Sustainable Fashion

B. Luis Chaves and A. Shirley Villalobos

Abstract One of the main problems in the fashion industry is its impact on the environment as a result of its value chain due to its energy consumption, exploitation of natural resources, waste disposal, CO_2 emission, generation of solid waste, indiscriminate use of synthetic materials, among others. Reducing, avoiding, minimizing, limiting, stopping, etc., are key points in the sustainability agenda: we must go further, considering that the best way to reduce the environmental impact is not to recycle but to produce and waste less [1]. The meaning of sustainable fashion is not very clear, particularly when this can be analyzed from different perspectives: a commercial and an anthropological one. Journalists and scholars have defined fashion in terms of history, cultural identity, personal communication, social position, lifestyle, change, speed, and even sexuality and eroticism [2]. Color is a critical element in fashion and is probably one of the principal causes of environmental problems. Substituting fossil fuels in the production of clothes is possible through renewable energy; however, these are still essential to manufacturing many textile materials, including textile colorants. The truth is, the fashion industry is facing a complicated environmental problem, also considering the accumulation of toxic and inorganic residues and water overconsumption. This situation is a reality. We only need to look at the standards of the European Chemical Agency—REACH. Currently, the term 'sustainability' feels too ambiguous; many companies claim they are sustainable when, in reality, they only carry out superficial environmental activities, so much so that a term for this practice has already been coined: Green Washing. In the medium-term, sustainability will end up being a better-defined term each time and will work as a restriction and a standard for the fashion industry and its value chain, which, in many cases, will be difficult to meet. Developing concepts related to durability and versatility through

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materials and intelligent design of processes and products will be a significant way to care for and protect the environment.

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1 Fashion

Understanding the meaning of fashion is complicated due to its connotation and outreach. We can draw a comparison to any economic activity, be it individual or communal, that revolves around people if we study the definition of tribe presented by the writer Seth Godin [1]. Said definition could explain the meaning of fashion from different perspectives: "A tribe is a group of people interconnected to a leader or an idea." For many years, humans have belonged to one tribe or another. A group only needs two things to be a tribe: a common interest and a means to communicate.

(a) What does fashion mean?

Associating the term fashion with its meaning in Spanish (Moda) is interesting: Statistically, Moda (fashion) is defined as the value with the most frequency in a data distribution. This is a priority in companies of product sales and general services and clothing; the serious issue occurs when the mechanisms used to reach targets threaten the environment and, in many cases, respect for people.

Anne Hollander [2] defines fashion in the following way: "Everyone has to dress up tomorrow and go to work during the day. This has been shaped in the West in the last 700 years, and this is fashion."

A simple interpretation of this definition circumscribes fashion around western culture. It has probably been to a certain extent true over the last 100 years and is associated with the progress of communication media and advertisement. However, it has been seen throughout history in the richness of attires in many Asian, American, African, and even European cultures thousands of years; paradoxically, M. Bernard [3] synthesized it with this phrase: "When we see a movie or TV show and a person wearing an outfit is shown, we can identify a place in history."

The first time that the men from the Spanish Empire made contact with the Andean textile art was in the year 1526; art made excellence by over 4500 years of uninterrupted development. It was a place in the world where rags did not exist, where dressing up was a cult to beauty to which every individual had the right.

We do not want to forget a quote from Fernando de Szyszlo, one of the most renowned Peruvian plastic artists (1925–2017): "Undoubtedly, the most important contribution of Peru to the history of universal art are the textiles created between approximately 1400 BC and 1600 AC." Fashion had been accompanying humanity for thousands of years.

Malcolm Barnard's [3] observations referring to the relationship between history and fashion and fashion and time are enlightening. We would like to highlight three of these observations.

- History is a background to fashion. It is the stage of important tales in mankind's history that can be simply associated through an article of clothing.
- History is a context for fashion; a possible explanation for this is the French revolution and its extravagant dresses.
- In its relationship with history, fashion is a seesaw and tightly connected; due to this relationship, fashion can transform history.

In the book "Fifty Dresses that Changed the World" [4], it is mentioned that young modern women of the 1920s changed the perception of their role in a male-dominated world through morally aggressive dresses.

In the last 100 years, scholars and researchers have been attempting to understand the meaning of fashion. It is undeniable that it is intimately associated with articles of clothing, without failing to recognize that their primary function is to protect our body from weather conditions.

After analyzing its definition by several authors, what is fashion? It is art, design, cultural expression, communication, emotions, identity, image, social position, and color.

There are many ways to answer this question and we have found several theories and postulates searching for the meaning of fashion. It is evident that there are discrepancies across different interpretations of fashion and several aspects are involved when we search for a definition. We face contradicting references in personal and cultural emotions, expressions, design, brands, and especially thinking and culture that lead to representing an idea or cultural experience.

One of the most controversial topics is the acceptance of fashion as art. From a wide perspective, it is possible to consider fashion an art; its aesthetic and communicative objectives through which ideas, concepts, emotions, and a general view of the world can be expressed support this postulate.

However, different authors, including Baudrillard Jean, 1981 [5], conclude that fashion is not art through the mechanical reproduction of articles of clothing. Fashion manifests itself through an article of clothing that is fashionable. It has to be available for many people. This refers to the mechanical production of several copies; thus, fashion is not art. In the end, this discussion is about whether the articles are produced mechanically or not. We can state that if the article is created by hand, only one edition, and for personal use, then this activity could be considered art.

Particularly, the vision of fashion and art should be associated with beauty and creativity. There are creative processes, for instance, of clothes knitted in Jacquard fabrics where the combination of colors, the structure of the textile makes it possible to obtain fabric with unmatched beauty and we resist to say that this combination of processes, raw material, and creativity is not art.

The association of design with fashion is undeniable, and it is related to the necessary variety and velocity for the creation of clothes. Besides, traditionally, the designer remains anonymous, and their design can be reproduced indeterminately. Therefore, the design ends up being a tool that lets us develop concepts and reinforce the claim that fashion is not art.

Fashion and clothes can be explained as a means of communication, appearing in beliefs or ideas associated with cultural aspects. This point is considered key to understanding the meaning of fashion from the point of view of a regular person.

Belonging to a tribe—a culture associated with our beliefs and values—is often related to clothing and fashion as a differentiating element and plays a very important role in an aspiring necessity. The need for change in social status is associated with the way one dresses, translated into the need for speed and variations in design to allow the person to achieve their objectives. Change is progress. In the end, fashion requires and reflects an experience, a conception of time of change and, of course, different.

The presence of a leader or leadership in fashion can lead to a change in clothes. If the velocity decreased significantly, we would be before a concept of classical clothing.

(b) **Is it a way for us to communicate?**

It is a fact that an article of clothing can send messages. Often, it allows us to identify the behavioral characteristics of a person when they wear certain clothing. It can indeed lead us to mistaken interpretations about specific situations, but we cannot deny the fact that a message is being emitted.

The sender/receiver communication model can be inadequate for the meaning of an article of clothing, but the communication is there. The main question is whether, through fashion, it is possible to send clear messages about who we are or what we wish to be. This will be a significant challenge for fashion gurus.

In an interview with Ryan Smith for Vogue [6], actress Jessica Alba stated that fashion is your visible personality and represents who you are. These are some of the many common assumptions of the relationship between fashion and identity. Fashion can represent values and beliefs of different cultural groups and the relationship among their people, which can ultimately lead to the construction of a political position.

A clear example of this claim was the political group, the Black Panthers. Scholars mention it as the most influential organization of the black movement in the US during the late 1960s. During the times of Mao Tse Tung, the Chinese cultural revolution is another clear example of the relationship between clothing and political movements, whatever its causes were.

A controversial topic is a relationship between fashion and the large number of people that work in the textile industry. Unfortunately, a significant part of them does so in unsafe economic and ergonomic conditions. These topics have only become relevant in the fashion industry at the start of the twenty-first century. Awareness of the situation is being spread. The big question is, ethical, moral, or economic reasons?

Today, the new consumers are pushing more and more for responsible behavior from the brands, including in the fair treatment of people as well as the environment, the relationship between fashion and what we wear and the image we wish to project,

specifically a physical stereotype, often associated with femininity, even able in some cases to influence and control people's behavior.

The image may or may not be associated with identity; it could be a very powerful stimulus, negative like anorexia which in some cases can reach extreme levels, or positive like online influencers who can affect the behavior of hundreds of thousands of people. It is incredible what a single article of clothing can achieve: create a new image or identity to change it.

From an anthropomorphic and social perspective, understanding the meaning of fashion is important to choose adequate routes to frame the fashion industry inside the new conditions that begin to impose social responsibility and environmental responsibility on the new consumers.

There are two topics that fashion researchers and scholars seem to place on a lower level of importance: design and color. In terms of color, we can assume it is intrinsically incorporated into the design. However, its importance, considering the current market situation, goes further.

(c) **Design versus color?**

The images we can observe through night vision goggles, whatever the design of an article of clothing may be, cannot be appreciated for their charm.

In her article published in July 2020 on WGSN [7], Jenny Clark's observations reveal the importance of color in people's daily lives, especially during these days when we are all affected by COVID-19. "Color is an important part of visual communication that can evoke a strong emotional response in all of us; in these difficult times, it is used to transmit different emotions and reactions related to different global crises."

Before examining how color is used, we must learn about our cognitive response to this and its ability to evoke physical and emotional reactions. Several studies show that certain colors evoke a subconscious physical response that is related to primal instincts.

Apart from a physical response, we also have an emotional and personal relationship with colors linked to our own memories and experiences. These factors, combined with centuries of tradition and social conditioning, have created a subjective response that is independent of color. One thing is certain: when facing the global problems of the future, the color will be used in a more conscious manner."

It is anecdotal to mention that the sense of sight utilizes 60% of all the energy consumed by all five senses. One of the greatest challenges the fashion industry faces is the production of colors, considering environmental restrictions.

The need for a change and differentiation requires the speed in processes of creation, production and commercialization of fashion, a situation that the fast fashion sector has understood well and taken advantage of.

Another aspect barely mentioned and often assumed to be intrinsic to clothing is comfort. It has been hard to find observations and/or comments about the need to wear comfortable clothing in all the analyzed data. In the near future, we foresee that

it will be a primordial feature of an article of clothing, and its design will have to have meaning and necessity in its true dimension.

(d) **Concepts**

The book "The Story of Purpose," written by Joey Reiman in 2013 [8] lets us know the proposals associated with the development of concepts. In these times, purpose and meaning make better institutions and lasting legacies for everyone involved.

Brene Brown's phrase [9] is inspiring. "Maybe stories are just data with a soul." "A story is a new narrative for business. Stories shape our lives because we are creatures who search for a reason." [10].

But what does all of this have to do with fashion? Today, fashion itself does not matter to the new consumer. They need to see in it a purpose, be it social, personal, or cultural. How can we give fashion, or any other activity or business, a purpose?

To define a purpose through Concepts (master idea) is a proposal by Joey Reiman [8]. He references Theodore Roszak, a University Professor in California, and concluded that Master Ideas refer to great moral, religious, and metaphysical teachings, which are the foundations of culture.

Master ideas are not based on facts but on the conviction, that thought will shake the soul. Roszak himself presented two key characteristics of the Master Idea: they must be infectious and lasting. They are here to stay and frequently, when people hear about them, are taken into peoples' lives immediately.

Can fashion transmit this effect? We believe so. Through Concepts (Master Idea), it is possible to do so, but always seeking the common good in all its magnitude. Reiman proposes nine principles to develop a Master Idea: the nine principles of a Master Idea (Concepts):

1. The Master Idea is timeless. How can this affect fashion? It may sound confrontational with the fashion industry, but it is completely aligned with sustainability.
2. The Master Idea teaches: Storytelling is a powerful tool nowadays.
3. The Master Idea fulfills us.
4. The Master Idea is a war chant. (Steven Jobs: Think different)
5. The Master Idea is based on ethos; the character or identity of people is identified.
6. The Master Idea is transformative; it creates a holistic change around a new organization and objective.
7. The Master Idea inspires: Searching for new meanings
8. The Master Idea is born not from data processing but absolute conviction.
9. The Master Idea tells a story.

(e) **State of fashion**

- **What does fashion hold for us in the upcoming years?**

According to the publication presented by The Business and Fashion and McKinsey & Co.: The State of Fashion 2018 [11], the report mentions ten key tendencies to consider in the fashion industry in the short term; these are:

(1) Volatility and uncertainty
(2) Globalization is rebooted
(3) The Asian pioneers (e-commerce) and their influence in the market
(4) Getting personal
(5) Electronic platforms (Amazon vs Tmalls)
(6) Obsession for mobility
(7) Artificial Intelligence
(8) Sustainability
(9) Price as a strategy
(10) Startups as new players in the market.

Analyzing these ten tendencies, we can claim that eight of them are geared toward market development. In layman's terms, it can be the fashion industry or any other industry, such as the home or education industries. These are the two specific topics that must be studied and considered for future strategies in the fashion world.

Sustainability will be paramount in the future of the said industry, but it will also make it more personal through concepts and values, personalization of experiences, etc.; these will be key aspects in the future of the industry. These topics have been brought up; the first is an inherent part of this report. The second one brings us to explain the need and importance of developing concepts associated with fashion and clothing.

2 Sustainability

(a) Definition

According to the Brundtland report [12], Sustainability means that the raw materials consumed should be available in sufficient quantities for future generations. To understand what the concept of sustainable development intends to convey, we must highlight some of the conclusions drawn from the "Brundtland Report," which will be listed below.

- The globally dominant models of economic growth inevitably lead to the gradual exhaustion of the world's natural resources and a rise in poverty, reaffirming the idea of a lack of intergenerational solidarity.
- Nevertheless, with positive and conciliatory intent, the report considered that with a more equal and rationalized distribution of goods, growth is possible and poverty can be reduced, but, to achieve this, relevant actions from the political leader and effective participation from the population in integrating the objectives of economic and social development with environmental conservation are all indispensable, which are grouped in the sustainable development category.

What happens to the consumer?

Do they understand the problem with the environment? Are they conscious about the risk of the irreversibility of this problem, mostly caused by their shopping behavior?

There is no clear answer to these questions; probably environmentalists and environmental aficionados can find them.

(b) **Environmental Impact**

K. Ulrich and S. Eppinger, in their book Product Design and Development [13], present a design process based on environmental problems that can be applied to the design process of any product or service and can lead different interest groups within the fashion industry to understand the imperative need to take care of the environment throughout the different inherent stages of said industry.

A complete analysis of several industrial sectors is performed, and the necessity to explain the environmental performance of products and processes is established while considering the following factors:

- Environmental impact of materials/raw material used in the manufacturing of the product; regarding fashion, we can establish the difference between using cotton fibers, celluloid fibers, protein fibers, fibers derived from fossil fuels, among others.
- It is clear that the behavior of each of these fibers, from their extraction and/or creation to their final use, will have a different impact on the environment.
- Recycling: In general terms, any textile fiber can be recycled, but we have to consider the implications of said process for the environment, for example, the consumption of water and energy.
- The amount of material that can be incorporated into an article of clothing without affecting its features and performance has a limit, either due to market or environmental requirements.
- **Clean Energy**: The possibility of using renewable energy in the fabrication, distribution, and commercialization processes are aspects to consider during clothing design activities.
- **Emissions**: Clearly establish the permitted levels of emissions.
- **Water consumption**: A critical problem in the textile industry, which is magnified when we use this resource while diminishing food production.
- **Solid waste**: Especially hazardous and/or inorganic ones, whose degradation can take not years, but centuries.

Ulrich and Eppinger [13] clearly define two cycles of life:

- The life cycle of an industrial product begins with the extraction and processing of raw material and/or natural resource, then the production, distribution, and use of a product. Finally, when the product can no longer be used, there are several options, to recover it or reuse its components, recycle the material, burn it, or bury it.
- The life cycle represents the growth and decomposition of organic products in a continuous loop.

As shown in Fig. 1, both cycles intersect with the use of natural materials and industrial materials. While the life cycle of an industrial product can last a few months or years, the natural life cycle can take various ranges. In the case of organic materials, these quickly decompose into nutrients for the extraction of similar materials. Other natural resources are created over long periods and are considered non-renewable, and their decomposition might take thousands of years and risk polluting the earth.

There are three great challenges in product design toward sustainability:

- Eliminate the use of non-renewable natural resources, including fossil fuels.
- Eliminate the availability of synthetic and inorganic materials that do not decompose quickly.
- Eliminate the availability of toxic waste that is not part of the natural life cycle.

Lewis and Gertsakis [14] explain some of the environmental impact derived from the manufacturing sector in general:

- Global warming as a result of the buildup of greenhouse gases.
- Solid waste, especially those that cannot be recycled and must be burnt or buried.
- Exhaustion of non-renewable resources such as fossil fuels, coal, minerals, etc.
- Water pollution, especially due to discharge, results from industrial processes and is poured into rivers and public sewage, including heavy metals, fertilizers, solvents, etc.

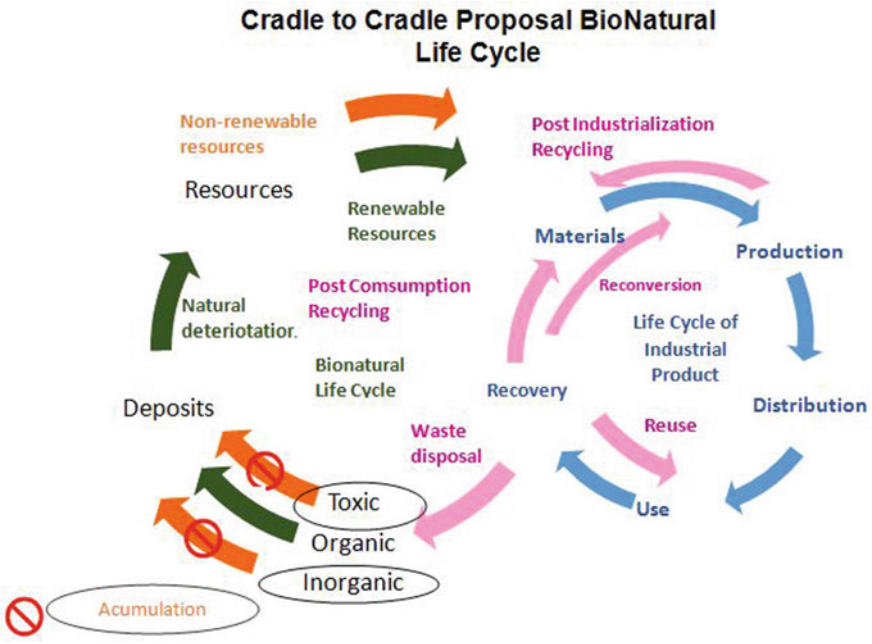

Fig. 1 Cradle to Cradel BioNatural life cycle

- Air pollution due to the emission of gases in thermal processes, from generating plants to vehicles with internal combustion engines.
- Soil degradation due to the extraction of raw materials in mining, the expansion of the agricultural borders for the production of food, the forestall industry, and even in the production of prohibited substances.
- Biodiversity: displacement of a variety of plants and animals caused by urban and industrial development.
- Exhaustion of the ozone layer due to the emission of gases that destroy it.

Ulrich and Eppinger [13] have proposed a model called Design for Environment (DFA), which should be studied by the fashion industry, which allows one to evaluate and determine whether a product and/or process is environmentally and socially sustainable.

Based on the model proposed by said researchers, we present the following table (Fig. 2), a chart to evaluate the environmental impact of the various textile fibers.

It is a challenge for the fashion and clothing industries to establish methods to measure the environmental impact of the extraction and manufacturing processes of the textile fiber, whichever its origin may be.

In a report by the House of Commons—Environment Audit Committee of the UK titles "Fixing Fashion: Clothing Consummation and Sustainability" [15], a comparison between natural and synthetic fibers is drawn.

Description	Energy consumption	Depletion of natural resources	Waste disposal	Gas emission	Solid waste production
Animal Fibers					
Alpaca - Camelids					
Wool					
Cashmere - Mohair					
Silk					
Others					
Plant fibers					
Cotton					
Linen					
Jute					
Others					
Synthetic Fibers					
Polyester					
Nylon					
Acrylic					
Polypropylene					
Others					
Viscose					

Low
Medium
High

Fig. 2 Textile fibers and their environmental impact

Producing natural fibers like cotton, wool, silk, and cashmere requires the use of water, soil, animals, food, and chemicals.

Synthetic fibers like polyester are made with petroleum, a non-renewable resource that requires intensive use of energy for its production.

Cotton is the most used natural fiber. It requires a large amount of water and uses fertilizers and insecticides. The ecological cotton alternative is gaining a lot of momentum.

Animal fibers, by nature, create methane, one of the gases that contribute to the greenhouse effect. Animal mistreatment is a concern, a topic that relevant associations are trying to solve.

Synthetic fibers are manufactured from plastic, including polyester, polyamide and acrylic, or from plants (trees), ground and chemically dissolved, and then transformed in fibers such as viscose, mode, rayon, lyocell, etc.

Petroleum-based synthetic fibers have less impact on land and water, but greenhouse gas emissions are higher.

Developing the market for recycled fibers is a challenge, as the circular fashion model presents it; it is an important matter; however, it has limitations considering the characteristics and performance of the products made with recycled fibers.

A critical factor to bear in mind is plastic microparticles, which create problems in marine life and its food chain.

Synthetic textiles are the most important source of microspheres in the oceans.

It is a challenge of the fashion and garment industry to establish methods to measure the environmental impact of the production of textile fibers.

Higg Index, developed by "Sustainable Apparel Coalition" [16] (It is stated that the index allows us to measure the environmental impact of various textile fibers, specifically in the emission of greenhouse gases (methane and nitrogen dioxide, not including CO_2)).

In addition to evaluating the environmental impact of the raw material, it is important to assess it through the whole value chain in the textile industry.

In Fig. 3, we show a diagram to evaluate the environmental impact throughout the entire value chain of the textile industry from fiber made of animal fiber.

The most important aspects to consider:

Animal fibers (protean) are a renewable resource. It is possible to use renewable energy sources to process them, but often it is necessary to use non-renewable energy, especially fossil fuels.

The main problems originate from wet processes, as these cause the greatest environmental impact due to the chemical characteristics of inherent chemical materials of such processes.

The chemical industry associated with the production of these raw materials is aware of the original situation. In most cases, it meets the conditions and requirements set by regulators (Governments) of the main producing countries. Will this be enough?

The elimination of waste is one of the greatest negative environmental factors. The creation of waste in the textile industry must be very clear; identify it and evaluate its

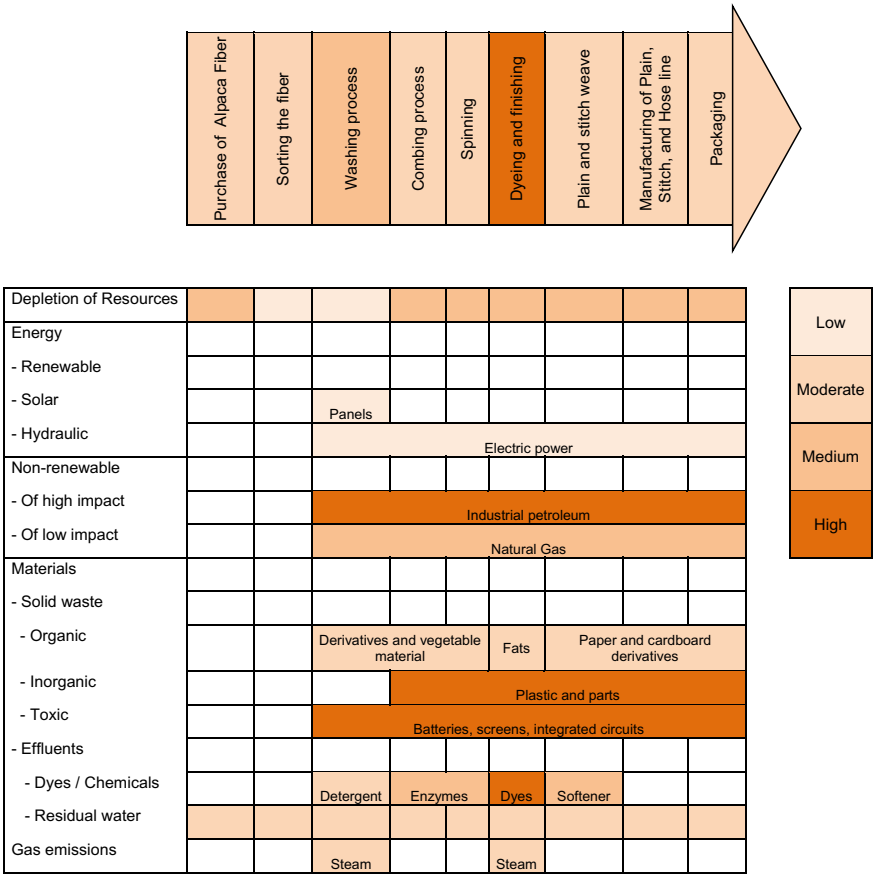

Fig. 3 Value chain of alpaca animal fiber

environmental impact considering the current internationally recognized regulations. REACH, implemented by the European Chemical Agency, is a good example.

Figure 4 shows a chart explaining the extent of the possible environmental impact of the different materials and waste used in the textile industry for animal fibers.

(c) Speed and buildup

The velocity of the fashion industry is a characteristic associated with their commercial and financial needs, which has been deepened with the development of fast fashion, with a negative effect on the environment.

This greater velocity creates a higher buildup of inorganic and toxic waste in the environment.

The appraisal presented in the Sustainable Fashion Handbook [17], edited by Liz Parker (UK) and Marsha A. Dickson (USA), on the topic of velocity explains the magnitude and extent of this topic.

Description	Organic	Inorganic	Toxic
Textile fibers			
- Animal fibers			
- Vegetable fibers			
- Synthetic fibers			
Containers and packaging			
- Cardboard boxes			
- Plastic bags			
- Wooden boxes			
- Paper bags			
Effluents			
- Chemicals		REACH certification	
- Dyes		REACH certification	REACH certification
- Auxiliary		Biodegradable	REACH certification
- Residual water			
Other solid waste			
- TI			Batteries and LCD
- Construction materials			
- Machinery and parts		Metal	Batteries
- Plastic			Oceans
- Wood			

Fig. 4 Elimination of waste

"They refer to the ancient Greeks where they establish two types of time: one focused at the moment and another focused in the time that has passed." Regarding nature, some ecosystems acquire long-term balance and resilience, adapting to change at different rates.

Nature combines changes that occur slowly at a large scale with small but sudden ones. The different paces in changes allow the ecosystem to survive potentially dangerous and harmful events.

They mention Stewart Brand and his book "The Clock of the Long Now," where he proposed that any transcending human civilization needs a rhythm for quick and slow activities to balance themselves out.

These layers from fast to slow: Art-Fashion, commerce, infrastructure, government, culture, and nature.

Fashion brings forth sudden and imaginative change while the slower laters maintain invariability and the long-term.

Crucially, the system works when each activity respects the rhythm of the other, but, today, the fashion industry as it is designed does not respect other activities. There is plenty of evidence that suggests fashion is disconnected from its effects on culture and nature, creating social problems, large amounts of waste, and climate change. In fact, the fashion industry's commercial agenda seems to promote the opposite to a multilayered system of variable velocity.

What is commercialized is a variety of similar products fabricated and consumed at high economic velocity instead of finding the appropriate rhythm of cultural, social, and environmental needs.

It is clear that, regarding sustainability, we must begin by being aware of the damage created by the excessive velocity in fashion toward the system in general. Which should be our response to fast fashion?

(d) **Actions**

The fashion industry is performing actions that seek to revert the environmental impact caused by their activities.

Specifically, it is worth mentioning the Sustainable Apparel Coalition [18], with participant-partners that include renowned brands, manufacturers, public and private institutions, among others. Their objective is to establish a global alliance for sustainable production.

It has developed the Higg Index, looking to standardize the protocols to measure the environmental impact of the clothing industry's value chain.

Its vision is a clothing industry that produces no unnecessary environmental harm and positively impacts people and communities associated with their activities.

Cradle to Cradle Products Innovation Institute [19] is another organization that is proposing much more aggressive solutions to eliminate environmental impacts.

Dorough and Braungart [20], authors of the book "Cradle to Cradle" (2002) are the leaders of this proposal. In their book, they explain the beginnings of the concern by industries and governments regarding the environment, which go back to the Rio Summit in 1992, where a basic strategy to deal with environmental problems is brought up. Eco Efficiency is proposed, transforming the traditional industry toward economic, environmental, and ethical concerns, doing more with less.

Stephan Schmidheiny, one of the founders of the Business Council for Sustainable Development, predicted that by 2002 it would be impossible for a business to be competitive without being ecoefficient. The bigger industries achieved impressive results, but will this be enough?

Many industries and governments are promoting the application of 4R to counter negative environmental impact: Reduce, Reuse, Recycle, and Regulate.

Dorough and Braungart [20] propose to go further and explain the problems derived from applying 4R.

Reducing the amount of toxic waste: to be more efficient in the usage of raw material and in our processes is good, but will not cease the emission of greenhouse gases, the buildup of toxic waste, the exhaustion of raw material, or the destruction of the environment. They will only be slowed and the environmental consequences will be postponed.

Very little is known about the industrial contaminants for the slowing strategy to be healthy in the short term.

Reusing waste and feeling something good for the environment is being done. If, in the end, these end up somewhere else somehow, these results are very discouraging for the environment and, thus, for people. We are postponing the problem.

Reusing mud in the sewers. These can contain residues that can pollute food-producing fields. In many cases, it would be less dangerous to bury these materials in sealed dumps.

Recycling has a problem. The quality of the material decreases with the number of cycles. Such is the case of the metallurgical industry. Recycled steel has worse properties than the original and, in many cases, cannot be used in the automotive industry.

Recycled paper releases particles that can be inhaled by people causing irritation in the respiratory system.

Recycled threads have a resistance problem that affects their performance in posterior productive processes (efficiency).

Regulations can be applied on a large scale but are traditionally applied at the end of the line, applying control and sanctions once the damage has been done.

Good intentions are present when regulations are enforced to protect the common good. However, destructive and low-intelligent designs can be regulated and can reduce immediate negative consequences. Enforcing regulations at the end is proof of an error in design. This is called license to harm.

Being less evil is to accept things the way they are, to believe that appropriately designed, dishonest, and destructive designs are the best humans can do, an imaginative flaw. A completely different model is needed.

Mc Dorough and M. Braungart [20] propose a new design objective.

- Constructions that, just like trees, produce more energy than they consume and cleanse their own residual waters.
- Factories that discharge potable water.
- Products that, once their useful life is over, do not become useless waste, but biodegrade instead.
- Recovered materials for human and natural uses.
- Means of transport that improve quality of life while also distributing products and services.
- A world of abundance.

Such a task awaits, but would it be easier to colonize Mars?

"Getting there, where no human ever has set foot." Let us not cause a great disaster here to then go to a less welcoming place. Let us use our creativity to stay here, to be once again natives of this planet.

Mc Dorough and Braungart's proposal can seem unreachable. Nevertheless, the problem exists and the challenge is clear. We have a long and arduous road to travel, and even more when we consider the havoc caused by coronavirus (COVID-19) on our society.

3 Coronavirus

The devastating effects of coronavirus can be explained with the changes in the rhythm of human activities [21]. The rhythm of the healthcare system changed, and it could not adapt to the rhythm of the coronavirus and its effects. The most amazing thing is that this scenario had been forecast by several researchers and journalists over thirty years ago.

According to an article by Robin Marantz Henig, published in National Geographic last April [22] titled "Experts warned of a pandemic decades ago. Why weren't we ready?".

She mentions a virologist named Stephen Morse who, in the 1990s, coined the term emerging viruses; then, the author wrote about the introduction of new, potentially devastating pathogens—"climate change, massive urbanization, the proximity of humans to farm and forest animals that act as viral reservoirs", accelerating their spread through war, the global economy, and international air travel. Very few people took this potential threat seriously. "The single biggest threat to man's continued dominance on the planet is the virus."

It is recommended to read the report crafted by the Board of Innovation titled Low Touch Economy [23] where they propose that, in the post-COVID-19 era, the economy will be shaped by new habits and regulations, based on the reduction of close interaction between people and things, and the tight restrictions on hygiene and health. The disruption created would change the way we feed ourselves, work, buy, exercise, manage our health, socialize, and use our free time with an unprecedented rate of change.

The world changed, and, thus, all social, cultural, and economic activities must be redesigned, including fashion.

How much? It cannot be determined. Proposals are and will be contradictory. Some people think that said changes can be very deep. Others claim or are hopeful that normalcy will return when the pandemic is overcome as a result of a vaccine or herd immunity.

It is clear that the pandemic will delay the efforts of developing sustainable industries, including fashion. We wish to highlight the report presented by the Boston Consulting Group, Sustainable Apparel Coalition, and Higg, Co.L: "Weaving a Better Future: Rebuilding a More Sustainable Fashion After COVID-19." [24]

It summarizes the actions to follow in four postulates:

- Protect critical assets to survive the crisis.
- Solve stock problems along with providers
- Integrate sustainability through a business recovery strategy
- Accelerate transparency while sustainability objectives are increased.

Sustainability is a basic necessity for society's future. However, the reason why this necessity exists must be acknowledged. Firm believers of sustainability and people who are pressured into following it due to pressure from the consumers both exist.

We must prevent that, in 30 years' time, we will be regretting situations even more severe than the pandemic because we did not know how to handle the environmental impact caused by human activity. COVID-19 is a serious warning.

4 Conclusions

Some observations on fashion and sustainability are the following: Fashion is tightly associated with people's behavior and needs. Should we not understand this, it will be very difficult for people to do so. It is their means of communication and expression and educating them on sustainability and its importance for the future of society will take time.

Sustainability can be an investment or an expense nowadays. Prioritizing sustainability in industries is not urgent. Survival and jobs are the main objective. Solution proposals to environmental impact developed by Ulrich and Eppinger in their book Product Design and Development [13] and those of Mc Dorough and Braungart in Cradle to Cradle [20] are a base to develop a path to sustainability.

The 4R proposal, reduce, reuse, recycle, and recover, is the best option today. However, it is not a solution to the problems originated by the speed set in the fashion industry, particularly in fast fashion.

The accumulation and how and where it takes place, would force us to take actions that many environmentalists may question.

The consequences of not compartmentalizing and/or isolating toxic and even inorganic waste currently have disastrous consequences on the environment. Until a solution to this problem is not found, we estimate that the best course of action is to establish high security dumps and whose responsibility should lie with the agents of the industry's value chain in general.

We must regard as important to measure this proposal's long- and short-term effects, and a very clear example is electric cars. They would be fueled with non-renewable energy and there will be no emission of contaminating gases, but the need to save this energy forces us to use batteries, which will ultimately have a negative environmental impact.

Color is a determinant element in fashion and must thus be treated in its true dimension. This is a huge challenge for the fashion industry in general to develop real colors that are completely degradable or inert toward the environment. This topic will be critical in the sustainability agenda.

What is impossible to measure is impossible to regulate. There is a need to establish protocols and procedures first to establish standards (4R) and then measure the environmental impact of the fashion industry's value chain. These must be simple so that they allow a person or agent of any group of interest to understand and measure the environmental impact of their actions, be it a farmer, stockbreeder, industrial worker, investor, and especially clients.

There are many efforts that establish indexes or parameters that allow the measurement of different forms of environmental impact. However, these focus on specific

stages along the value chain or the interests of different organizations. The bias with which these results are interpreted can be unfair and cause irreparable damage to specific interest groups of the value chain in the fashion industry, and experience tells us that the weakest part will be the most affected one.

In this first document, we sought to develop an appropriate relationship between fashion and sustainability, considering the environmental impact and its negative effects.

We hope to do so again in the future, but between fashion and social responsibility with its main interest groups, especially those most exposed: workers.

Finally, and especially due to COVID-19, we recommend acting with responsibility, resilience, empathy, and gratitude.

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