] emphasises the importance of social media such as Instagram in people's lives and how the media allows trends to spread, enabling brands to engage with their customers directly and create a close relationship, taking advantage of this proximity to influence their purchasing decisions. Within social media, there is a niche of users who promote sustainable production and consumption and environmental protection. When these users gain recognition and followers, they become potential influencers.[21,22,23] This is why it is considered an opportunity to encourage the consumption of sustainably produced goods and services, as there is little point in producing sustainably if consumers continue to have the same consumption habits. The strategy is to grow sustainably and change consumer mindsets.[24]

However, this strategy can be a double-edged sword, as some companies can take advantage and implement what is known as greenwashing, which, according to a study, basically consists of advertising campaigns selling their image as sustainable and drawing the public's attention to sustainability. Still, they are not sustainable, and their production processes are anything but sustainable.[25] In short, they take advantage of the recognition generated by being a sustainable brand only to gain a competitive advantage. Still, their actions continue to have the same negative impact on the environment.[26,27,28]

This recognition can be obtained through green labels, which are positive because they allow producers to certify that their products comply with sustainable processes at certain stages of the supply chain. This enables consumers to make informed decisions and purchase products from companies that implement sustainable practices. Similarly, labels improve companies' image, generating greater appreciation and support and increasing their products' profits.[29,30]

On the other hand, in the textile sector, it is advisable to implement the circular economy, which, according to a study, aims to establish a system that allows the introduction of textile waste after consumption to start the life cycle of new products. In this way, waste completes a cycle and, at the end of it, is incorporated to start another.[31]

These strategies, methods, and approaches contribute to achieving sustainable development goals. By implementing them, companies obtain benefits, a better brand image, and consumer appreciation. Similarly, the impact of companies and consumers on the environment is reduced.

CONCLUSIONS

Implementing the Sustainable Development Goal, which focuses on sustainable production and consumption, is essential to addressing the negative impacts of the textile sector and transforming its processes into sustainable ones. The textile industry is known for its high demand for natural resources, water pollution, waste generation, and labour exploitation in many parts of the world. These processes are gradually degrading the ecosystem in which we live.

Innovative and responsible approaches, the use of renewable and organic resources, and the reduction of chemicals, which are the most polluting substances, are essential to achieving sustainable development in the sector. Companies and countries must understand the relationship between sustainable development goals and the sector to take the right measures to counteract the environmental problems we are experiencing and contribute to positive change for the planet.

The textile sector does indeed leave a significant negative footprint on the environment, but measures can still be taken to counteract this situation that affects the world. This is where the importance of countries and/or companies implementing strategies, new processes, and technologies to increase sustainability and help improve the environment lies. It is important to note that the more companies or countries adopt sustainable measures, the more they will want to implement them, taking them as an example, and this will help these strategies spread globally.

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