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**How eco–innovations can lead the way towards the
creation of a sustainable business model**

A multiple case study of the apparel & footwear industry

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Abstract

The objective of this research paper is to analyse what are the types of eco-innovations and sustainable strategies of the apparel and footwear industry that are more suitable for the creation of a sustainable business model.

The study is elaborated in two parts. On one hand, the apparel companies are analysed based on their types of eco-innovations and sustainable strategies. In order to obtain an evident result, a matrix has been used to categorize the eco-innovations under the transformational strategies perspective. Moreover, the study proceeds by evaluating the overall environmental performance of the companies at stake, to create a tension between theoretical and practical results.

On the other hand, the research advances with an analysis of customer's perceptions about the companies' sustainable strategies and environmentally sustainable products.

To obtain a clear result, a survey has been used to evaluate consumer's opinions on a sample of 150 respondents, which has been investigated through a principal factor component analysis.

Outcomes show a clear preference for one of the companies analysed. Anyway, an unavailability of deeper data has blocked the possibility to have a complete analysis of the environmental performance and to correctly establish which should be the best practices to adopt.

Customers perceptions on companies' sustainable initiatives show a weak interest about environmental issues, even though clear preferences emerged for the same company that has been privileged in the first part of the analysis. Anyway, customers' perceptions on sustainable products have showed unclearly results, mainly establishing a common misunderstanding between the concept of environmental sustainability and the interest towards environmentally friendly product.

Nevertheless, most of the customers show an unawareness towards the sustainability aspect of the companies, highlighting a fundamental problem of disinformation.

Key words: sustainable business model, eco-innovations, transformational strategies, environmental performance, consumer

Abstract (French version)

L'objectif de cette recherche est d'analyser quels sont les types d'éco-innovations et des stratégies durables de l'industrie du vêtements et de la chaussure qui sont plus adaptés à la création d'un modèle d'affaires durable.

L'étude est élaboré en deux parties. D'une part, les entreprises de vêtements sont analysées en fonction de leur type d'éco-innovations et de stratégies durables. Afin d'obtenir un résultat évident, une matrice a été utilisée pour classer les éco-innovations dans la perspective de la stratégie de transformation. De plus, l'étude procède à l'évaluation de la performance environnementale globale des entreprises concernées, afin de créer une tension entre les résultats théoriques et pratiques.

D'autre part, la recherche avance avec une analyse des perceptions des clients sur les stratégies durables des entreprises et des produits écologiquement durables.

Pour obtenir un résultat clair, on a utilisé un sondage pour évaluer les opinions des consommateurs sur un échantillon de 150 répondants, qui a fait l'objet d'une analyse des principaux facteurs.

Les résultats montrent une nette préférence pour l'une des sociétés analysées.

Quoi qu'il en soit, l'indisponibilité de données plus approfondies a bloqué la possibilité d'avoir une analyse complète de la performance environnementale et établir correctement quelles devraient être les meilleures pratiques à adopter.

Les perceptions des clients sur les initiatives durables des entreprises montrent un faible intérêt pour les questions environnementales même si des préférences claires ont émergé pour la même entreprise qui a été privilégiée dans la première partie de l'analyse.

Quoi qu'il en soit, la perception des clients sur les produits durables a montré des résultats non dénoués, en établissant un malentendu commun entre le concept de durabilité environnementale et l'intérêt pour un produit respectueux de l'environnement.

Néanmoins, la plupart des clients montrent une méconnaissance de l'aspect durable des entreprises, mettant en évidence un problème fondamental de désinformation.

Mots clés: modèle d'entreprise durable, éco-innovation, stratégies transformationnels, performance environnementale, consommateur

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List of Abbreviations

ADIDAS	ADIDAS AG
BCI	Better Cotton Initiative
BM	Business Model
CO ₂	Carbon dioxide
EVA	Ethylene-vinyl acetate
FSC	Forest Stewardship Council
GHG	Greenhouse Gas
ILO	International Labour Organization
ISO	International Organization for Standardization
LWG	Leather Working Group
n.a.	not available
NIKE	NIKE INK.
NO _x	Nitrogen oxides
PC	Principal component
PCA	Principal component analysis
PET	Polyethylene terephthalate

PUMA	PUMA SE
RDS	Responsible Down Standards
SAC	Sustainable Apparel Coalition
SBM	Sustainable Business Model
SBT	Science-based target
SO _x	Sulphur oxides
ZDCH	Zero Discharge of Hazardous Chemicals
WCED	World Commission on Environment and Development

Agenda

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1. Introduction

1.1 Research question

The objective of this research thesis is to evaluate the current achievements of apparel and footwear multinational organizations towards the creation of a sustainable business model.

The main purpose is to analyse the types of eco-innovations implemented by the companies and to evaluate whether these efforts are generating a positive environmental impact and whether they are more keened to foster the creation of a business model for sustainability.

The thesis addresses only the part of sustainability which concerns the environmental aspect rather than the social one.

The analysis aims at identifying mass market eco-innovations capable to offset the negative effect of a huge customer demand and to promote circular initiatives.

Besides the fact that an infinite number of variables are to be studied in order to assess the sustainability aspect of a firm, the main focus here is to understand if the sustainability strategy of the organization can sustain long-term benefits for the environments, the firm and the society.

In order to implement a clear research on the companies, the overall industry trends and challenges have been analysed, as well as the overall performance and sustainability strategy of the organizations.

Moreover, the study proceeds by evaluating whether companies' sustainable innovations are perceived by the customer as a value increase and therefore create to some extent a competitive advantage in the market.

1.2 Methodology

The approach used for the analysis is a multiple case study grounded on secondary and primary data. As Yin (1984) described it, the case study research can be compared to a research strategy. The data used are a combination of observations, journals and academic articles. (Kathleen M. Eisenhardt¹). A case study research can be based on qualitative data, quantitative data or both (Yin, 1984).

The multiple-case study paper research at issue is based both on qualitative data observed from articles, journals and observations, and quantitative data collected through a survey. This type

¹ "Eisenhardt - Building Theories from Case Study Research.Pdf."

of data-combination can create useful synergies, thanks to the relational aspect identified through qualitative information and the counterproof generated by quantitative evidences.

As Mintzberg (1979) describes, theory foundation requires qualitative data, which do not directly explain the significances between variables, but allows for the explanation of such relations. Furthermore, as Pfeffer (1982) advised, a theory must be coherent, testable and parsimonious and it should emerge at the end not at the beginning of the study, as a natural response from data analysis.

Specifically, the research paper starts by analysing the current sustainability trends of the apparel and footwear sector, to identify a common basis from which to start. The findings will be useful in order to better understand companies' initiatives and their way of doing business. Moreover, each company of the multiple-case study is deeper analysed in order to gain information about their sustainability strategies, eco-innovations, environmental performance and targets.

All the information gathered are then used for the main purpose of the research, which is the transformational strategies' perspective under which the three companies are analysed in comparison. The result is then compared with the current environmental performance, even if a lot of limits have been found, due to the different unit of analysis used by companies and the veiled unwillingness to disclose more than the necessary.

Finally, the quantitative data are used to find a positive feedback in the customer perception about the companies and their products, to verify the extent to which society is informed about environmental issues and the degree to which companies are promoting and informing their customers about environmental initiatives.

Consequently, as the qualitative data allowed for the creation of a theoretical basis, the quantitative response offered the possibility to confirm to some extent the accuracy of the research.

1.3 Motivation of the research: a matter of priorities

The world has limited resources. While population and consumption are growing, critical and vital resources such as forests, freshwater and fisheries are decreasing rapidly.

At the same time, climate change is having an impact on precipitation intensity, temperature magnitude and frequency of extreme climate events.

Although natural cycles are not homogeneous, the sharp increase of temperature verified in the last decades cannot be explained by natural cycles, but rather by greenhouse gases created by humans. The current level of carbon dioxide, methane and nitrous oxide has never been higher over the past 800.000. (National Geographic, 2019).

Reducing water and energy consumption, GHG and chemical emissions is not sufficient to restore the well-being of the environment and of the society itself. The neoclassical business model of “take, make, dispose” does not fit with the needs of the present. Sustainable business model is the first step towards a more circular economy, in which products are recycled, upcycled and reused.

The mass market must learn how to produce more with less, to tackle the urgent need of protecting the environment. Moreover, such innovations will help on one hand to face the current environmental challenges, on the other, since competition is changing towards the creation of new markets rather than competing in an existing one, they will provide in this sense a win-win situation for companies innovating for sustainability (Boons et. al, 2013).²

Anyway, while the need to innovate for sustainability is becoming more urgent, the lack of body of literature that concerns the way in which companies can achieve sustainable business models makes it complicated for them to identify the right means to assess and identify innovative design alternatives (S. Evans et. al, 2017).³

While numerous ecological choices are available in the niche market, mass market multinational corporations are still unaware of the best practices to generate business model for sustainability.

Thus, since mass market operations are the ones which are mainly responsible for environmental damage, it is fundamental that companies begin to innovate.

For this reason, the paper wants to identify which are the types of sustainable innovations that can better support a shift towards sustainable business models in the mass market, leading to a better environmental and social economy.

² Boons et al., “Sustainable Innovation, Business Models and Economic Performance,” April 2013.

³ Evans et al., “Business Model Innovation for Sustainability,” 2017.

2. Literature Review

2.1 Business model: a definition

The first use of the term “business model” was found with Bellman et al. in 1957 (Osterwalder et al., 2005⁴).

A business model is the reflection of the company’s strategy (Casadesus-Masanell & Ricart, 2010), and it dispatches the company’s position across the value chain, its key assets and value proposition.

Moreover, the business model has been picked up regularly in the context of information technology, and mainly used in the sense of business modelling (process models).

Based on Zott and Amit article (2007), a business model can be described as the way in which an organization is connected with external stakeholders and how it creates value for all the exchange partners.

In the article, they also identify two topics of business model design, efficiency-centred and novelty centred. Efficiency-centred relates to which degree a firm is achieving transaction efficiency through their business model. Novelty-centred is related to new ways of conducting economic exchanges among various participants. (Zott and Amit, 2007⁵).

A business model can also be seen as composed by four elements: value proposition (intrinsic value of the product), supply chain (how upstream relations with suppliers are managed), customer interface (how the relations with customers are managed) and financial benefit (how cost and benefits are spread along the organization structure).

It can be defined as a bundle of activities, organized to meet consumer’s needs, with the specifications of which parties operate these activities and how are they linked with each other (Zott, Amit 2011⁶).

Business models can be distinguished by their purpose: they can be the basis of the strategist marketing of innovative processes, product and services (e.g., Pateli and Giaglis, 2005; Teece, 2010; Zott and Amit, 2008). Moreover, business models can be changed themselves to create

⁴ Osterwalder, Pigneur, and Tucci, “Clarifying Business Models.”

⁵ Chesbrough Henry, “Business Model Innovation: It’s Not Just about Technology Anymore.”

⁶ Amit and Zott, “Creating Value Through Business Model Innovation.”

competitive advantage by disrupting the competition dynamics (e.g., Chesbrough, 2010; Demil and Leqocq, 2010; Johnson, 2010; Zott and Amit, 2010).

Stewart and Zhao (2000) describe a BM as “a statement of how a firm will make money and sustain a competitive business”.

On the other hand, it has also been referred to as “the design of key interdependent systems that create and sustain a competitive business” (Mayo and Brown, 1999).

Slywotsky (1996)⁷ refers to business model as “the totality of how a company selects its customers, defines and differentiates its offerings, defines the tasks it will perform itself and those it will outsource, configures its resources, goes to market, creates utility for customers and captures profits.”

Business model can be furthermore defined as a conceptual tool to gain a deeper understanding of how the firm does business and it can be then used for analysis, comparison and performance assessment, management, communication and innovation. (Osterwalden and Pigneur, 2005⁸).

Business model has been analysed also under the innovation perspective, as “a coherent framework that takes technological characteristics and potentials as inputs and converts them through customers and markets into economic outputs. The business model is conceived as a focusing device that mediates between technology development and economic value creation” (Chesbrough & Rosenbloom, 2002, p. 532⁹).

Teece in 2010 articulated that “the essence of a business model is that it crystallizes customer needs and ability to pay, defines the manner by which the business enterprise responds to and delivers value to customers, entices customers to pay for value, and converts those payments to profit through the proper design and operation of the various elements of the value chain”.

The definition clearly describes the aim of a business model, which is being able to extract customer value and create profit. Customer value depends itself on the company value proposition, the value creating logic and the strategic value delivery configuration.

⁷ Szekeley Francisco, “Incremental, Radical and Game-Changing: Strategic Innovation for Sustainability.”

⁸ Clarkson, “A Stakeholder Framework for Analyzing and Evaluating Corporate Social Performance.”

⁹ Chesbrough Henry, “Business Model Innovation: It’s Not Just about Technology Anymore.”

For this reason, a firm has to manage its partnership, supplier relationship and activities to offer superior value to its customers, as well as marketing and distribution channels.

Moreover, managing cost efficiency and revenue streams is the ultimate aspect of the business model function.

2.2 Business Model Innovation

Innovation requires a huge amount of financial and human resources, time and considerable investments, starting from research and development to plants and equipment and even to restructure an entire business unit. (Amit, Zott)¹⁰. From a global survey of Economist Intelligence Unit, it has been found that 54% of the majority of the firm prefers new business model structure than new products or services. From another study conducted by IBM, on a sample of 750 corporate and public sector leaders, it has been found that “competitive pressure has pushed business model innovation much higher than expected on CEO’s priority list”. (IBM’s global CEO report 2006: Business Model innovation matters¹¹).

Business model innovation matters for entrepreneurs and academic researchers for several reasons. First, it is often under-utilized as competitive source. Second, business model innovation is more difficult to replicate by competitors than product or process innovation. Third, it creates different competitive dynamics, disrupting the usual way of doing business. (Amit, Zott 2012).

An innovative business model is one which creates a new market or allow a company to exploit new opportunities in an existing market. (Amit, Zott 2012).

From Zott and Amit article (2012), it is possible to identify three different ways in which a business model can be innovated: by integrating new activities (content innovation), by connecting the same activities in new ways (structure innovation), or by changing the party that was before in charge of one specific activity (governance innovation). Moreover, they identified four value drivers of BM: novelty, describing the degree of business model innovation; lock-in, that refers to those activities that increase business model participants to transact within the system; complementarities, that refers to those activities that create interdependencies in the structure; and efficiency, that refers to activities that increase efficiency in the system.

¹⁰ Amit and Zott, “Creating Value Through Business Model Innovation.”

¹¹ Pohle and Chapman, “IBM’s Global CEO Report 2006.”

From IBM global survey of 2006, CEOs have identified three different type of innovations, business model innovations, operational and products, service and markets innovations. The majority of them explained how business model innovation is the real “game changer”, and that a company with a radically different BM would disrupt the competitive dynamics of the industry in which it is competing.

Business model “innovation” does not mean to change “what you do” but rather change “the way you do business” and going beyond product and process innovation. (Amit and Zott, 2012).

2.3 Sustainability: the new economic model

The World Commission on Environment and Development (WCED) in a report of 1987 defined sustainability as “the development that meets the needs of the present generation without compromising the ability of future generations to meet their needs.”

The economic and social crisis are increasingly bringing attention to the effect of the neoclassical organization’s business model on the totality of the economy and the society.

Sustainable management deals with social, environmental and economic issues and the way in which organizations transform in order to contribute to sustainable development.

Sustainable innovation is a process where sustainability considerations (environmental, social and financial) are integrated into company systems from idea generation through research and development (R&D) and commercialization. This applies to products, services and technologies, as well as to new business and organizational models. (Charter et al., 2008; Charter and Clark, 2007¹²).

Sustainability not only relates with reducing water and energy consumption, de-forestation, preservation of the ocean and climate change. Sustainability is also about sustaining society, economy and about creating the right balance between them.

The sustainability definition is composed of three concepts: economic, environmental and social, also defined as profits, planet and people.

¹² Charter and Clark, “Key Conclusions from Sustainable Innovation Conferences 2003–2006 Organised by The Centre for Sustainable Design.”

The purpose and vision of a sustainable firm does not merely concern economic value, but rather it encompasses at the same time social, environmental and economic goals.

Sustainable development is a process of change in which the use of resources, the investments allocations and the technology trajectories are not only directed to the present, but rather consider future and present at the same level. The way society is acting must be changed towards a less material and energy exploitation way of operating.

As Huber (2000)¹³ explained in its research, the drivers that push firms to become “greener” can be categorized in three main classes:

- *Legal motifs*, which mean that companies are obliged to follow administrative and legal rules.
- *Economic reasons*, which cover the possibility to generate competitive advantage, cost efficiency and structural cost reduction.
- *Social reasons*, which include the increase image value perceived by customers, stakeholders and governments, as well as be a well-integrated part of the society without causing negative externalities. Despite this can be seen as a pure and idealistic model, it is rather a necessity in order to increase customer base and loyalty.

2.4 Eco-innovations

The European Commission defines eco-innovations *as changing consumption and production patterns and developing technologies, products and services to reduce our impact on the environment* (European Commission, 2008¹⁴).

This statement explains how this type of innovations creates competitive advantage, but it also generates at a same time a “greener” economy and industrial mechanism.

Eco-innovation has been defined also as *the creation of new, or significantly improved product or service, process, marketing method, organisational structure which, with or without intent, lead to environmental improvements compared to other alternatives* (OECD, 2008).

Eco-innovation does not only concern an innovation which purposely limits environmental damage, but all those innovations which in a way improve the environmental performance of processes and products.

¹³ “Towards Industrial Ecology: Sustainable Development as a Concept of Ecological Modernization.”

¹⁴ Boons et al., “Sustainable Innovation, Business Models and Economic Performance,” April 2013.

Eco-innovations can be measured under a multiplicity of perspective, such as their nature, drivers and their effects. Moreover, they could be analysed under a financial and economic perspective or under an environmental one.

A type of eco-innovations analysis has been performed by Renning (2000)¹⁵, which categorize them by their nature, that can be:

- *technological*, to cure or prevent environmental damage,
- *organizational*, such as management instruments,
- *social*, changing consumption patterns and consumer behaviour,
- *and institutional*, which is achieved through collaboration of different organisms.

Following this categorization, a business model is identified as an eco-innovation if it creates benefit for the public and the private. This can be achieved if the business model creates a superior economic value, which is a strategic necessity, and if it helps in contributing to a sustainable development of the organization and the society towards efficiency, sufficiency and consistency principles.

2.5 Transformational strategies towards a sustainable business model

Joseph Huber in 2000 identified three *transformational strategies* which can be related to sustainable developments:

- *Sufficiency* is related to population growth and environmental capacities, as well as consumer behaviour. Sufficiency means the reduction of resources exploitation and a shift towards renewable sources. The principle entails also a psychological change from a growth-based economy to a sufficiency one, which can be seen as an impossible goal in the current capitalist society.
- *Efficiency* deals with the reduction of environmental damage by increasing the efficiency of processes per unit of output (Schaltegger et al., 2003). This is the principle that better fits the current economy, since it can reduce environmental harm and support industry competitiveness.
- *Consistency* identifies a transformational strategy which not only covers sufficiency and efficiency principles, but it goes beyond, creating lasting turnover of material flows in

¹⁵ Rennings, "Redefining Innovation — Eco-Innovation Research and the Contribution from Ecological Economics."

the mass market. The principle entails the integration of industrial systems with natural systems, without artificial limits.

The main revolution that has been adopted by companies is the efficiency one, which implies economy growth combined with environmental and ecological adaptation, thus increasing environmental performance through management systems in production processes.

This attitude implies an approach towards the use of renewable energy and resources, that still does not create new raw development paths.

The principle which boosts this revolution is inherent in the input-output ratio, meaning that companies want to produce more with less material and energy.

Applied to the sustainability strategy, this means finding an efficient way to use the less possible amount of resources, which results in technology efficiency in production to reduce water and energy consumption and recycling of resources. The best unit of analysis under this type of strategy is energy and material consumption, as well as CO₂ emissions per unit of product.

Anyway, efficiency strategy is limited itself, reducing the consumption rate of non-renewable resources means on the other hand increasing the quantity of those resources and the environmental goal is offset by economic and demand growth.

On the other hand, the sufficiency strategy is a principle that derives from the question *how much is enough?*, which answering is not as easy as one can think.

The idea behind this strategy is a self-limitation principle, which entails the exploitation of resources and capacities with moderation to decrease collective demand of product and services. Energy- and material-intensive productions are the main drivers of the strategy, of which effects should be achieved in a change of individual consumer behaviour and choices.

The limits of this principle, anyway, are in the definition itself. Indeed, the idea behind does not fit with the utilitarian and capitalist society which is always craving for something more.

Furthermore, reducing consumption with an increasing growing population is a paradox which cannot be bear and that will probably lead to a social and ecological catastrophe.

This principle goes side by side with the idea of durability of resources, which entails the use of resources over and over again.

Both sufficiency and efficiency have a limit in time-perspective, since population growth would offset the results at a certain point in time.

The combination of both strategies would increase the length of time in which the industrial system will be sustainable, but it would not be sustainable in a long-term perspective. Furthermore, businesses do not agree with the sufficiency strategy of limiting production and consumption.

The problem derives from the fact that the greater the population quantity, the greater will be the environmental impact. Sufficiency and efficiency can't cope with a constant increase in population quantity and a necessary production and distribution on a global scale.

For this reason, *consistency* (Huber 1995)¹⁶ needs to be adopted by companies to go beyond by implementing a **qualitative** change of the industrial system and by transforming the current approach of products and technologies. The strategy would allow for a constant turn-over of resources stream on a mass distribution.

The core meaning refers to the total compatibility and coherency between industrial and natural systems, either by creating closed loops or technological cycles, or by integrating the processes together with the resources natural flows.

The main difference with the other strategies is that while sufficiency deals with conservation of nature and efficiency with improving present technologies, the consistency strategy points at innovation of new technologies, processes and products which generate a qualitative change of industrial mechanism.

Anyway, the magnitude of this type of changes cannot be bear by a single company, but rather by a cooperation of governments, researchers and companies. Moreover, as with any type of change, disruption is part of the outcome that will lead to economic and social conflict, creation of new skills, capabilities and know-how and destruction of the older ones.

Transformational strategy	Principle	Limits
<p><i>Sufficiency</i></p> <p>Psychological shift of consumption patterns and conservation of natural resources</p>	<ul style="list-style-type: none"> • Reducing resource impact on the environment • Modify consumption behaviour and change of non -sustainable activities • Define how much is <i>enough</i> 	<ul style="list-style-type: none"> • Modern utilitarian society attitude and consumer behaviour • Actual definition of consumption in economic and moral terms

¹⁶ “Towards Industrial Ecology: Sustainable Development as a Concept of Ecological Modernization.”

<p><i>Efficiency</i></p> <p>Reduction of waste and resource consumption per unit of output while improving technological efficiency</p>	<ul style="list-style-type: none"> • Creation of new product-costumer systems • Improving efficiency of resources usage and energy and water consumption • Environmental Management system improvement • Reducing material usage per unit of production 	<ul style="list-style-type: none"> • Constant increase of demand and population growth • Lack of know-how about the majority of the inefficiencies
<p><i>Consistency</i></p> <p>Integration of industrial processes with the natural system and change of technological pattern</p>	<ul style="list-style-type: none"> • Creation of an industrial ecology • Circular economy grounded on pure energy • Complete substitution of non-renewable resources • Energy and materials flows in defined technological cycles 	<ul style="list-style-type: none"> • Economic rather than technology creates barriers to closed-loops • This principle entails a close cooperation between organization and governments • Creation of conflict from this new type of disruptive innovations

Figure n.1: “Transformational strategy in a nutshell”, Source: Ludeke-freud 2010, Huber 2000

These strategies support sustainable development, but they must be combined to create a lasting change. In order to be effective, efficiency must be coupled with sufficiency and consistency to create radical rather than incremental changes.

Indeed, the properly strategy should comprise an objective which represents long-term consistency while using mid-term efficiency and respect the limits imposed by sufficiency.

2.6 Sustainable Business Model

The theoretical conception of a sustainable business model has still not been clearly defined. Schaltegger & Wagner (2006¹⁷) define a case for sustainability as the integration of environmental and social issues in the core business of the organization.

The challenge is to create a sustainable business model which does not only comply with standards, but that creates a competitive advantage.

The body of literature explores different type of concepts on the matters: conceptualization of a sustainable business model (Stubbs and Cocklin 2008¹⁸), business models for sustainable energy (Wüstenhagen & Boehnke 2008), identification of new sustainable business models in

¹⁷ Schaltegger, Freund, and Hansen, “Business Cases for Sustainability.”

¹⁸ Stubbs and Cocklin, “Conceptualizing a ‘Sustainability Business Model.’”

China (Birkin et. all 2009) and Innovative business models for a clean tech economy (Johnson & Suskewicz 2009). All of these studies use business model as unit of analysis, but the focus still remains on general managerial practice.

On the other hand, ‘New Business for Old Europe’, written by Tukker and Tischner (2006), explores the sustainability-oriented business model innovations, based on the potential of value proposition and product-service systems, that create competitive advantage through social and environmental benefits.

The aim of the article is to verify that companies can solve or tackle sustainability issues through innovative value propositions and consequently radical business model innovations.

A sustainable business model can be described as “a business model that creates competitive advantage through superior customer value and contributes to a sustainable development of the company and society.” (Ludeke-Freund, 2010¹⁹).

From Stubbs and Cocklin(2008) perspective, a sustainable business models entails a systems at the firm-level perspective, constructed on the triple bottom line approach to state the purpose of the firm and its performance, including stakeholders, of which environment and society are part.

Moreover, an organization that implements an SBM creates internal structural and cultural capabilities to obtain a firm-level sustainability and engages stakeholders to achieve sustainability throughout the entire system. (Stubbs and Cocklin, 2008²⁰).

Boons and Ludeke-Freund (2013) provides a systematic model through which business model can be changed and modified to allow sustainable innovation to succeed:

1. *Value proposition*: it is a useful tool to measure the degree of ecological, social and economic value.
2. *Supply-chain*: concerns the integration of suppliers who take responsibility towards the company’s stakeholders. In order to achieve this, suppliers must be engaged into sustainable supply chain management.
3. *Customer interface*: involves customers into taking in consideration their consumption patten and the company’s stakeholders.

¹⁹ Lüdeke-Freund, “Towards a Conceptual Framework of Business Models for Sustainability.”

²⁰ Stubbs and Cocklin, “Conceptualizing a ‘Sustainability Business Model.’”

4. *Financial model*: concerns the allocation of economic costs and benefits across the business model. (Maas and Boons, 2010²¹).

Moreover, the author identifies, leveraging from Rennings' studies, three main drivers which can boost the creation of eco-innovations: technology push, regulatory pull and push and market pull. The last is the driver which can be identified as business model innovation, and all of three urge for eco-innovations such as renewable energy or water consumption efficiency.

The theory supports that business model management can help in the implementation of sustainable innovations or become itself the innovation.

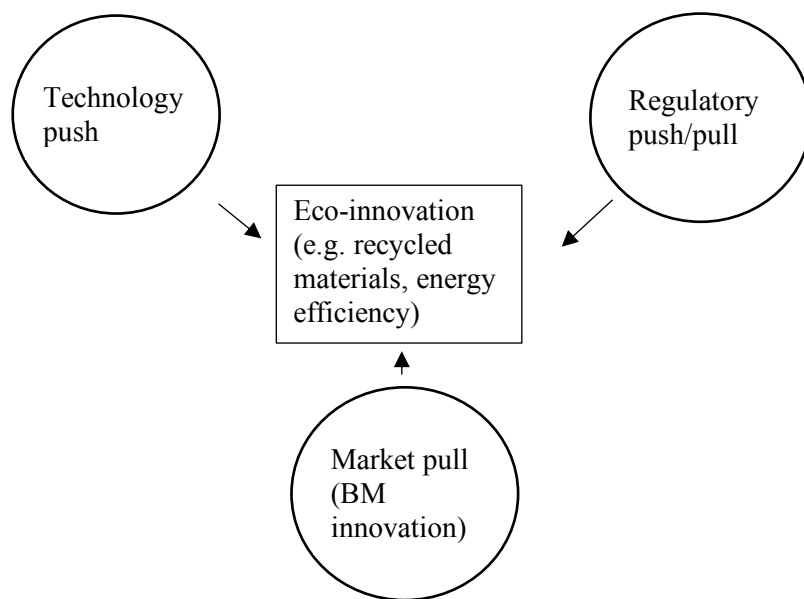


Figure n.2: “Eco-innovations drivers”, Source: Ludeke-freud

As Zott and Amit (2007) theorized, business models may be modified towards any type of “design theme”, which it will be, in the case of business model for sustainability, the sustainability strategy.

An overall definition, proposed by Schaltegger, Hansen and Ludeke-Freund²² (2012) states that:

“A business model for sustainability helps describing, analysing, managing, and communicating a company’s sustainable value proposition to its customers, and all other stakeholders, how it creates and delivers this value, and how it captures economic value while

²¹ Boons et al., “Sustainable Innovation, Business Models and Economic Performance,” April 2013.

²² Schaltegger, Freund, and Hansen, “Business Cases for Sustainability.”

maintaining or regenerating natural, social, and economic capital beyond its organizational boundaries.”

From Lozano²³, a sustainable business model utilises a triple-bottom line approach to evaluate performance, regards stakeholder’s needs rather than expectations, considers environment as a stakeholder and covers equally the system and firm-level perspectives.

Moreover, adopting a sustainable business model requires that organizations create internal structural and cultural capabilities to obtain sustainability at the firm level and to join forces with key stakeholders to achieve sustainability at the system level.

2.7 The transition from Linear Business Model to Sustainable Business Models

The transformation from BM to SBM is not effortless. Changes must be implemented across all the steps of the value chain, from shareholders and suppliers to distributors and consumers. Different perspectives have been implemented by several authors and theories.

Bocken, Short, Rana and Evans (2014)²⁴ propose eight SBM archetypes, grouped in three categories:

- I. **Technological:** reduce energy and material waste and utilize renewable product and process;
- II. **Social:** increase sufficiency and deliver functionality;
- III. **Organizational:** changes the firm purpose towards society and environment.

These archetypes cover the business model concept under the resource-efficiency theory, by maximizing assets utilization with minimum waste of resources expenses.

According to Abeldasky (2016) an SBM encompasses four different models, specifically: the firm, the environment, the decision-maker and the customer. To all these four models, the firm provides value. This view addresses internal and external stakeholders, through the decision-maker and customers models, management and strategy theory.

²³ Lozano, “Sustainable Business Models.”

²⁴ Bocken et al., “A Literature and Practice Review to Develop Sustainable Business Model Archetypes.”

Roome and Louche (2016)²⁵ state that SBMs are the product of the relations and interactions between individuals inside and outside the company, based on three sections: creating networks for learning and action for the new vision, exploiting new business concepts taken from outside the company and developing a new structure accordingly to the reconfigured network.

Technology, product and process innovations are not the only and most useful means through which achieve SBMs, business model innovation itself is the most efficient way to accomplish it. (Yang et al. 2017²⁶).

The transition should start from the root of the BM definition, that is the relationship and exchanges with stakeholders. These connections determine the way a firm is structured and governed, reason for which the firm's behaviour changes as the relations with stakeholders' changes. (Perrini and Tencati, 2006).

Stakeholders have been categorized by Clarkson (1995) in three levels: primary, of which the participation is essential for the firm to function, secondary, which are not directly engaged in the firm work and public, which constitute an external support to the firm. At the top of those, society and nature should be treated as equal stakeholders in order to boost the BM transformation into SBM.

Co-creation of value is a fundamental aspect for the outcome of an efficient sustainable business model, the company must indeed be able to create value for itself, the customer and the public. Therefore, creating positive externalities (public), creating value for itself (customer equity) and generating value for the individual customer (customer value).

For this reason, business models for sustainability should develop strategic value propositions and value capture approaches well combined with sustainability business-oriented strategies²⁷.

Sustainable business model can be efficient only if eco-innovations are marketed in the right way, in order to promote life-style changes and capture customer value thanks to the alternative strategic logic.

²⁵ Roome and Louche, "Journeying Toward Business Models for Sustainability."

²⁶ Evans et al., "Business Model Innovation for Sustainability," 2017.

²⁷ Bocken et al., "A Value Mapping Tool for Sustainable Business Modelling."

2.8 The importance of marketing in eco-innovations implementation

The purpose of sustainable business models, as the co-creation of value for public benefits, i.e. society and environment, and private benefits, i.e. customers and firms, may be limited by the missing compensation for the reduction of negative externalities or the creation of positive ones. As private benefits, the most important one for firms is customer value, which is the strategic core of a business model. In business model for sustainability, this capability is complemented with the sustainability-oriented value proposition.

Thus, as Meynhardt and Stock (2009)²⁸ identifies, to increase awareness about society and business inter-relations and environmental concerns, marketing is the tool to combine public and customer value. Indeed, business model eco-innovations, when marketed and transferred in the right manner, can provide competitive advantage thanks to extended customer value.

The concept of *extended customer value* covers four main way of value creation which are important for the potential impact of the business model:

- Value creation for the customer and the company.
- Value creation for the public and the company.
- Value creation for the public and the single customer.
- Value creation for public, customer and the company.

Developing marketable eco-innovations and actually creating value can realize transformational strategies for sustainable development. Anyway, in order to be effective, sufficiency, efficiency and consistency oriented eco-innovations must be marketed in the right way.

One of the purposes of business model for sustainability is to provide innovative value propositions based on eco-innovations to overcome competition, by leading customer to increase their willingness to pay premium price and increase customer demand.

Sustainable innovations not only have to fit with the business model but also must provide an economic turnover and help in some way to solve environmental problems.

As Ludeke-Freud explained in his research, the development of marketable eco-innovations (i.e sustainable products), should help, on one hand to overcome the barriers of sustainable strategies through the three transformational strategies, on the other the right marketing strategy should increase the financial aspect and the value proposition of the company. Together, they

²⁸ Meynhardt, "Public Value Inside."

create extended customer value that generates market pull for further creation of eco-innovations.

Thus, the ability to inform customers in the proper way will boost sustainable development and company's value.

3. The apparel industry

3.1 Overview

The apparel industry, by definition, is the sector composed by footwear, accessories and clothing companies.

The footwear and apparel sector is one of the fastest-growing of the century, with a projection of growth equal to 1,5 trillion dollars. The demand for apparel and footwear product has radically increased over the past few years, mainly in Europe, U.S.A and China.

In the next chapters, Nike Inc, Adidas AG and Puma SE will be analysed in further details. These three companies belong to a specific segment of the apparel sector: the footwear market. This market comprises shoes, sneakers, athletic footwear and related goods. The main materials used in the manufacturing are leather, textile and a range of synthetic materials.

The footwear industry has changed over the past few years, becoming not only a pure necessity for sports reasons, but rather playing a central role in expressing the customer personality.

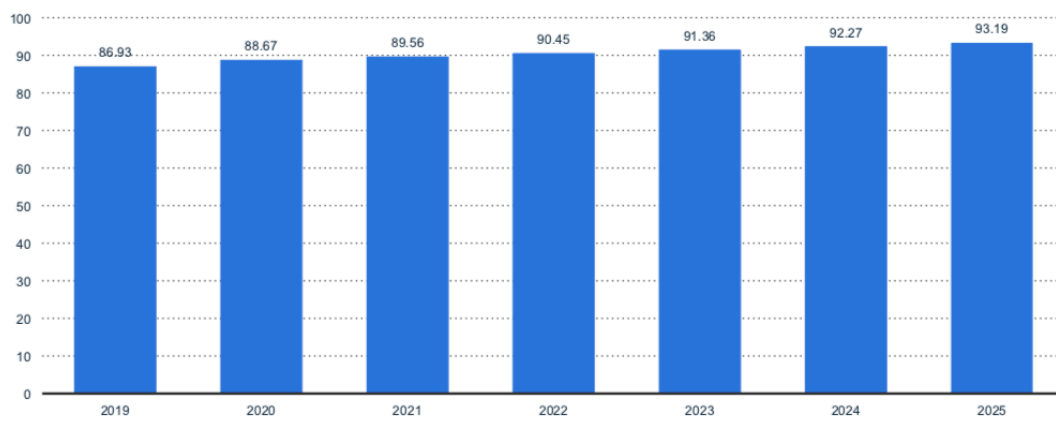
Moreover, the industry has been exposed to an increase awareness of customer about eco-friendly product and the impact of manufacturing and of disposal of the products, resulting in a customer segment searching more and more for products that meet environmental standards.

3.2 Market analysis

The footwear segment, athletic footwear in the specific, is very competitive, with numerous different brands worldwide. Moreover, the pace of technology and innovation is increasing rapidly, creating both risk and opportunities for the companies. The main issue for the companies relies in the ability to be able to forecast and predict customer preferences ahead of time.

The footwear market is composed by numerous small and medium-sized brand manufacturing and retailers. Few well-established brands lead the market, such as Nike Ink., Adidas AG, Puma SE, New Balance Inc. and Under Armour.

As we can see from the graph below, the global footwear sector is expected to grow at a rate of 3,44% (CAGR) from 2018 to 2023.

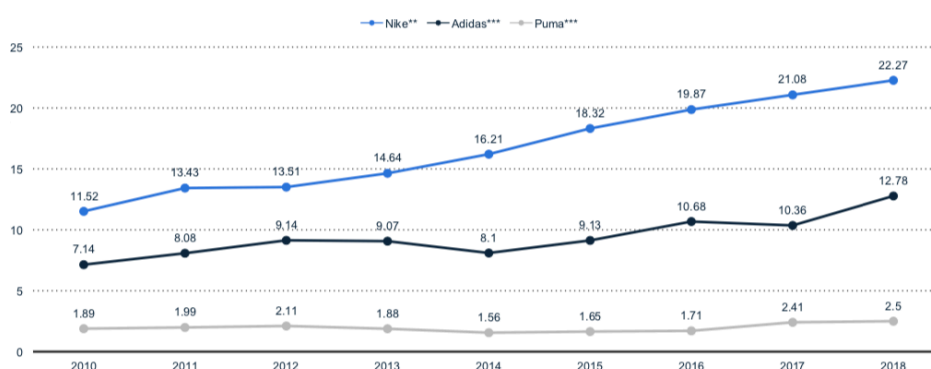


Graph n.1, “Worldwide size of the footwear segment”, Source: Statista 2020

By comparing the three main players in the industry, it can be deduced that from 2010 to 2018 there has been an overall increase in the market resulting in an increase in revenue.

Nike Ink remains in the head, with an overall revenue of 22,27 Billion \$ in 2018.

This sharp increase is due to the increase awareness of customers of unhealthy situations and their consequences, creating a boost of fitness activities and, as a consequence, the demand for appropriate footwear shoes and piece of clothing.



Graph n.2, “Revenue increase 2010-2018”, Source: Statista 2020

The main challenge of the industry concerns the availability of raw materials. Cotton is, and has always been, the primary resource for the textile sector. Nowadays, due to the high tension created by the supply side, there may be several problems in satisfying the extremely growing demand of the sector²⁹.

World production of cotton fibre is expected to increase by 16% by 2028 (OECD-FAO Agricultural Outlook 2019-2028³⁰).

²⁹ Rana et al., “Carbon Footprint of Textile and Clothing Products.”

³⁰ OECD and Food and Agriculture Organization of the United Nations, *OECD-FAO Agricultural Outlook 2019-2028*.

Anyway, the consumption of the same is expected to grow even more due to the increase of income per capita and climate change is a further risk for the future production of cotton fibre.

3.3 Sustainability in the apparel sector

Sustainability in the apparel, fashion and footwear sector has been called with different names, such as green, ethical and sustainable fashion, but the meaning remains the same.

Sustainability in the apparel sector does not mean a single aspect, but a range of particular aspects which touch several broader areas: social compliance and healthy environment, quality and safety of product, marketing, human resources and financial aspects.

Anyway, sustainable development still remains the same, and it involves three part: environmental, economic and social aspects. (Elkington, 1997).

The definition in practice means that fair work is adopted by all the supply chain, that products are made with recycled or organic materials, pollution and waste reduction and transparency towards customers and stakeholders.

Sustainability has become a trend and a source of competitive advantage rather than pure necessity, and a multiplicity of apparel brands have introduced initiatives to promote the use of organic and recycled cotton and polyester as well as cutting-edge technology to reduce environmental harm.

The sustainability trend which has impacted the apparel industry has changed the industry perception towards more strategic partnership rather than opportunistic relationships, and to a more collaborating rather than competitive industry point of view.

In the last years, companies have started analysing the level of social and environmental responsibilities which is incorporated in their value proposition and business model.

This necessity to be greener not only is realized to protect environment, but also for the increased value and profitability generated from the perception of a more ethical and responsible company.

Being able to communicate the efforts to customers and stakeholders through transparency is fundamental to engage them in the process.

3.4 Co-operating for a better future: Sustainable Apparel Coalition (SAC)

As previously explained, the recent trend towards a more sustainable future has impacted deeply also the apparel industry, generating a various number of coalitions, partnerships and unions to boost the sustainable development of the companies by collaborating instead of competing.

For example, the Sustainable Apparel Coalition or SAC, is the leading alliance in the apparel, footwear and textile industry (apparelcoalition.org³¹) created in 2010 by global sustainable leaders in the apparel and footwear sector.

The SAC is a trade organization composed by brands, retailers, manufacturers, governments and non-governments organizations as members, who together represent more than one third of the global apparel and footwear industry (Radhakrishnan, 2014³²).

The aim of the union is to address the urgent challenges that the world is facing right now, by promoting transparency, improve sustainability performance and achieve environmental and social standards. The vision anchored in this partnership is to create a footwear, textile and apparel industry that creates no unnecessary harm to the environment.

In order to accomplish their mission, the coalition has created a common tool, the Sustainable Apparel Index, able to assess the impact of the entire supply chain of apparel products.

For this reason, they want to share all the information regarding the life-cycle of a product. A product has been defined as eco-friendly when it is produced, used and disposed in a way that reduced or eliminate environmental harm.

The purpose is indeed twofold, that is formulating plans to reduce environmental impact and damage and develop an assessment tool to evaluate the magnitude of a product's environmental harm.

3.4.1 The Higg Index

The Higg Index is a tool used to assess a product's sustainability, which is connected to the entire supply chain of a product, from its manufacturing to its disposal.

The Index was developed based on a different tool created by Nike and Outdoor industry association, the Apparel Environment Design Tool and Eco Index.

In 2013, SAC realised the Higg Index 2.0, based on a range of different tools already in use, such as the Eco Index and the Nike's apparel Environmental design tool, to create a standardized method to measure and evaluate environmental performance of apparel products.

³¹ "Sustainable Apparel Coalition."

³² "The Sustainable Apparel Coalition and the Higg Index."

The tool is based on life-cycle analysis, evaluating impacts and improvement across all the supply chain, except from retailing (SAC 2012³³). The Higg Index provides an important means for companies to detect opportunities for improvement and recognize the several facet of environmental sustainability.

The Higg Index is composed of three different tools: facility, brand and product tools.

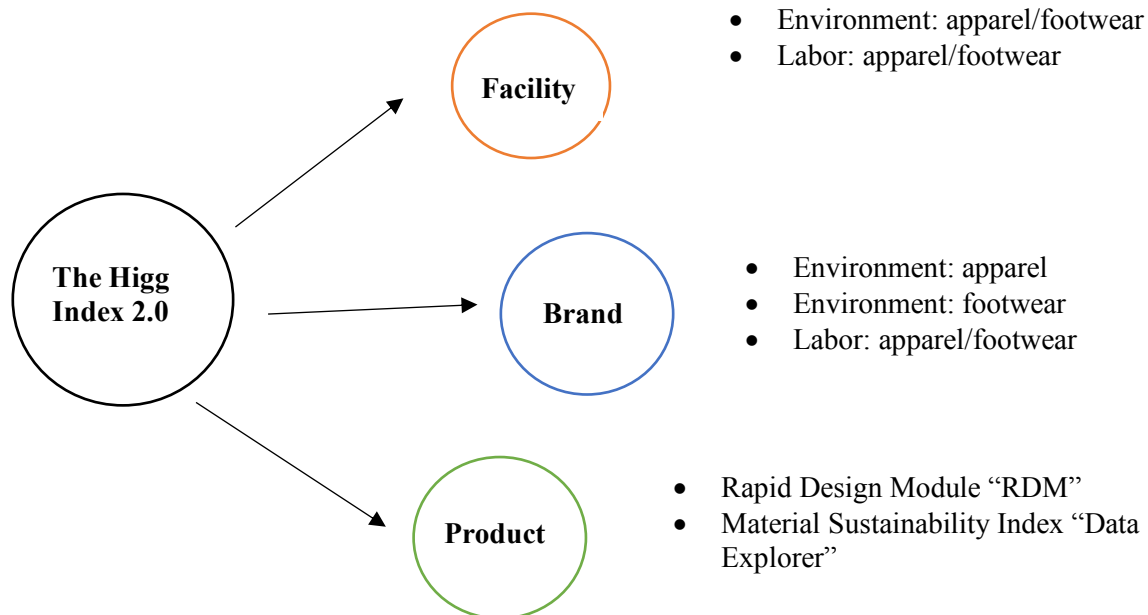


Figure n.3: “The HIGG Index”, Source: Sustainable Apparel Coalition 2020

As explained in Figure n.3, the Higg Index has three specific modules, and each of them deals with specific aspects of environmental and social issues.

3.5 The impact of the apparel & footwear industry

The apparel industry is strictly correlated with the textile industry, which prepares the material for the apparel sector to create products able to meet the desire of customers.

Both industries are blameable for high consumption of water, energy, chemicals and overexploitation of resources. On a worldwide basis, the industry accounts for 8% of the GHG emission. (Quantis, Measuring Fashion: Insights from the Environmental Impact of the Global Apparel and Footwear Industries study, 2018).

The apparel and footwear sectors are responsible for damaging the environment in different steps of the production life-cycle. Indeed, the industry depends on several manufacturing processes, thus creating a highly fragmented supply chain and a huge sustainability challenge.

³³ “Sustainable Apparel Coalition.”

The different steps of an apparel footwear product create unique environmental problems:

Lifecycle phase	Environmental Impact
Resources and raw materials	Resource consumption, GHG emissions, air and water waste, land use, solid waste
Fibre production	GHG emissions, air and water waste, land use, solid waste
Clothing/footwear production	GHG emissions, air and water waste, land use, solid waste
Packaging	Solid waste
Distribution	GHG emission
Retail	Solid waste
Use	Resource consumption, solid waste

Figure n.4: “Impact of the apparel industry”, Source: Radhakrishnan, 2014

As for the first stage, the most common materials used by the sector comprise natural fibres such as cotton, and synthetic fibres manufactured from petrochemicals. Polyester is the most used chemical material in apparel and footwear products, composing the 60% of the apparel clothing and footwear, which, besides being a cheap solution, has a manufacturing process which is highly pollute and it is hard to recycle.

In particular, the process of dyeing and finishing phases are one of the major contributors in climate change.

Indeed, researchers found out that 50% of GHG emissions derives from three crucial phases: fibre production accounts for the 15%, yarn preparation for the 28% while the biggest impact lies in the dyeing and finishing processes that accounts for 36% of the emissions. (Quantis, 2018).

Moreover, the current apparel production and demand is generating an increase in the request for fibre that results in a greater amount of textile waste.

A research made by Lenzing (2016), estimates that in 2016 the amount of fibre produced reached 99 million tons, most of them synthetic (62,7%) and other cellulosic and protein (24,3%).

Indeed, only 1% of the material used for apparel and footwear products is recycled and used for new products, while 87% of the input sources are landfilled.

On a global scale, only 25% of the piece of clothing and shoes are accumulated for reuse.

The materials that are not used for recycling often end up in the ocean, such as acrylic, polyester and nylon, that have been identified as the major problem of ocean pollution.

Water usage has reached 93 million cubic meters per year, equal to 4% of the global potable water.

3.6 Challenges for the textile and apparel industry

Organizations in the industry are still creating value based on the almost obsolete linear business model.

Anyway, the “take, make, dispose” model does not apply for the changes needed to address the environmental challenges the world is facing.

Changing the current business model for a sustainable one is a big step forward and a research made on the apparel industry in Europe, that can be applied worldwide, identified three innovation trends that will encompass the industry in the next years³⁴:

1. product, process, retail, packaging, consumer use and interaction will be more **digitalized**;
2. increasing **transparency** in supply chain stages to meet environmental goals and lead organizations exploit resource in a more efficient and sustainable way;
3. the creation of **new value proposition** based on **innovative and sustainable business model** inspired by the circular and sharing economy.

All the counter-productive negative effects created by production of apparel products could be solved or partly-solved by transforming the linear model in a sustainable one.

The speed and difficulties to be overcome to transition from one model to another depends on knowledge, degree of engagement of stakeholders and awareness.

Different challenges refer specifically to the apparel industry, such as decreasing material waste, use of energy, toxic materials and maximization of resources by enhancing the possibilities for recycle.

Minimization of waste across the entire life-cycle is one of the main challenges the industry has to overcome to renovate the business model.

Most of the problems arise during the design stage, which comprises almost 80% of the environmental impacts.

³⁴ Koszewska, “Circular Economy — Challenges for the Textile and Clothing Industry.”

The fibre and materials used for product manufacturing does not fit with the circular and sustainable business model concept.

Despite the direct waste created by the industry, the linear model creates environmental problem due to consumer purchases at the end of the product life-cycle. The current capitalist society is based on buying more than what actually is used, and product are even used less than what they can actually endure.

There are three main characteristics to be modified in the current model in order to change it:

- *Minimize waste*: the apparel sector, in order to achieve an SBM, should aims at reducing economic activities impact concerning GHG emissions and solid substances.
- *Retain product in use*: designing a product of which materials and components can be durable and re-usable.
- *Creation of renewable systems*: avoid the use of non-renewable materials and benefit from renewable energy sources instead of carbon fossil.

Even if companies in the industry are heavily investing in innovations across all the supply chain in order to meet the necessary environmental standards, as World Economic Forum stated in 2010, the current trends are inefficient, because the focus remains on incremental rather than radical transformation. The only way to efficiently reduce environmental damage is to change the current unsustainable business model.

Multiple-case study: moving towards SBM

4. Nike Inc. overview

Nike Inc. is an American multinational company founded in 1971 based in Beaverton, Oregon. The company engages in the design, development and manufacturing of footwear, apparel and accessories and it is the largest supplier of sport shoes and apparel.

The Nike purpose is to *unite the world through sports to create a healthy planet, active communities and an equal playing field for all.*

Nike Inc. owns three major brands, including Nike, Converse and Jordan brands.

The Nike brand offers six different product categories: running, basketball, Jordan brand, football shoes, training and sportswear.

Innovation and transparency are at the heart of Nike strategy and vision, boosting the research and development department in order to achieve the best product.

Nike has 78,000 employees working world-wide with a total revenue for footwear and apparel products of 35,772 billion US\$ (Statista, 2020).

Despite being born as an apparel company with the aim to progress sports, during the recent year Nike has changed its mission and purpose to help protect the sport itself and the environment.

In 2019, Nike invested more than 81\$ million to impact the worldwide community.

As a target, Nike is evolving and leaning towards a manufacturing process that uses 100% renewable energy and 99,9% of the material has been recycled and transformed into energy.

Nike is one of the leading companies in the apparel industry, a position gained in time by using a strong marketing approach and creating strong relationships with famous athletes³⁵.

Nike shoes and apparel products are not produced internally since the company outsources the production to several independent factories present in 13 countries worldwide, mostly outside of the United States.

For footwear products, the company mainly uses natural and synthetic rubber and leather such as nylon and polyester, and polyurethane films used to make the cushion of a particular type of sports shoes.

³⁵ Mahdi, Abbas, and Mazar, "A Comparative Analysis of Strategies and Business Models of Nike, Inc. and Adidas Group with Special Reference to Competitive Advantage in the Context of a Dynamic and Competitive Environment."

Nike markets are divided in four main divisions: North America, EMEA, China and APLA. During the last decades, Nike Ink. has focused all its activities towards the minimization of its environmental footprint, the quality of its products and the satisfaction of customer needs. As for November 2019, Nike finished goods are made in 41 countries by 533 different companies, while materials are processed in 11 different countries by 78 facilities. External manufacturing can seem like a lack of control, but Nike carefully selects its suppliers and raw materials thanks to a global procurement team which decide for the right manufacturer and resources. In 2015, Nike opened one of its biggest logistic centres in North America, Tennessee, which manages all three line of product of the company, footwear, apparel and equipment, to be delivered either to distributors or directly to final customers. Following LEED certification, Nike ensure high cost efficiency and sustainability standards, which are then spread to Europe thanks to the four logistic hubs in Belgium.

Almost 50 years ago, Nike has been accused of using sweatshop and of labour slavery. Since then, Nike core business changed directly towards the achievement of an ethical and environmentally friendly supply chain.

This has been achieved thanks to a Code of Conduct delivered to all the suppliers which they must follow both internally and when purchasing materials from other facilities.

4.1 Innovation at Nike: incremental or radical?

Since 1977, Nike decided to shift its core proposition towards the pursuing of a sustainable development and the complete control of their activities' impacts on the environment.

Anyway, innovating in order to reduce environmental damage might not be enough in order to maintain a sustainable development in the future.

Radical innovations are needed in order to change the linear business model and transform the way companies do business³⁶.

4.1.1 Nike Grind

In 1993, Nike started the **Nike Grind Program**, based on the idea of re-using materials and avoid waste. Nike Grind materials are produced with the surplus of recycled manufacturing materials and excess of athletic footwear. All the different substances, from rubber, fibre and

³⁶ Boons et al., "Sustainable Innovation, Business Models and Economic Performance," April 2013.

leather, are divided from each other and grouped, in order to obtain a recovered one-type material.

Subsequently, the materials obtained, which are high-quality, are used to create different type of surfaces, that range from football fields to basketball stadiums and gym flooring.

The program has the same goal of **Reuse-a-Shoe** program, which has been implemented with NRC (National Recycling Coalition), a non-for-profit organization collecting the materials to be re-used. Nike then transports the material to the recycling facilities, which extract three main parts: rubber, foam and the “fluff” from the upper layer.

These three materials are then processed together with other companies, such as Ecore and Playtop, and used to construct sporting fields.

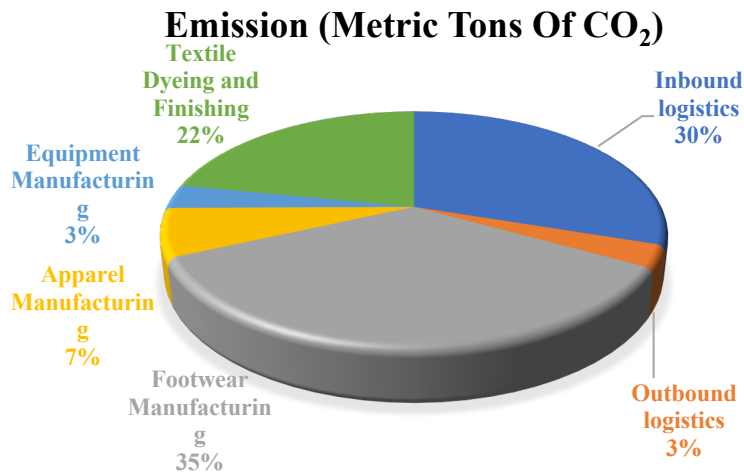
The purpose of the project is undeniably to reduce waste to landfill, but its effectiveness has to be analysed. First of all, the material used for the sporting field are indeed re-entered in the supply chain instead of becoming waste. The toxicity created on the environment by landfill waste, such as groundwater and soil contamination, are surely reduced by Nike Grind programme, increasing Nike environmental performance.

Anyway, transportation of the recycled materials from the collection points to the recycling facilities generates greenhouse emissions that before were not created. The distance is also huge, since the facilities are based only in USA and materials are arriving from all over across Europe and USA. Moreover, shoes are collected from shops all over the country not from a single point, thus creating environmental impact due to track transportation which would diminish the overall effect of Nike Grind initiatives.

The CDP (collection/delivery points) transportation process anyway has been proved as one of the most effective in reducing the numbers of trips.

As for year 2019, inbound and outbound logistics still accounts for the 33% of the total CO₂ emissions, when compared with footwear, apparel and textile manufacturing and textile dyeing and finishing (Nike FY19 Impact Report³⁷).

³⁷ Koszewska, “Circular Economy — Challenges for the Textile and Clothing Industry.”



Graph n.3, “Energy and Carbon emission”, Source: FY19 Nike impact report

As a matter of fact, the initiative itself creates means for downcycling the materials of a product to produce another with rather less value than the first one. This process should be used when all the other options of circularity and recycling are not available.

Also, the program could achieve greater potential if extended worldwide, but without overexploiting sea and plane ways of transport that are the most polluting ones.

4.1.2 Scaling sustainable materials

Overall, since 2018 the use of sustainable materials increased of 20,6% in the apparel, while in the footwear segment, the use of sustainable resources has decreased from 32% to 30%.

Renewing and innovating materials is an important and necessary step in order to reduce carbon emission, 25% of which are mainly generated by the processing of five materials: polyester, EVA, rubber, leather, and cotton.

Starting from 2010, Nike began to transform plastic bottles into recycled polyester to be used for the production of apparel and footwear. As in Year 2019, Nike transformed almost 1 billion plastic bottles in polyester. **Converse’s Renew project** is one of the type of shoes which are manufactured with recycled polyester, made from PET canvas. Each pair of shoes requires a number of 11 plastic bottles, together with upcycled textile and recycled cotton canvas blends. Not only plastic bottles are removed from landfill, but this process reduce further carbon emission which will be created when using conventional polyester. It has been measured than in 2019, 28.000 metric tons of CO₂ emission were avoided.

In 1993, Nike started its journey against regular cotton usage. Cotton is one of the materials that requires more water consumption: it is needed 10,000 litres of water to make 1 kilogram of cotton and hazard pesticides used in the production are usually found nearby water resources (WWF).

As for year 2019, the use of Better cotton, recycled or certified organic have reached 86% of the total usage of cotton in the production of apparel and footwear.

Nike is an active and important member of the SAC and for this reason materials employed in the production are assessed using the Material Sustainability Index (MSI).

To produce shoes and apparel, of which each product can contains up to 30 different materials, Nike analyses the MSI in order to compare the different materials' impact and understand which of them are the ones with less environmental impact.

4.1.3 Move to Zero

In 2019, Nike started to operate towards a well-defined goal: move to zero. This sentence means being able to produce products with zero waste and zero carbon emission, guided by Nike vision of protecting the future of the world and of the sport. Move to Zero has been developed to minimize environmental footprint generated by the company and to improve the positive impact as a brand.

There are five main goals that Nike aims to reach:

- operate its facilities with 100% renewable energy by the year 2025,
- reduce by 30% carbon emission across the global supply chain,
- transform 99,9% of all the waste related to footwear and apparel manufacturing,
- re-use over 1 billion plastic bottles to be diverted into sneakers and jersey,
- upgrade the Reuse-a-shoes and Nike Grind program.

From 2015 to 2019, the use of renewable energy in the factories increased of 93%, reaching an overall percentage of 27% of all the energy used by the company. Even though the trend demonstrates a huge step forward, reaching the 2025 target will require a radical change of operations. In 2020, an PPA (power purchase agreement) has been made with Iberdrola Renewables that will create 100% renewable energy able to operate al the European energy consumption.

The textile dyeing and finishing phase is the stage which uses the greater quantity of energy, which is now covered only by 12% of renewable energy.

Carbon emissions is another issue that Nike is actively trying to tackle in order to reach its goal. One of the several means of transport used by the company is air transportation, that produce 42 times more carbon emission than sea freight. For this reason, Nike started to cooperate with Sustainable Air Freight alliance, which promotes responsible transportation.

Despite an energy consumption reduction of 15% per square foot, the total fuel consumption and emission of CO₂ increased of 10,65% in 2019.

Waste is a further challenge for Nike, especially in the modern world in which the demand for product has increased in quantity and speed creating supplementary problems to reduce waste. The amount of waste per unit produced has increased of 8% in 2019 with respect to the trend FY15-FY18, mainly due to the manufacturing of the sole of a particular type of shoes. The materials used are EVA, phylon and rubber, which represent 30% of manufacturing waste. Thanks to an implementation of Nike design guidelines towards its contractors, phylon waste per pair decreased of 11% in FY19.

Another 27% of footwear manufacturing waste is generated by leather (both synthetic and non) and textile. One way to reduce partially the unused has been the installation of modern cutting machines which, thanks to the improved precision, can reduce gaps between parts cut from the materials.

Waste creation does not derive only from manufacturing processes, but also from distribution and packaging practice. Cardboard carton represents 85% of the waste generated in the distribution centres.

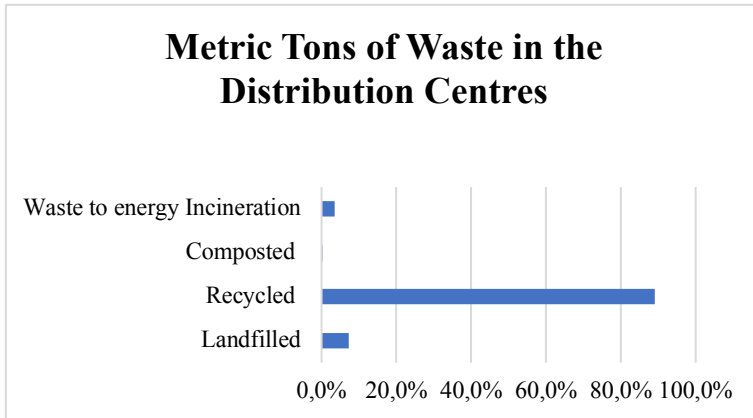
For this reason, a Reuse-a-box program has been implemented, to reuse carton for outbound shipments, in several distribution centre such as in the Japan one.

In the EMEA region, a new box design has been introduced for e-commerce footwear delivery, which has 50% less carbon footprint than the ones used in the previous year.

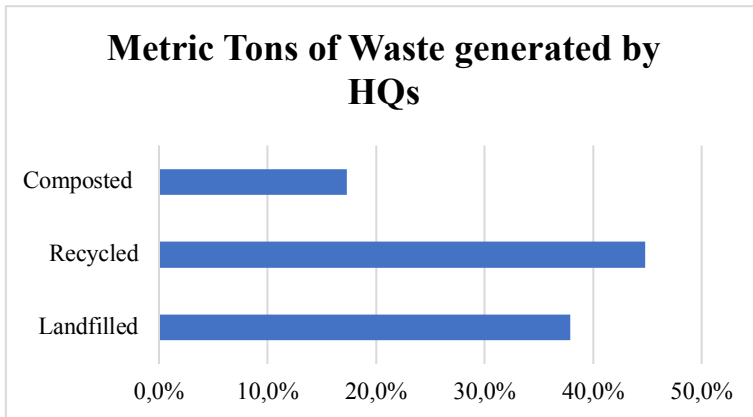
For apparel, the end-of-life stage of the product has been reinvented towards the Shirt-to-bag program which transforms apparel into bags made by 100% polyester that can be further bought on the website.

Waste not only occur in the supply chain but also in the HQ worldwide, where Nike have started initiatives to teach employees sustainable practices to increase awareness, which generated a 7% decrease of waste per occupant.

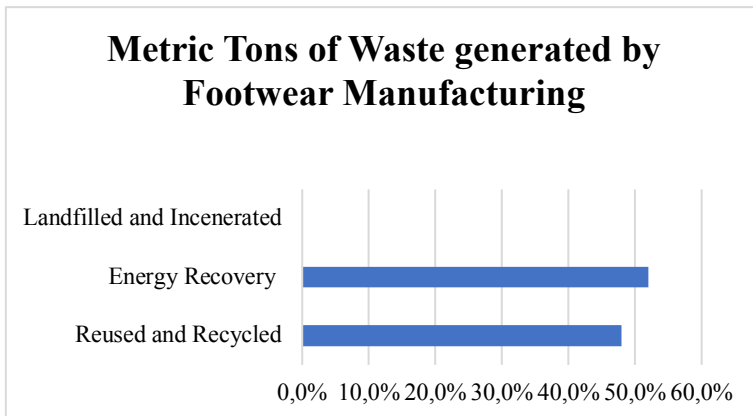
The following graphs show the percentages of waste generated specifically by Distribution Centres, Head Quarters and Footwear manufacturing:



Graph n. 4, “Waste generated by distribution centres”, Nike Impact Report FY19



Graph n. 5, “Waste generated by HQs”, Nike Impact Report FY19



Graph n. 6, “Waste generated by FW manufacturing, 2019”, Nike Impact Report FY19

As we can see for the graphs, the main percentage of waste is recycled for other use, even if the overall quantity of waste generated by the company increased by 7,7% in the footwear manufacturing process since 2018.

4.2 Towards circularity

Achieving circularity and long-lasting products is not an easy transformation and it entails a strong collaboration between all the parts of the supply chain.

Cyclability, material design, circularity model, green chemistry and durability are all fundamental pillars to be innovated in order to create a sustainable business model aimed at the circular economy.

The design and materials choice of the product is the initial critical stage above which all the next phases rely on.

Considering that energy, waste and chemistry materials account for 60% of the total company impact, there are a huge number of questions to be posed when innovating for new materials, such as how to use recycled materials instead of virgin or how to incorporate natural fibres with other materials.

Flyleather shoe is one of the most sustainable Nike's products, made by 50% of leather manufacturing waste that would have gone otherwise to landfill. Thanks to the use of recycled materials, the production of the shoe generates lower carbon footprint and, due to the cut and roll method, also waste is radically reduced.

Nike Air Sole is one of the most innovative Nike's products, which consists of pressurized air inserted inside a flexible bag called air sole unit. Since 1990, the manufacturing waste generated from the production of Air sole unit has been reused in each pair of shoes, by putting the materials back into machines and processes so they can be used further.

This process allows for 90% of the materials to be reused and to avoid waste to landfill.

Vapormax Random are a pair of shoes made with unused yarn derived from the manufacturing of others Nike product. The name "random" derives from the multi-colour design of the shoe, since it is made from different yarn colour which would have otherwise gone to waste. Moreover, this shoe contains over 75% of recycled materials and the heel counter is manufactured with recycled CD's.

Since 2012, Nike has been producing the **Flyknit**, a product which made possible to reduce 3.5 million pounds of waste. The shoes are made with a radical new technology which creates a

light upper while at the same time it reduces waste and quantity of materials used of about 60% with respect to the other footwear products³⁸.

Moreover, since the majority of the emissions when producing a sport shoe are made during the upper part phase, Nike has innovated to find a way to reduce carbon emission. For this reason, Flyknit uppers are made mainly by recycled PET (plastic bottles) 95%, nylon 5% and spandex 5%. Indeed, an LCA analysis of 2016 shows that Flyknit technology reduce not only waste, but also energy consumption and emissions generated during the distribution phase.

Nike Space Hippy is a new sport shoes collection which aims at tackling climate change by promoting circular design. The shoes are made with scrap materials recollected from factories floors. This type of shoe is the one with lowest carbon footprint and without any type of constraint, since it is made from materials that are “on-site”. The line starts from the idea that waste itself can become a product.

The shoes are made at least by 85% of rPoly created from yarn surplus, plastic bottles and t-shirts.

As the Move to Zero initiatives started, Nike and Converse factories recycled in FY19 3 million pounds back into footwear products.

Innovative materials and waste are two challenges that can be analysed and resolved together. Being able to divide each material components of a single product in order to recycle them with different systems would be a huge step towards the elimination of waste. Disassembly is indeed the first step in order to have a clearer vision of each component that creates a footwear or apparel product.

Green-chemistry, the second necessary steps towards circularity, entails searching for chemical processes which reduces or eliminates the use of hazardous substances.

Refurbishment plays an important part in order to stretch the product life through repair of materials and components.

Nike willingness to create a sustainable business model has actually become a necessity for the company and the industry. The path is long and challenging, but a lot of efforts have been made until now, in order to reduce CO₂ emissions, waste and energy use.

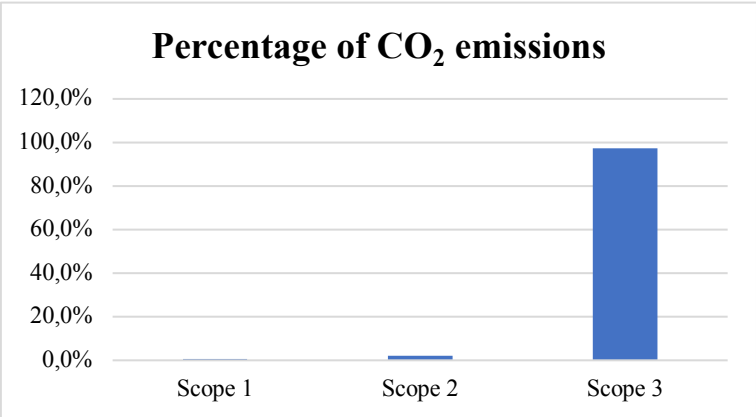
³⁸ Dray et al., “Exploring the Sustainability of Nike Flyknit Shoes.”

Anyway, innovations are fundamental for Nike to take a step forward, because reducing waste per unit or energy consumption is not enough, due to the capitalistic model in which the firm is operating, that will require production increase every year offsetting the efforts made.

4.3 Overall performance

Energy and carbon emission are one of the main challenges to be tackled in order to fight climate change.

The emissions generated overall by the company to produce its products derive from Scope 1 and 2, which consider direct emissions from owned facilities and indirect emissions of purchased energy, and Scope 3, which represents all the indirect emissions that are generated by the value chain.

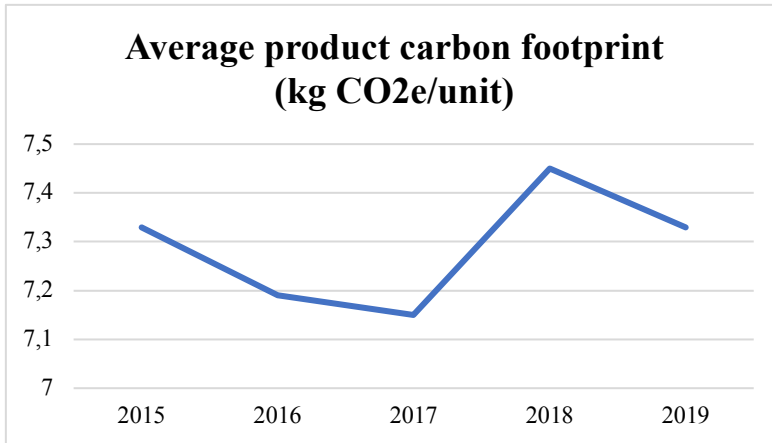


Graph n.7, “Summary of Co₂ emissions from scope 1,2 and 3, 2019”, Nike Impact Report 2019

As it can be seen from the graph, 97,38% of the total CO₂ emissions are generated by Scope 3, while Scope 1 and Scope 2 together represents the 2,6% of the overall CO₂ emissions.

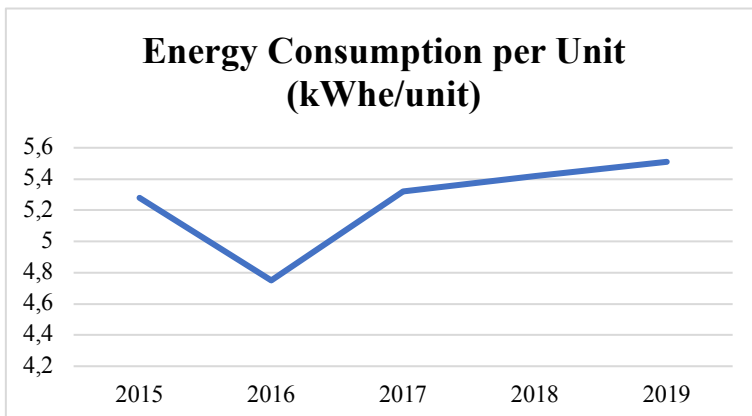
Together, the company had produced 3.290.739 metric tons of CO₂ in 2019.

For what concerns average product footprint, the trend shows a decrease on emissions until 2017, while in 2018 there has been a sharp increase. In 2019, the carbon footprint per average product has been equal to 7,33 (kgCo₂e/unit).



Graph n. 8, “Average product carbon footprint 2015-2018”, Nike Impact Report 2019

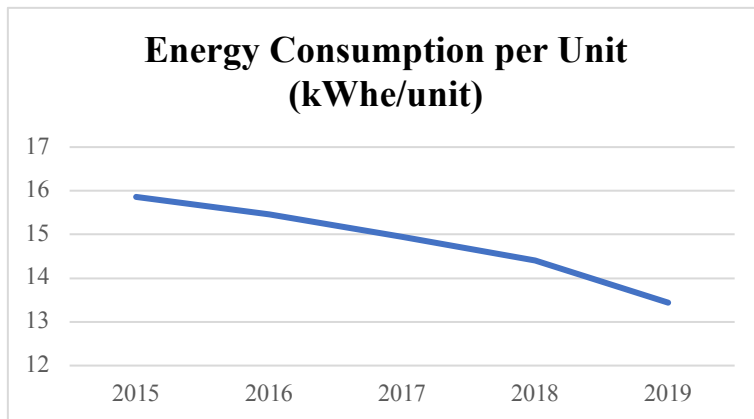
On the other hand, as it can be seen from Graph n.9, energy consumption per unit generated by key operations has increased during the last five years, reaching 5,51 kWh/unit in 2019. Key operations comprehend manufacturing of finished goods, both outbound and inbound logistics, headquarters and Nike owned retail.



Graph n.9 “Energy consumption per unit in key operations, 2015-2019”, Nike impact report 2019

Energy consumption in textile dyeing and finishing per unit has decreased since 2015, reaching a 13,44 kWh/unit in 2019.

Indeed, this phase is one of the most energy-intensive of all the supply chain.



Graph n.10 “Energy consumption per unit in textile dyeing and finishing, 2015-2019”, Nike impact report 2019

5. Adidas Group: an overview

Adidas is a multinational company founded in Germany in 1924, with his headquarters based in Herzogenaurach. The company designs and manufactures shoes, apparel and accessories and it is the second largest sportswear firm after Nike.

Adidas is the holding company, which represents also the Reebok sporting company, Bayer Munich and the technology company Runtastic.

The company has more than 59.000 employees in more than 100 nations all over the world. In 2019, the company generated a profit 23,640 € billion by producing over than 1,1 billion sports products.

The purpose of Adidas is *to be the best sport company in the world*, and believe that *through sports, everybody has the power to change lives*.

The company has six global headquarters based respectively in Amsterdam, Portland, Boston, Shanghai, Hong Kong and Panama.

The culture of the company is based on 3C – creativity, collaboration and confidence- and the workforce is perfectly balanced with a percentage of 48% male employees and 52% female ones.

The company has created a business plan called “Creating the new”, of which goals finish in 2020, that aims at increasing brand awareness and generating bottom-line growth.

Getting closer to customer is the most impellent target for Adidas, which will be accomplished through three strategic decisions: speed, cities and open sources.

The company relies on more than 630 primary suppliers and subcontractors, by which the majority of the wet processes are performed. All the contractors follow a strict Code of Conduct in order to establish environmental standards and a safe workplace.

Adidas Group focus on a differentiation strategy, with the corporate level concentrating its efforts on innovation, to create new products and processes.

The competitive advantage generates from its diversified and multi-brand portfolio are managed by a global sales function and a global brand one, in order to maintain the corporate level in the long-term.

Huge investments are constantly made to improve marketing and distribution channels, able to evaluate consumer behaviours and develop strategies to meet their needs.

There are six strategic pillars on which Adidas basis its operations: wide brand portfolio, cutting-edge innovation, implementation of marketing/distribution channels, vertical management of all the teams, quickly responsive supply chain and always work following environmental standards.

Adidas Group, with its huge product portfolio and the strong worldwide presence, is one of the companies with the highest brand value, in the third position according to Forbes.

5.1 Sustainability at Adidas

The “creating the new” plan does not only describe the strategy at corporate levels, but also the products and processes innovations needed in order to create value in a sustainable way.

Adidas has introduced sustainability in its value proposition and core operations, as the Parley Ocean plastic and Better Cotton initiatives demonstrate, which has positioned it in the first 50 “Best Global Green Brands”.

The sustainable strategy implemented by Adidas addresses six main challenges, which direct impact sports in all of its facet.

The strategy applies until 2020, which is the year in which the environmental standards must be met.

Specifically, three of the six challenges deal with environmental sustainability:

1. *Valuing water:* water is an essential element. Adidas aims at decreasing 20% usage at strategic suppliers, 35% at apparel production suppliers and 35% per employees at the company owned sites.
2. *Innovative processes and materials:* using more sustainable and recycled materials is a fundamental step towards a more sustainable practice. Adidas aims at decreasing 20%

waste reduction at strategic suppliers, 50% waste diversion to diminish landfill. Moreover, the Better Cotton Initiative directs towards a 100% replacement of conventional cotton usage. The initiative deals further with the replacement of plastic bags and the adoption of recycled polyester and use of ZDCH lists for chemical substances.

3. *Energy preservation*: carbon emissions and energy consumption are huge challenges to be overcome in order to diminish climate change. Adidas is working to further reduce by 20% energy consumption at strategic suppliers.

The strategy also develops over three main closed loop strategies to be achieved by 2020:

- **Recycled loop**: this principle will be pursued thanks to the introduction of two new materials, primeblue and primegreen.
- **Circular loop**: a product which does not have an end-of-life, but rather it creates another life cycle.
- **Regenerative (bionic) loop**: the idea is the creation of a product with multiple lives that in the end go back to nature.

5.1.1 Product: Innovation, materials and end-of-life

High performance products and sustainability standards should not cancel but rather increase potential of one another. Innovative materials and design are the two main ways by which it can be reduced the environmental impact of a product.

One of the initiatives developed by Adidas is **Parley for the Ocean**. Parley is a global organization of which aim is to raise awareness of companies, governments and brands about the fragility of the world we are living in.

Thanks to this co-operation, Adidas is aiming at creating long-term changes by avoiding use of single-use and plastic bags, divert plastic waste from the ocean and convert it into sportswear, reinvent virgin plastic in Parley Ocean Plastic and, eventually, innovate to find new ways to eliminate plastic use.

As a result, the Parley Ocean Plastic was born, a new material created from upcycle waste recollected from beaches before it reaches the oceans. The waste, mainly PET bottles, is brought together by the organization which delivers them to Adidas suppliers, that transform waste into yarn. The yarn is used, instead of virgin plastics, to make the adidas x Parley products.

Anyway, transportation of materials collected to suppliers represents an increase of CO₂ emissions. Adidas is trying to increase the number of points of collection in order to diminish the distance between them and suppliers.

The main innovation in design and material which has been produced by Adidas is a closed loop model, called the *futurecraft.loop*, which is a type of running shoe that can be 100% recycled: the shoe can be taken back to the company, divided into components, and used again to recreate a new pair of shoes.

The program aims at creating a circular design model to reach zero waste across all the supply chain and processes. Indeed, the initiative entails the creation of a product of which raw materials can be further used, without any waste, to create another one.

The ideal goal is a pair of sports shoes which is not limited in time and that does not have an end-of-life stage.

There are a lot of challenges inherent with this new type of product consumption, customer must be willing to change their mindset towards a more circular economy perspective and be willing to return the pair of shoes to the company.

Moreover, once the product is taken back, a lot of processes are needed in order to give it a new life. The cleaning process at first is essential, then the shoes are melted down into new pellets, that are worked up to create the new components. A virgin TPU (Thermoplastic Polyurethane) material is added at the recycled parts, creating the first Generation 2 of Futurecraft.loop.

The launch of this initiative is dated Spring Summer 2021, and for this date Adidas must be ready to market the idea in order to convince customer and change the consumption patter society is used to.

In 2016, Adidas published the first shoe made using **Biosteel® fibre**, which is a replication of natural silk created by a German company AMsilk.

Futurecraft Biofabric is the Adidas' shoe which is made 100% from Biosteel® fibre, which is completely biodegradable and high-performance since it is 15% lighter and stronger than the other materials.

This innovation is more than just a closed loop, since the shoe life follows a natural system process, achieving a completely new step towards sustainable development.

Since 2012, with the launch of **Element Soul Shoe**, Adidas started the low-waste initiative, which entails the creation of apparel and footwear product with less parts and recycled materials. From the first model, upgraded model have been launched by the company, which are made with 12 parts instead of 30 and a 95% pattern efficiency.

In the same year, Adidas has started the “Sustainable Footprint” program, which is basically a “take back and recycle” initiative, which has spread in more than nine Adidas stores worldwide. Consumers can collect footwear and apparel products that they no longer use from any brand and send them to the distribution centres, which collect and separate materials ranked by quality, which can then be used in a second-hand market or as raw materials.

On the same initiatives stream, **FORMOTION™** is a technology introduced by Adidas in the footwear industry which was previously used in the automotive sector. Thanks to this technology, the sprue units, which is the phase in which melted plastic is insert in the shoes, are eliminated, reducing by 50% material waste. Moreover, the less use of glue reduces toxicity emissions, as well as the light weight reduce CO₂ transportation emissions.

Last but not least of the innovations, **Sport Infinity** is a project created with the European Commission, that joins researchers, experts and a variety of industry and creates products from material excess of other industries. The idea is a pair of shoes that can be not only recycled, but rather reinvented to meet customer’s desires thanks to an inexhaustible 3-D material.

In April 2020, Adidas presented two new materials which have the potential to end the use and waste of plastics. **Primeblue** and **Primegreen** are two new fabrics which are entirely made with recycled polyester. Primeblue contains Parley Ocean Plastics while Primegreen does not contain virgin plastic material. Both will be used to pursue Adidas strategy of Recycled loop and closed loop.

5.1.2 Processes: adopting different dyeing practices

Instead of the usual dyeing process, Adidas adopted a **solution dyeing** process that takes place at the fibre production stage, which colours the yarn at its beginning phase without the need to dye the yarn anymore. This kind of process prevents the use of huge amounts of water and energy, since yarn does not need to be dye.

In 2012, Drydye was introduced by Adidas and since then it has been used to create four million yards and saved more than 100 million litres of water in the apparel and footwear production.

Drydye is an inventive technology which entails no use of water and 50% less usage of chemicals and energy. Indeed, with the usual dyeing process, 25 litres of water are necessary to produce only one T-shirt, which are replaced with carbon dioxide mechanism, which is further then put into a gasification process to be recycled.

No Dye is another process adopted by Adidas that use materials in their real colour without the need to dye them. In this case, no dyeing process is needed, avoiding the use of huge amount of water, energy and chemicals.

5.1.3 Distribution and packaging

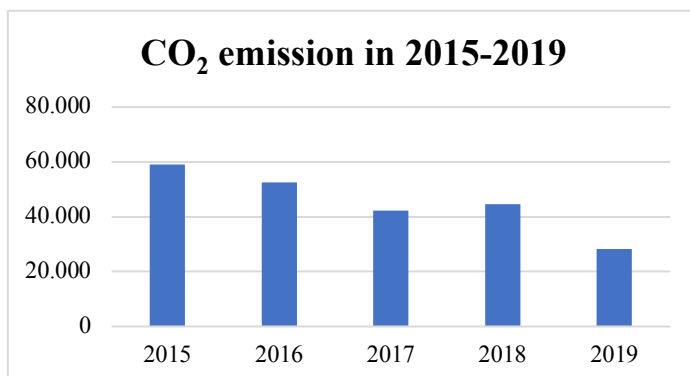
Transportation and packaging generate huge quantity of carbon emissions and waste problems. The packaging of fashion and footwear products is made with polybags, which assure the safely distribution of products to final customers.

Adidas is trying to find a sustainable solution alternative to polybags, which are made of plastics. From 2021, Adidas will shift to completely recycled polybags, which will reduce the waste of plastic usage, while since March 2020 in London, the group have implemented a circular infrastructure for the recycling of polybags.

5.2 Overall performance

The overall performance of Adidas is compared to the previous years based on the operations of 100 company sites worldwide. In 2019, Adidas overcame the 2015 baseline of carbon emission, reducing further by 12% the overall emissions, that combines in a total of 52% from 2015.

Scope 1, that is direct CO₂ emissions from sources the company owns, and Scope 2, emissions generated from the purchase of electricity, combined reached an amount of 28.310 CO₂ e³ in 2019.



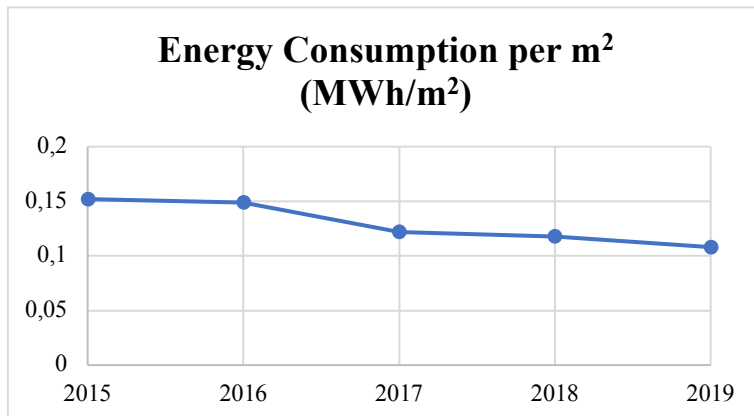
Graph n. 11, “Carbon emissions from Scope 1 and Scope 2”, Adidas Green report³⁹, 2019

³⁹ “2019 Green Company Report”

As it can be seen from Graph n.11, the overall five years trend shows an important decrease of carbon emissions, despite a slight increase in 2018.

Energy has been another challenging problem which Adidas is trying to tackle every year.

The company supply renewable energy from Germany, validated by GOs (Guarantees of Origins) and started buying renewable energy certificates which ensures that energy does not come from carbon sources.

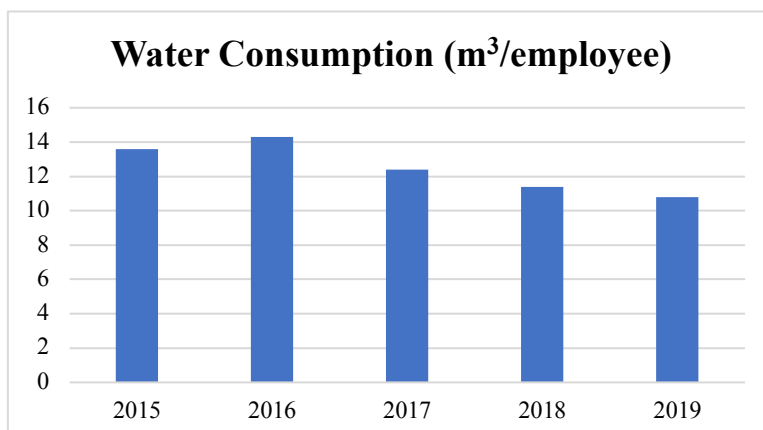


Graph n. 12, “Energy Consumption per m² 2015-2019”, Adidas Green report, 2019

Energy efficiency consumption had an accumulated reduction from 2015 baseline of 29%.

Water consumption has also been reduced in the same period by 32% per employee, while the goal for 2020 is to reach an accumulated reduction of 35%.

The increase efficiency in energy consumption has been achieved thanks to the creation of photovoltaic installations in Germany which produced in 2019 a total of 1.164.260 kWh energy of which 99% has been used by the other facilities.



Graph n. 13, “Water Consumption (m³/employee) 2015-2019”, Adidas Green Report 2019

In order to keep track of the sustainability strategy and goals, Adidas implemented an Integrated Management System, which controls facilities through ISO standards.

Energy consumption and environmental safety are example of ISO validations which certify corporate, retail and showrooms facilities.

6. Puma SE: an overview

Puma is a multinational corporation based in Germany, which produces and sells apparel and sportswear, accessories and footwear products. The company was founded in 1948 and it is public since 1986.

The mission of the company is summarised in the phrase *Forever faster*, which entails to be the fastest sports brand in the world, aiming at reaching goals higher than the rest of the industry competitors. The main area that Puma wants to enhance is football, running and training, golf and motorsports.

In the last decades, the company sponsored seven football union at the FIFA world cup and it has increased its presence in the golf industry, by acquiring Cobra Golf, a cutting-edge golf tools company.

In 2015, the partnership with Rihanna to empower women presence in the sports industry helped Puma improving style and performance in their products.

The overall strategy and culture are rooted in five main priorities:

1. *Brand heat*: Puma aims at strengthening their brand value throughout partnership with legendary athletes to connect with the youngest generation.
2. *Product*: innovative design and materials to influence the sports industry and lifestyle.
3. *Women's*: “where the gym meets the runway” describes Puma initiative to empower women through their products.
4. *Distribution*: Puma is strengthening their position worldwide by enhancing relationships with key distributors to become a reliable partner.
5. *Organization*: improving organization capabilities is fundamental to run operations smoothly. For this reason, the company has implemented an International Trading Organization, managing invoice and order flows centrally.

Puma grew over the years reaching 14.000 employees worldwide and an overall of 5,5 billion euros in 2019.

Puma's footwear and apparel products are manufactured by 123 core suppliers around the globe, mainly in Asia, Europe and America. All the suppliers are listed in the website of Puma, with specification of the type of product they make.

All the supplier must follow the Code of Conduct, which is carefully monitored by the company itself.

The process of audit follows six steps, at the end of which the necessary improvements to be done are listed and exposed to the owner.

To monitor carefully the work environment, Puma is part of Fair Labour Association since 2004 and a partner of Better Work initiative, that improve labour standards compliance.

6.1 Sustainability Strategy

As the CEO of Puma stated, *sustainability is a key value of Puma, deeply integrated in the business operations. Sustainability is one of the main drivers of the company to move and work faster.*

The sustainability strategy is based on ten pillars to be reached by FY2020, which deals with environmental standards, human rights and safety.

The aim of the strategy is to create an overall positive impact, by challenging water and energy consumption, hazardous substances and climate change.

In 2011, the company started the first Environmental Profit and Loss account, which highlights the relations between Puma and the environment as a partner. The account analyses the impact of the organization on the environment, not only from Puma's own facilities and offices, but from the entire upstream supply chain.

Since raw materials are one of the main causes, Puma started partnership with Leather Working Group, Better Cotton Initiative and Forest Stewardship Council to reduce negative environmental impacts.

To tackle climate change, reduce carbon emissions is the main priority, for which Puma developed a science-based target to delimit emission standard.

Overall, the 10 challenges developed by the company for 2020 have unique targets. As 2019, Puma is showing their success in achieving them:

- *Stakeholder engagement:* as for 2019, global stakeholder meetings have been round in America and Europe. By 2020, Puma is aiming to increase stakeholder dialogue, public reporting and consumer information.

- *Human rights*: as the Code of Conduct already provides constant assessment of the state of work, the company wants to improve the impact across all the supply chain and set human rights across the operations and suppliers worldwide.
- *Social compliance*: conform to ILO standards must become fundamental for all the suppliers, from basic raw materials to finished goods.
- *Climate change*: even if the science-based target is still developing, the 3% reduction per year has been achieved.
- *Chemicals*: zero discharge of hazardous chemical from the supply chain is the target for 2020.
- *Water & Air*: in 2019, Puma improve compliance of ZDHC wastewater guidelines to 90%, while the goal for 2020 is that all the core suppliers met good practice on 90% of air emissions and water treatment.
- *Materials*: in 2019, 75% of the materials used in apparel is Better Cotton, 90% of leather is LWG (Leather Working Group) for footwear and 90% of cardboard and paper from FSC (Forest Stewardship Council). For 2020, Puma is aiming to adopt more sustainable materials for the products.
- *Environmental P&L*: the environmental profit and loss is been published every year, but the aim is to calculate it independently from Kering on an annual basis.
- *Health and Safety*: the goal is to have zero fatal incidents and to reduce below one the number of injuries.
- *Governance*: enhance staff training while maintaining and improving the compliance system.

In order to monitor and manage the progress of the sustainability strategy, Puma has designed a *Puma sustainability organization*, organized as follows:

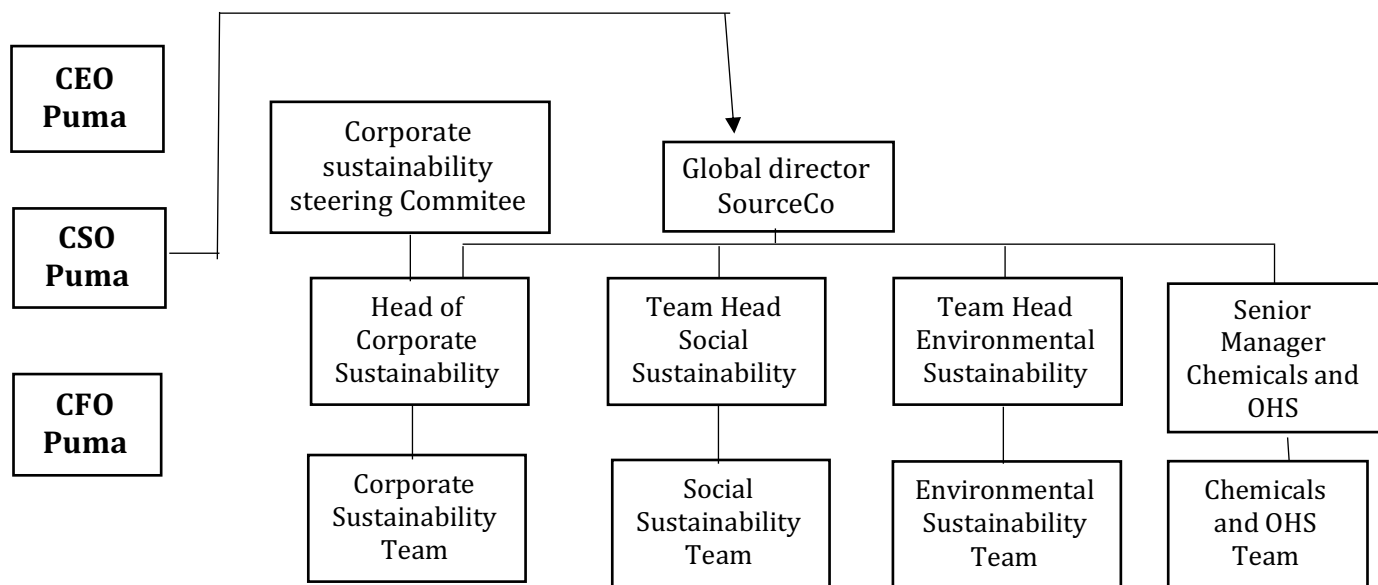


Figure n.5: “Puma sustainability team”, Source: PUMA sustainability report 2019

6.1.1 Puma: starting from materials

Raw materials, as explained, are one of the main causes of environmental impact. Leather, rubber, cotton, polyester and paper must come from more sustainable sources. As far as 2019, Puma is being able to use leather exclusively from Leather Working Group in the Asian facilities, and it is aiming to reach 100% certified leather in all the capacities.

Better Cotton Initiative is another program which aims at using cotton produced without causing environmental harm. The objective is to transform 90% of the production with conventional cotton with recycled, organic and Better Cotton.

As well as cotton, conventional polyester has a high environmental impact. For this reason, Puma decided to use polyester certified by Bluesign, which is a system that wipes out polluted substances since the beginning of the process.

Paper for packaging purpose is being changed with paper certified by Forest Stewardship Council and recycled paper. The certification implies that the paper which is being used has been produced preserving the forest ecosystem and balance.

Down feather, used for footwear cushions, which is standard certified, will be used in 90% of the products. The RDS certification ensure that the feather is produced without affecting the welfare of animals, starting from the beginning of the supply chain.

6.1.2 Co-operating for eco-innovations

Since 2012, Puma started a project with Fuseproject in order to redesign their polybags and shoe boxes. The program is called “**Clever Little Bag**”, and it encompasses the whole life cycle of the bag, from its manufacturing to its distribution. The bag reduces cardboard consumption by 65% and it is made by recycled PET.

Thanks to another collaboration with First mile, Puma realized its first sustainable collection of footwear and sportswear clothes, “**Forever Better**”. First Mile is a network organization which collects plastic bottles from Hawaii, Honduras and Taiwan to create job and reduce plastic waste. The waste is collected in the recycling facilities to process it and transform it in pellets, which are then manufactured in fibres. Moreover, the fibres are processed to create a more sustainable yarn.

The apparel products are made by 95% of recycled plastic, indeed each jacket of the collection is created with 12-15 recycled bottles, while footwear products are made on average with 50% of recycled plastic.

Together with Asos, Puma started a joint collection made with sustainable materials and with zero carbon emissions. The collection, called **Sustainability Pack**, is made with certified cotton which, after disposal of the product, it will revert to its natural cycle.

Moreover, the manufacturing process is carried out ensuring that no toxic substances pollute the water supply. Greenhouse emissions are reduced, and almost eliminated, from all the supply chain and colours are chosen from certified supplier to ensure that no chemicals have been used.

In India, Puma started a collaboration with Goonji, a non-profit organization, to stimulate the creation of a circular economy and promote the upcycle of footwear and sportswear materials. The products donated are sorted and segregated in order to create customized kits, such as school or family kits.

In Hong Kong, the same principle is carried out. Donation of unused footwear and sportswear products are distributed to help people, while those that are non-suitable are upcycled with the **Billie system**, a waterless process which aims at decreasing water consumption in the textile industry.

6.2 Overall performance

Since 2015, which will be used as baseline year, Puma has implemented 19 checks on energy efficiency usage on the locations directly owned. The controls are made on the social and environmental levels, such as environment protection and chemical use.

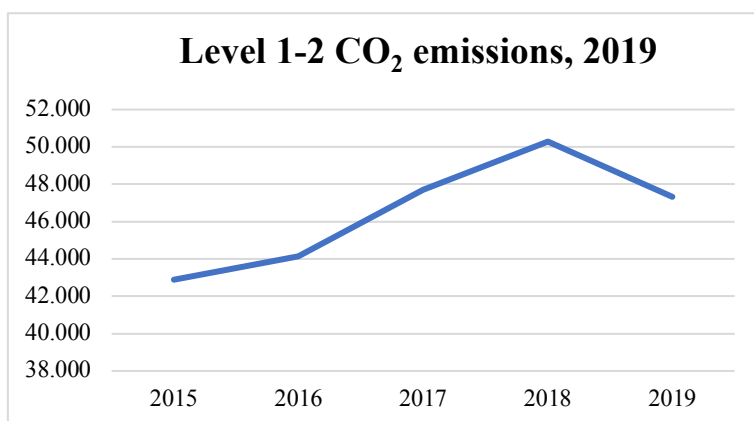
Moreover, Puma is partner of the SAC and, in 2018, thanks to the creation of the Fashion Industry Charter for Climate Action, Puma was able to adopt a science-based CO₂ emissions target.

In 2019, Puma increased the shares of purchased energy from renewable sources by 75%. Carbon emissions from the global supply chain derives from three levels: level 1 refers to the direct CO₂ emissions from owned locations, level 2 refers to the indirect emissions from owned locations while level 3 comprehends emissions from production, business trips and goods transportation.

For this reason, the company has been able to reduce emissions of level 1 and 2 by 38% compared to 2018.

On the other hand, emissions generated by level 3 has increased, which is why Puma extended the energy efficiency program to China and Taiwan, to be part of the Clean by Design program of the Apparel Impact Institute.

The same program has been adopted in Vietnam, which has been very successful resulting in a 5.500 tons reduction of CO₂.

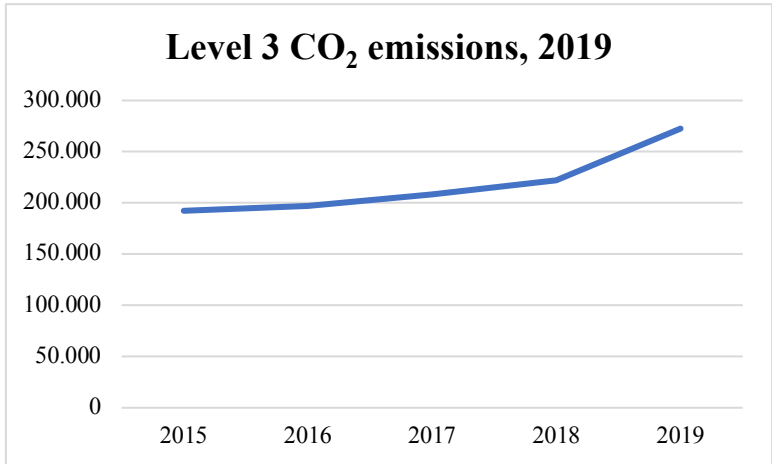


Graph n.14, “Carbon Emissions from level 1-2, 2019”, Puma sustainability report 2019⁴⁰

⁴⁰ “Puma_Geschaeftsbericht_2019 (1).Pdf.”

As it can be seen from the graph, the level of emissions increased during the years, probably due to an increase in production. Anyway, the overall carbon emission from owned locations has been reduced by 5,9% from 2018.

On the other hand, as anticipated, the quantity of carbon emissions from level 3 has increased during the 5 years range since 2015.



Graph n.15, “Carbon Emissions from level 3, 2019”, Puma sustainability report 2019

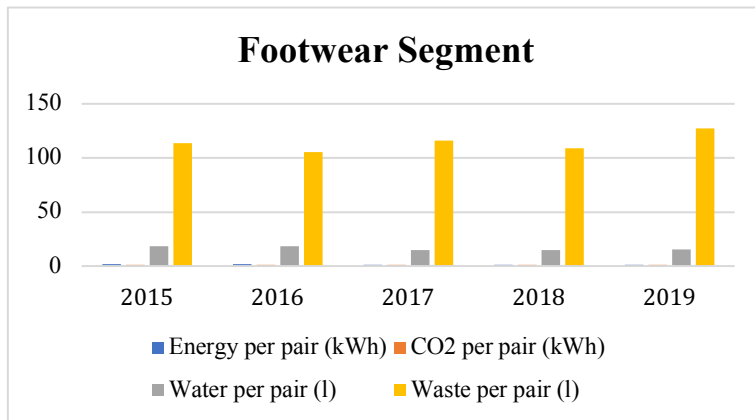
For what concern raw materials, Puma has identified that 50% of the ecological footprint derives from their extraction and production. For this reason, Puma has increased over the years the amount of sustainable materials used in their manufacturing processes.

Categories	Material	2015	2016	2017	2018	2019
	BCI	3%	19%	40%	50%	82%
Textile	Bluesign	15%	24%	47%	66%	98%
Accessories	Bluesign Polyester	20%	21%	34%	46%	100%
Footwear	FSC certified	85%	78%	95%	92%	100%
Footwear	Leather LWG medal rating	99%	94%	99%	99%	98%

Figure n.6: “Development of use of sustainable materials since 2015”, Source: Puma sustainability report 2019

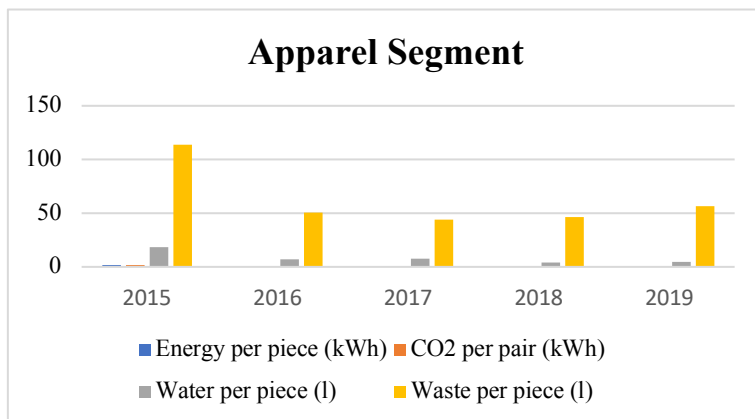
Each segment in which Puma competes generates different amounts of energy and carbon emissions, as well as waste and water usage.

As for the footwear segment, the graph below shows the impact of each pair of shoes. Waste is the most important part, which increased by 17% since 2018.



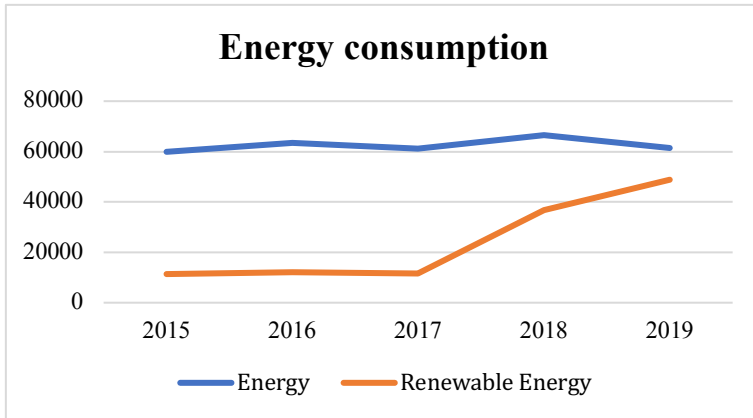
Graph n. 16, “Impact of a pair of shoes, 2015-2019”, Puma sustainability report 2019

On the other hand, waste in apparel production has decreased by 50% since 2015. Anyway, the performance of 2019 shows an increase of 21% of waste compared with 2018.



Graph n. 17, “Impact of the apparel segment, 2015-2019”, Puma sustainability report 2019

For what concerns energy consumption, the amount of overall energy consumed by Puma remains overall at the same level over the five years range, while the shares of renewable energy consumption have radically increased during the last two years, reaching 79% of the total energy in 2019.



Graph n.18, “Energy and renewable energy consumption, 2015-2019”, Puma Sustainability report 2019

7. Overall Comparison: towards a sustainable business model

The main objective of the comparison is to analyse the degree to which the sustainability strategies and eco-innovations implemented by the companies are fostering the way towards sustainable development and the creation of a business model for sustainability.

In order to evaluate these efforts made towards a more sustainable future and business model different variables must be evaluated.

First, the ability of a firm to perform well in respect of environmental standards is influenced by the degree of sustainability of its supply chain. The supply chain indeed incorporates the majority of the production and distribution processes, making it necessary for companies to monitor supplier practices. For this reason, a brief chapter encompasses the degree of sustainability standards implemented by the companies to summarize the previous analysis.

Second, it is evident that all the three companies are innovating and evolving in order to reduce their environmental impact, but the type of innovation is critical in order to make this endeavour efficient in the long term.

Incremental innovations such as the reduction of waste to landfill and the use of renewable energy and better cotton are effective in the short term, but while society is growing and demand at the same time, these innovations can fail to reach a positive impact and reduce only partially the environmental damages.

For this reason, the effectiveness of eco-innovations will be analysed accordingly to a transformational strategies' perspective, identified by Huber in 1995.

Moreover, the ability of a company to inform its customers about its effort is necessary in order to duplicate the environmental positive effects it creates and to influence customer choices towards a sustainable economy and society.

Hence, the third part will concentrate the analysis on the perception of customers about the innovations and strategies performed by the companies and the industry as a whole.

In order to have a clear idea of the effectiveness of the marketing strategy performed by the firms to promote sustainable products and materials, a survey has been run on a sample of 150 people.

7.1 Green supply chain and targets

The supply chain climate action is an index that was established by IPE (Institute of Public and Environment affairs) and CDP. Each year, a report is published which analyses the quantity of GHG emissions from over 118 IT and textile companies, from the CITI (Corporate Information Transparency Index).

The index uses four main indicators: GHG emissions information, performance and targets and strategy used to accomplish these goals.

Overall carbon footprints are a great indicator in order to identify GHG emissions of a product life cycle, helping companies identifying their carbon hotspots, which are the stages that generate the highest quantity of emissions.

The SCTI report identifies the top 30 companies with the “greener supply chain”, positioning Nike at second position, Puma at fifth and Adidas at the eighth position.

For this reason, in terms of supply chain sustainability all the three companies are publishing data to be the more transparent as possible.

On the other hand, the CITI index, reflecting the seriousness of responsibilities imposed by the brand on its supply chain factories, identifies Adidas on the third position, Nike at the seventh and Puma at the twelfth⁴¹. At the same time, by using the HIGG index, the SCTI and ZDCH standards, as well as Code of Conduct, the companies are able to keep track of their supplier operations and environmental impacts.

Both Nike and Puma are part of the Sustainable Apparel Coalition, while Adidas, as well as Nike and Puma, are all part of the UN fashion charter for climate action, with the aim of maintaining the temperature increase below 2°.

To summarize the initiatives already implemented by the three companies, the CITI and SCTI index have been used in order to complement the previous analysis made in the dissertation.

	Nike INK	Adidas AG	Puma SE
BCI	x	x	x
Recycled Polyester	x	x	x
ZDCH	x	x	x
FSC certified	x	x	x
LWG	x	x	x
Bluesign	x	x	x

⁴¹ “IPE.”

Adoption of a sustainability strategy	x	x	x
Code Of Conduct	x	x	x
Sustainable Apparel Coalition	x		x
Fashion Industry Charter for Climate Action	x	x	x
Global Fashion Agenda- Circular Fashion System Commitment	x	x	
Paris Climate Agreement	x	x	x
Science-based target	x	x	x
Targets	By 2050 zero carbon-emissions By 2025 100% renewable energy in North America and 100% sustainable cotton	By 2030 reduce carbon footprint by 30% By 2024 recycled polyester in all the products By 2050 achieve climate neutrality	By 2030, 35% reduction of Co2 emissions Scope 1 and 2

Figure n.7: “Summary of the companies initiatives and targets”, Source: own research

7.2 Analysis of eco-innovations under the transformational strategies’ perspective

After having analysed the different sustainable strategies implemented by the companies, it is important to categorize them under a theoretical perspective in order to understand their long-term potential.

In order to group innovations, it has been used the transformational strategies model identified by Huber in 1995, which identifies three different types: efficiency, sufficiency and consistency.

Each of these strategies have specific underlying principles and outcomes, which is the reason why analysing innovations under this perspective allows for a more complete evaluation of their mid-term and long-term outcomes and their capacity to change the linear business model with a sustainable one.

Indeed, the degree of change which the innovation can carry depends on its type. Business model cannot generate sustainable development when innovations entails only an efficiency- or sufficiency-revolution.

In order to have a satisfying result, not all the innovations implemented by the companies will be taken in account, but only those which represent a step further, i.e. adoption of BCI or recycled cotton and recycled polyester will not be counted as innovations, but rather as an increased effort in order to minimize environmental impact.

Moreover, the apparel industry as a whole is embracing the sustainability trend and it is replacing the majority of non-renewable resources with renewable energy and materials.

7.2.1 Which eco-innovations are considered?

Nike, Adidas and Puma have implemented strong sustainability strategies and put a lot of efforts to reduce the environmental impact of their business.

Indeed, all of them have adopted the Better Cotton Initiative or LWG, as well as ZDCH guidelines for hazardous substances, showing an improvement in materials quality usage.

Moreover, efficiency in cutting, dyeing and all manufacturing processes has been improved by the overall industry. Energy consumption is decreasing and a shift towards renewable energy sources has become a requirement in the apparel and footwear sector, as well as water consumption efficiency has become a priority.

Waste is being reduced thanks to operations of recycling or by increasing productivity of manufacturing processes, as well as Code of Conduct given to suppliers to follow.

It does not make sense to evaluate initiatives which are being implemented as a starting point by the industry as a whole. Instead, it is important to evaluate the type of eco-innovations which are unique and that have a potential in creating a long-term effect.

For example, Adidas *Drydie* and *Nodye* technologies have not been taken in account since efficiency-improvement innovations are common in all three of the companies and the number of process-innovations is huge.

Moreover, all the innovations which improve the input-output ratio of production would have been categorized as efficiency transformational strategy, based on the nature and purpose of the innovation itself. Anyway, this does not mean that all the efficiency-centred innovations are removed from the analysis, but only those in which sustainability is mainly a side purpose rather than the main one.

Only innovations which entail a step further will be incorporated in the analysis. This simply means that inventive pair of shoes made with unusual sustainable materials, recycled operations which creates closed-loop or natural integration of resources are considered.

Indeed, only the major innovations can in some way show the underlying transformational strategy which is being pursued by the company, while incremental innovations on processes may mislead the complete picture.

To conclude, the history of sustainability initiatives is very long. All the three companies show a list of incremental innovations pursued during their years in the business. Anyway, some of these projects have been already closed and for this reason will be not taken in consideration.

7.2.2 Grouping eco-innovations by transformational strategies

Understanding in which transformational strategy the eco-innovation belongs to is not straightforward.

Starting from the fact that eco-innovations can belong to two or more transformational strategy at the same time, analysing the purpose of the initiative and its performance must be managed carefully. It is fundamental to be consistent in the analysis of the companies and innovations in order to obtain a clear result and it must be taken into consideration that the strategies are not mutually-exclusive but rather, most of the times, complementary.

Define efficiency transformational strategy is unproblematic. If the innovation improves the input-output-system of existing production, by reducing material and energy usage, it surely belongs to the efficiency-centred one.

Indeed, most of the innovations, due to their nature, belong to the efficiency-strategy. Anyway, a characteristic that can clarify to which group the innovation is part is the specification of *existing production*. A complete revolution of the product creation systems may not only be part of the efficiency strategy, but also of the consistency and sufficiency one.

For what concerns the sufficiency transformational strategy, categorization of eco-innovations can be more problematic.

For example, Huber identifies the concept of durability as belonging to the sufficiency strategy. Anyway, durability, as re-using over and over a material, can be identified also with the recycling practice adopted by the companies.

Moreover, if the material is used an infinite amount of times it creates a closed-loop, which is then categorized under the consistency transformational strategy.

An important property of the sufficiency-strategy is the consumption limitation and the psychological aspect, which means that innovations should to some extent influence consumer behaviour and consumption patterns.

For this reason, eco-innovations have been sorted as sufficiency-centred when this psychological aspect is present.

On the other hand, consistency strategy is pretty straightforward, since innovations which create a qualitative change of the industrial system are not common and fairly recognizable.

Closed-loop systems, natural integrated systems programs are all part of the consistency strategy.

7.2.3 Environmental performance

In order to complete the analysis, the companies are compared based on their overall performance in terms of environmental impact.

Four main variables have been considered: CO₂ emissions, energy and water consumption and waste creation.

The main problem for the analysis derived from the different unit of analysis used by the companies to evaluate their impact. For example, Puma disclosed information about impact per pair or piece of clothing, Adidas the total impact generated by administrative, production and distribution offices while Nike disclosed overall performance information and specific energy and CO₂ emissions per unit.

Even if harmonization of data and unit of analysis would have provided a better idea for the comparison, there are no sufficiently precise data to implement it. Modifying emissions per unit to emissions per product would have required more deeper information that it can be actually found.

Anyway, both Nike and Puma have disclosed enough information to generate a point for discussion, while Adidas, on its “Green Company report” has disclosed only the information regarding scope 1 and 2, while scope 3 is not present.

For this reason, Adidas data cannot be taken entirely into consideration, since Scope 3 emissions, which cover the entire supply chain, are indeed the most critical impact.

The data reported on the table differs from each firm, but they still provide an idea of the environmental performance of the companies.

Moreover, for Nike and Puma it was possible to extract the total consumption of the organizations in terms of CO₂, energy, water consumption and waste.

7.3 The matrix

Specifically, three dimensions have been used in order to create the matrix:

- Eco-innovations realized by the companies,

- Transformational strategies,
- Overall company performance of CO₂ emissions, energy consumption, water consumption and waste per product or unit of output.

Combining these three dimensions allows to evaluate the types of eco-innovations under a strategy perspective to assess the degree to which they will lead to sustainable development.

The first part of the analysis concerns the different transformational strategies that drive the eco-innovations of the companies, while the second part is focused on the comparison between the environmental performance of the firms.

7.3.1 Eco-innovations under the transformational strategy perspective

Company	Eco-innovations brief description	Transformational Strategies		
		Efficiency	Sufficiency	Consistency
NIKE INC.				
<i>Nike Grind</i>	Nike Grind are materials created from surplus of manufacturing and used to create surfaces of athletic fields			X
<i>Converse Renew</i>	This type of shoes is made with PET, upcycled textile and recycled cotton	X		
<i>Reuse-a-shoe</i>	Thanks to this program, old shoes are collected and the materials are reused for creating sporting fields		X	X
<i>Nike Air Sole</i>	Nike Air sole are made by re-using waste generated by the manufacturing process	X		
<i>Flyleather</i>	This pair of shoes is made with leather collected from manufacturing waste	X		
<i>Flyknit</i>	A new technology which aims at radically reducing waste	X		
<i>Space Hippiie</i>	A type of shoes with the lowest carbon footprint, made from scrap "on site" materials	X		
<i>Vapormax Random</i>	This type of shoes is made with yarn that would have gone to waste	X		
		Efficiency	Sufficiency	Consistency
ADIDAS AG				

<i>Parley for the Ocean</i>	A type of sport shoes and new plastic upcycled from plastic bottles which would have gone to the ocean	X		
<i>Futurecraft.loop</i>	This type of shoes is created in its own closed cycle loop		X	X
<i>FutureCraft Bionic</i>	A type of shoes which is entirely made by Biosteel fibre, a 100% biodegradable and high-performance material			X
<i>Sport Infinity</i>	The collaboration with the European commission resulted in a project for the creation of a pair of shoes that can be reinvented according to customer's desire		X	X
<i>Element soul shoe</i>	This type of shoes has a 95% of efficiency pattern and it is part of a broader low-waste initiative	X		
<i>FORMOTION™</i>	A technology introduced by Adidas to reduce material waste	X		
<i>Primegreen and Primeblue</i>	Two new materials which are entirely made of recycled polyester to create recycled closed loop			X
		Efficiency	Sufficiency	Consistency
PUMA SE				
<i>Clever little bag</i>	A re-designed bag with FusoProject to reduce waste and carbon emissions	X		
<i>Forever Better</i>	The First Mile x Puma initiative collects plastic bottles which are recycled and used to create footwear and sportswear	X		
<i>Sustainability pack</i>	It is a zero-carbon emission collection made in partnership with Asos, which is entirely bio-degradable and it does not use toxic substances			X
<i>The Billie system</i>	A technology for upcycling surplus of apparel and footwear material		X	X

Figure n. 8: "Eco-innovations under the transformational strategy perspective", Source: own research

As it can be seen from the matrix, each company has developed eco-innovations following to some extent a precise strategy.

Nike main strategy has been identified as efficiency-centred one. Indeed, 75% of the eco-innovations are ranked under the efficiency principle, since their main purpose concerns the improvement of input-output efficiency. Indeed, most of the eco-products are created with surplus of manufacturing materials, recycled yarn and on-site scraps. On the other hand, innovations such as Nike Grind change the life of materials, by increasing the length of its life. Nike Grind materials are revitalized and re-introduced in the supply chain or used for other purposes, such as sporting fields, play surfaces and walkways. In this case, the materials do not become waste but rather resources, to be introduced in another life cycle.

On the same idea, Reuse-a-shoe by Nike is an innovation, but also an idea, which is part both of the consistency and the sufficiency strategy. Consistency because the materials collected are further used for different purposes, meaning that their life-cycle does not end in one product, sufficiency because it tackles the consumer approach and behaviour about product life cycle. Indeed, the materials are obtained from shoes brought back by customers to Nike stores, which are then de-composed into different materials and re-use for other purposes.

The underlying sufficiency strategy is clear in the fact that the eco-innovation will work only if customer changes the buy-use-throw away way of thinking.

On the other hand, Adidas has implemented 7 major eco-innovations in the last years, of which only the 30% are efficiency-centred.

It seems pretty obvious by taking a look at the matrix that Adidas is implementing a difference strategy than Nike, more focused on a combination of sufficiency and consistency transformational strategies.

For example, the *futurecraft.loop* eco-innovation is a pair of shoes which, at the end of its life, is taken back to Adidas, decomposed, and recreated for Generation 2. The process can be reproduced an infinite amount of time. This type of innovation, which completely represents the consistency strategy principle, is the one that can provide a long-term sustainable development and change the current linear business model utilised in the economy.

On the other hand, a psychological change is needed in the customer approach towards end-of-life product phase, not directly under the self-limitation principle, but rather under the non-linear principle which is necessary to pursue sustainable development.

On the same line of thought, Sport infinity shoes are made with an inexhaustible material that can be reshaped according to customer needs and preferences. Once the shoe is old-fashioned, or does not fit anymore with what customer wants, the shoe can be brought to the company which it will re-designed it accordingly to customer personal taste, with even a higher-level of customization. The collection is now limited to football shoes, but it can be expanded to every other type of line, such as running or training.

This kind of infinite closed-loop perfectly defines the consistency transformational strategy, while also implementing a sufficiency-revolution in the society. Instead of throwing away the product, change it. The same amount of material can be changed an infinite amount of times, eliminating the need to use more resources and generating more waste.

Pursuing with eco-innovation consistency-centred, the Future Bionic is a shoe made with Biosteel fibre, a completely biodegradable material which follows natural cycle flows.

For this reason, it does not create waste, but rather it returns to its natural origin, providing an important step towards sustainable development. As such, also Primeblue and Primegreen materials are consistency-oriented eco-innovations.

Puma, on the contrary, does not seem to have a clear transformational strategy. One of the problems is the limited amount of eco-innovations it has implemented, which is mainly because of the reduced investment capacity compared to the other two companies.

Anyway, as it can be seen from the matrix, half of the eco-innovations are efficiency-centred, despite the great efforts implemented by the company in creating products entirely made from recycled materials and with the least possible CO₂ emissions, such as the Sustainability Pack made by Adidas x ASOS.

In conclusion, it can be said that Nike and Puma are pursuing an efficiency transformational strategy, even though in different ways and magnitude mainly due to differences in investment capacities.

Oppositely, Adidas is mainly focused on a consistency/sufficiency transformational strategy. It has also to be said that Adidas have also implemented efficiency eco-innovations to increase input-output ratios and it is constantly improving to increase the percentage of recycled materials and lowering energy and water consumption.

For this reason, the analysis under the transformational strategies perspective will privilege Adidas eco-innovations, since the best way to pursue sustainable development is the combination of all the three strategies.

For this reason, it is feasible that Adidas eco-innovations will result in a business model transformation towards a sustainable business model.

Indeed, under the perspective of Bocken, Short, Rana and Evans (2014), a sustainable business model will be achieved through a technological change, as eco-innovations, social, based on the sufficiency-theory, and organizational, as changing the purpose of the company towards environment.

Adidas is, in this sense, closer than the other companies towards a radical change of the way it does business, with the potential to be a pioneer in the adoption of a sustainable business model in the mass market.

7.3.2 Comparison of the environmental performance of the companies

Company	Environmental Performance			
	CO ₂ Emissions	Energy Consumption	Water consumption	Waste
NIKE				
Performance per unit (key operations)	1,94 per unit (kg CO ₂ e/unit)	5,51 (Kwhe/unit)	n.a ⁴²	n.a
Performance per kg/unit (textile dyeing and finishing)	4,06 per kg (kgCO ₂ e/unit)	13,44 (Kwhe/unit)	94,3 (L/kg)	n.a
Performance per product (average product carbon footprint)	7,33 (kgCo ₂ e/unit)	n.a.	n.a.	n.a
Overall performance (Scope 1, 2 and 3)	3.290.739 total metric tons of CO ₂ emissions	10.292.530 total energy consumption (Mwh)	15.437,3 total water consumption (million litres)	145.434 tons of total waste (DCs, HQs and manufacturing)
	CO ₂ Emissions	Energy Consumption	Water consumption	Waste

⁴² The cells labelled as “n.a.” mean that the data of that particular environmental performance of the company are not available.

ADIDAS AG				
Performance per m²	n.a	0,108 energy consumption (Mwh/m ²)	n.a	n.a
Overall performance (Scope 1 and 2)	28.310 tons of CO ₂ emissions [tCO ₂ e]	186.638 total energy consumption (MWh)	308.340 total water consumption (m ³)	2.247 tons of total waste (DCs, HQs and own manufacturing sites)
	CO₂ Emissions	Energy Consumption	Water consumption	Waste
PUMA SE				
Performance per pair (Key operations)	1,2 (Kg)	1,9 energy per pair (Kwh)	19,6 water consumption per pair (litres)	183,3 waste per pair (l)
Performance per m² (leather production)	3,2 (Kg)	8,2 energy (kWh)	74, 7 (l)	0,8 (kg)
Performance per kg/tons (fabric production)	4,4 CO ₂ emissions per kg (kg)	12.636,3 energy consumption per kg (kg)	105,5 water consumption per tons (m ³)	62,08 waste production per tons (t)
Overall performance (Scope 1,2 and 3)	319.852 CO ₂ emissions (y)	326.549 total energy consumption (MWh)	97.863 total water consumption (m ³)	27.350 total waste (t)

Figure n.9: “Comparison of the overall environmental performance”, Source: own research

As previously explained, the second part of the matrix analysis covers the overall environmental performance of the companies. In order to make the comparison, the data have been adapted based on unit of analysis, even though a lot of limits have hindered the possibility for harmonization.

The main problem has been Adidas data, which not only are provided exclusively under a total consumption perspective, but they do not cover the Scope 3 emissions part, which encompasses all the indirect emissions from facilities that are neither owned or controlled by the company, but of which impact is part of the product manufacturing process.

It is indeed a fundamental aspect to be taken in account to have a whole and clear idea of the product carbon footprint.

Even if Adidas seems to have the best performance in terms of eco-innovations and transformational strategy, it cannot be further analysed due to missing information.

On the other hand, Nike and Puma have published the whole sphere of data, providing the possibility to have a deeper analysis.

The emissions per pair, counting key operations and raw materials, are very close to each other: Nike shows a 7,33 kg of CO₂, while Puma shoes produces 8,8 kg. Surely, the overall impact is higher for Nike due to a very different sales capacity and market share, but on a ratio perspective, the two companies are on the same level.

For what concerns total consumption, the unit of analysis must always be *impact per product*. Indeed, in order to compare the two companies' total consumption, the net sales of Nike, equal to 3,9117 million US dollar, have been divided by the net sales of Puma, equal to 5,706 million US dollar in 2019.

Therefore, the ratio between the two values, resulting in a net sales of Nike seven times higher than Puma's, allows for a comparison of the total environmental impact based on the proportion perspective. For example, Nike CO₂ are ten times higher than Puma, showing that carbon emissions are higher for the American company than the German one. Then again, total waste of Nike is only 5 times higher than Puma, meaning that on a ratio perspective Puma is creating more waste than Nike. For what concerns water consumption, Nike is consuming fifteen times more than Puma, highlighting the necessity for the company to radically reduce its usage. Waste of Nike on the other hand is only five times higher than Puma.

7.4 Matrix analysis conclusion

Thanks to the matrix, it has been possible to have a clear idea of the companies' environmental performances against each other.

The first part of the analysis has stressed how Adidas sustainability strategy, focused on sufficiency and consistency eco-innovations, is the most promising one. Huber itself defined the consistency strategy, coupled with sufficiency and efficiency, as the best possible way to generate sustainable development.

If Adidas will continue with this type of trend, it will possibly transform its current business model in a sustainable business model for the mass market, which it has been not yet achieved by no other company in the market.

On the other hand, the impossibility to have a deeper understanding of its environmental performance does not allow to completely establish that Adidas operations and products are the best solution in the market.

The environmental performance analysis, on the other hand, has not been as successful as the first part, due to a harmonization problem. Anyway, Nike and Puma impacts, despite the improvement made over the years, are still huge. To achieve satisfactory results, the two companies must shift their focus towards a more consistency strategy to avoid only marginal results, and extend the improvement made in some of their products to all their collections.

The huge economy pressure generated by customer demand and an increase pace of technology and seasonality cannot be offset by efficiency-centred eco-innovations.

8. Consumers perceptions on eco-innovations

A business model effectiveness is based on its ability to create value for the firm itself, for customer and stakeholders, through value proposition, customer interface, supply chain and financial benefit.

The capacity to inform customers of the sustainability strategy of the company and sustainable products is fundamental to ensure that customers make the right choice and to exploit the competitive advantage generated.

This last chapter analysis how customers feel about the companies previously investigated and the products they produce. Given that customer is the end of the product purpose, it is important to evaluate also the type of customer segments which are currently present in the market. The only way to have a successful sufficiency/consistency strategy is by changing customer perception towards a more circular state of mind, and it can be possible only if customers are aware of the current environmental problem and the way in which they can tackle it.

8.1 The survey

In order to identify the perception of customer and the ability of the three companies to marketing the eco-innovations in the right way, a cross-sectional survey has been run.

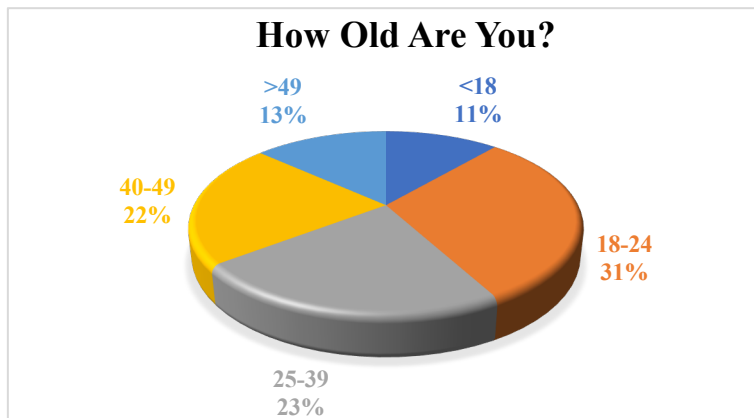
The survey is composed of ten questions, with multiple choice, brief text and checkboxes type of answers. The questions regard, each to a certain degree, the perception of customers about sustainability strategies, sustainable products and the importance of sustainability in relation with other product's characteristics.

The survey explores two different perspectives, the first is the respondent awareness of the sustainability strategies of the three companies and the extent to which the sustainable development is perceived by the customers. The second part reflects the perception on sustainable products and the degree to which eco-innovations are important, and thus create an increase in the item's value for the customers.

8.2 Demographics

The survey has been run on a sample of 150 people, with different ages, status and nationalities, in order to explore if different age categories and nationalities address environmental issues in the same or different way.

Of the 150 respondents, 60% are already working, 37% are students and 3% did not specify. The fact that the majority of the sample has a job, which makes them to some extent in charge of the money flow, allows to have a better idea about the value created by the products for them. For what concerns age, the categories analysed are five: the majority of the respondents belongs to the category 18-24, 23% to the 25-39 and 22% to the 40-49.



Graph n. 19, "Age categories", Own Research

Regarding the nationality, 94% of the respondents are Italian, meaning that the insights that will result reflects the consumption pattern and behaviour of the Italian population. The differences in status and age can also provide an interesting perspective, highlighting the variance of the consumption patterns between two or more segments.

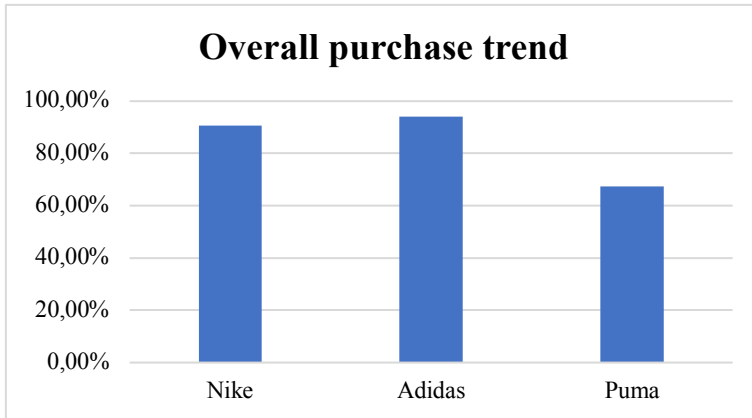
8.3 Consumer perspective: are companies innovating for sustainability?

The insights obtained from the survey are rather important for the research. The ability to promote and pursue sustainable development must not only concern the internal mechanism of the firm, but also the value proposition and its effects on customers.

As explained before, the first part of the survey analysis encompasses the customer perception on the progress made by the companies towards environmental sustainability.

Of the respondents, almost all are familiar with the three companies, 98,7% indeed gave a positive answer concerning their knowledge about the three companies.

Moreover, 63,3% of them have bought a product from Nike, Adidas and Puma, while only 7,3% of the respondents have bought only from one of the companies.



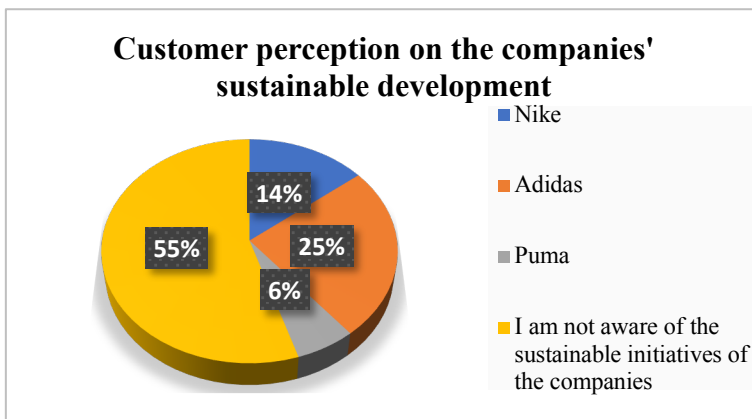
Graph n. 20, “Have you ever bought a product from one of these companies?”, Own Research

As it can be deduced from the graph above, the majority of the respondents have purchased products from Adidas, while Nike and Puma are respectively in the second and third position. However, when asked to the respondents about their preference if they were interested in buying a pair of sports shoes or sportswear, the majority of the respondent, 40%, has selected Nike as primary choice.

In regard to the familiarity with the three companies, 88,7% of the respondents is aware of the term environmental sustainability, which is important in order to verify if the answers of the survey are given with consideration. For this reason, to analyse the further questions, the answers taken into consideration refers only to those who are familiar with “environmental sustainability”.

Indeed, 54,9% stated that in their opinion all Nike, Adidas and Puma are innovating to pursue sustainable development.

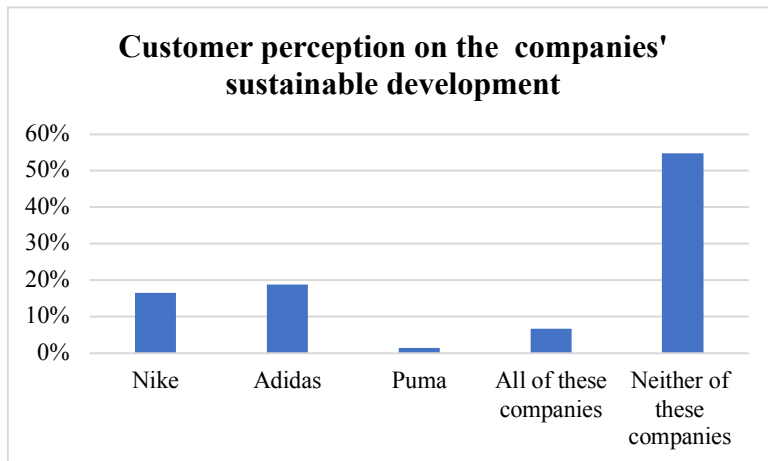
Half of the people is aware, to a certain degree, of the importance of sustainable development, but is not informed, or does not believe, that either of the companies in question are to some extent improving their sustainable performance.



Graph n. 21, “In your opinion, which is the company that produce more sustainable product?”, Own Research

Moreover, 25% reckon that Adidas is the company which produces products that are more environmentally sustainable, while in comparison only 14% think about Nike's products as more sustainable.

This line of thought has been analysed through another question, specifically about the marketing strategy implemented by the companies.



Graph n. 22, “In your opinion, which is the company that better promotes its products in terms of environmental sustainability?”, Own Research

The majority of the respondents reckon that neither of the companies are correctly promoting their products under their sustainable performance and neither their path towards disruptive eco-innovations. Anyway, 55% of the people who think this way corresponds to the ones that are not aware of the companies' initiatives.

On the other hand, of the respondents who are informed, 19% think that Adidas is the company that better promotes its products in terms of environmental sustainability.

These two questions highlight the prominent line of thought, which positions Adidas as the company which is more engaging in sustainable development and of which marketing strategy is more effective.

Nevertheless, the percentage of people which are aware of the companies' sustainable initiatives and eco-innovations are only 44% of the total of the respondents, underlying a major problem which is an almost complete unawareness of the customer about the efforts made by the companies to improve their sustainability performance. A company which changes its core business towards environmental purposes and which boost its R&D effort to create eco-

innovations to reach a sustainable business model should at the same time improve its capability to inform its customers.

Adidas has, in comparison, execute the most competent marketing strategy, as it is seen by the customer as the best company in promoting eco-innovations and pursuing sustainable development.

This is probably due to the fact that most of the eco-innovations created by Adidas entails a change in the customer perception of the product-consumption system, engaging customers in the path towards environmental sustainability.

8.4 Customer perception on sustainable products

The second part of the analysis covers the perception of customers on the sustainability performance of products. The focus still remains on sport shoes/sportwear, thus the opinion of the respondents regards specifically the importance of eco-innovations when purchasing apparel and footwear type of products.

In order to obtain a quantitative evaluation of the respondents' opinions, the questions are composed by a straight-forward statement on which people choose if they agree/strongly agree, disagree/strongly disagree or if they are indifferent, meaning that they don't have a specific opinion on that matter. The responses are then translated into numbers, from 1 to 5, with 5 being strongly agree and 1 being strongly disagree, to quantify the agreement to the statement.

The questions not only cover the sustainability aspects of the product, but rather a wider range of factors to establish also which the drivers when choosing what to buy are and if diminishing the environmental impact of the product actually provides an increase in the value of the item.

The set of questions, composed by 16 statements, can provide interesting insights about how customer prioritize product's characteristics and the degree to which environmental performance take place in their buying decision.

The aim is to identify if respondents can be categorized based on their approach and opinion towards sustainability products, and if different trends can incorporate specific preferences for a particular firm.

8.4.1 Analysis of the questions

The survey analysis for what concerns the second part is focused on identifying perception of customers about sustainable products and to identify if there are different lines of thought.

First, in order to understand if there are different opinions between the respondents, it is important to analyse the mean and the standard deviation of each question to understand if there are some particular questions on which the respondents mainly disagreed with each other.

A low standard deviation means that there is not too much dispersion in the answers given by the respondents, while a high standard deviation indicates that the answers are very different between each other. A high standard deviation has been defined, based on the nature of the variables, as higher than 1.

	Standard Deviation	Mean
Q1	0,7898	3,56
Q2	0,7297	4,33
Q3	0,8013	3,66
Q4	0,6999	4,327
Q5	0,6276	3,907
Q6	0,8702	3,367
Q7	0,8377	3,64
Q8	0,7047	4,2
Q9	0,7592	3,913
Q10	0,6097	4,527
Q11	1,0534	2,867
Q12	1,0356	2,607
Q13	0,9451	3,373
Q14	0,9000	3,427
Q15	0,7131	3,96
Q16	0,9247	3,254

Figure n.10: "Mean and Standard Deviation of the answers", Source: own research

The only two questions with a SD higher than 1 are question 11 and question 12, specifically related to whether companies should innovate to increase performance instead of sustainability and if it is important for them the environmental performance of the product they buy. It can be deduced that there are discordant perceptions about the relative importance of the degree of environmental sustainability with respect to performance, even though the mean is pretty low, meaning that the majority of the respondents disagreed to the statement.

Moreover, also question 13 shows one of the highest SD and deals with the drivers of consumer choice by identifying quality as the most important characteristic.

The other questions, which have a SD lower than 1, means that respondents have similar ideas about the concepts, even if SD are all very close to 1.

8.4.2 Principal component analysis

The principal components analysis⁴³ is a technique to reduce the dimensionality of the variable space and extrapolate tendencies and strong patterns from a quantitative dataset. This multivariate analysis can either use correlation coefficient or covariance matrix.

This mathematical procedure reduces a number of correlated variables into a smaller number of uncorrelated variables, which are called *principal components*. The first component describes as much as possible variance present in the dataset, while the others account for the remaining variance.

In order to identify if there are some underlying patterns in the survey's responses a database has been created composed by the sixteen quantitative questions and 150 observations. The analysis has been made with the software R studio.

In order to verify the measure of sampling adequacy of the database created from the responses, the Kaiser-Meyer-Olkin (KMO) test has been run. The test is used to evaluate if the dataset at issue is suitable for a PCA or factor analysis and it results in a number between 0 and 1 with a satisfactory value higher than 0,6.

The KMO test for the dataset analysed resulted 0,69, meaning that it is adequate for the Principal component analysis, as it can be seen from Appendix B.

8.4.3 PCA results

In order to implement the PCA and evaluate which and how many PCs to take into consideration for explaining variations in the data base, it is possible to identify the eigenvalue of each PC.

⁴³ Anton, *Elementary Linear Algebra*.

	Num	EigenValues	Prop.Eigen	CumProp.Eigen
1	1	3.508	0.2192	0.219
2	2	2.546	0.1592	0.378
3	3	1.548	0.0967	0.475
4	4	1.260	0.0787	0.554
5	5	1.102	0.0689	0.623
6	6	0.965	0.0603	0.683
7	7	0.795	0.0497	0.733
8	8	0.686	0.0429	0.776
9	9	0.640	0.0400	0.816
10	10	0.604	0.0377	0.853
11	11	0.558	0.0349	0.888
12	12	0.468	0.0293	0.917
13	13	0.430	0.0269	0.944
14	14	0.375	0.0235	0.968
15	15	0.275	0.0172	0.985
16	16	0.240	0.0150	1.000

Figure n.11 “Eigenvalues of PCs”, own research

The Kaiser/standard rule defines that it should be considered only those PCs with a variance (eigenvalue) higher than one.

Anyway, in this specific case, since according to this rule it must be considered five PCs, the elbow rule may help in better identifying the correct number.

The Elbow rule defines that if a sharp change of slope between one segment and another is present in the screen plot of the PCA, then only those components which are before the sharp change should be retained.

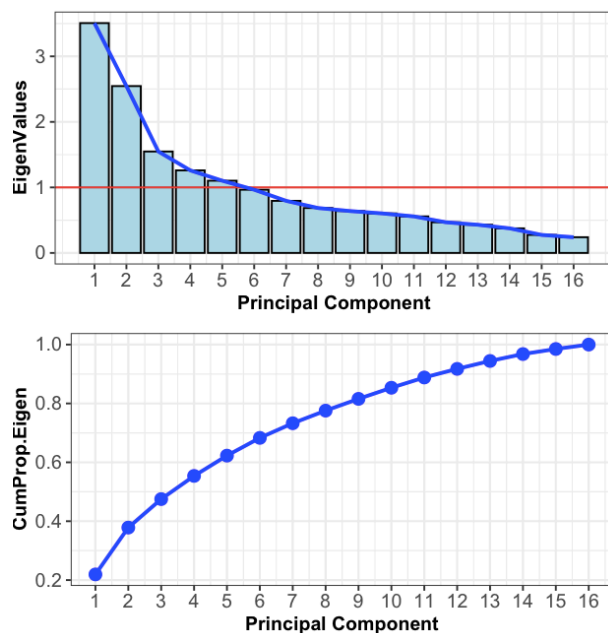


Figure n.12, “Screenplot of PCA”, own research

Indeed, the graph shows an acute change of slope between component three and four, suggesting that for this analysis only the first three component should be retained. As such, the

cumulative proportion shows that the first three components explain the 50% of variance of the database, which is a mediocre result.

Moreover, the proportion of eigenvalues shows that PC1 explains the 22% of the total variance, the 2nd the 16% and the 3rd the 9%. The other PCs identified explain a relatively small proportion of the total variance, resulting in an unimportant explanation of the dataset.

Before analysing the correlation between principal component and variables, it is useful to evaluate the cumulative proportion of each principal component with respect to the variables, that is the sum of the squared correlations between each variable and an increasing number of PCs.

As it can be seen from Appendix B, some of the variables are only explained enough when a greater number of PCs is used, but most of them are covered by the first three PC.

For example, the 1st PC explains more than half of six variables, the 2nd explains eight variables which were not previously described and the 3rd one covers three variables which were only partially explained by the first two. Anyway, some variables, such as the degree to which the brand is important in buying decisions, are only enough explained by using more PCs, which anyway will not be the case due to the small cumulative proportion that PCs other than the first three hold.

The correlations between the PCs and the respective variables are useful to understand the relationship among the variables, whose sign specify the direction of these relations.

The overall analysis of correlations can be explored in Appendix B, while, for the purpose of the analysis, the following graph shows the respective correlations of the variables with the first three PCs.

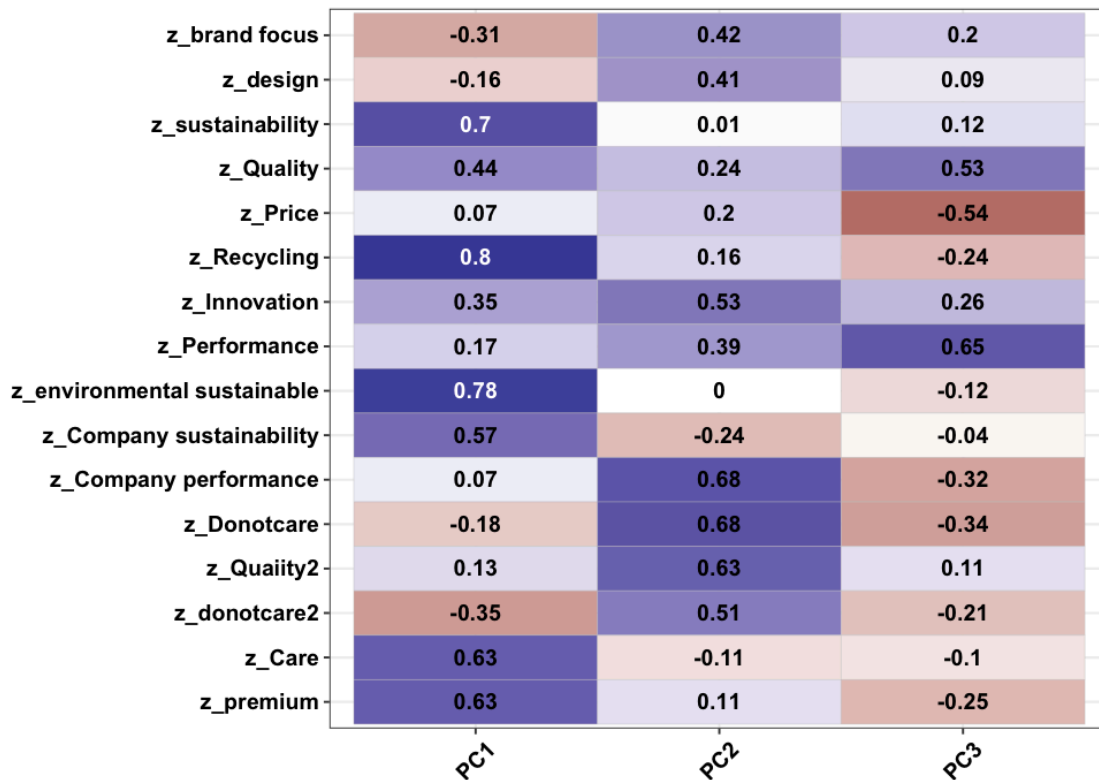


Figure n.13, "Summary of PCs", Source: own research

The first PC is highly correlated with seven of the variables. The specific of the variables correlated deals with the fact that respondents care about the sustainability aspect of products, about the use of recycled materials, that quality is an important factor, the importance of eco-friendly products, the fact that companies should invest to be more sustainable, the increased value generated by an environmentally sustainable product and their willingness to pay a premium price. Given the essence of the variables at issue, it can be established that the 1st PC explain a substantial trend towards sustainability, being in this sense a **measure of the importance of sustainability aspects during purchasing decisions.**

The highest correlation can be found with the variable concerning the use of recycled material, highlighting a trend mainly concerned towards waste as environmental damage.

Overall, this tendency opposes individuals which are interested in sustainability aspects of sportswear product s(high positive scores) with those who are indifference (low negative scores).

The second PC is highly correlated with other seven variables, being substantially complementary to the first one. The variables at issue concern the importance of the brand during purchasing decision, the design of the product, the degree of innovation, quality as main

driver during buying decision, and an overall indifference towards sustainability aspects of products identified by the three variables labelled “company performance” and “do not care”. It is important to explain that a positive correlation means that the highest the variable, the highest the component and, since a value equal to 5, the maximum, corresponds to a total agreement with the statement, this PC can be defined as the **measure of the non-importance of sustainability aspects during purchasing decisions**.

As such, this PC is devoted to explain those variables that were left unexplained by the first one. Specifically, it opposes respondents who are indifference during purchasing decisions about the degree of the environmental performance of products (high positive scores) with respondents who prioritize the sustainability aspects of products (low negative scores).

The 3rd PC on the other hand explains a countertendency, covering those variables which were not taken in account by the first two components.

This component is strongly correlated with three variables, that are performance, price and quality.

Specifically, while performance and quality have a positive direct relation, price is negative correlated. This means that this PC is a **measure of general factors during purchasing decision**.

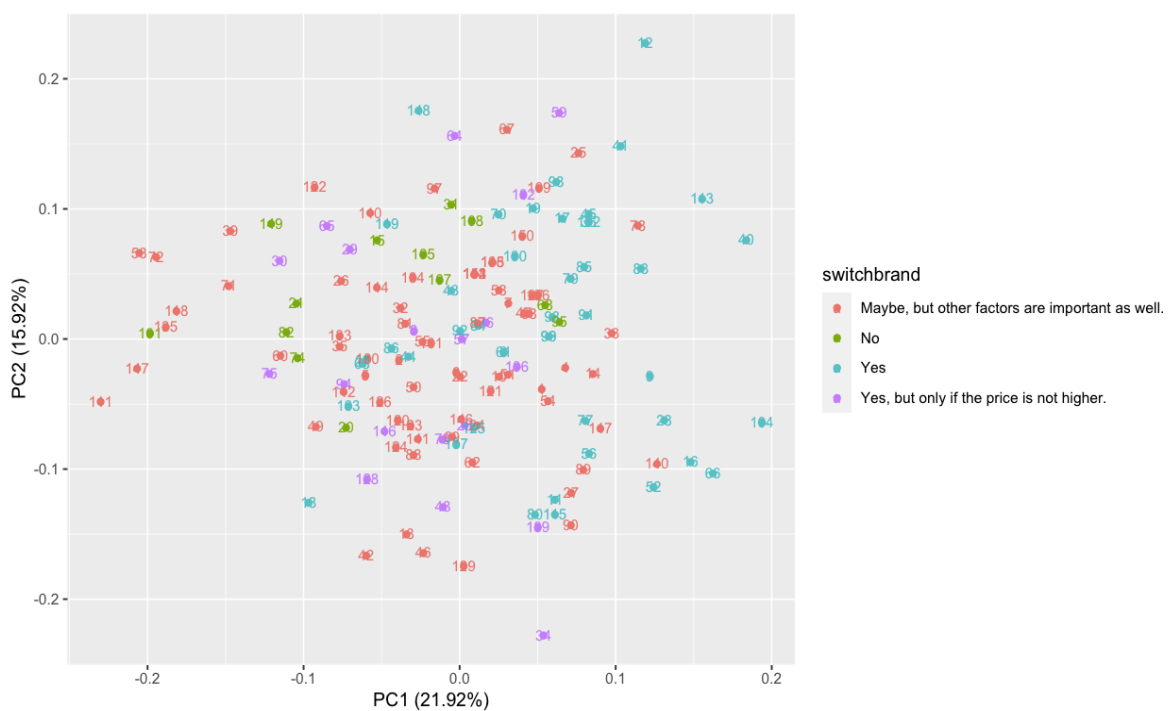
It highlights the inverse relation between price and quality, meaning that price is not important during purchasing decisions. Thus, respondents that have high positive scores with PC 3 will not be influenced by the price range of a product but rather by its qualitative and performance aspects.

Thus, PC one, explaining the 22% of the variance, describes a pattern with an interest towards sustainability, PC two, explaining 16%, is devoted to explain the opposite tendency towards a carelessness attitude on sustainability aspects when purchasing sports shoes and sportswear and PC three, explaining the 9% of the variance, is a countertendency simply elucidating deviations from the first two patterns, underlying an overall summary of factors important during purchasing decisions.

It can be also useful to visualise the respondents with respect to these three components, in order to see if there are some individuals that follows some particular patterns, or to see if respondents related to a specific component have a similar line of thought towards environmental sustainability.

For example, some qualitative variables have been taken into consideration in order to evaluate the distribution of choices in relation to principal components. The variables at issue analyse the perception of customer about the three companies' environmental performance, specifically about their ability to promote their products in terms of environmental sustainability, the degree to which their products are sustainable, sustainability initiatives and the respondents' willingness to switch brand based on the degree of eco-friendliness of their products.

To implement the analysis, a graphical representation has been made, according to the first two principal components. The respondents are represented by their number and they are coloured based on their response to the specific question.



Graph n. 23, "Scatterplot PC1 and PC2 –Switchbrand", own research

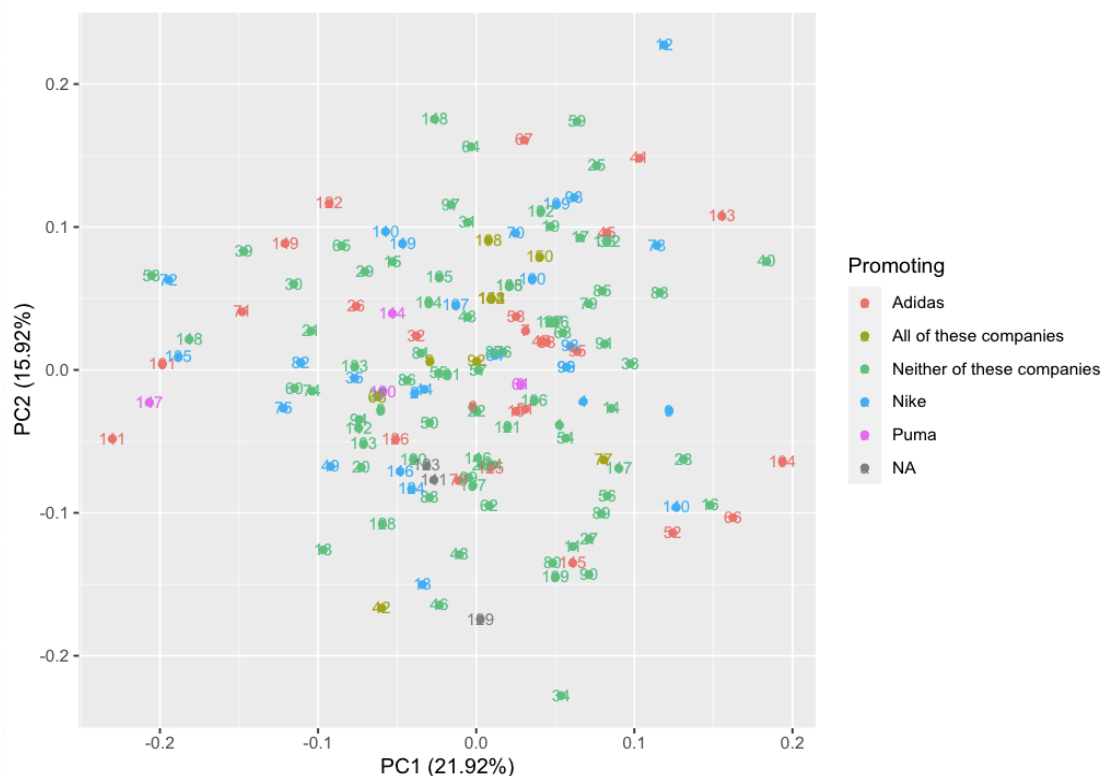
As it can be seen from Figure n.14, the colours do not follow a specific pattern. Anyway, the majority of the respondents which are willing to switch brand based on the degree of sustainability aspects of the product have a positive relation with PC1. It can be argued that the same individuals seem to be positive correlated also with PC2, but, as it can be explored in Graph IV of Appendix B, the variables which mainly describe the first quadrant are related to innovation and quality, meaning that this positive correlation does not concern an opinion on sustainability but rather on other factors. On the other hand, the respondents marked in green are the ones which are not willing to switch brand and seem to be more concentrated on the fourth quadrant, thus positive correlated with PC2 and negative correlated with PC1,

emphasizing the fact that those who are not interested in sustainability will not change their mind according to environmental aspects.

Another qualitative variable has been analysed in relation to PCs.

This question relates to the perception of respondents about the marketing strategy of the companies, specifically about the degree to which Nike, Adidas and Puma are promoting their products according to their sustainability aspects.

As it can be seen from Figure n.15 below, there is no clear patten identified between the respondents in relation to the two components. Anyway, this could also mean that the perception about the marketing strategy of these companies is not related to the degree to which the respondents are interested about environmental sustainability, but rather on a pure perception based on their general knowledge, underling a problem of disinformation caused by the companies themselves.



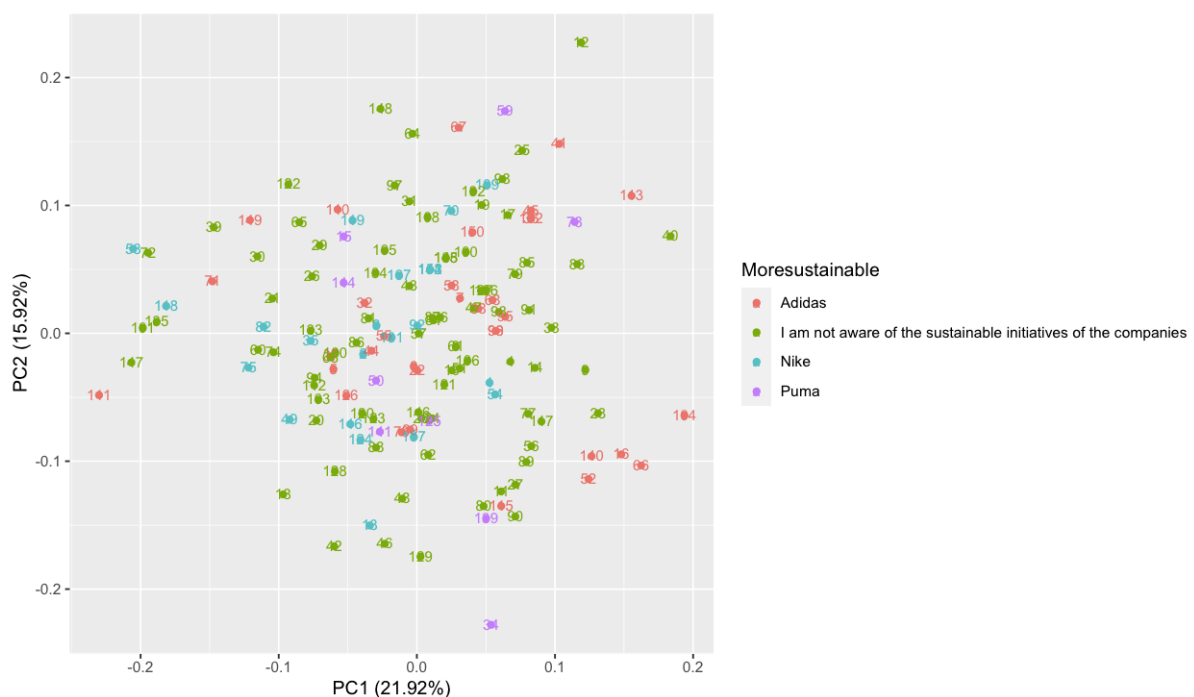
Graph n.24, “Scatterplot PC1 and PC2 - Promoting”, Source: own research

Nonetheless, also the question related to which is the company that in the respondents’ opinion produces products that are more environmentally sustainable does not show some defined configuration. As it can be seen from Figure n. 16, the only insight could be related to a slightly tendency of the respondents that have a negative correlation with the first component towards

Nike products, that could be either explained by a tendency of the non-interested people in sustainability which prioritize Nike only based on its brand, or an underlined confusion of respondents which are not aware of the environmental performance of its products.

At the same time, Puma appears rarely in the scatter plot, due probably to the inferior market share in comparison with the other two organizations.

On the other hand, while Nike's preferences seemed to be more leaned towards a negative correlation with the first component, Adidas, represented in red, is more oriented near the first and second quadrant, highlighting a positive correlation with respondents showing interest towards sustainable products, confirming the outcome obtained in the first part of the analysis.



Graph n.25, “Scatterplot PC1 and PC2 - Moresustainable”, own research

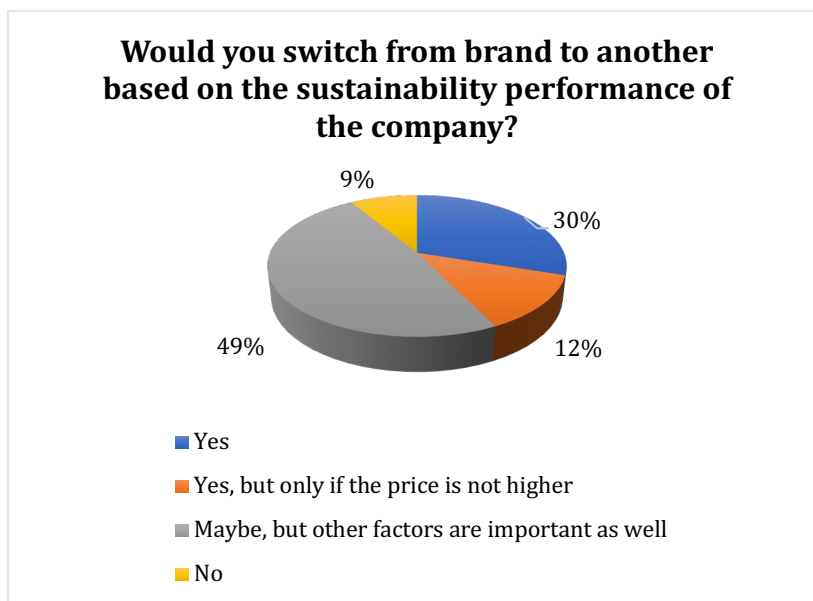
8.4.4 Insights

The first analysis made on the survey, consumers’ perception on companies’ sustainability strategy, have generated pretty useful conclusion.

Even if to some extent consumers are starting to perceive the absolute importance of pursuing sustainable developments for the world sake, the great majority is not informed about this urgency or it is not interested. While companies are, each to some extent, putting a lot of effort to enter the circular future of economy, consumers are still anchored in the old “buy, use, dispose” model of consumption which is not bearable neither in the short or long term.

A further question has been proposed in the survey, which has been previously analysed related to PCA, concerning the respondent's willingness to change from one brand to another based on the sustainability performance of the company.

The great majority, as it can be seen from the graph below, answered that they will probably change from one company to another, but other factors are important as well. This answer is interesting because, while quality and performance of the product still remains an imperative for customers, the possibility to change for an eco-alternative solution may actually increase the overall product's value.



Graph n.26 "Respondents willingness to change brand based on the sustainability performance of the company", Own Research

On the other hand, 30% of the people stated that they are more than willing to change company based on the sustainability performance, while 12% stated that they are willing to change only if the price is not higher.

For what concern the second part of the analysis, the PCA has not underlined specific patterns in the respondents' opinions, thus a cluster analysis has not been implemented.

Anyway, this blurred result can either mean an inaccuracy generated by the survey questions, or a general confusion of the interviewees about sustainability aspects. This second theory can also be reflected by the outcomes of the first part analysis, which show a majority of respondents mainly unaware of the environmental initiatives.

The weak tendencies of preferences identified in the scatter plot could maybe symbolize a preference for Adidas of customers interested in sustainability and a preference for Nike of those who are not interested in the environmentally sustainable aspects of products, but the relations are too weak to establish a final result.

Thus, the PCA has stressed one more time the main problem of the current society, which is an absolute lack of knowledge towards environmental damage and the important of eco-innovations, resulting in a confusion of opinions towards sustainability.

A general question has been proposed to the respondents about their opinion on the environmental sustainability concept in the final part of the survey. The majority of the answers reflect a deep concern about the importance of environmental sustainability, as a respondent stated: *“It is a very important aspect”*, or another reckons *“it's extremely important that all the firms invest in such a field.”*, or *“for me it is very important for a brand to be environmentally sustainable”*. Anyway, most of them also identify a problem of indifference towards the issue mainly caused by the consumers themselves, who will still buy products based on its quality and performance despite its environmental damage. Thus, respondents themselves underlined a lack of sensibility towards this concept, as interviewees explained: *“Firms must promote more the value of sustainability to make consumers more aware”*, or more *“Innovation in environmental sustainability is appreciated, but it is a small line on a whole list of priorities when purchasing a high-end product.”*, which is due to a mix of disinformation and indifference.

8.4.5 Limitations of the research

The survey has provided some useful insights and results, but a lot of factors can have distorted the overall analysis.

First, multiple-choice questions can oversimplify customer perception and preferences, misleading the real ways of thinking and behave, as well as being confusing and not perfectly clear.

For example, due to the complexity of the concept and the limited amount of space allowed by the survey, questions regarding companies' performance in contrast with sustainability may have been interpreted in the wrong way, as well as the concept of environmentally sustainability. At the same time, due to the nature of the sample and to its peculiar demographics, the survey cannot be taken as a general result, given the high participation of Italian respondents and the only marginal presence of other nationalities.

Second, errors such as *coverage*, which refers to the case in which the sample analysed does not cover all the segment of the population, and *measurement*, which refers to respondent's answers which do not truly reflect their behaviours, can have generated results which do not reflect the current population approach towards eco-innovations and sustainable products. (Survey Research, Benny S. Vissbr, Jon A. Krosnick, And Paul J. Lavraws).

Third, the PCA did not resulted in clear patterns, maybe due to the fact that surveys implemented on respondents that are not carefully selected and deeply analysed may generate blurred results, but they can be useful to generate insights for different type of researches.

Anyway, to better exploit this type of research, focus groups and in-dept interviews should be implemented, as well as cluster analysis.

Four, the attitude-behaviour gap⁴⁴ must be taken into consideration when analysing this type of patters. This problem has been identified by scholar to explain the mismatch between customers attitudes towards sustainability and the practical sustainability actions implemented by them.

On the other hand, the matrix analysis has provided some interesting result, even though limited due to the unavailability of data findings and the impossibility to achieve a transparent analysis of the environmental performance. The eco-innovations analysed, moreover, could may have some drawbacks which are not underlined by the company, offsetting their purpose to be greener. In-dept interviews with employees and manager of the companies will have provided more satisfactory results, allowing to implement a further analysis under the managerial perspective.

8.4.6 Future research

The results of the survey analysis have identified on one hand a slight preference towards the German company Adidas in terms of environmental performance, while on the other hand it has not been as successful for what concern respondents' patterns towards a single company' performance based on their approach toward sustainability. Anyway, this could be an interesting point of view for future research to identify if brand's choices in the apparel and footwear sector are influenced by sustainability aspects, as well as their willingness to pay for environmentally friendly products.

Moreover, questions concerning the motifs of this spread confusion can provide useful insights and suggestions on how to resolve this major problem, as well as a deeper analysis to make a

⁴⁴ Yee and Hassan, "ATTITUDE-BEHAVIOUR GAP IN SUSTAINABLE FASHION CONSUMPTION: THE ROLE OF FACILITATING CONDITIONS."

quantitative evaluation of the value increase of the item perceived by sustainability-oriented individuals.

On the companies' perspective, it could be useful to identify what could be the best way to promote and inform customers about eco-innovations and sustainability strategies, highlighting the features that best capture the attention of the consumers and the degree of competitive advantage generated, to answer to the most impellent question: how to educate customers about the urgency of environmentally sustainable products?.

For what concern the matrix analysis, this is only the basis from which companies can evaluate their eco-innovations characteristics and identify how much these will help them in reaching a sustainable business model. Anyway, a lot of steps separate this first phase from a complete transition of business models, that must be discovered and identified in order to create a manual of best practices from which organizations can take ideas and suggestions.

Moreover, it would be important to quantity the magnitude of the effect of each eco-innovation and their effect on the pace of the sustainable development, as well as their importance in the context of business model for sustainability.

Further, some questions have emerged from the research: how can the marketing strategy incorporate the path towards SBM? How can the competitive advantage generate being interpreted? What are the tasks of business management in this context? How can consistency eco-innovations be replicated at the business model level?.

8.5 Conclusions

The twofold analysis performed has suggested, to different extent, the same conclusion.

The apparel industry is co-operating and investing to ensure that the products do not cause environmental harm and that respect nature ecosystems, while still creating consumer value. Nonetheless, plenty of improvement must be done in order to define the industry "environmentally sustainable".

Companies are encouraging sustainable development, but they are still operating in a utilitarian society which imposes constant increase of production, offsetting per product efficiency innovations. Anyway, the transformational strategies' analysis shows several efforts towards a radical change of the way of doing business.

Customers are still not enough informed about the urgency to become more environmentally sustainable and for this reason the majority will not realize the value increase of a product which

respects nature. This is a fundamental aspect to be tackled to change the society and the economic systems. Companies should focus more on informing their customer segment of the importance of being environmentally sustainable and should promote their product based on this aspect.

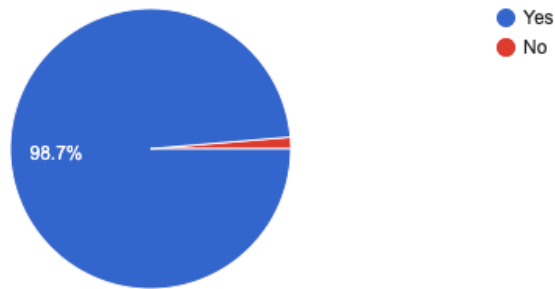
Anyway, as a concluding remark, both the survey and the matrix have highlighted the fact that Adidas is and is perceived as the company which produces more sustainable products and that promotes them in the best way. Thus, while consumption behaviour is changing, the company has the chance to extract more customer value and increase customer base through its sustainability-oriented strategy, that seems to be the best fit for the creation of a sustainable business model.

APPENDIX A: Detailed Survey Results

Q1

Are you familiar with the companies Nike, Adidas and Puma?

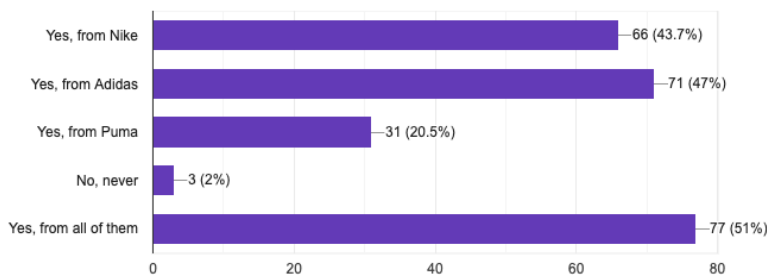
151 responses



Q2

Have you ever bought any product from one of them? (It is possible to select more than one option)

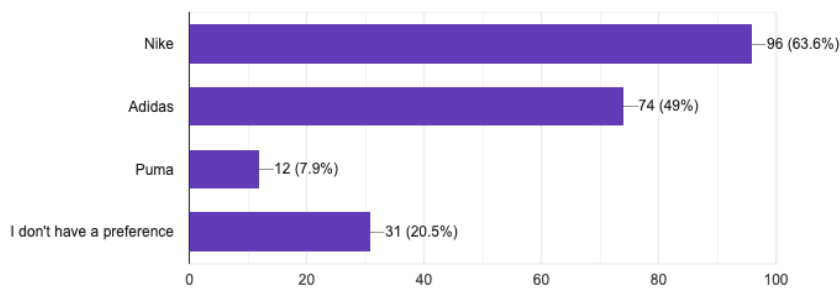
151 responses



Q3

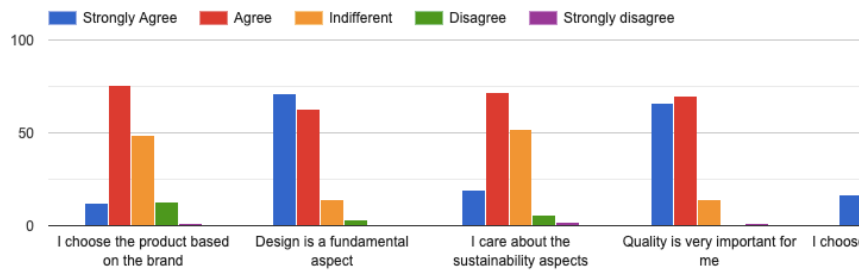
If you were interested in buying a pair of sport shoes or sportswear, which brand would you choose? (2 choices maximum)

151 responses



Q4

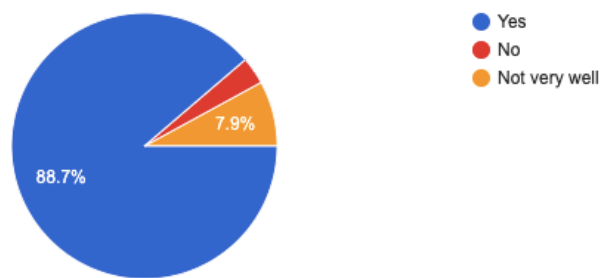
What are the drivers for you when you are interested in buying a pair of sports shoes or sportswear? Please select if you agree or disagree with these following statements.



Q5

Are you familiar with the term "environmental sustainability"?

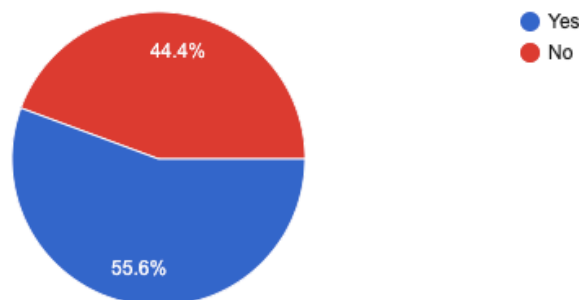
151 responses



Q6

Do you think that Nike, Adidas and Puma are innovating in order to be more environmental sustainable?

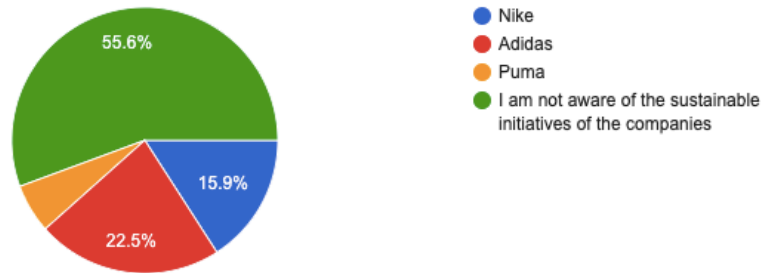
151 responses



Q7

In your opinion, which is the company that produce more sustainable products?

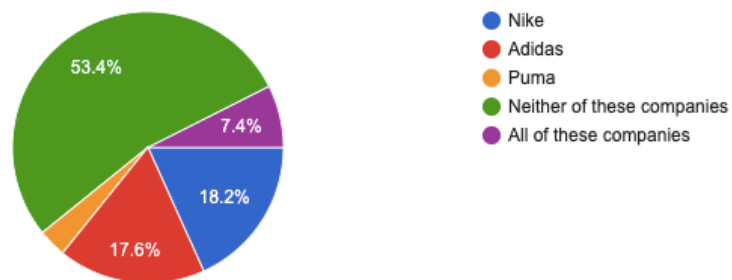
151 responses



Q8

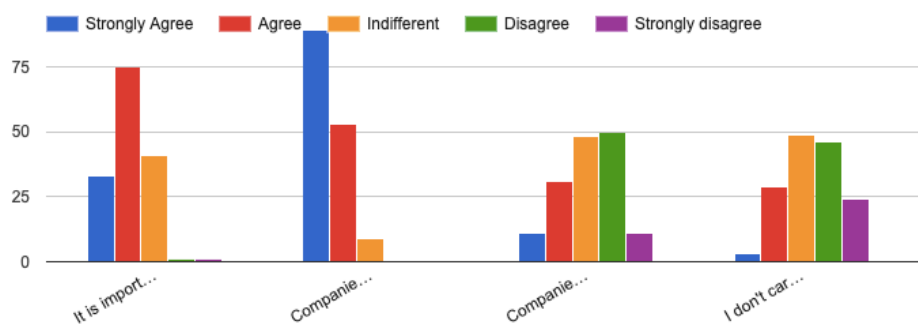
In your opinion, which is the company that better promotes its products in terms of environmental sustainability?

148 responses



Q9

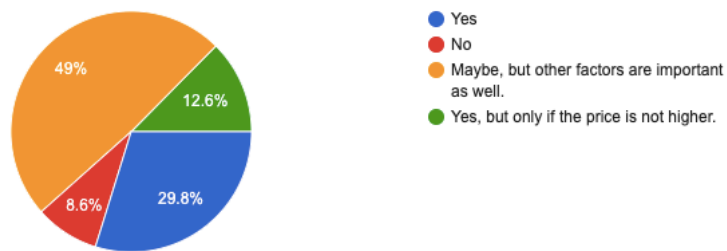
Please select if you agree or disagree with the following statements.



Q10

Would you switch from one brand to another based on the sustainability performance of the company?

151 responses



Q11

What is your opinion about innovating for environmental sustainability?

72 responses

It's extremely important that all the firms invest in such a field. But they have to be careful not to do the so called "green washing". Sustainability should be the normality of the materials and production process of the whole firm (see for example some brands that have the "sustainable collection"). This allows to reduce costs (economy of scale) and set a lower price. Otherwise, a sustainable choice will remain a kind of luxury good.

It would be an essential practice for our planet but few companies really care, the majority do it just for marketing reasons

Environmental sustainability should be, together with the infant labour and other production issues, one of the focuses of fashion companies in general (e.g. fabric production is also a highly polluting process).

All brands should invest on it now.

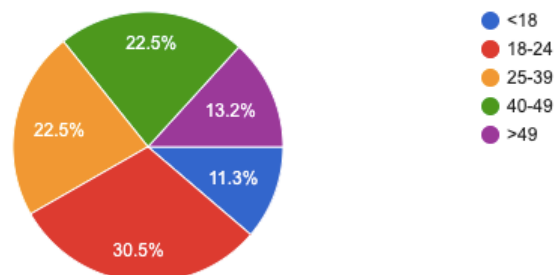
It is important

I think all companies should invest or look for opportunity to invest in innovative systems for environmental sustainability

Q12

How old are you?

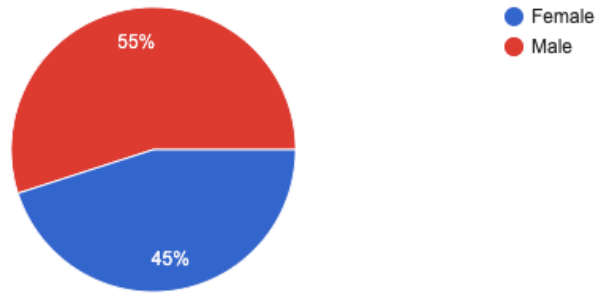
151 responses



Q13

Which is your gender?

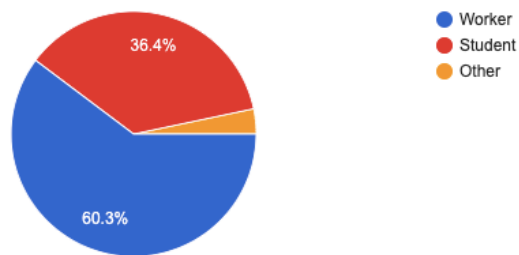
151 responses



Q14

Which is your status?

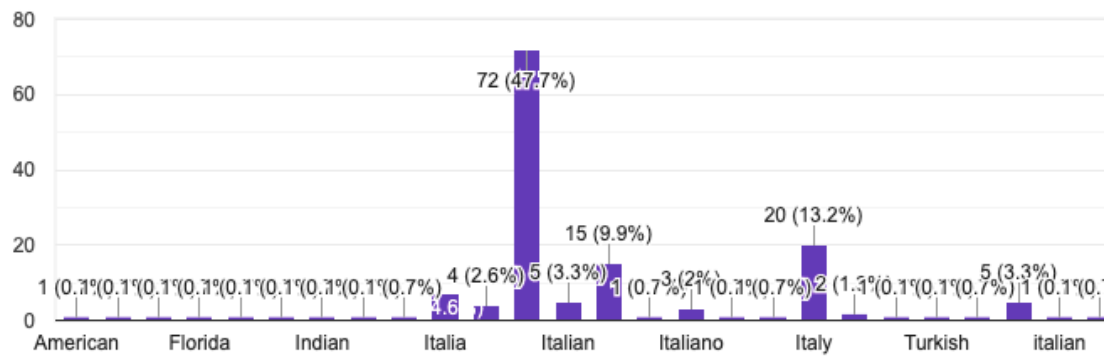
151 responses



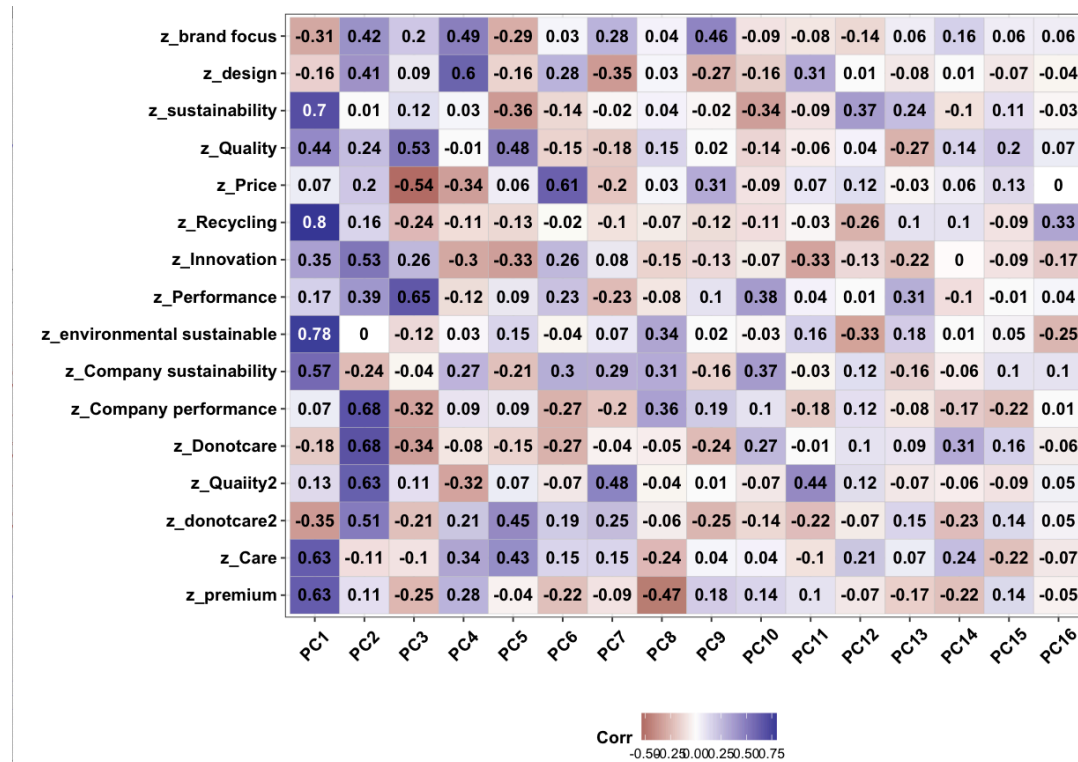
Q15

Which is your nationality?

151 responses



APPENDIX B – R studio PCA results



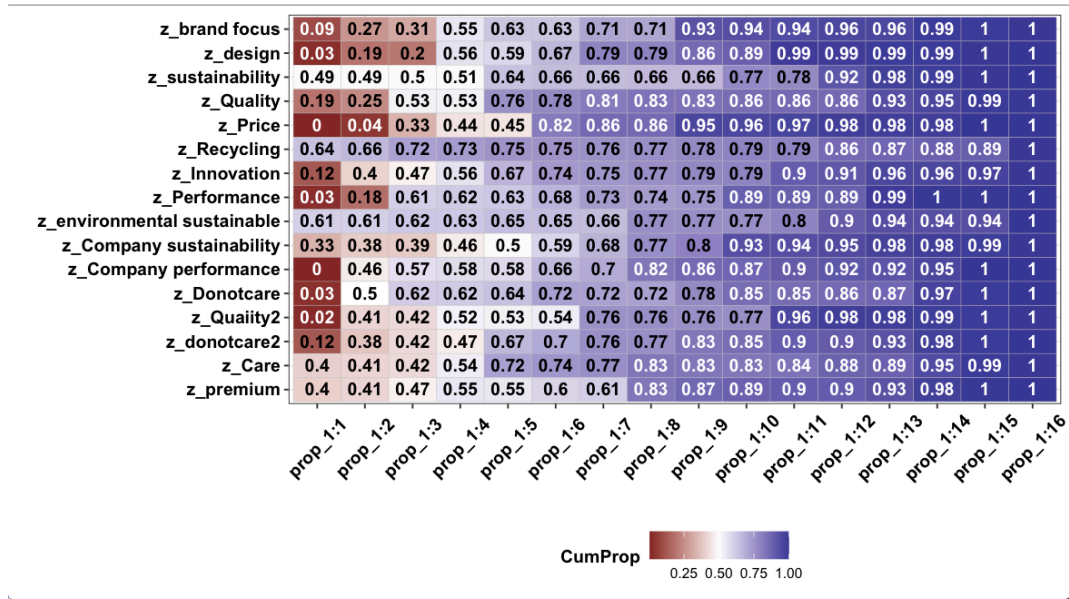
Graph I, “PCA correlations between variables results”, Own Research

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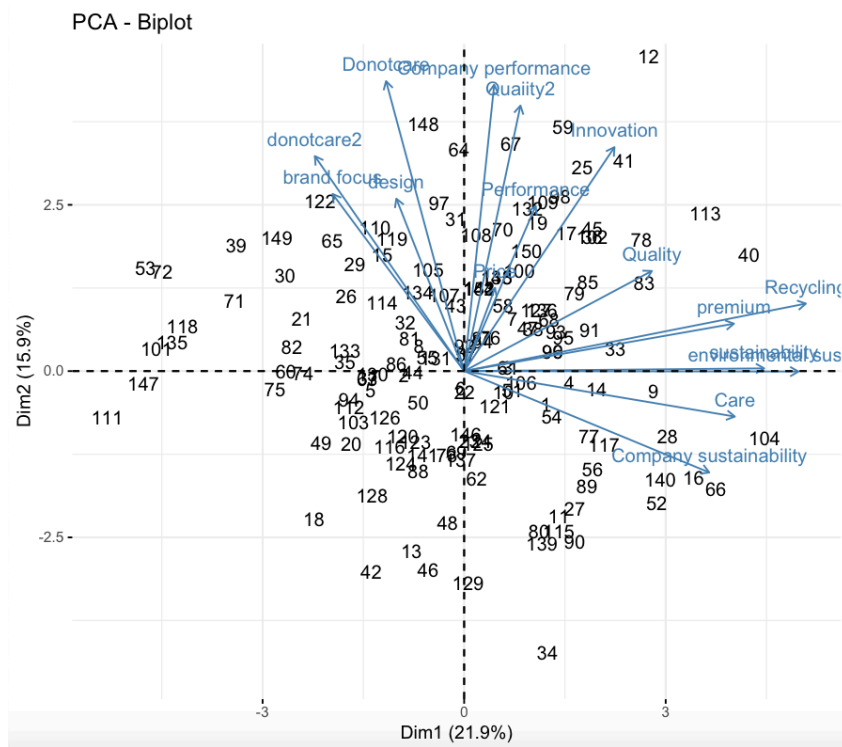
> KMO(data)
Kaiser-Meyer-Olkin factor adequacy
Call: KMO(r = data)
Overall MSA = 0.69
MSA for each item =
Brand-oriented          design          sustainabilityimportant          quality
0.66                    0.61            0.83                            0.57
price                   recycled        innovation                       performance
0.42                    0.75            0.61                            0.64
sustainability          companiesustainability          performance4          sustainabilitynotimportnat
0.77                    0.74            0.60                            0.65
quality4                notnecessary    increase value                 premium price
0.71                    0.65            0.68                            0.78

```

Graph II, “KMO test results for the dataset”, Own Research



Graph III, "Cumulative proportion of PCs", Own Research



Graph IV, "Biplot loadings and scores", Own Research

Bibliography

“2019 "Adidas green_company_report.Pdf,” n.d.

Adidas, *General Approach*, [online] /en/sustainability/managing-sustainability/general-approach/

Adidas, *Adidas aims to end plastic waste with innovation + partnerships as the solutions*, [online] <https://news.adidas.com/parley-ocean-plastic/adidas-aims-to-end-plastic-waste-with-innovation---partnerships-as-the-solutions/s/be70ac18-1fc9-45c1-9413-d8abaac2e849>

Adidas, ADIDAS AND PARLEY FOR THE OCEANS SHOWCASE SUSTAINABILITY INNOVATION AT UN CLIMATE CHANGE EVENT, [online] https://www.adidas-group.com/media/filer_public/76/d8/76d81fbf-8340-49cc-8a65-9d5585727d65/adidas_and_parley_for_the_oceans_showcase_sustainability_innovation_-_press_release.pdf

Adidas, Adidas - innovation, [online], /en/sustainability/products/sustainability-innovation/

Adidas, Adidas - material, [online], /en/sustainability/products/materials/

Adidas, Adidas- environmental approach, [online] /en/sustainability/managing-sustainability/environmental-approach/

Amit, Raphael, and Christoph Zott. “Creating Value Through Business Model Innovation,” n.d., 11.

Anton, Howard. *Elementary Linear Algebra*. New York: Wiley, 1987.

Bocken, Nancy, Samuel Short, Padmakshi Rana, and Steve Evans. “A Value Mapping Tool for Sustainable Business Modelling.” Edited by Gilbert Lenssen, Mollie Painter, Aileen Ion. *Corporate Governance: The International Journal of Business in Society* 13, no. 5 (October 14, 2013): 482–97. <https://doi.org/10.1108/CG-06-2013-0078>.

Bocken, N.M.P., S.W. Short, P. Rana, and S. Evans. “A Literature and Practice Review to Develop Sustainable Business Model Archetypes.” *Journal of Cleaner Production* 65 (February 2014): 42–56. <https://doi.org/10.1016/j.jclepro.2013.11.039>.

Boons, Frank, Carlos Montalvo, Jaco Quist, and Marcus Wagner. “Sustainable Innovation, Business Models and Economic Performance: An Overview.” *Journal of Cleaner Production* 45 (April 2013): 1–8. <https://doi.org/10.1016/j.jclepro.2012.08.013>.

“Sustainable Innovation, Business Models and Economic Performance: An Overview.” *Journal of Cleaner Production* 45 (April 2013): 1–8. <https://doi.org/10.1016/j.jclepro.2012.08.013>.

Charter, Martin, and Tom Clark. “Key Conclusions from Sustainable Innovation Conferences 2003–2006 Organised by The Centre for Sustainable Design,” n.d., 49.

Chesbrough Henry. “Business Model Innovation: It’s Not Just about Technology Anymore.” *Strategy & Leadership* 35, no. 6 (January 1, 2007): 12–17. <https://doi.org/10.1108/10878570710833714>.

Dray, Madeline, Robert Kraynak, Helen Lee, and Kristine Schantz. “Exploring the Sustainability of Nike Flyknit Shoes.” *Procedia CIRP*, 2014, 9.

“Eisenhardt - Building Theories from Case Study Research.Pdf,” n.d.

Evans, Steve, Doroteya Vladimirova, Maria Holgado, Kirsten Van Fossen, Miying Yang, Elisabete A. Silva, and Claire Y. Barlow. “Business Model Innovation for Sustainability: Towards a Unified Perspective for Creation of Sustainable Business Models.” *Business Strategy and the Environment* 26, no. 5 (2017): 597–608. <https://doi.org/10.1002/bse.1939>.

“FY19-Nike-Inc.-Impact-Report.Pdf.” Accessed April 23, 2020. <https://s3-us-west-2.amazonaws.com/purpose-cms-preprod01/wp-content/uploads/2020/04/10225416/FY19-Nike-Inc.-Impact-Report.pdf>.

“Green supply chain CITI evaluation IPE.” Accessed June 10, 2020.

<http://wwwen.ipe.org.cn/GreenSupplyChain/CITI.aspx?hy=7&tt=&index=0>.

Koszevska, Małgorzata. “Circular Economy — Challenges for the Textile and Clothing Industry.” *Autex Research Journal* 18, no. 4 (December 1, 2018): 337–47.

<https://doi.org/10.1515/aut-2018-0023>.

Lozano, Rodrigo. “Sustainable Business Models: Providing a More Holistic Perspective.” *Business Strategy and the Environment* 27, no. 8 (December 2018): 1159–66.

<https://doi.org/10.1002/bse.2059>.

Lüdeke-Freund, Florian. “Towards a Conceptual Framework of Business Models for Sustainability,” 2010, 28.

Mahdi, Hussain A Ali, Mohammed Abbas, and Taher Ilyas Mazar. “A Comparative Analysis of Strategies and Business Models of Nike, Inc. and Adidas Group with Special Reference to Competitive Advantage in the Context of a Dynamic and Competitive Environment” 6 (2015): 11.

Meynhardt, Timo. “Public Value Inside: What Is Public Value Creation?” *International Journal of Public Administration* 32, no. 3–4 (March 19, 2009): 192–219.

<https://doi.org/10.1080/01900690902732632>.

Nike, *Nike Sustainability. Move to Zero*, [online], <https://www.nike.com/sustainability>

Nike, *Our approach to sustainable products*, [online] <https://purpose.nike.com/sustainable-product-approach>

Nike, *Sustainability: Nike news*, <https://news.nike.com/sustainability>

Nike, *Nike Circular Design Guide*, [online] <https://www.nikecirculardesign.com/>

OECD, and Food and Agriculture Organization of the United Nations. *OECD-FAO Agricultural Outlook 2019-2028*. OECD-FAO Agricultural Outlook. OECD, 2019.

https://doi.org/10.1787/agr_outlook-2019-en.

Osterwalder, Alexander, Yves Pigneur, and Christopher L. Tucci. "Clarifying Business Models: Origins, Present, and Future of the Concept." *Communications of the Association for Information Systems* 16 (2005). <https://doi.org/10.17705/1CAIS.01601>.

Pohle, George, and Marc Chapman. "IBM's Global CEO Report 2006: Business Model Innovation Matters." *Strategy & Leadership* 34, no. 5 (January 1, 2006): 34–40. <https://doi.org/10.1108/10878570610701531>.

"Puma_Geschaeftsbericht_2019 (1).Pdf," n.d.

Puma, *Puma sustainability*, [online] <https://about.puma.com/en/sustainability>

Rana, Sohail, Subramani Pichandi, Shabaridharan Karunamoorthy, Amitava Bhattacharyya, Shama Parveen, and Raul Fanguero. "Carbon Footprint of Textile and Clothing Products." In *Handbook of Sustainable Apparel Production*, edited by Subramanian Muthu, 141–66. CRC Press, 2015. <https://doi.org/10.1201/b18428-10>.

Rennings, Klaus. "Redefining Innovation — Eco-Innovation Research and the Contribution from Ecological Economics." *Ecological Economics* 32, no. 2 (February 2000): 319–32. [https://doi.org/10.1016/S0921-8009\(99\)00112-3](https://doi.org/10.1016/S0921-8009(99)00112-3).

Roome, Nigel, and Céline Louche. "Journeying Toward Business Models for Sustainability: A Conceptual Model Found Inside the Black Box of Organisational Transformation." *Organization & Environment* 29, no. 1 (March 2016): 11–35. <https://doi.org/10.1177/1086026615595084>.

Schaltegger, Stefan, Florian Lüdeke Freund, and Erik G. Hansen. "Business Cases for Sustainability: The Role of Business Model Innovation for Corporate Sustainability." *International Journal of Innovation and Sustainable Development* 6, no. 2 (2012): 95. <https://doi.org/10.1504/IJISD.2012.046944>.

Stubbs, Wendy, and Chris Cocklin. "Conceptualizing a 'Sustainability Business Model.'" *Organization & Environment* 21, no. 2 (June 2008): 103–27.

<https://doi.org/10.1177/1086026608318042>.

“Sustainable Apparel Coalition.” Accessed January 22, 2020. <https://apparelcoalition.org/>.
Szekely Francisco. “Incremental, Radical and Game-Changing: Strategic Innovation for Sustainability.” Edited by Strebel Heidi and Mollie Painter Gilbert Lenssen Aileen Ionescu-Somers and Simon Pickard. *Corporate Governance* 13, no. 5 (January 1, 2013): 467–81. <https://doi.org/10.1108/CG-06-2013-0084>.

“Towards Industrial Ecology: Sustainable Development as a Concept of Ecological Modernization,” n.d.

Yee, Loi Wai, and Siti Hasnah Hassan. “ATTITUDE-BEHAVIOUR GAP IN SUSTAINABLE FASHION CONSUMPTION: THE ROLE OF FACILITATING CONDITIONS” 2, no. 7 (n.d.): 4.

Zott, Christoph, and Raphael Amit. “Business Model Design and the Performance of Entrepreneurial Firms.” *Organization Science* 18, no. 2 (April 2007): 181–99. <https://doi.org/10.1287/orsc.1060.0232>.

Affidavit

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