

# The Contribution of LCA Applications to the Development of National Ecolabel Criteria for the Personal Care and Cosmetic Sector

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## ABSTRACT

One of the industries which cause negative environmental impacts throughout the supply chain is the personal care and cosmetic products industry. The development of national ecolabelling criteria has been considered necessary to decrease the environmental pollution originating from the production and consumption of these products. This research was conducted for specific types of personal care and cosmetic products (bar soap, liquid soap, shampoo, hair conditioner, shower gel, hand and body cream, shaving soap, and shaving foam) that are produced and consumed in Turkey. Consumers have begun to look for more environmentally friendly products due to the increase in plastic and chemical pollution. This creates a need for companies to promote the green nature of their products to comply with the environmental awareness of consumers and their demands. Within this framework, the sector's approach to environmentally friendly products and ecolabeling was evaluated by applying life cycle assessment (LCA) as the decision-making mechanism. In addition to that, internationally recognized ecolabel standards, which are mainly used by countries with high import and export capacity, were analyzed. As a result of LCA studies, national environmental label criteria have been developed for personal care and cosmetic products. The environmental and socio-economic aspects of the products are evaluated based on sustainable production and consumption principles. Apart from the environmental benefits, it is expected that the implementation of the Turkey Ecolabel System, which is on a voluntary basis, will increase the market shares of products and the competitive abilities of the companies.

**Keywords**—*Personal care and cosmetic products; LCA; Ecolabel standards; National criteria development*

## I. INTRODUCTION

Cosmetics and personal care products have been used for generations, and their existence in modern times has become an integral component of human life and more specifically sanitation. In addition to the need for personal hygiene, the desire to look young and well-groomed has also enabled the cosmetics industry to grow at an undeniable rate in the last decade. The size of the personal care and cosmetics market has reached approximately 500 billion dollars as of 2017 globally. According to data from the same year, it is observed that EU countries (77.6 billion euros), the USA (67.2 billion euros), and China (43.4 billion euros) have the highest shares in the consumption of personal care and cosmetic products based on retail sales prices (1). In 2020, the European cosmetics and personal care

market, which is the world's largest cosmetics market, was expected to be worth 76.7 billion euros at retail sales price. Among the European countries, the share of Germany (14 billion euros), France (11.5 billion euros), the United Kingdom (9.8 billion euros), and Italy (9.7 billion euros) have corresponded to more than half of the total capacity (2). The cosmetics industry exports of Turkey have also increased to 70.8 million dollars in 2019 while the imports decreased by 10.3% to that of 1 billion dollars (3). Moreover, the export capacity of Turkey was estimated to be 136.5 million dollars by October 2020 with the main export markets being the USA, Iraq, England, Russia, and the Netherlands, respectively. From the total export value, hair product has the highest percentage with 11.6%, followed by soap products at 5.3%, body lotions and creams at 3.1%, and shaving products at 1.7% (4).

The cosmetic industry is an interesting area to look into as certain synthetic chemicals, which are also defined as environmentally persistent, bioactive, bioaccumulative, and endocrine-disrupting compounds and which exist in the formulations of personal care and cosmetic products, pose a significant threat to ecological and human health (5). Increasing awareness about the environment and human health within different sectors has led to changes in consumption habits and the cosmetic industry is no exception. Consumers who want to reduce their environmental footprint by cutting the purchase of products made of synthetic chemicals have shown interest in more environmentally friendly products and services. Several studies examining consumer behavior reveal that environmentally friendly products are preferred more than conventional products and a growing interest in responsible consumption and production, which is one of the critical issues determined within the context of the Sustainable Development Goals (SDGs), have been observed (6)(7)(8). In the light of these data, it is foreseeable that companies will be steering towards innovative and sustainable alternatives in their value chains, especially in product formulations by taking strategic decisions to obtain an environmental label since ecolabel application plays a key role in guiding consumers to eco-friendly products (9).

The concerns regarding the environmental impacts of personal care and cosmetic products have been increasing tremendously, especially due to the unqualified selection of raw materials, which worsens the biota of aquatic environments (10). The consumption stage in the life cycle, which directly affects the wastewater stream, along with packaging selection and waste management are the specific processes that were considered necessary to be standardized in terms of environmental sustainability. A managerial and technical roadmap was developed by prioritizing environmental sustainability parameters according to the life cycle evaluations of the products in the project and is carried out in cooperation with the Turkish Ministry of Environment, Urbanization and Climate Change and Boğaziçi University with the aim of developing environmental label criteria with LCA principles. Life cycle assessment (LCA) is a decision-making mechanism that evaluates the environmental impacts of any process, system, or product by analyzing them via special software, which comparatively interprets these impacts to the "cradle to grave" approach and used that to provide fundamental information for policy development. The hot spots with the highest environmental impacts are determined by evaluating the relevant impact categories for each step of the process. Determination of hot spots and related impact categories with the LCA methodology provides an advantage of a better understanding of ecolabel indicators (11).

This study, which is highly significant in directing attention to eco-labeled products in the market, is expected to encourage several companies in taking a step in developing products with lower environmental impact, improving their environmental performance, and increasing consumer demand by providing environmentally labeled products to their customers. Furthermore, an effective governance system which includes guiding stakeholders; making the applicability of environmental label criteria valid for companies using various chemicals transported from all over the world; and considering issues such as government interventions, market requirements, and consumer awareness, is expected to encourage stakeholders to participate in the process of reducing the environmental impact of the product.

## II. LITERATURE

Personal care or cosmetic products comprise multiple chemical components that are divided into various categories based on the value that they add. For instance, the group of chemicals that are used to add odor are called fragrance, whereas the group of chemicals that are used to extend the shelf life of a product and act as antimicrobials, antioxidants, etc. are called preservatives (12). Surfactants that have emulsifying, thickening, and conditioning effects, especially in hair products, are another example of chemical components that are frequently used (13).

Some of these chemical components are known to have a damaging impact on human and ecological health. For example, there are 26 fragrance agents defined as allergen chemicals according to the Food and Drug Administration (FDA). Hexyl cinnamal, citronellol, linalool, and limonene, which are included in many products in the market, are among these allergen fragrances. The use of these fragrances in the cosmetic industry was prohibited by the European Commission since 2019. Other fragrance agents that are known by their trade names are lylal (hydroxyisohexyl 3-cyclohexene carboxaldehyde; HICC) and lilial (butylphenyl methylpropional). These are classified as toxic substances for reproduction per the CLP Regulation and their use has been revised by the International Fragrance Association and will possibly be banned starting from March 2022. Furthermore, triclosan, which is one of the preservatives used in dental care products, has been debated upon its benefits towards the users. However, a survey conducted has shown high concentrations of triclosan in Japanese rivers (14) where it can then turn into chlorinated compounds which shows poisonous characteristics in water bodies (15). Thirdly, the synthetic surfactants such as sodium lauryl sulphate (SLS), cocamidopropyl betaine, and cocamide diethanolamine (DEA), which are commonly included in hair products, are known to cause both health damages like eye irritation and environmental damages due to their non-biodegradable structures in water and soil (12).

Ecolabel system is, hence, helpful as it gives correct and clear information to consumers regarding the environmental sustainability of products or services. It also provides an advantage for producers in terms of the market competition as it claims to offer environmentally more efficient and safer products (16). Ecolabel standards have been developed in an attempt to reduce the environmental impacts of chemicals and to integrate more sustainable methods in agricultural production activities. Encouraging environmentally friendly consumption and sustainable production techniques in the industry will improve the ecological and environmental aspects and performance of a product, raise awareness among all stakeholders about their responsibilities, and support the growth in institutional capacity, which leads to creating an evaluation system that is more reliable for both producers and consumers (17). Ameliorating the environmental performance of a product, which has been adopted by not only key stakeholders such as manufacturers and buyers but also secondary parties such as intermediary firms and institutions, has already been recognized to have a positive effect by incentivizing the purchase of products made with eco-friendly technologies (18). The development of such products can be achieved by using an integrated approach similar to LCA methodology which aims to diminish potential risks of the product across its entire life cycle. The Turkish Ministry of Environment, Urbanization, and Climate Change aim to support sustainable consumption and production practices by encouraging businesses that follow environmentally friendly processes and has implemented voluntary environmental labeling practices in line with the Environmental Label Regulation (dated: 19.10.2018) and the standard "TS EN ISO 14024:2018 Type 1: Environmental labeling - Principles and methods". Moreover, national environmental label practices are expected to push manufacturers to evaluate their product chain and prioritize issues such as low carbon emissions, waste prevention, energy efficiency, water-saving, and reduced use of harmful chemicals in their products/service.

Environmental labeling and ecolabel system are also related to the life cycle assessment approach and there are a few life cycle assessment studies conducted in the personal care and cosmetic sector. For instance, the impacts of the ecological scenarios that are ameliorated with operational techniques (the use of palmitic/stearic triglycerides, which are produced as a by-product in the olive oil industry, in variable formulations) in comparison to the conventional formulation (caprylic/capric triglyceride) were analyzed in an LCA study performed for hand creams. The results showed that the hand creams

produced with ecological scenarios cause less environmental impacts. Moreover, among these scenarios, it is shown that the use of palmitic/stearic triglycerides in the content of a pre-formulated component is more environmentally advantageous than direct use (19). Another study observed that the type of packing material used in a product's life cycle has also a significant impact on its environmental performance. In this national LCA study, PET packaging of a liquid soap, which was previously used, is compared with HDPE packaging, which is presented as an alternative. The results indicated that the HDPE use leads to a 15.6% decrease in the global warming potential, an 8.2% decrease in the acidification potential, and a 12.6% decrease in both the eutrophication and ozone depletion potentials compared to the PET use (20). Similarly, improvements such as refilling practices and/or the use of recycled materials as much as possible in the production of packaging have been observed to play a role in reducing the overall environmental impact of the product. It has also been determined that the type of energy used and the methods applied in waste management throughout a product's life cycle have a significant impact on the product's environmental performance. Raw material selection and extraction is also another variable that is critical for the environmental performance of the product.

When exploring raw materials within the personal care and cosmetic sector one valuable raw material that is discussed is palm oil. Most cosmetic products commonly contain substances derived from palm oil and its derivatives such as palm stearin and palm kernel oil, fatty acids, esters, fatty alcohols, fatty amines, and glycerin. As an example, fatty alcohols are utilized frequently in cosmetic and pharmaceutical products as a plasticizer, lubricant, and thickening agent (21). However, palm oil cultivation contributes to the greenhouse effect by creating negative impacts such as deforestation as well as methane and nitrogen oxide emissions from nitrogenous fertilizers. Forest trees absorb more carbon dioxide than palm trees; therefore, the destruction of forests and planting palm trees to obtain palm oil results in a drastic reduction in carbon dioxide sequestration. Furthermore, the peat soil in which palm trees grow creates more carbon dioxide when peat oxidation occurs. The milling process also releases methane, which has a negative impact on the environment (22). To minimize these negative impacts, it is critical to obtain palm oil, palm kernel oil, and their derivatives from fields where sustainable agricultural methods are applied.

In addition to raw material selection, one critical factor to look into regarding the environmental impact of products after consumption is their biodegradability which is a process that takes place when organic substances are decomposed into simpler organic and inorganic compounds such as carbon dioxide, water, ammonia by microorganisms in metabolic or enzymatic ways (23). Hence, biodegradation potential informs consumers about the environmental safety of products and assist them in selection of environmentally friendly ingredients (24). The persistent character of chemical substances in nature poses a danger to organisms in the long-term exposure, even in low levels, and causes irreversible potential problems depending on the frequency and concentration of the entrance to water bodies. For instance, when the surface-active agents end up in lakes and rivers, they decrease of oxygen level, disrupt the circulation between air and water, and leads the photosynthesis and aerobic oxidation of the aquatic organisms lower the water quality which result in environmental problems such as eutrophication (25). The prevalence of these substances in nature can be limited through a standardization that sets a framework for the use of biodegradable ingredients (26).

Manufacturers tend to increasingly use synthetic chemicals to both improve their formulations and fulfill consumer demands. The problem arises after these products reach consumers since they are released to aquatic environments after use (27). Thus, critical dilution volume has been considered an important methodology to determine the impact of these chemicals on aquatic bodies. (5). Additionally, personal care and cosmetic products may contain some hazardous chemicals which can have negative impacts even at low concentrations (28). Consequently, the use of these hazardous chemicals is prohibited while the use of other non-hazardous chemicals is permitted but only at certain concentrations. Certain preservatives, colorants, and fragrance compounds are some of the most toxic and banned chemicals in personal care and cosmetic products. Preservatives are important because they enable products to fully perform their functions; however, their use is limited by values such as biological density (BCF)

and octanol-water partition coefficient (log Kow) due to the toxic, irritating, and sensitizing properties of these chemicals (29). Colorant agents can cause both allergic reactions and skin irritation (30). The production of fragrance substances, which can either be natural or synthetic, in a laboratory can cause ethical and safety problems (31).

Energy utilization, which is part of the different operational stages in a product's life cycle, also has an impact on the environment as it contributes to global warming the most (32). For this reason, it is of vital importance to abandon conventional methods and to encourage the use of renewable energy sources to reduce environmental impacts and mitigate climate change. For instance, Aveda has succeeded in being one of the pioneer cosmetic companies for responsible manufacturing by transitioning to green energy via wind power technologies and has reduced its carbon emissions over the past 30 years (33).

Packaging, which has a tremendous effect on the branding of personal care and cosmetic products, and recycling of packaging materials are also highly significant for sustainable and economic development in terms of improving brands' competitiveness on the market. Hence, a shift from the old-fashioned model for production and disposal of plastics to a new model that evaluates the life cycle of plastics from an environmental point of view is essential since the disposal of plastic waste is unsustainable in the long run (34). Therefore, considering the increase in plastic production and the ineffectiveness of waste management, there is a concern that the atmospheric emissions can reach up to 6.5 Gt CO<sub>2</sub>-eq. and the cumulative plastic pollution can reach up to 12,000 Mt by 2050 (35)(36). Waste management is also essential in the cosmetics industry as it ensures that waste from the products and packaging materials is prevented from being released to the environment once the product is no longer in use. Moreover, it is used to control that the waste amount is regulated; and that recyclable package is contributing to the economy. It should be noted that the type of waste is not restricted to bottles and tubes; that is, it also involves cardboard and boxes as the secondary packaging so virtually, all the consumer packaging ends up as solid waste after consumption (37).

The demand for organic and natural content in personal care and cosmetics owing to the sensitivity of consumers to both protecting environmental health and ensuring sustainable production has become a factor that directs manufacturers to more environmentally friendly technologies, especially in recent years (38). Organic content means the components in the product formulation are obtained following organic agriculture practices in which there is no use of pesticides, synthetic fertilizers, sewage sludge, genetically modified organisms, and ionizing radiation. On the other hand, natural content refers to ingredients in the product formulation that are mainly derived from plants and/or animal origins (39). It is expected that the consumption of organic products reduces health risks, which stems from, for instance, pesticide residues, and environmental contamination due to the synthetic chemicals used in the product (40).

Fitness for use, which has gained a significant role as the cosmetic industry has an upward trend in the recent decades, shows the product's capacity to accomplish its primary and secondary purposes. Even if personal care and cosmetic products are manufactured by well-known and trustworthy companies, most prevalent beauty products contain various chemical ingredients that may be noxious and cause some allergic reactions in consumers (41). For this reason, some laboratory tests are devised through international guides to prove the efficacy and congruency of the products before releasing them to the market (42). This will also encourage manufacturers to avoid using unsuitable components in their products due to their potential effects. The information written on the ecolabel of personal care and cosmetic products is very determinant in consumers' choices. The implementation of the ecolabels may result in putting too much information on the frame which should be avoided (43). Nonetheless, manufacturers aim to supply reliable and detailed information to make consumers aware of the product's environmental performance and its sustainability aspects (16).

### III. METHODOLOGY

A research survey has been conducted to summarize the relevant conditions regarding environmental sustainability and evaluate product compositions in terms of environmental labels within the personal

care and cosmetics sector in Turkey. The survey was done to understand the perspective of the producers in the sector and with the participation of relevant institutions, stakeholders, and reliable brands which has then provided production data on the cosmetics and care products that are discussed in the study of the environmental label system. Evaluation of the obtained survey results was made using the SPSS statistical analysis program. Within the context of life cycle assessment, studies were carried out for personal care and cosmetic products such as liquid and bar soap, shampoo, hair conditioner, shower gel, hand/body cream, shaving soap, and shaving foam and their environmental impacts have been examined at various stages including raw material supply; production; filling (primary packaging); secondary and tertiary packaging; distribution; and use and disposal of wastes (wastewater, packaging waste, etc.) generated. The environmental impact categories that were considered are global warming potential (GWP), acidification potential (AP), eutrophication potential (EP), ozone depletion potential (ODP), freshwater aquatic ecotoxicity potential (FAETP), and photochemical ozone creation potential (POCP). These impact categories are used to frame the impacts of analyzed products on air and water quality.

The life cycle evaluation studies aim to develop national environmental label criteria by identifying the points that need to be highlighted from raw material supply to waste management. The development process of environmental label criteria requires a great deal of research, support mechanisms (life cycle assessment in this study), and input from multiple stakeholders. To develop the national ecolabel criteria, it is required to research the chemicals, resource consumption, and waste generation in the context of the value chain. Moreover, the related national legislation and international standards should be considered in the context of relevance and inclusiveness. As a first step, out of the 66 ecolabel standards that are approved by the international market, 10 widely applied ecolabel standards (EU Ecolabel (44), Blue Angel (45), COSMOS (46), Good Environmental Choice (Bra Miljöval) (47), Nordic Swan (48), Korean Ecolabel (49)(50), Green Seal (51), Ecocert (52), Green Choice Philippines (53)(54), Environmental Choice New Zealand (55)) which are also valid in countries with high export rates were examined. As the support mechanism, GaBi 8.0 software and Ecoinvent databases were utilized to assess the data obtained from industry and literature sources. Throughout the study assumptions ranging between 20% and 30% were made in some cases depending on the quality and adequacy of the available data. The relationship between these international ecolabel standards and the national criteria was taken into consideration in accordance with the information on the national legislation to accurately assess the feasibility, effectiveness, and bindingness of the national criteria.

#### IV. RESULTS AND DISCUSSION

The national criteria of the ecolabel, which is a voluntary scheme and is developed for personal care and cosmetic products, cover a broad area in terms of sustainability. The ecolabel applications carried out under the coordination of the Turkish Ministry of Environment, Urbanization and Climate Change is an important milestone that encourages companies to pursue sustainability goals and allow them to publish reports and announce the environmental impacts of their products transparently based on LCA studies.

##### A. Evaluation of Survey Results

The survey that was conducted with the participation of the manufacturers was effective in developing the national ecolabel criteria since it investigated the views of stakeholders, who are active in the sector, on subjects such as ecolabel and LCA. The survey results showed that only 43% of the participants have knowledge about life cycle assessment method, and it was seen that in the LCA studies, the participants mostly focus on the "final product manufacturing" stage of a life cycle (23.5%) followed by "packaging" (21.6%), and "distribution/transportation" (13.7%). Additionally, it was observed that the participants prefer to apply the ecolabel application mostly with the purpose of presenting the products as quality (32%) followed by encouraging consumers to be responsible (23%) and then addressing consumers' demands (18%).

Additionally, the survey reflects how numerous chemicals with multiple purposes are used in the production of personal care and cosmetic products but also explores how certain regulations have

taken effect within the sector. For instance, in the production stage, it was seen that the most-used chemicals are "mineral oils, Vaseline and relevant hydrocarbons" and "synthetic fragrances and aromatic substances" (11.7%). However, phthalates are included in the List of Excluded Substances in Cosmetic Products which is in the Appendix 2 of the Cosmetics Regulation (the Turkish Ministry of Health/Date: 23.05.2005 and No: 25823); therefore, no participant indicates phthalate use in their products.

Finally, the survey also looks into the packaging habits of the participants. Packaging is a tool that protects the product, ensures its distribution to consumers in a safe way, and enables the transportation and storage of the product. It is important for packaging to be reusable and recyclable, and to be considered as secondary raw material in several industries. The survey results showed that the participants mostly prefer PET (21.2%) in packaging followed by PP and PE (both 19.2%).

#### *B. Evaluation of Life Cycle Assessment Results*

According to the results, it is observed that the environmental load in global warming and ozone layer depletion impact categories has mostly originated from the distribution process whereas the production process has the highest impact in the other categories. Moreover, although the production process of shower gel creates a greater effect in acidification, eutrophication, and photochemical ozone creation impact categories compared to the consumption phase, the consumption phase in the life cycles of shampoo and hair conditioner has the highest effect in all categories. The reason is that the amount of water used to rinse hair care products and the energy spent to heat the water are too high compared to the water and energy used to wash off shower gel. When it comes to hand and body creams, which are leave-on care products, the production process has a massive impact on acidification, eutrophication, and photochemical ozone creation impact categories, while production process of the primary packaging, on the other hand, affects ozone layer depletion and freshwater ecotoxicity potential and raw material supply affects the global warming potential among the other impact categories. For shaving products, depending on the life cycle stages, it is seen that raw material supply, transportation of products to the consumer, and the transportation of wastes to landfill affects the impact categories of global warming, ozone layer depletion, and photochemical ozone formation potential, while production of both products and primary packaging stages affects the impact categories of acidification, eutrophication and freshwater ecotoxicity potential.

Emissions arising from the fuel used in the transportation of raw materials and delivery of the products to the distribution points; emissions stemming from the unsustainable production of energy sources such as electricity, natural gas or steam used in fundamental processes such as production and/or packaging; and emissions being released as a result of the interaction between chemicals in the mixing phase during the production process have all contributed in developing the aforementioned impact categories. The disposal methods (landfill, incineration, and recycle) of packaging waste generated during the post-consumer phase were also evaluated, and it was concluded that the most beneficial disposal method in terms of environmental performance changes depending on the packaging type.

#### *C. The Criteria of Environmental Label*

The environmental, social and economic aspects of the study were carried out in accordance with the United Nations Sustainable Development Goals. Consequently, a feasible national environmental labelling standard for the personal care and cosmetic products, which can be applied on the national scale and is in parallel to the national sustainability priorities, have been developed based on the results of the LCA studies and by considering the international ecolabel standards for the sector and their impacts.

The criteria developed are related to the results of the life cycle study. To be more precise, sustainable supply of palm oil, palm kernel oil and their derivatives, biodegradability, toxicity to aquatic organisms, excluded and limited chemicals, organic and natural content are the specific criteria that are related to raw material acquisition, and consumption stages in the context of the life cycle, whereas energy management, packaging and fitness for use are related with the production process. Due to this direct

relationship between the life cycle assessment and the environmental label criteria, the adverse environmental impacts observed at any LCA stage will be reduced and/or prevented by the criteria established within the scope of the study. The national environmental label criteria, which are created by evaluating the potential effects of personal care and cosmetic products throughout their life cycle, and based on the compatibility of eco-label standards examined on a global scale with national legislation, are listed below.

- Sustainable Supply of Palm Oil, Palm Kernel Oil, and Their Derivatives: Cultivation and supply of palm oil cause adverse effects on the environment. Obtaining the palm oil used in environmentally labeled products from fields operating with sustainable methods is a necessary criterion to minimize these negative effects.
- Biodegradability: All surfactants are expected to be readily biodegradable both aerobically and anaerobically as the biodegradability of surfactant is important. However, the organic substances in cosmetic products might contain substances that are considered to be aerobically and/or anaerobically non-biodegradable in limited amounts within the context of national environmental labeling criteria.
- Toxicity to aquatic organisms: Preventing the release of synthetic chemicals into the environment as they do not degrade in nature is a more ideal and easier solution than finding new ways to remove these chemicals from the water bodies.
- Excluded and limited chemicals; Some of the fragrances, colorants, and preservatives, the use of which was restricted are also evaluated within the scope of this criterion in addition to the chemicals that are excluded in the formulations (alkylphenol ethoxylates and other alkylphenol derivatives, trisodium nitrilotriacetate, formaldehyde and formaldehyde separators, parabens, etc.) and harmful chemicals with at least one hazard statement.
- Energy Management: It aims to alleviate the pressure on climate change by encouraging the use of renewable and clean energy sources. Most of the emissions released into the atmosphere during the production of personal care and cosmetic products are due to energy use. For this reason, energy management has also been evaluated among the criteria that are regarded as necessary for the environmental label.
- Packaging: In accordance with international guidelines which cover primary and secondary packaging design criteria and aim to minimize the environmental impacts of packaging, this criterion has been given priority in the national environmental labeling system of Turkey, as well.
- Waste management: The packaging material of each product poses a waste potential. Organic chemicals exist in cosmetics and personal care products create a trace in nature both during the use of the product and after the product is finished due to the disposal of the packaging and the residual product in it. Recycling of plastic material is an integral part of the circular economy. Therefore, waste management is among the criteria deemed necessary for the national environmental label.
- Organic and natural content: This criterion requires that the components within the product which are extracted from plants and/or animals to be obtained without disturbing the function of the ecosystem in any way, or without further endangering the endangered/at risk species, or without making a possible negative contribution to environmental pollution.
- Fitness for use: Companies' reliability and preferability are enhanced when information regarding the product's potential effects is presented to the consumer in an honest and transparent manner. For this reason, manufacturers who want their products to have an environmental label, are responsible for having the conformity tests required by this criterion.
- Information written on the ecolabel: It is a criterion that considers it to be necessary to inform the consumer about the product and its highlighted environmental and sustainable aspects. The information that is included in the environmental label is expected to be presented in a clear, concise,



and understandable manner such as "reduced impact on aquatic ecosystems", "production and packaging with environmentally friendly techniques".

## V. CONCLUSION

With the increase in the utilization of personal care and cosmetics products, producers have found themselves manufacturing synthetic chemicals in lieu of those obtained naturally as these chemicals help producers to meet the increase in demand. Nevertheless, there is a considerable amount of evidence indicating that such chemicals are harmful to both human health and the environment since they may be toxic and bioaccumulate or may cause some long-term damage. Hence, consumers are provided with options such as having access to products with an environmental label that expresses the quality and sustainability of a product which in turn helps consumers to be informed about their choices daily.

In this study, the national ecolabel criteria have been developed for the selected personal care and cosmetic products (bar soap, liquid soap, shampoo, hair conditioner, shower gel, hand and body cream, shaving soap, and shaving foam). During this process, several national and international regulations, declarations, standards, and guides were examined to ensure that the criteria would be as comprehensive, reasonable, and feasible as possible. Life cycle assessment (LCA) methodology was applied to establish a relationship between the set of criteria and the impacts resulting from each life cycle stage. Another important thing to state is that assistance is provided by the Turkish Ministry of Environment, Urbanization and Climate Change throughout the study, and technical feedback and/or evaluations were delivered by the Technical Committee and the industry itself. Government support, market demand, and consumer awareness along with the business ethics approach for loss of biodiversity and needs of future generations will accelerate the interest for supplying the ecolabel criteria content. The ecolabel will provide transparency which is the key to assist stakeholders in making decisions.

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