

Sustainability paradigm in the cosmetics industry: State of the art

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ABSTRACT

Sustainability is one of the main impacting trends that is shaping today's industries, and the cosmetics sector is no exception. The paper presents a systematic literature review of the sustainability paradigm affecting cosmetics industry, trying to investigate the state of the art of the scientific literature about the embracement of sustainability and Circular Economy paradigm by the cosmetics sector, digging deeper the distinctive practices that should be employed by companies along the cosmetic product lifecycle, and the connection with the several stakeholders involved in the Green Transition path. The study has been pursued from a double perspective: firstly, from a final customer's point of view, trying to understand which main factors are influencing the green purchasing behavior in the cosmetics industry and their managerial implications. Then, from a product lifecycle perspective, deepening what are the best practices for the development of a sustainable cosmetic product. Moreover, the paper proposes possible insights to develop a managerial framework able to support cosmetics SMEs in their transition toward sustainability, starting from the findings identified in the literature review.

1. Introduction

Sustainability is becoming an increasingly urgent issue in today's societies (Garetti and Taisch, 2012). From one side, the depletion of natural resources is increasing and scientists are claiming that the Earth is facing a climate emergency (Ripple et al., 2020). From the other side, the population is still growing, contributing to the increased demand for scarce natural resources (Manufuture Vision 2030, 2018; United Nations, 2019; United Nations, 2020). In this scenario, manufacturing industry is one of the main contributor to energy and resource consumption and emissions (Garetti and Taisch, 2012; World Economic Forum, 2019), causing sustainability to be a compelling challenge for the sector (Manufuture Vision 2030, 2018) and worth to be tackled more than ever. The majority of manufacturing companies who embraced sustainability into their vision claimed to outperform their competitors and to obtain benefits in terms of brand reputation, customer satisfaction and savings due to resource efficiency and decrease of waste, and a competitive advantage in the long-term (Eccles et al., 2012; Haanaes et al., 2011; Isaac et al., 2016). Among all, the cosmetics sector has been keeping growing over the years, reaching worldwide a

market value of around 500 billion US\$ in 2019 (Statista, 2019). Because of its continuously growth worldwide and due to its high consumption of natural resources, cosmetics industry represents one of the main sectors requiring a long-term vision to manage sustainability. The need to guide the sector toward a Green Transition is pushed by a strong emphasis on improving the environmental and social sustainability of its activities and products (Bom et al., 2019). Several are the definitions of cosmetic product that can be found in literature. Some sources distinguish between cosmetic products, skincare products, personal care products, and fragrances, which are all part of the beauty and personal care market (Statista, 2019). Other authors make a distinction between skincare products, toiletries, hair care products, decorative cosmetics (color, or make-up), and fragrances (Łopaciuk and Loboda, 2013; Rossi and Hoffman, 2007). Instead, according to the regulation (EC) No 1223/2009 of the European Parliament and of the Council of 30 November 2009, a cosmetic product can be defined as: "Any substance or mixture intended to be placed in contact with the external parts of the human body (epidermis, hair system, nails, lips and external genital organs) or with the teeth and the mucous membranes of the oral cavity with a view exclusively or mainly to cleaning them, perfuming them,

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changing their appearance, protecting them, keeping them in good condition or correcting body odours” (Union, 2019).

The decision to adopt a sustainable commitment for cosmetic companies is usually in first place driven by the expectation of obtaining economic benefits, even in terms of developing higher-value products or gaining more customers (Civancik-Uslu et al., 2019; L’Haridon et al., 2018). It is besides true that the improvement of economic and environmental performances often comes together, such as in the case of the application of Circular Economy (CE) principles (Acerbi et al., 2021; Civancik-Uslu et al., 2019). Cosmetics companies needs to expand their green vision to the entire supply chain, as the sustainability issue should encompass the entire lifecycle of a product and thus all the involved actors in the supply chain (Li et al., 2010).

Therefore, the present contribution aims to investigate the state of the art of the scientific literature about the embracement of sustainability and CE paradigm by the cosmetics sector, digging deeper the distinctive practices that should be employed by companies along the product lifecycle, and the connection with the several stakeholders involved (e.g., customers, both B2B and B2C, suppliers and other industrial actors) in this path. To this aim, the main research question addressed is the following: “*What is the state of the art of sustainability in the cosmetics industry?*”. More in detail, the contribution investigates how the sustainability paradigm takes place in the cosmetics industry according to the extant literature, by covering the topics under a product value chain perspective. Therefore, two sub-research questions, which are better explained in the research methodology section, are addressed in this contribution:

- RQ1.1. *What are the main factors influencing the green purchasing behavior in the cosmetics industry?*
- RQ1.2. *What are the best practices for the development of a sustainable cosmetic product along its lifecycle?*

Firstly, from a final customer’s point of view, the authors tried to understand which main factors are influencing the green purchasing behavior in the cosmetics industry and their managerial implications answering to RQ1.1. Then, answering to RQ1.2., from a product lifecycle perspective, deepening what are the best practices for the development of a sustainable cosmetic product. In addition, through the review of the state of the art, the still open scientific gaps are identified paving the way to future researches.

The rest of the paper is organized as follow: Section 2 presents the research methodology at the base of the work, while Section 3 shows the process and the results coming from the systematic literature review has been conducted. Section 4 presents the discussion about literature review findings and gaps identification, and Section 5 ends the paper with some final remarks.

2. Research methodology

In this section, the research methodology of the work is explained by addressing the following research stages: (i) definition of the eligible criteria adopted to collect data to perform the systematic literature review enabling to investigate the state of the art of sustainability in the cosmetic sector; (ii) research process employed to cluster and analyse the selected contributions.

2.1. Cosmetics industry and sustainability: literature review methodology

Despite cosmetics sector has been keeping growing over the years, it is recent its entrance in the sustainability market, which is worthwhile to analyze given the size and relevance of the cosmetics sector. Thus, the paper aims to analyze the link between sustainability and its application to the cosmetics industry, to understand the current state concerning the adopted best practices. Therefore, the following initial

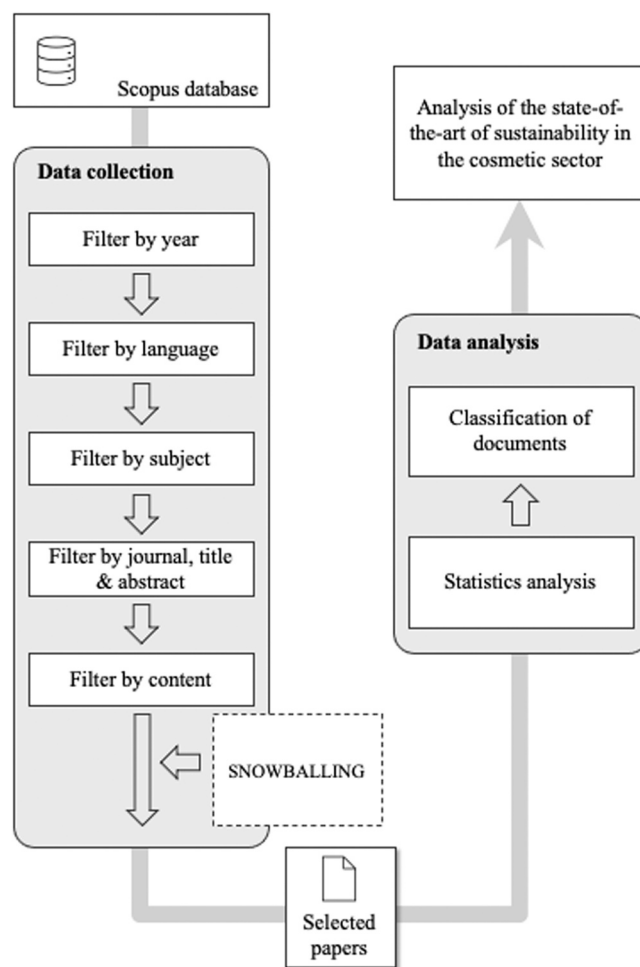


Fig. 1. Literature review approach.

research question has been formulated: *What is the state of the art of sustainability in the cosmetics industry?* This question enables to set the boundaries of the research. However, being it too generic, a preliminary rough literature search was carried out. In particular, the aim was to identify the main topics tackled in the literature about sustainability issues in the cosmetics industry. As a result, several themes arose from this preliminary attempt, which led to the formulation of research questions characterized by an appropriate level of detail and consistent with the authors’ managerial and industrial background. The areas deemed worth investigating relate to consumers and their behavior towards purchasing green cosmetics and sustainable cosmetic products development. In light of those considerations, specific research questions were formulated with regard to the area they refer to: RQ1.1 *What are the main factors influencing the green purchasing behavior in the cosmetics industry?* And RQ1.2 *What are the best practices for the development of a sustainable cosmetic product along its lifecycle?* A systematic literature review has been conducted to address these research questions. The overall literature review approach is represented in Fig. 1 and articulates into two main phases: (i) data collection and (ii) data analysis. Respectively, they consist of (i) gathering and filtering papers and (ii) analyzing and classifying data collected in terms of content and statistics. The resulting outcome consists of an extensive analysis of the state of the art of sustainability in the cosmetics industry, which led to the identification of literature gaps, comprising the absence of a managerial tool that could strategically support companies to face a transition towards a sustainable business.

2.1.1. Data collection process

Starting with the data collection description, Scopus database has been adopted to gather papers and articles from scientific journals. Since sustainability is a multidisciplinary and broad area, it was decided to filter the results by subject to narrow down the research set to the most relevant and appropriate papers. In addition to this, to map the state of the art of sustainability in the cosmetics industry, only the most recent works were taken into consideration, thus defining a specific timeline of analysis. Afterward, the results were filtered by title, excluding those articles that were clearly out of the analysis scope. Particularly, very specific cosmetic applications and works focused on chemical-related topics lacking managerial implications were excluded from the analysis. Finally, the remaining articles were filtered by reading the abstract and ultimately by content. To obtain a comprehensive set of research works, synonyms for the terms “cosmetics” and “sustainability” were identified through a brainstorming phase. From this procedure, some keywords emerged, including “cosmetics”, “cosmetics industry”, “personal care”, or “beauty”, followed alternatively by “sustainability”, “circular economy”, “green purchase behavior”, “eco-design”, “green”. It was found out that those expressions resulted in publications which could be mostly returned using only the strings “sustainability” OR “green” OR “circular economy” AND “cosmetic” (which could be in the title, in the abstract or keywords); thus, the latter expressions were considered to obtain all papers on the researched topic. A brief explanation of the subsequent filters have been applied is reported below:

1. Filter by year. The results were filtered by year, considering only the most recent works to faithfully map the most recent trends regarding sustainability-related issues in the cosmetics industry. Only papers published from 2010 onwards were considered, since there is a big increase in volume of articles on sustainability published in the last 10 years, compared to the entire period before 2010 (Maier et al., 2020).
2. Filter by language. In addition to this, articles in languages other than English or Italian were excluded.
3. Filter by subject. The last filter was applied based on the subject. Even narrowing the scope down to the cosmetics sector, sustainability is a multidisciplinary field, and it can regard several subjects (e.g., medicine, agricultural sciences, social sciences, business management, and accounting); as a result, many studies belong to very different areas were displayed by Scopus. Nonetheless, the research aimed to develop a comprehensive view of the topic of sustainability in the cosmetics sector. Hence, only the subjects that could potentially give relevant insights for the industrial field in terms of management and engineering implications were considered. Thus, the research was filtered by excluding “Veterinary”, “Psychology”, “Neuroscience”, “Decision Sciences”, “Arts and Humanities”, “Mathematics”, “Nursing”, “Health Professions”, “Multidisciplinary”, “Computer Science”, “Immunology and Microbiology”, “Physics and Astronomy”.
4. Finally, no filter was applied to the document typology: books, book chapters, articles, and conference papers were included in the analysis.

As a result of this first filtering phase, the number of works found was, however, high and equal to 1357.

Subsequently, a second filtering phase (i.e., skimming and screening) was performed, firstly considering journal ranking. To ensure the quality of the material analyzed, only articles whose journal ranks Q1 and Q2 according to *Scimago Journal and Country Rank* were considered. The selected publications were then skimmed by title and abstract and ultimately screened by their content’s relevance. The following rules were set up to perform the skimming and screening phases:

- Inclusion of studies of any geographical scope: papers from all over the world were considered, without discriminating the findings obtained in different geographical areas.

- Inclusion of case studies applied to cosmetics companies.
- Inclusion of studies of potentially any topic related to sustainability in the cosmetics industry (e.g., materials, production processes, legislations) if managerial and engineering considerations could be derived from their analysis.
- Exclusion of very specific cosmetics applications even if related to sustainability (e.g., antiaging properties derived from green processing of sweet cherry byproducts): indeed, the competencies of the authors were not deemed adequate to analyze very specific and technical papers regarding cosmetics applications critically.
- Exclusion of papers focusing on out-of-scope topics (e.g., studies of chemical properties of molecules in cosmetics formulae), which do not have explicit managerial implications.

At the end, a cross-reference snowballing approach was adopted to include further papers to the identified set of publications. The approach consists of reviewing the selected papers’ references and citations to identify additional articles to include in the analysis. Among the references and citations, it was decided to also consider sustainability reports of organizations operating in the cosmetics sector, in order to provide a complete overview of the industry’s best practices. The reason for using this approach was driven mainly by the nature of sustainability-related material for what concerns the cosmetics industry. A need for developing a more comprehensive view was indeed identified, given the fragmented nature of the findings regarding the topic under investigation. For a better understanding of the literature review data collection process, a visual representation is illustrated in Fig. 2.

2.1.2. Data analysis process

Moving to the data analysis, the eligible contributions have been analysed clustering them in an iteratively way by reading the contributions and employ the SLIP (Sort, Label, Integrate and Prioritize) method (Maeda, 2006) already adopted in sustainability related studies (e.g. Acerbi et al., 2021); (Sassanelli et al., 2020)). The categories identified for the classification can be defined in the following way:

- Consumers: from the literature review, it emerged that consumer-related material mainly concerns the analysis of the factors influencing the consumers’ green purchase behavior in the cosmetics market. In this section, also the main managerial implications identified by researchers will be illustrated.
- Life cycle stages of the cosmetic product: this section is divided into different subsections in line with the model elaborated by Bom et al. (Bom et al., 2019):
 - o Design and Life Cycle Thinking (LCT);
 - o Sourcing;
 - o Manufacturing;
 - o Packaging;
 - o Distribution;
 - o Consumer use;
 - o Post-consumer use.

For each of them, the issues and best practices identified in the literature are shown and discussed.

3. Literature review results

In this section, the literature review process is explained in detail. The underlying methodology will be further explained and justified, reviewing all the steps which were carried out. For this purpose, the two phases of data collection and data analysis will be described in depth. Finally, the content of the literature review will be illustrated and discussed.

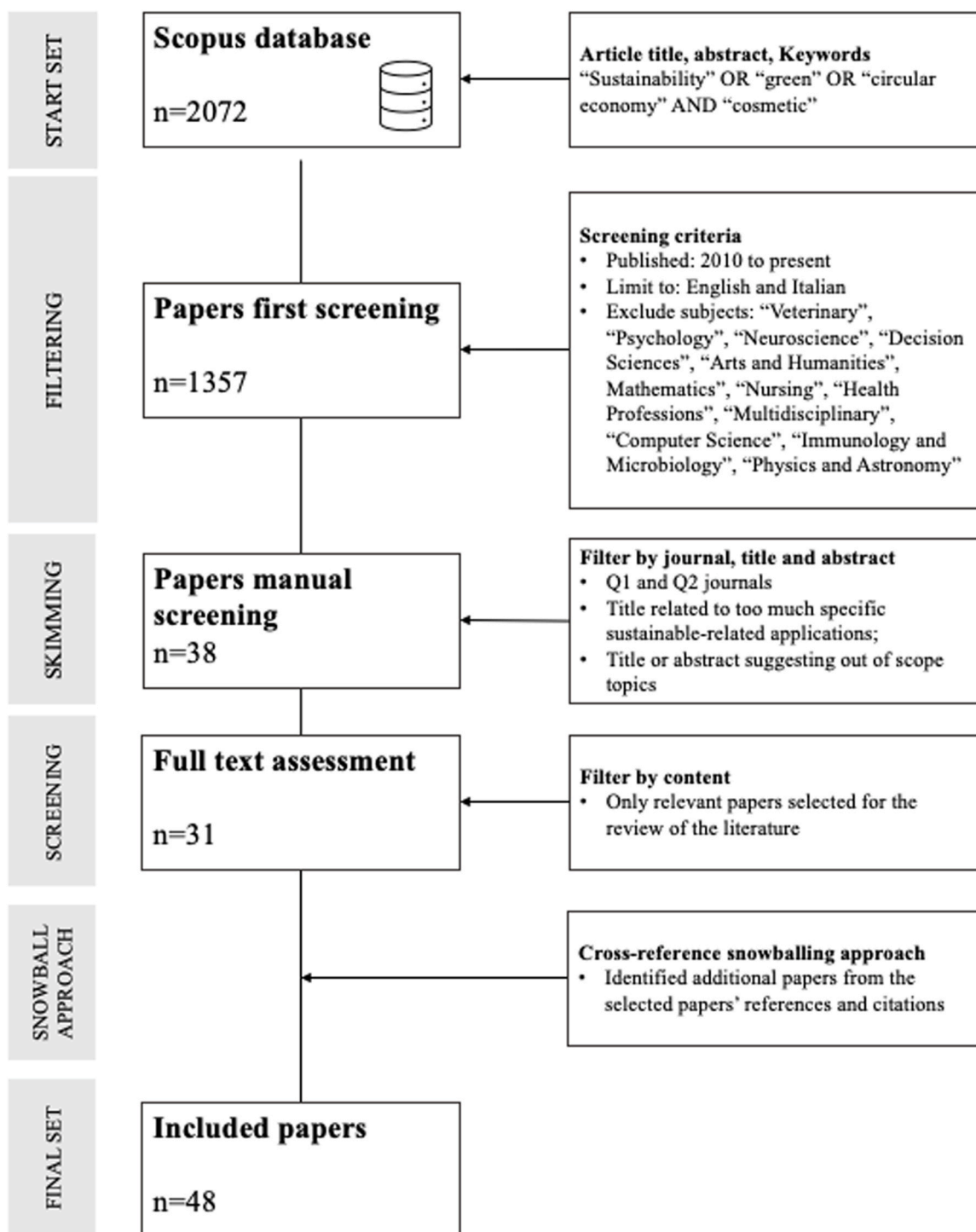


Fig. 2. Data Collection.

3.1. Preliminary statistics of publications on sustainability in cosmetics industry

Over the years (and only considering from 2010 onwards), the number of papers published linked to the topic of sustainability in the cosmetics sector has increased. This represents evidence of the growing interest in this field. Data about publications returned by Scopus using the strings chosen for the literature search is reported in Fig. 3.

Regarding the papers selected, which account for 48 publications in total, they are for the majority (i.e., around 80 %) journal articles or reviews, as displayed in Table 1.

Finally, among the 43 selected articles, reviews, and conference papers (i.e., excluding reports and books), 16 are case studies (i.e., around 37 % of the sample). All the documents (articles, reviews, conference papers, reports and books) were then classified according to the different stages of the cosmetics product value chain, as illustrated in Table 2: 26 of these (i.e., 52 % of the sample) are related to the consumers and/or to the consumer use phase; 15 of these (i.e., 30 % of the sample) are related to the design and LCT phase; 13 of these (i.e., 26 % of the sample) are related to the sourcing phase; 5 of these (i.e., 10 % of the sample) are related to the manufacturing phase; 6 of these (i.e., 12 % of the sample) are related to the packaging phase; 7 of these (i.e.,

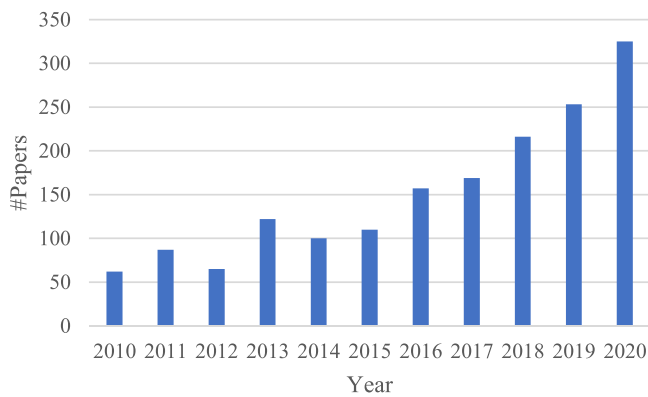


Fig. 3. Number of papers published per year from 2010 to 2020 (before filtering phase was performed).

Table 1
Number of papers per type of publication.

Publication typology	#Publications
Article	31
Review	7
Conference Paper	5
Report	4
Book	1

14 % of the sample) are related to the distribution phase; while 9 of these (i.e., 18 % of the sample) are related to post-consumer use phase.

3.2. State of the art of sustainability in the cosmetics industry

Sustainability issue in cosmetics sector can be faced from various perspectives, e.g., consumers, supply chain, raw materials, and the sustainability assessment of a product along its life cycle. As reported in the Table 2, the contributions tend to cover these aspects sometimes in a heterogeneous way. Therefore, an analysis of the literature is reported below, based on the entire product value chain perspective (i.e., considering final consumers and the different product life cycle stages answering respectively to RQ1.1. and RQ1.2).

3.2.1. Consumers

Most consumer-related material mentions the need to deal with the growing trend of sustainability in the cosmetics market. Consumers nowadays are more aware of the necessity to shift toward green products, as environmental and ethical considerations are increasingly relevant factors in their purchase behavior (Liobikienė and Bernatoniene, 2017). From the literature review, it emerged that, when analyzing the factors influencing the Green Purchase Behavior (GPB) in the context of cosmetic products purchase, the main instruments used are surveys and focus groups. Moreover, in general the frameworks and theories applied for the investigation are mainly the Theory of Planned Behavior (TPB) (Askadilla and Krisjanti, 2017) or the Pro-Environmental Reasoned Action (PERA) model (Chin et al., 2018), which are both an evolution of the Theory of Reasoned Action (TRA), or the VBN (Value-Belief-Norm) Theory (Kim and Chung, 2011); (Quoquab et al., 2020); (Zahid et al., 2018).

Different studies regarding the GPB in the cosmetics market in some cases obtained different results. This can be due to two main reasons: (i) on the one hand, to the country in which the study was conducted, its culture and its economic development; (ii) on the other hand, to the fact that, when carrying out this kind of studies, researchers analyze the determinants of green products purchase in general including all green products into one term, and this leads consumers to be confused and authors to obtain different results in terms of internal (attitudes, value

awareness), social and external (regarding to external circumstances) factors impacting on green purchase (Ambak et al., 2019; Liobikienė and Bernatoniene, 2017; Pudaruth et al., 2015). Indeed, the motivations that drive the consumer to buy green products could be cultural, market-driven, or personal, or all three simultaneously (Askadilla and Krisjanti, 2017; Fatoki, 2020; Ghazali et al., 2017); (Kim and Chung, 2011); (Sahota, 2014c). Consumers' confusion is also due to a lack of uniformity in terms of labels, standards, and certifications (Golsteijn et al., 2018): eco-labels and certifications are fundamental in order to change the perceptions of green products (Hsu et al., 2017; Ikram et al., 2021; Zahid et al., 2018); they can be helpful, especially in case of imitation, where the copied products result in harmful ingredients for the user and the environment (Askadilla and Krisjanti, 2017; Chin et al., 2018; Hsu et al., 2017); (Kim and Chung, 2011); (Zahid et al., 2018). Moreover, the literature underlines that most consumers are uncertain about a clear definition of green cosmetics, and this lack of knowledge is perceived as a barrier to green living (Sahota, 2014c). The authors decided to use the Stimulus-Organism-Response (SOR) model (Kotler et al., 2016) to give a systematic overview of the different studies in the literature regarding the GPB of cosmetics consumers, as reported in Fig. 4. The SOR theory is widely used in literature to investigate the links between stimulus (input), organism (processes), and response (outputs) (Kim et al., 2020). This model is useful when analyzing the decision-making and buying process of a consumer: the behavioral response of a consumer (e.g., in terms of what product to buy, where to buy it, when to buy it, at what price) depends on its decision-making and psychological factors: (i) perception, (ii) motivation, (iii) attitude, (iv) learning. These are created and influenced by:

- External stimuli: environmental, marketing. They create the need.
- Cultural and social factors: culture, social class, reference groups, family, roles and status.
- Personal factors: age/stage in the life cycle, occupation, wealth and consumption attitudes, lifestyle, personality, self-concept, expectations.

This model has been used in order to frame the current knowledge on GPB in the cosmetics market by categorizing the different studies according to the nature of the insights provided. A brief explanation of the three factors analysis of SOR model applied to GPB in cosmetics market is reported below.

- External stimuli (environmental, marketing)

It has been already stated that environmental and sustainability issues have increasingly become a public concern over the past years, motivating cosmetics consumers to purchase green products. As a consequence, this increasing awareness has led to increasing attention focused on green consumerism (Chin et al., 2018; Fatoki, 2020). Consumers' willingness to adopt green cosmetics can be enhanced from several green constructs, such as corporate transparency, green brand image, green brand trust, and green brand equity (Lee and Chen, 2019). In their work, (Chin et al., 2018) investigated consumers' purchasing intentions toward green cosmetics products using the pro-environmental reasoned action (PERA) model, indicating that Perceived Authority Support (PAS) has a positive effect on Perceived Environmental Concern (PEC). PAS and PEC have positive effects on attitude (AT) and subjective norms (SN), and AT and SN have positive effects on behavioral intention (BI) to purchase green cosmetics products, with the key factor being attitude (Chin et al., 2018). In some cases, a cosmetics company could become more sustainable due to a request of the market or of any other stakeholders of the supply chain. In fact, it is usually the customer who asks the supplier for obtaining a better sustainable performance, nonetheless it can sometimes happen the opposite scenario (i.e., the request is propagated downstream from supplier to customer) (Civancik-Uslu et al., 2019).

Table 2
Classification of papers by content.

Reference	Consumers	Life cycle stages of a cosmetic product						
		Design & LCT	Sourcing	Manufacturing	Packaging	Distribution	Consumer use	Post-consumer use
(Liobikiénė and Bernatoniėnė, 2017)	X							
(Sahota, 2014c)	X							
(Golsteijn et al., 2018)	X	X					X	X
(Hsu et al., 2017)	X							
(Zahid et al., 2018)	X							
(Amberg and Fogarassy, 2019)	X							
(Quoquab et al., 2020)	X							
(Kim and Chung, 2011)	X							
(Pudaruth et al., 2015)	X							
(Ambak et al., 2019)	X							
(Fatoki, 2020)	X							
(Cervellon and Carey, 2014)	X							
(Chin et al., 2018)	X							
(Askadilla and Krisjanti, 2017)	X							
(Ghazali et al., 2017)	X							
(Papista and Dimitriadis, 2019)	X							
(Lee and Chen, 2019)	X							
(Choi and Lee, 2019)	X							
Environmental Sustainability Report, 2019, Cosmetics Europe		X	X	X		X	X	X
Good Sustainability Practice (GSP) for the cosmetics industry, Cosmetics Europe		X	X	X		X	X	X
(L'Haridon et al., 2018)		X						X
(Civancik-Uslu et al., 2019)		X						
(Bom et al., 2020)		X	X	X	X	X		X
(Secchi et al., 2016)		X						
(Francke and Castro, 2013)		X					X	
(Philippe et al., 2012)		X	X	X				
(de Camargo et al., 2019)		X					X	
Glew and Lovett, 2014		X						
(Campion et al., 2014)		X						X
Vargas-Gonzalez et al., 2019		X						
(Mellou et al., 2019)			X					
(Fonseca-Santos et al., 2015)			X					
(Bom et al., 2019)			X		X	X		
(Faria-Silva et al., 2020)			X					
(Sahota, 2014a)			X					
(Sahota, 2014b)			X		X			
Le Tourneau and Greissing, 2010			X					
Hitce et al., 2018			X					
(Fortunati et al., 2020)			X					
(Cinelli et al., 2019)						X	X	
(Drobac et al., 2020)					X	X		
(Li et al., 2010)						X		
(Feng et al., 2018)							X	
(Boxall et al., 2012)								X
(Vita et al., 2018)								X
(Demichelis et al., 2018)								X
Progress report, L'Oréal, 2019		X		X			X	
(Brones et al., 2017)		X						
(Sehnm et al., 2019)							X	
SPICE et al. (SPICE et al., 2019)					X			

- Cultural and social factors (culture, social class, reference groups, family, roles and status)
According to the results found in literature, beliefs are the factor that positively becomes a determinant in TPB (behavioral belief, normative belief, and control belief). Moreover, behavioral belief, normative believe, as well as control believe were acted as subjective attributions that influence consumer's perception toward an object, which in this study is environmentally-friendly cosmetic products (Askadilla and Krisjanti, 2017). Using the TPB to examine the effects of consumer values and past experiences on consumer purchase intention of organic personal care products, (Kim and Chung, 2011) study aims to consider further the moderating effect of perceived behavioral control on the attitude-intention

relationship. The results of the study indicate that environmental consciousness and appearance consciousness positively influence attitude toward buying organic personal care products. The addition of past experiences as a predictor of purchase intention and perceived behavioral control as a moderator of the attitude-purchase intention relationship yielded an improvement on the TPB model.

- Personal factors (age/stage in the life cycle, occupation, wealth and consumption attitudes, lifestyle, personality, self-concept, expectations)

More than ever, consumers think about future generations, considering to protect the state of the environment during their decisions (Amberg and Fogarassy, 2019). Some authors pointed out that

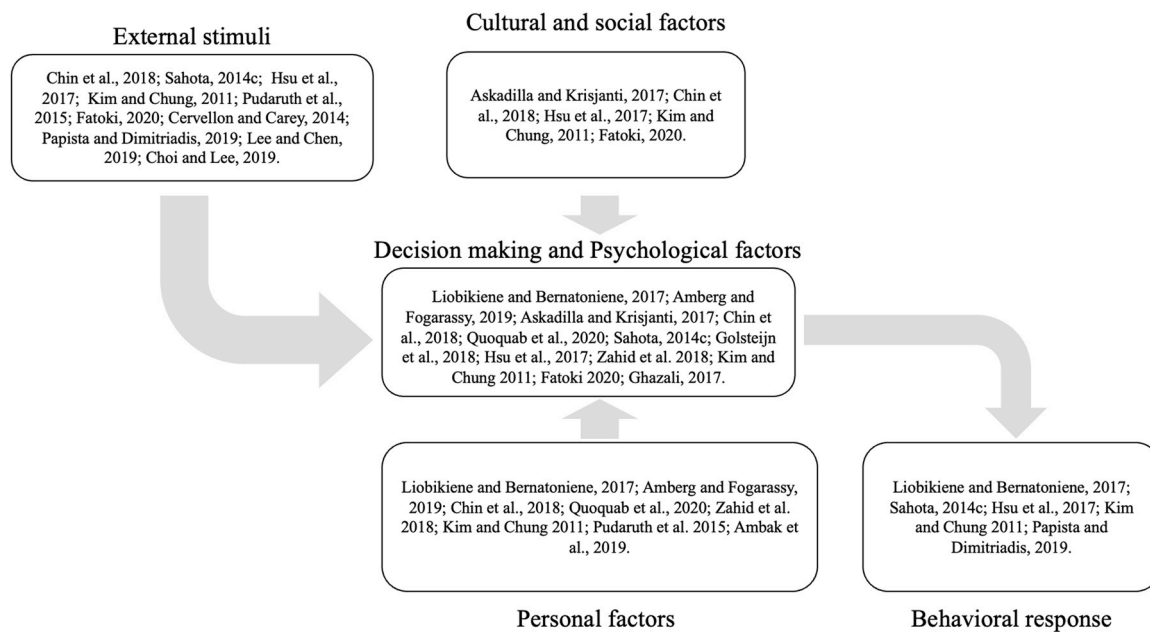


Fig. 4. Categorization of papers according to the Stimulus-Organism-Response model (adopted by (Kotler et al., 2016)).

environmental awareness and price sensitivity significantly mirrors the level of green purchase attitudes (Amberg and Fogarassy, 2019; Chen and Deng, 2016), while knowledge can influence the entire decision-making process of consumers. Green trust and green purchase intent have a connection, positively influenced by perceived price. Higher perceived price results in higher trust from the consumer in the case of green products, therefore, has a higher effect on purchase intent as well (Wang et al., 2019). Consumers are more and more interested in an environmentally friendly lifestyle, since they not only consider environment protection perspectives, but also want personal advantages from green products (Amberg and Fogarassy, 2019). In their study, (Quoquab et al., 2020) examined the difference between male and female consumers in terms of their green purchase behavior of cosmetic products in the Malaysian context, and investigated the relationships between “values and pro-environmental beliefs”, “pro-environmental beliefs and personal norm” and “personal norm and green purchase behavior” (Quoquab et al., 2020). The finding of this research confirmed the positive relationship between pro-environmental beliefs and personal norms. This output is in agreement with the VBN theory and, according to this theory, individuals’ beliefs about the environment will affect their norm. More specifically, consumers’ awareness of consequences and ascription of responsibilities activate their personal norm to behave in such a way that can help and protect the environment. Applying the Theory of Planned Behavior (TPB), (Hsu et al., 2017) explain the effects (i.e., attitude, subjective norm, and perceived behavioral control) on purchase intention of green cosmetics products, trying to determine if country of origin and price sensitivity moderate the links between purchase intention and its antecedences. The results of their work indicate that attitude, subjective norm, and perceived behavioral control have a significant impact on purchase intention of green skincare products, and that country of origin and price sensitivity can enhance the positive effects on the links between purchase intention and its antecedences.

3.2.2. Sustainability along cosmetic product life cycle

The literature review conducted on the green cosmetics market highlighted the increasing relevance of sustainability issues in the cosmetic sector. In the light of this emerging trend, the cosmetics industry needs to develop innovative products which reflect the sustainability concerns of final consumers. With this aim, Bom et al. suggest addressing those issues by considering the single stages of a cosmetic

product life cycle (Bom et al., 2019). In particular, their model considers the lifecycle phases with a sustainable approach: design, sourcing, manufacturing, packaging, distribution, consumer use, and post-consumer use (Bom et al., 2019). Thus, this section of the literature review is carried out based on this classification, providing an in-depth analysis of the single lifecycle stages of the cosmetic product.

– Design & LCT

The cosmetic products design stage is acknowledged to have a significant environmental impact, even if the exact proportion can vary according to the specific product considered (Cosmetics Europe, 2019). To develop a cosmetic product with an improved environmental profile, a perspective that takes into account the entire life cycle is widely adopted in the industry. Indeed, a sustainable product is characterized by the required functionalities and improved social, economic, and environmental impacts over the entire life cycle (Cosmetics Europe, 2012; L’Haridon et al., 2018). Most of the studies regarding Life Cycle Thinking (LCT) in the cosmetics industry are related to evaluating a specific product’s environmental impact along its life cycle rather than developing new LCT methodologies customized for cosmetics products. Different LCT approaches (i.e., Life Cycle Assessment (LCA), Environmental-, Carbon-, and Water-Footprinting) have started to be used to measure the environmental impacts of different products to improve their environmental profile (Civancik-Uslu et al., 2019). These approaches can be used to meet sustainability and CE principles within the product (Civancik-Uslu et al., 2019). However, a product’s environmental performance should be improved without worsening its functionalities and benefits (Civancik-Uslu et al., 2019; L’Haridon et al., 2018). Those approaches are helpful especially when regulation and guidelines are not harmonized, as it is the case of the cosmetics industry, thus helping in the decision-making process and evaluation of alternatives by providing the decision-maker with objective results (Bom et al., 2020).

– Sourcing

Raw materials sourcing refers to all the processes necessary to extract raw materials, treat them and deliver them to the cosmetics manufacturer. They are extracted or synthesized in many parts of the world and are delivered to the cosmetics manufacturer through a network of producers and distributors. These upstream activities constitute

one of the most complex phases to be analysed of the product life cycle since different actors are involved, several subprocesses are necessary to realize the inputs for the cosmetics manufacturer, and each of these subprocesses takes place in a different geographic area. As a consequence, the resulting environmental impact of the raw materials sourcing cannot be overlooked.

The trend of asking for “greener” personal care and cosmetic products is leading companies to employ natural ingredients and raw materials to develop such products (Mellou et al., 2019). However, currently, there is no uniformity among the different standards for defining cosmetic products to be organic or natural (which can vary, for instance, by geographical area, country, regulation agency) (Bom et al., 2019; Fonseca-Santos et al., 2015). It is exactly because of the inexistence of a standard with respect to the formulation that several groups came out with their own guidelines regarding raw materials and their extraction processes (Fonseca-Santos et al., 2015). Moreover, being a product defined as natural does not necessarily mean that it is also sustainable (Bom et al., 2019; Bom et al., 2020; Mellou et al., 2019). As an example, the results of the analysis concerning the cosmetic cream described in (Secchi et al., 2016) show that sometimes an alleged “eco-friendly” ingredient (such as a natural by-product derived one) could result in a less preferable environmental profile if assessed from a life cycle perspective. Actually, the environmental performance of the bio-based ingredient taken into account as a potential alternative raw material by (Secchi et al., 2016) is mainly affected by the treatments needed to make it suitable for use as a cosmetic ingredient. Nevertheless, with the accurate design of formulations and ingredients dosages, the bio-based compound could bring positive contributions. Some papers emphasize also the importance of using an ecodesign approach to reduce the environmental impacts of products (Martinez et al., 2017; Secchi et al., 2016). It is possible to identify three main characteristics: (i) the way the material is synthesized/extracted/purified needs to be as sustainable as the source of the material itself (not all synthesized materials are bad, not all natural materials are good) (Bom et al., 2019; Bom et al., 2020); (ii) ingredients’ biodegradability and bio-based composition should be evaluated (Bom et al., 2020); (iii) a safety assessment should be carried out to ensure the safety of raw materials or ingredients of non-conventional natural origins (Mellou et al., 2019); indeed, being natural does not mean to be safe. The latter point becomes of particular relevance as cosmetic products can come in contact with the external parts of the human body such as the skin, with the consequent risk of causing allergies, irritations, or other side effects (Mellou et al., 2019). This risk becomes a limitation specifically in the case of the application of food ingredients or food waste (in a logic of Circular Economy) in cosmetics or other personal care products, which are identified as potential raw materials for the industry (Faria-Silva et al., 2020). However, there is a multitude of natural substances or by-products that could be employed for the production of cosmetics. In particular, industrial waste or by-products discarded by several agro-industries are a possible choice not only for the cosmetics sector but also for the food and pharmaceutical ones. Among the raw materials that can have commonalities between the food sector and the cosmetics sector, the literature confirms that β -carotene is widely used in the food, cosmetics and pharmaceutical industry as a natural colouring, antioxidant and anti-inflammatory agent. The main sources of natural β -carotene include extraction from vegetable resources (i.e., carrots) and microbial fermentation (i.e., microalga *Dunaliella salina*) (Kyriakopoulou et al., 2015). (Kyriakopoulou et al., 2015) presents a comparative analysis between conventional solvent extraction of β -carotene and innovative green extraction methods. Another carotenoid pigment commonly used in the food, feed and cosmetics industries is Astaxanthin (Pérez-López et al., 2014).

The recycling and reuse of agro-waste using green technologies will reduce water consumption, greenhouse gas emissions and worldwide pollution (Mellou et al., 2019). Several research groups have started to process plant and food waste to obtain new sources of active agents,

mostly antioxidants, antimicrobials and antiageing compounds to be incorporated in cosmetic products (Faria-Silva et al., 2020). In a review article of the International Journal of Cosmetic Science (Mellou et al., 2019), some studies on the research and development of cosmetics with natural ingredients or biotechnological ingredients were illustrated. An example deals with Cocoa pods. Cocoa pods are waste materials of cocoa plantations that, when discarded, can create the *Phytophthora palmivora*, a fungus that can cause the black pod disease. This pathogen, if left untreated, can destroy yields (annually, the pathogen can cause a yield loss of up to $\frac{1}{3}$ and up to 10 % of total trees can be lost completely). Cocoa pod extracts were tested as potential ingredients to reduce wrinkles with extremely positive results: skin wrinkles reduced at $6,38 \pm 1,23$ % with the application of a gel containing the extracts within three weeks (Mellou et al., 2019). Therefore, Cocoa pods extracts can be included in anti-wrinkle products with significant results on the skin after prolonged application and save the plantation floors from the harmful pods (Abdul Karim et al., 2016). It is nevertheless worth mentioning further work is needed to reach a more stable quality of by-products and a higher productivity and economic feasibility of their production processes to consider them as fully exploitable choices (Mellou et al., 2019).

The emerging of new cosmetics ingredients should be developed following green chemistry principles (Sahota, 2014a). In particular, new materials or ingredients should be taken into account only if they significantly contribute to improve the final product’s environmental profile. In addition to this, the chemical processes needed to transform the raw material into a cosmetic ingredient should be considered, along with the role of ingredients dosages on the product’s environmental performance (Cosmetics Europe, 2019; Sahota, 2014b; Secchi et al., 2016). In this perspective, some cosmetics companies are also investing in biotechnologies to reduce the extraction of raw materials. A real case is represented by MÁDARA Cosmetics, a Latvian skincare and hair care brand which created the active ingredients of two of its products using plant stem cells developed in its lab, without ever harvesting actual plants, in order to preserve land, water resources and biodiversity (Cosmoprof Worldwide Bologna, 2019). Contrary to regular plant active ingredients extraction, MÁDARA’s technology allows the brand to develop only the plant cells that have the highest concentration of nutrients in bioreactors instead of growing the whole plant (Cosmoprof Worldwide Bologna, 2019).

– Manufacturing

Many initiatives are implemented to reduce the environmental impact of manufacturing in the cosmetics industry; however, there is much margin for improvement (Cosmetics Europe, 2012). The main issues in this respect mainly have to do with the reduction of manufacturing waste, which is of particular concern for the cosmetics industry given the cost of its disposal; greenhouse gas emissions and energy consumption (which are closely linked); water consumption, which is fundamental in the production of cosmetic products; and water pollution (Cosmetics Europe, 2019). In this regard, the recommended actions range from the use of renewable sources of energy such as investing in solar photovoltaic power or wind power (Bom et al., 2020; Cosmetics Europe, 2019); reducing manufacturing temperature (Cosmetics Europe, 2012; Philippe et al., 2012) and process duration (Philippe et al., 2012); optimizing cleaning procedures which, since they imply the use of washing hot water, would mean to reduce water consumption and/or its temperature (Bom et al., 2020; Cosmetics Europe, 2012); optimizing production planning in terms of optimal sequence of batches (e.g., to save some washing steps) (Bom et al., 2020; Cosmetics Europe, 2012); considering responsible building design (Cosmetics Europe, 2019) and insulation measures to reduce energy consumption for heating, air conditioning and hot water piping (Cosmetics Europe, 2012) or the implementation of innovative solutions to increase energy efficiency (e.g., installing highly effective ventilation

systems, ventilated exterior wall cladding and using LED lighting) (Cosmetics Europe, 2019); considering replacement of old equipment by new, energy efficient electrical devices (e.g., pumps, extruders) (Cosmetics Europe, 2012); considering “energy recycling” from hot waste water or air (Cosmetics Europe, 2012); design of manufacturing processes aimed at maximizing resource efficiency, through the minimization of waste generation (e.g., through the use of technologies such as 3D printing (Bom et al., 2020) or the use of refillable and reusable boxes for transporting ingredients (Cosmetics Europe, 2019)) or waste recycling (some plants already recycle 100 % of their waste) or biotreating (Cosmetics Europe, 2019); to rain-water harvesting and reuse of wastewater to reduce water consumption and wastewater treatment before its release in the environment (Cosmetics Europe, 2019).

– Packaging

The packaging is a leading contributor to a cosmetic product’s sustainability (Bom et al., 2019; Bom et al., 2020). That is partly due to the fact that plastics is the privileged material for realizing cosmetics packaging, given its flexibility and light weight, thus contributing to land and marine pollution (Bom et al., 2019; Cinelli et al., 2019; Sahota, 2014b). The choice of employing petrochemical plastics is indeed due to its multi-properties (Cinelli et al., 2019). It is essential to underline that packaging should play a fundamental role in preserving the cosmetics product, ensuring its functionalities, and positively influencing the consumer’s choice (Bom et al., 2019). In particular, the packaging of the cosmetic product fulfills the following functions: (i) to contain and protect the formula; (ii) to enable the delivery and application of the optimal amount of formula to the consumer; (iii) to maximize effectiveness of the formula; (iv) to maximize the complete dispensing of the formula; (v) to allow for its shipping and transportation; (vi) to communicate about the product; (vii) to promote brand values; (viii) to display legal information (SPICE; Quantis; L’Oréal, 2019). For this reason, the choice of materials deserves particular attention in order to meet the consumers’ willingness to purchase it, to protect the product, and finally to minimize its environmental impact. In addition to this, being sustainable cosmetics often made of natural or organic ingredients, further issues and limitations are posed on the choice of materials for the primary packaging, given the high vulnerability of such products (Bom et al., 2019).

There is a multitude of alternatives in terms of packaging materials. In descending order of impact on sustainability - according to a survey conducted by Bom et al. (Bom et al., 2020) - the following options can be identified: non-renewable materials, plastic/polymeric materials, aluminum, wood, glass, recycled materials and biopolymers or plant-based plastics. Thus, glass, biopolymers and plant-based plastics resulted in being the most sustainable packaging materials (Bom et al., 2020). Among the most sustainable options, some examples of materials which could be employed are seaweed, cornstarch, mushroom fibers, avocado nuts and bamboo (Drobac et al., 2020). In relation to the disposal phase, the product formula should be considered when choosing biodegradable materials for packaging since preservatives or other substances could contaminate the packaging, thus altering its biodegradability process (Cinelli et al., 2019). That would seem not to be a problem since strategies related to reuse or recycling were deemed more relevant than the biodegradability of the packaging itself, according to Bom et al. (Bom et al., 2020). Nonetheless, some authors argue that cosmetics packaging is “hardly collected and recycled, and that the use of sustainable compostable or biodegradable materials is an important challenge and opportunity for sustainability” (Cinelli et al., 2019). Usually, flexible packaging tends to be incinerated at its end-of-life, given it is hardly reusable and even recyclable due to the contamination with the cosmetic formula. On the other hand, rigid packaging seems to be a more sustainable choice since it can be washed and recycled, even if for a limited amount of times (Cinelli

et al., 2019). In conclusion, both biodegradability and strategies related to reducing, reuse, and recycling are relevant for cosmetics packaging (Bom et al., 2019). In particular, some authors highlight that not only the choice of materials is relevant but also the use of excessive layers both for primary and secondary packaging has a significant impact on sustainability (Bom et al., 2019; Bom et al., 2020). As a result, a growing trend has been emerging towards the development of lightweight and durable packaging (Drobac et al., 2020).

– Distribution

The impact on sustainability is also determined by the transportation of ingredients, materials, packaging, and final products. The reduction of CO₂ emissions associated to the transportation of cosmetic products is indeed a major concern for many cosmetics companies (Cosmetics Europe, 2012; Fortunati et al., 2020), with fuel consumption accounting for at least 30 % of transport operating costs (Cosmetics Europe, 2012). With this regard, there is a tendency to avoid particularly impacting transportation modes and to shift from road to rail transportation and from air to sea as well as to use electric or hybrid vehicles (Cosmetics Europe, 2019; Fortunati et al., 2020), where the latter choice is driven by the relevance of the environmental impact of the type of fuel being used (Bom et al., 2020). In addition, existing vehicle fleets and assets should be closely monitored to ensure fuel economy; some actions recommended with this aim include maintaining correct tire pressures and replacing worn tires, managing the vehicle aerodynamics, choosing the best route to travel, and avoiding unnecessary wheel load (Cosmetics Europe, 2012).

When it comes to optimizing the distribution phase, which basically consists of minimizing transport miles and thus emissions, the variables that should be considered include load utilization and frequency of deliveries. The right balance should be found, considering their trade-off. Indeed, the higher the load utilization, the more the vehicle will be put in effort and thus the greater the emissions. On the other hand, reducing load utilization would lead to a higher frequency of deliveries, contributing to an increase in transport miles and, equivalently, in emissions (Bom et al., 2019). Nonetheless, increase load utilization is usually recognized as a significant area for improvement (Cosmetics Europe, 2012). However, the optimization problem can be extended to consider additional variables, such as the location and capacities of distribution centers, vehicles capacity, and even the product’s structural and material design. Regarding the latter point, the development of “compact” products represents a further step towards sustainability. Realizing products that are smaller in volume and lighter can help reduce not only packaging but also the number of journeys required with a consequent decrease of Greenhouse Gas (GHG) emissions (Cosmetics Europe, 2019). That becomes of particular relevance with the expansion of e-commerce (Drobac et al., 2020), which brings with it an increased number of smaller shipments from the firm’s warehouses to the customer’s home (Li et al., 2010); in this respect, the use of technology should be encouraged to optimize logistics operations in terms of planning and monitoring transport-related activities (Cosmetics Europe, 2012) and providing real-time information about customer orders (Li et al., 2010).

– Consumer use

The use phase contribution to a cosmetic product’s environmental impact mainly depends on water resource depletion and the energy required for heating it; thus, it varies according to the product category considered (Cosmetics Europe, 2012). In particular, there is accordance in the literature in considering this stage as one of the most impactful from the environmental point of view for rinse-off or wash-off cosmetic products such as shampoos, conditioners, shower gels, and soaps (Cosmetics Europe, 2012; de Camargo et al., 2019; Francke and Castro, 2013; Golsteijn et al., 2018). That is particularly evident as, according to Cosmetics Europe, approximately 90 % of

CO₂ emissions generated during the product lifecycle are associated with water and energy consumption in the use stage (Cosmetics Europe, 2012; Cosmetics Europe, 2019). In this regard, possible solutions aimed at reducing the environmental impact of this stage lie in the development of innovative products which require less water and energy, such as “two in one products” for shampoo and conditioner (Cosmetics Europe, 2019) or education of consumers in terms of sustainable consumption (Cosmetics Europe, 2012; Cosmetics Europe, 2019; Francke and Castro, 2013); the latter includes reducing water temperature by 1° or 2 °C and time spent in the shower as well as dosing the correct amount of product, turning off the tap during tooth-brushing and drying hair naturally or using a lower setting on a hair drier (Cosmetics Europe, 2012). Several channels could be employed to educate consumers: sustainable-related information could be directly provided at point-of-sale, companies websites, social media, schools (where the consumers of the future can be educated starting from their childhood) (Cosmetics Europe, 2019). Supporting customer during the post-purchase phase by providing information about how to use a cosmetic product is also vital in order to build long-term relationship with the customer (Feng et al., 2018).

Some authors do not lack to mention the social dimension of this phase. In this respect, employees’ health and social care fall within the consumer use considerations. They are estimated to bring indirect economic benefits to the company, such as easier access to credit, risks reduction, increased brand reputation, ability to meet stakeholders’ needs, and consequent increase in sales and profit. In general, to align to CE principles, a cosmetics company should implement social initiatives towards women, children, and other categories and promote a responsible use of products (Fortunati et al., 2020).

– Post-consumer use

The consumption phase is also responsible for the discharge of cosmetics formulae following use. Similarly to pharmaceuticals, cosmetic and personal care products are made of chemicals and thus contain “biologically active compounds that are designed to interact with specific pathways and processes in target humans and animals” (Boxall et al., 2012). For this reason, the emission of pharmaceuticals and personal care products (PPCPs) into the environment is regarded as a main concern given the associated potential effects and risks on human and environmental health (Boxall et al., 2012; Vita et al., 2018). Regarding this issue, in the literature, particular emphasis is put on rinse-off cosmetics, which deserve further attention given their continuous release in the environment after their use (Campion et al., 2014); in this respect, many authors stress the relevance of their aquatic impact (Campion et al., 2014; Golsteijn et al., 2018; L’Haridon et al., 2018; Vita et al., 2018). In order to improve the environmental profile from this point of view, first of all, it is necessary to measure their impact (L’Haridon et al., 2018; Vita et al., 2018). Nonetheless a standardization of assessment methods is needed to ascertain the effects and related risks of cosmetics raw materials on the aquatic environment, the most widely used parameters are acute aquatic toxicity, chronic aquatic toxicity, bioaccumulation and biodegradation (Vita et al., 2018). In line with the most adopted measures, when it comes to improving the environmental profile of rinse-off cosmetics, attention should be paid to enhance the biodegradability of the formula as well as decreasing grey water footprint, which should be prioritized being it the most impactful water footprint (Campion et al., 2014). That does not necessarily hold true for other product typologies, for which improving biodegradability or grey water footprint could result not to be convenient compared to other strategies (e.g., improving packaging for make-up products) (L’Haridon et al., 2018). However, in general, enhancing the available organic matter of cosmetics waste could be key as it often results to be made of hazardous non-readily biodegradable compounds. In this regard, some authors identify the most promising physical-chemical pre-

treatments aimed at reaching this objective, which however need further research to reach full economic sustainability (Demichelis et al., 2018).

Finally, to decrease the impact caused by the continuous release of rinse-off cosmetic products into the environment, many cosmetics companies reduced or even discontinued the use of plastic microbeads based on individual voluntary actions under the recommendation by Cosmetics Europe (Cosmetics Europe, 2019). These non-biodegradable particles used for exfoliating and cleansing purposes are indeed an unsustainable choice, which however could be replaced by biodegradable microbeads (Bom et al., 2020).

Another concern that arises during the post-use phase is the discharge of cosmetics packaging waste. Its management depends on the strategies adopted by the company, but also on several other factors, which include consumer actions, infrastructure, investments made in modern collection, separation and processing systems, and the packaging typology itself. Among the strategies which can be implemented there are packaging reuse (which usually takes place through refilling policies), recycling, incineration with energy recovery or composting (Bom et al., 2020; Cosmetics Europe, 2012; Cosmetics Europe, 2019). There is not the best option in general, since several considerations should be made, and all the alternative strategies should be considered to choose the one that best suits the situation. For instance, recycling and reuse should be considered respectively only if safety requirements are met and product quality can be ensured. For what regards these latter options, however, consumers participation is essential; thus, companies should cooperate with external parties such as national associations or waste management companies in order to educate consumers and to increase their awareness in terms of the associated environmental and cost benefits they can take advantage of; similarly, consumers could be incentivized through initiatives and rewards for returning the packaging at the product end-of-life (Cosmetics Europe, 2012; Cosmetics Europe, 2019).

4. Discussion about literature review findings and gaps identification

As it emerged from the literature analysis, there is enough evidence of a trend of green purchasing in the cosmetics market. Nonetheless, several are the factors and stimuli that determine consumers’ green behavior, and findings in the literature in this respect are often fragmented and sometimes even inconsistent. However, the authors tried to unify them through the SOR model to have a unified view of the determinants affecting consumers’ behavior. In addition, some recommendations were given to exploit the green phenomenon, and they include increasing consumers’ awareness and decreasing barriers associated with green consumption, just to mention some. Thus, at least from the market side, the relevance for businesses to introduce a sustainability shift was confirmed. Starting from those considerations, the aspects related to cosmetic product sustainability encompassing the entire product life cycle were considered and analyzed. In this process, the three sustainability dimensions were considered to identify the main issues and recognized best practices for each product’s life cycle stage. According to the analysis conducted, it is indeed widely accepted that adopting a Triple Bottom Line (TBL) (Neri et al., 2021; Okorie et al., 2021) and a LCT approach is the direction to take when dealing with sustainable issues. Regarding the latter aspect, there is clear evidence that LCA is widely used to quantitatively measure cosmetic products’ environmental impact, which brings as a major advantage the fact of providing decision-makers with objective results. Nonetheless, this methodology entails some shortcomings, among which there are difficulty in gathering data and the lack of inclusion of economic and social dimensions. What emerged also from the analysis, is that there exist several drivers that push organizations to become sustainable and that being fully sustainable means extending the green vision to the entire supply chain (and thus, to the entire life cycle of the product).

The confusion which characterizes this sector for what regards laws and regulations can lead cosmetics companies to feel lost in their soon-to-become inevitable transition to a sustainable business.

In light of the above considerations, the following research gaps were outlined:

- (i) Currently adopted methodologies are focused on measuring environmental impacts of products (e.g., LCA), neglecting social and economic considerations;
- (ii) The cosmetics industry is characterized by a lack of standards and precise regulations, in particular for what regards the transition to sustainability;
- (iii) It is not been yet developed a comprehensive framework that enables and guides the shift to a sustainable business in the cosmetics sector (considering the triple perspective of consumers, cosmetic product lifecycle and managerial practices), especially regarding Small Medium Enterprises (SMEs), which usually have not the resources to develop their own frameworks and sustainable business models.

4.1. Circular economy practices in cosmetics industry

All businesses depend on, and impact, biodiversity (Sahota, 2013). The cosmetic industry depends on biodiversity as it provides a source of innovation and raw materials. Nature is established as a source of fundamental inputs and ingredients. As confirmed by the scientific literature, it is important for cosmetic companies to keep up with the expectations from consumers (Chin et al., 2018); Lin et al., 2018), as a crescent amount of people are slowly shifting mindset, seeking sustainability through their purchases. Consequently, national, and international policies are continuously increasing, and sustainability standards and certifications are on the rise. UN Sustainable Development Goal 12 (Ensure sustainable consumption and production patterns) assures that this spotlight will not fade. One solution is to use innovative natural ingredients to meet sustainability and performance demands in categories such as skin care, hair care, bath & shower products and colour cosmetics (Dupont, 2019). In the next sections, some of the main CE trends currently present in cosmetics industry for both (i) ingredients and (ii) packaging are presented and discussed.

4.1.1. CE practices in cosmetic ingredients industry

Regarding the ingredients, chemical-free cosmetics formulas and the ability to switch to natural and organic cosmetic compounds, are replacing harmful synthetic substances throughout the entire supply chain (Amberg and Fogarassy, 2019; Bom et al., 2019). Bio-based derivatives from food side streams are one way to cater to increasingly conscious consumers. By reducing waste and improving efficiency, the by-products of food production are helping make sustainable personal care and cosmetics both attainable and desirable (Dupont, 2019). Natural ingredients need to be produced in a sustainable way that maximizes the use of limited resources, coherently with CE paradigm, which starts with extracting the maximum value from resources. According to (Mellou et al., 2019), companies in response to the increasing eco-consumerism are trying to incorporate in cosmetics formulations agents of natural origin and sustainable raw materials and ingredients. In addition, transforming waste materials into higher value substances is of great importance and cosmetic application could be a solution to reuse by-products discarded by several agro-industries. As pointed out by (Fonseca-Santos et al., 2015), there is a lack of harmonization between the guidelines and standards provided by the regulatory agencies to categorize cosmetics into natural or organic products. In particular, with regards to the formulation, because of the inexistent standard, several groups came out with their own guidelines regarding raw materials and their extraction processes. (Bom et al., 2019) designed and applied a survey to cosmetics professionals to address all the phases of a cosmetic product life cycle. Raw materials

selection phase was considered the one with the highest impact on sustainability. In addition, the need to look for new materials, or in any case to use different recycling strategies, is the result of a growing attention towards sustainability issues also in the cosmetic packaging field. The solutions are different, and bioplastics represents one of the possible way with more benefits. Bioplastics are plastics that, by definition, can undergo biodegradation. They are appearing on the market as sustainable alternatives to traditional plastics. Bio-based materials instead, although of natural origin, may not be biodegradable, which is the condition of a material which, once dispersed in the environment, degrades into chemical compounds after no more than 6 months due to the action of bacteria (Dupont, 2019). The attention to use bioplastics for cosmetic packaging is a complex but interesting challenge, because their use would allow the pack to be composted at the end of its use, triggering circular flows in the life cycle. The main problem is to understand whether they can meet the same standards of materials used today.

4.1.2. CE practices in cosmetic packaging industry

There are two main approaches to sustainable and circular packaging: (i) design approach and (ii) materials. Both are complementary that is, eco-design packaging can involve the use of materials with low environmental impact (Cinelli et al., 2019); Sahota, 2013). The main challenges relate to cosmetic packaging sustainability is to provide the actors in the supply chain with ideas and indications useful for an innovation that give attention to economic, environmental and social aspects. The principle of 5Rs' (Recycling, Reusing, Replacing, Recovery, and Reducing) is only a prerequisite: an holistic approach to sustainability is needed which points to the processes and which affects the entire life cycle of packaging, from realization to disposal (Giroto, 2011).

The big limits to sustainable packaging instead, are represented by its characteristics. First, cosmetic packaging performs several fundamental functions. Second, cosmetic packaging is mostly made up of different components often made with different materials, because each performs a specific function. All these set limits on the recycling and use of "alternative" materials. According to the Sustainable Packaging Coalition (SPC), sustainable packaging can be defined with the use of eight fundamental features, which can be summarized as follow (Jedlicka, 2009):

- it is beneficial, safe and healthy for communities throughout its life cycle;
- it meets market criteria for performance and cost;
- it is sourced, manufactured, transported, and recycled using renewable energy;
- it maximizes the use of renewable or recycled source materials;
- it is manufactured using clean technologies and best practices;
- it is made from materials healthy in all probable EoL scenarios;
- it is physically designed to optimize materials and energy;
- it is recovered and used in biological and/or industrial "cradle to cradle" cycles.

To meet these features, the attention is paid nowadays to two aspects:

- Composite materials with high biocompatibility, high chemical stability and low toxicity, which can facilitate the production of packaging more compatible with the environment and capable of meeting the requirements of CE;
- Design of single material packaging and acting on the various layers of protection that make up the surface of the packaging and that act as a barrier to external agents.

Today the substances that can represent a future for biodegradable plastic are different, mostly agricultural and marine origin (Faria-Silva

et al., 2020); Lovett, 2015). These are biopolymers, that is, polymers derived from renewable sources, extracted from plants, or obtained by chemical synthesis using monomers of biological and renewable origin or polymers produced by genetically modified bacteria or microorganisms (de Paula Pereira, 2009; (Fonseca-Santos et al., 2015). Among the best known, there are the (i) cellulose derivatives, ideal because they contain a percentage of lignin which guarantees hardness to the packaging; (ii) chitin, one of the most common biopolymers in nature, insoluble and particularly suitable for packaging materials; and (iii) polyhydroxyalkanoates (PHAs), thermoplastic polyester polymers synthesized by various types of bacteria, which are able to have almost all the characteristics of traditional packaging polymers (Meyer, 2011).

5. Conclusions, limitations, and possible future steps

The diffused perception among cosmetics companies is the presence of a tradeoff between the undertaking of a sustainable path and the financial benefits to be obtained. For this reason, managers tend to consider sustainability more as a topic to address market and governments expectations, rather than a corporate objective (Nidumolu et al., 2009). Nonetheless, the implementation of sustainability in business practices and processes (e.g., by reducing waste and increasing operational efficiency) can lead in the long-term to several benefits, such as an increase of the market share and a reduction of operational costs (Haanaes et al., 2011; Nidumolu et al., 2009). The main conclusions, limitations, managerial implications and possible future steps of the work are presented the following subsections.

5.1. Limitations

The main limitation of the study is related to the absence of an entrepreneurial point of view. In fact, even if the best practices that a cosmetic company should encompass to embrace its Green Transition along the different stages of the product value chain have been highlighted, it is missing the analysis of the literature regarding the dynamics through which a cosmetic company can manage internally the sustainability transition. Future analysis should include the mechanisms and dynamics a cosmetic organization has to face when it decides to take the path for sustainability.

5.2. Research implications

The literature review proposed in this work confirmed that there is enough evidence of a trend of green consumerism in the cosmetics industry. For this reason, it is no overstatement to say that sustainability research and innovation continually shapes the environmental, social, biological and physical characteristics of cosmetics product and processes. What emerged also from the analysis conducted, is that there exist several drivers that push cosmetics organizations to become sustainable and that being fully sustainable means extending the green vision to the entire supply chain and to the entire product lifecycles. Cosmetics companies are required to shift toward sustainable practices, integrating environmental and social objectives with the economics already considered. To support this transition, methodologies and methods that allow companies to evaluate their current environmental sustainability level, define strategies, set objectives, implement actions, and monitor the improvements are necessary. Systematic analysis aimed to identify the assessment tools that can be applied to assess environmental sustainability performances in the cosmetics industry are required.

Moreover, selecting suppliers which have established a sustainability policy or cooperating with fair-trade organizations are indeed considered good sustainable practices according to Cosmetics Europe (Cosmetics Europe, 2012). Thus, when assessing a raw material or ingredient' sustainability level, several considerations have to be made, considering all the three sustainability dimensions (Bom et al., 2019).

Preserving biodiversity and the environment, trying to reduce CO₂ emissions, waste, and water and plastics consumption is also on the agenda of many other companies, which try to make the sourcing phase more sustainable (Fortunati et al., 2020).

Suppliers' selection process is gaining more attention as one of the main important parts of the decision-making process through which cosmetics companies evaluate and choose their most sustainable suppliers, affecting in this way the overall sustainability of final products. Further research to deepen the elaboration of evaluation model allowing the selection of the proper suppliers, assessing them according to a set of key indicators suggesting their sustainability-oriented performances is required.

5.3. Managerial implications

Few strategic and managerial practices currently adopted by companies operating in the cosmetics industry were just introduced, together with their motivations to become green and the dynamics which characterize this sector.

The decision to adopt a sustainable commitment for companies is usually in first place driven by the expectation of obtaining economic benefits, even if in terms of developing higher-value products or gaining more customers (Civancik-Uslu et al., 2019; L'Haridon et al., 2018). In other cases, a company could become more sustainable due to a request of the market or of any other stakeholders of the supply chain. Thus, a cosmetics company needs to expand its green vision to the entire supply chain, as the sustainability issue should encompass the entire lifecycle of a product and thus all the involved actors in the supply chain (Li et al., 2010).

In this regard, several strategies can be adopted by cosmetics companies to reach a green supply chain. In an industry characterized by a lack of standards and precise regulations (Bom et al., 2020; Feng et al., 2018), cooperation should also be encouraged horizontally between different cosmetics companies, in order to facilitate the development of a "dominant design", and with environmental groups, in order to overcome the barriers associated to GPB (Feng et al., 2018). Developing strategic alliances is indeed part of the strategies which can be implemented in order to promote sustainable innovation diffusion in the cosmetics market, together with implementing successful customer education and building a sustainable company image (Feng et al., 2018). For what regards the latter, this strategy can be pursued encouraging both internal and external communication. It is in fact essential for a company to report actions undertaken to avoid indifference from the stakeholders' side. Nonetheless, attention should be paid to avoid excessive communication that could result in "greenwashing" claims and instead create skepticism among consumers (Sahota, 2014b). In addition, sustainability efforts should be communicated externally across several communication channels, such as social media, to help spread the necessary information and increase brand credibility (Feng et al., 2018; Sahota, 2014b); however, there are also less straightforward ways of communicating externally, and packaging is one of them, as it can be considered "an extension of the company's brand" (Feng et al., 2018). At the same time, internal communication is key to contribute to spreading the sustainability vision across the entire organization (Feng et al., 2018). This is a particularly delicate issue, as businesses are made of people and thus, a company sustainability transition should happen considering all the dynamics and challenges linked to the "soft side" of an organization.

5.4. Possible future steps

In order to address the gap identified as a result of the literature review, the authors suggest that a managerial framework able to support cosmetics SMEs in their transition to sustainability should be developed. The foundations to build this tool could mainly have theoretical basis starting from the literature gaps highlighted in this work, as

Table 3
Possible future researches.

Topic	Description
Theoretical contribution 1: literature review analysis of entrepreneurial dynamics and practices for Green Transition in cosmetics industry.	To perform a literature review in order to collect and analyze the main logics, dynamics, practices and barrier through which a cosmetic company (especially SMEs) can manage internally the sustainability transition, considering a TBL perspective. A possible future research question to be addressed could be: “ <i>What are the dynamics through which a SME’s can manage sustainability issues in the cosmetic sector?</i> ”
Theoretical contribution 2: literature review analysis of methodologies and methods that allow companies to evaluate their products and processes environmental sustainability performances.	To perform a literature review in order to collect and analyze the main methods, methodologies, metrics and tools to assess environmental sustainability impacts of cosmetics products and processes.
Theoretical contribution 3: literature review and state-of-the-art advancement with the development of sustainable suppliers evaluation models.	Further research to deepen the elaboration of evaluation model allowing the selection of the proper cosmetics suppliers, assessing them according to a set of key indicators suggesting their sustainability-oriented performances is required. The foundations to build this managerial framework or tool could mainly have theoretical basis starting from the literature gaps highlighted in this work, as the framework or tool should be developed through a deductive method, starting from pre-existing theories and reorganizing them in an innovative way.
Practical contribution 1: development of managerial framework or tool able to support cosmetics SMEs in their transition to sustainability.	

the framework should be developed through a deductive method, starting from pre-existing theories and reorganizing them in an innovative way. In particular, the authors suggest that the underlying structure of the framework could be based on the roadmap concept Phaal et al., ; Phaal, 2004; Phaal & Muller, 2009 (Phaal et al., 2004; Phaal, 2004; Phaal and Muller, 2009), since the aim should be to guide companies to change over time while integrating the various aspects and functions involved in the transition. In parallel, the implementation logic could refer to the Plan-Do-Check-Act (PDCA) cycle, as it should consist of an iterative approach in a rationale of continuous improvement, given the importance of approaching sustainability transitions incrementally. A table with the different future research topics suggested by the authors and described above are summarized in Table 3.

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Data availability

Data will be made available on request.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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