“In Search of a Green Product Definition”

AUTHORS	Fabien Durif Caroline Boivin Charles Julien

ARTICLE INFO	Fabien Durif, Caroline Boivin and Charles Julien (2010). In Search of a Green Product Definition. *Innovative Marketing* , *6*(1)
RELEASED ON	Thursday, 15 April 2010
JOURNAL	"Innovative Marketing "
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
0	0	0

Fabien Durif (Canada), Caroline Boivin (Canada), Charles Julien (Canada)

In search of a green product definition

Abstract

Although green products are increasingly prevalent, many controversies surround their acceptance on the market, especially given the high number of greenwashing cases. The major problem seems to be linked to the very definition of the concept of green products. The definition is unclear, the concept boundaries are poorly defined, and the literature still lacks a commonly accepted definition. What is a green product? This article compares the definition of green product within three different perspectives (academic, industrial, consumers) based on a descriptive meta-analysis, a bibliographic approach, and a consumer survey.

Keywords: green marketing, green product, definition, descriptive meta-analysis.

Introduction

Interest in green products has grown in recent years, as indicated by increased consumer demand (Chen, 2008), increased supply by companies (Chung and Wee, 2008), consumer and environmental protection offered by nongovernmental entities, universities developing specific green marketing courses, and increased number of research publications (Hartman and Ibanez, 2006; Nyborg, Howarth and Brekke, 2006).

In regard to consumption, the green movement has an undeniable presence in the majority of industrialized countries, as many studies indicate: (a) 34% of consumers claim to buy green products (Boston Consulting Group inquiry developed in Europe, Canada, USA, Japan, and China in January 2009); (b) 30% of the American population leads a lifestyle that is healthy and that favors environmental sustainability (inquiry by the Canadian magazine *Protegez-Vous*, Vol. "Achetez Vert": 2008); (c) the expenditures related to products and services perceived as being environmentally respectful will double in 2009 and will reach US$500 billion in the United States (Landor Associates Penn, Schoen & Berland Associates, and Cohn & Wolfe: 2007 study on green brands). Furthermore, this phenomenon is currently not even restricted by the worldwide economic recession: (a) 84% of buyers who believe that North America is going through a long-term recession mentioned that their organization would continue to purchase green products in the next 3 to 5 years (TerraChoice Environmental Marketing inquiry on professional American and Canadian buyers, *"Ecomarkets 2009 Summary Report)*; (b) the vast majority of American green consumers has not abandoned green products but switched for less expensive ones (Grail Research inquiry, Monitor Group, *The Green Revolution*, June 2009).

The situation is similar on the green-product supply side. For example, the new TerraChoice study has shown that, between 2007 and 2008, the number of green products available in North American relevant stores increased from 40% to 176%. This is particularly true in the household cleaning product category. Indeed, almost all housecleaning product manufacturers have developed green product lines or have "greened" their products. In the United States, for example, the market for green household cleaning products grew from US$17.7 million to more than US$64.5 million in 2008 (Athavaley, 2009).

Although green products are increasingly prevalent, many controversies are related to the concept, especially the high number of greenwashing cases (Peatie and Crane, 2005). This phenomenon strengthens the element of doubt in consumers' minds about the "greenness" of products (Laufer, 2003). Indeed, whether in academic research or professional studies, we note that consumers increasingly question the green nature of products on the market. According to the 2009 TerraChoice study, 98% of the 2219 green products selected in North America were not green and were guilty of at least one of the seven sins of greenwashing, which are identified in their 2007 study (hidden trade-off, no proof, vagueness, irrelevance, lesser of two evils, fibbing, and worshipping false labels).

The main problem with green products relates to definition. The definition is unclear, the concept boundaries are poorly defined, and the literature still lacks a commonly accepted definition (Rivera-Camino, 2007; Hartmann and Ibanez, 2006). According to Ottman (1998, p. 89), a well-known author in the field of green marketing:

Green products are typically durable, non toxic, made of recycled materials, or minimally packaged. Of course, there are no completely green products, for they all use up energy and resources and create by-products and emissions during their manufacture, transport to warehouses and stores, usage, and eventual

disposal. So green is relative, describing products with less impact on the environment than their alternatives.

So, what is a green product and do green products really exist? This article aims to compare green-product definitions within three different perspectives: (1) academic, (2) industrial, and (3) consumers.

1. Methodological process

1.1. Academic perspective: Descriptive meta-analysis. To produce a synthesis of the definitions of green products seen through academic eyes, we conducted a meta-analytic procedure and used Hunter and Schmidt's (2004) descriptive meta-analysis method, in particular. This method draws up the descriptive overview of the precise research domain in order to depict a global image, but does not try to analyze or to correct the errors in the selected study (Glass, McGaw and Smith, 1981; Glass, 1977).

Three strategies were used in selecting references: (a) the AB I/Inform Global database was consulted using selected keywords both in French and English as well as combinations of these keywords, such as "green product(s)", "environmental product(s)", and "ecological product(s)"; (b) the same procedure was used but with the publication source specified: *The Journal of Business Ethics*; and (c) online searches of Web sites for international marketing *(AMA, EMAC, AMS, AFM)* and management *(EURAM, AIMS, AMA)* associations were conducted. The basic criteria for reference inclusion were: (a) only peer-reviewed references; (b) both conceptual and empirical studies; and (c) studies covering green-product issues.

Two judges examined abstracts and, if needed, the entire article. These procedures netted 179 references from 1971 to 2009, from which 35 definitions of the green-product concept were culled. These definitions were analyzed using ATLAS.ti software. A list of 20 initial codes was used to develop an integrative designation of green product.

1.2. Industrial perspective: Bibliographic approach. A bibliographic approach was adopted to produce a summary of the definitions of green product from the industrial perspective. Two strategies were used in document selection: (a) the AB I/INFORM Trade and Industry database was consulted (scholarly journals, including peer-reviewed, not taken into account); and (b) documents found with Google (Google.ca) using "green product" as keywords in English and French. Only references containing a definition of the green-product concept were taken into account. Due to the large number of references required to pinpoint green-product definitions, the procedure quickly became long and extensive. Because the data saturated quickly (identical and redundant definitions), a limited number of references were used: 5 professional articles and 6 Web sites. Content analysis was also performed.

1.3. Consumer perspective: Survey. To produce a summary of green-product definitions from the consumer standpoint, we surveyed a sample of people from an average-size Canadian city. The analysis measuring unit was the primary buyer of household cleaning products. The data were collected on a university campus with a self-managed survey. A total of 104 surveys were completed and used for the study. The rate of participation was not compiled because when a potential respondent declined participation, another one was approached. The main characteristics of the sample are: 54.5% are women, 98% are students, all were born after 1985, 74.7% have at least a university degree inferior to bachelor, 63.6% are single, 96% do not have children, 75.8% make less than $20,000 per year.

The survey – studying consumer perceptions towards household cleaning products – comprised 22 questions divided into 3 different sections. Household cleaning products were specifically chosen because they represent, along with recycled paper, the most frequently purchased green products on the market (Grail Research Monitor Group, *The Green Revolution*, 2009). A total of 23 statements were used to measure green-product definition. These statements resulted from manipulating items for measuring green products used in other studies (e.g., D'Souza, Taghian and Lamb, 2006) and items from the professional literature analysis. Seven-point Likert scales were used. The data were analyzed with descriptive measures as well as exploratory factor analysis.

2. Results

2.1. Definition of a green product: academic perspective. We identified 35 definitions of the concept "green product" in the literature (see Table 1). The definition of green product varies according to the domain of the study. Within the literature, not only the type of product studied is never the same, but the definitions themselves concentrate on different elements such as environmental impacts (e.g., Albino, Balice and Dangelico, 2009); preliminary production aspects (e.g., Eichner and Pethig, 2006) or life-cycle's elements (e.g., Pickett-Baker and Ozaki, 2008). Furthermore, there is no consensus on the termilology used for the concept as some authors refer to "green innovations"

(e.g., Chen, Lai and Wen, 2006) while some others refer to "eco-efficiency product" (e.g., Parthasarathy et al., 2005; Magerholm, 2003), "environmentally-product" (e.g., Pickett-Baker and Ozaki, 2008), "environmental innovation" (e.g., Triebswetter and Wackerbauer, 2008; Wagner, 2000) or "green product" (e.g., Chen, 2008; Hartmann and Ibanez, 2006). This obvious diversity of terms may indicate that finding a universal meaning for the concept of green product is a strenuous task.

So, in order to get a better image of the concept of green product in the literature, we codified 35 definitions. The most frequently listed codes compiled for this definition are: environment (30 occurences); product (19); maximize (13); reduction (11); life-cycle (11); design (10), and resource (10). We, thus, formulated the following integrative definition: *"A green product is a product whose design and/or attributes (and/or production and/or strategy) use recycling (renewable/toxic-free/biodegradables) resources and which improves environmental impact or reduces environmental toxic damage throughout its entire life cycle"*. Note that each code contains several synonymic terminologies; for example: Green: *"environmental"* or *"ecological"*; Attributes: *"functions", "ideas", "practices",* or *"qualities"*; Uses: *"incorporates";* Recycling: *"renewable", "toxic-free",* or *"biodegradable";* Resources: *"energy", "materials",* or *"ingredients";* Benefits: *"maximizes", "encourages",* or *" contributes";* Reduces: *"minimizes", "saves", or "eliminates",* and Toxic damage: *"pollution"*.

Table 1. Green product definitions in the academic literature

Year	Author(s)	Definition
2009	Liu and Wu	Products whose functions or ideas deal with the process of material retrieval, production, sales, utilization and waste treatment available for recycling, reduced pollution and energy saving.
2009	Albino, Balice and Dangelico	Product designed to minimize its environmental impacts during its whole life-cycle. In particular, non-renewable resource use is minimized, toxic materials are avoided and renewable resource use takes place in accordance with their rate of replenishment.
2009	Wagner	Environmental innovations: measures of relevant actors (firms, private households), which: (i) develop new ideas, behavior, products and processes, apply or introduce them, and; (ii) contribute to a reduction of environmental burdens.
2008	Triebswetter and Wackerbauer	Environmental innovations: techno-economic, organizational, social and institutional changes leading to an improved quality of the environment.
2008	Pickett-Baker and Ozaki	Defining environmentally sustainable products is complex. In a strict sense, there is no such thing as a truly sustainable or green product, as all products we buy, own, use and discard in our everyday lives will have negative environmental impacts at some stage in their life cycles.
2008	Eerola and Huhtala	Organic food: Its production has a reduced environmental impact but organic food products are often thought of as having different consumptive characteristics than conventional ones.
2007	D'Souza, Taghian and Khosla	One that has to represent a significant achievement in reducing environmental impact; they may also have to incorporate strategies of recycling, recycled content, reduced packaging or using less toxic materials.
2007	Chen	Green product development addresses environmental issues through product design and innovation.
2006	Hartmann and Apaolaza Ibanez	Green product attributes may be environmentally sound production processes, responsible product uses, or product elimination, which consumers compare with those possessed by competing conventional products.
2006	Chen, Lai and Wen	Green innovation: hardware or software innovation that is related to green products or processes, including the innovation in technologies that are involved in energy-saving, pollution-prevention, waste recycling, green product designs, or corporate environment.
2005	Parthasarathy, Hart, Jamro and Miner	Eco-efficiency: estimates (or metrics) which provide early recognition and systematic detection of economic and environmental opportunities and risks in existing and future business activities.
2005	Wee and Quazi	Being green is defined by 2 basic goals: reducing waste and maximizing resource efficiency.
2005	Ferraro, Uchida and Conrad	Impure public good consisting of a private good (e.g., rainforest honey) bundled with a jointly produced public good (e.g., biodiversity protection).
2005	Kleindorfer, Singhal and Van Wassenhove	Sustainable Operation Management: set of skills and concepts that allow a company to structure and manage its business process to obtain competitive returns on its capital assets without sacrificing the legitimate needs of internal and external stakeholders.
2005	Gurau and Ranchhod	Ecological product: product that was manufactured using toxic-free ingredients and environmentally-friendly procedures, and who is certified as such by a recognized organization, such as SKAL in the Netherlands; BIOKONTROL in Hungary; INAC, OKO-GARANTI or QCLI in Germany.
2004	Huang, Gumley, Strabala, Li et al.	IMAPP broadcasting products can provide immediate information to government, educational, commercial, and research sector users in areas such as severe weather monitoring, forest fire detection, fisheries management, weather forecasting, aviation safety, and ice forecasts.
2003	Eichner and Pethig	Green designing: when producers explicitly incorporate environmental and recycling issues into their product design and manufacturing decisions.
2003	Osada	One that contributes to environmental protection or preservation.
2003	Pujari, Wright and Peattie	"Design for-environment", defined as "a practice by which environmental considerations are integrated into product and process engineering design procedures.
2003	Tanner and Kast	Green food: one that fosters changes in the food chain, such as changes in production, trade practices, or consumption, are crucial steps in the quest for sustainable development.
2003	Magerholm	Eco-efficiency: product or service value per environmental influence (Ecoefficiency indicator = economic performance indicator/environmental performance indicator).

Table 1 (cont.). Green product definitions in the academic literature

Year	Author(s)	Definition
2002	Janssen and Jager	Products with an alternative design such that less physical resources are required during its life cycle.
2001	Dosi and Moretto	With environmental attributes.
2001	Mebratu	Environmental procurement: systematically building environmental considerations into your day-to-day procurement decision-making and operations.
2000	Stafford, Polonsky and Hartman	Green alliances seek common ground among ecological, social and commercial interests, encouraging enviropreneurship.
2000	Anonymous	Products that are environmentally benign.
1997	Roarty	Greening business: moving away from damaging the environment and moving towards products that are sustainable.
1997	Marron	Environmentally superior.
1996	Chan	Environmentally friendly.
1995	Schuhwerk and Lefkoff-Hagius	Less harmful to the environment.
1994	Davis	Environmentally friendly or ecologically safe: Not harmful to or is beneficial to the environment.
1993	Berman	Environmentally sound product.
1991	Weber	Products claiming to be environmentally friendly and biodegradable.
1990	Schorsch	Those that: 1) are grown organically, 2) are made of degradable materials, 3) contain little or no phosphates, or 4) are not tested on animals.
1977	Harmon	Environmental product costs: costs involved in minimizing a product's adverse impact on the environment resulting from extraction of its raw material, production, consumption and disposal.
1975	Herberger Jr.	Ecology appeal: among the product's characteristics its viability with the environment is recognizable, understandable and marketable.

2.2. Definition of a green product: industrial perspective. We selected many identifiable definitions of the green-product concept from the industrial literature and notably definitions of green household cleaning products (see Table 2). As in the academic literature, the concept is manipulated in many different manners: "ecological product", "environmentally friendly product", "green initiatives", "green product", etc. As Ottman (1998, p. 89) wrote, in the industrial perspective, it seems that the definition or the legislation surrounding a green household cleaning product does not really exist in the industrial perspective (www.leportailbio.com). However, there are some important distinctions between the academic and industrial perspectives. First, in the academic literature, the topic of certification only appears in one of the 35 definitions identified in academic literature whereas in the industrial literature certification granted by an official entity is a sine qua non condition in defining a green product. Second, the notion of animal protection appears many times in the industrial perspective, in the sense that a green product should not have been tested on animals. Third, in the industrial perspective, a green product is generally a product that must respect the "3 R" ("reduce", "reuse", and "recycle").

Table 2. Some examples of green product definitions in the industrial perception

Source	Denomination	Definition
www.etiquette.ca Canadian social enterprise	Responsible product Ecological product (housecleaning product)	In order to be considered responsible, a product must stand out with at least one of the four following criteria: respect of the environment, social economy, firm with a social vocation, respectful towards employees. Respect of the environment: (a) Biological product (rejecting the smallest amount of toxic matter in the environment); (b) Eco-efficient product (optimization of recyclable resources or renewable energy sources); (c) Product with an entire lifecycle paired to basic environmental concerns; (d) Product with a lifecycle which contributes directly and voluntarily to an ecosystem regeneration. Biodegradable product accepted by an official label in 30 days. Product that comes in a recyclable wrapper (or box). Product which does not evacuate strong OVC (organic volatile composites).
www.humanvillage.com Consumer and entreprise association	Green product	Product conceived for it to be the least harmful for the environment. Product with planned autorecycling. Product which is identifiable due to an official logo. Product that must respect the "3 R": reduce, reuse and recycle.
www.consoGlobe.be Online store	Green product	Officially labeled biological product. From ecoconception or socially responsible. From fair trade and labeled. Product permitted energy savings. Recyclable product (eco-materials). Natural product: not tested on animals. Non polluting and healthy product.
www.leportailbio.com Online store	Ecological product (housecleaning product)	Product that is non-toxic for the environment. Biodegradable product. Product made of bottomless resources (no fossils, no minerals). Product not containing any chemical organic components (from the oil industry). Product that is plant based with clean and renewable resources. Product made with essential oils.
www.aboneobio.com Online store	Ecological product	Product made with washing plant bases. Efficient product. Biodegradable product. Product which preserves resources. Product not tested on animals. Product that may contain natural allergens.

Table 2 (cont.). Some examples of green product definitions in the industrial perception

Source	Denomination	Definition
Converting Magazine (Industrial review) (July 2008, vol. 6, number 7, p. 22)	Green initiatives	Use or promote sustainable materials. Have "green" credentials. Better manage waste and/or work with recyclable, compostable or biodegradable materials wherever possible.
MCI (Magazine Circuit Industriel) (industrial review)	Green product	Non-toxic product. Biodegradable product. Product ecologically inclined (if only the product does not contain any NPE (nonylphenoxyethoxylate). Product that uses biotechnologies.
Parenting (June 2007, vol. 1, number 5, p.30)	Housecleaning product	Biodegradable; plant-based; hypoallergenic; formulated without dye or synthetic fragrance; nonflammable; does not contain chorine, phosphate, petroleum, ammonia, acids, alkalized solvents, nitrates, or borates.
www.biocoop.fr Biocoop (Biostore network)	Housecleaning product	Product without petroleum-derivatives, without phosphates, without non biodegradable sequestrating agents, with no dye or scent, with no modified enzymes, without brighteners.
Grail Research-Monitor Group (Biostore network)	Green product	Made of recyclable or re-usable material/packaging. Energy-efficient/uses renewable sources of energy. Non-toxic in nature. Contributes less to greenhouse gas emissions. Has received green certification. Requires less water for manufacturing/use. Manufactured/marketed by a socially responsible company. Grown or manufactured locally. Not tested on animals. Free-range/produced from animals that are allowed to roam freely.

2.3. Definition of a green product: consumer perspective. Results of a univariate descriptive analysis (see Table 3) indicate that for consumers, a green household cleaning product is mainly a "biodegradable product" (6.13 on 7), "non-toxic for nature" (6.11), "with minor impact on the environment" (6.09) and "safe for the planet" (6.09). For consumers, a green household cleaning product, thus, possesses attributes linked to 2 of the "3 R" ("reduce" and "reuse"). On the opposite, elements associated with certification, a sine qua non condition in defining a GP in the industrial perspective, do not seem to be important for consumers to define the green nature of a product. In fact, the items "Product certified by an independent entity" (4.46) and "Product certified by the manufacturer" (3.91) are some of the lowest scores (20th and 23rd ranks on 23 items). The item "Product not tested on animals" is also not paramount in defining a green product (4.98; 16th rank).

Table 3. Descriptive analysis of green housecleaning product's definition (consumer perception)

Rank	According to you, what is a green housecleaning product? (Evaluate, on a scale of 1 to 7, 1 = strongly disagree and 7 = strongly agree)	Mean	Standard error
1	Biodegradable product	6.13	1.215
2	Product non-toxic for nature	6.11	1.23
3	Product with minor impact on the environment	6.09	1.315
4	Product safe for the planet	6.09	1.301
5	Product which preserves natural resources	5.81	1.44
6	Product made of recyclable content	5.76	1.318
7	Product with no phosphate	5.57	1.572
8	Product with no ammonia	5.56	1.555
9	Product non toxic towards health	5.52	1.712
10	Energy saving product	5.52	1.530
11	Product without petroleum-derivatives	5.49	1.569
12	Product which uses less water to make	5.24	1.804
13	Product made with natural or organic ingredients	5.17	1.623
14	Biological product	5.03	1.704
15	Product made by a socially responsible enterprise	4.98	1.657
16	Product not tested on animals	4.8	1.917
17	Product with no modified enzymes	4.66	1.776
18	Fair trade product	4.6	1.77
19	Product with no dye or scent	4.47	1.879
20	Product certified by an independent entity	4.46	1.806
21	Product made locally	4.39	1.903
22	Hypoallergenic product	4.32	1.923
23	Product certified by the manufacturer	3.91	2.058

An exploratory factor analysis was used to analyze the scale structure. In order to assess if all items should be retained in the factor analysis, item-to-total correlation and average inter-item correlation were computed (see Table 4). As a rule of thumb, the item-to-total correlations of the scale should exceed 0.50 and inter-item correlations should exceed 0.30 (as suggested by Hair et al. (2006, p. 137) and cited by Turker (2009)). Surprisingly – given the importance of the item in the univariate analysis – according to these criteria, the item "biodegradable" should be eliminated.

Table 4. Item-to-total correlation and average inter-item correlation of the 23 original items

Item	Item-to-total correlation	Average inter-item correlation
Biodegradable product	0.397	0.205
Product made of recyclable content	0.665	0.374
Product with minor impact on the environment	0.617	0.340
Biological product	0.747	0.438
Product not tested on animals	0.678	0.409
Product non-toxic towards health	0.642	0.377
Product safe for the planet	0.577	0.343
Energy saving product	0.726	0.455
Product certified by an independent entity	0.535	0.329
Product certified by the manufacturer	0.586	0.341
Fair trade product	0.710	0.438
Product non-toxic for nature	0.733	0.473
Product without phosphate	0.841	0.539
Product without ammonia	0.792	0.513
Product without petroleum-derivatives	0.799	0.512
Product without dye or scent	0.778	0.485
Product with no modified enzymes	0.772	0.469
Product which preserves natural resources	0.767	0.495
Product made with natural or organic ingredients	0.686	0.431
Hypoallergenic product	0.688	0.404
Product which uses less water to be manufactured	0.709	0.447
Product made by a socially responsible enterprise	0.700	0.409
Product made locally	0.660	0.401

The factor analysis was carried with principal component analysis along with orthogonal rotation procedure of varimax for summarizing the original information with minimum factors and optimal coverage. Table 5 shows the obtained factorial structure of the scale. A high KMO value of 0.872 reveals the adequacy of the data for factor analysis. In order to understand how variance could be portioned, component analysis was performed to the data set. Factor analysis revealed four distinct factors with eigenvalues greater than 1.0, explaining 68.831% of the variance, which can be deemed sufficient in terms of explained total variance. As seen from Appendix 5, factor 1 accounts for 21.101% of the variance (eigenvalue 4.642), factor 2 for 17.990%, factor 3 for 15.545% and factor 4 for 14.195%. The factors can be labeled as: (1) non-toxic for nature ("Product which preserves natural resources"; "Product without petroleum-derivates"; "Product without phosphate"; "Product made of recycle content"; "Product non-toxic for nature"; "Product without ammonia"; "Product made with natural or organic ingredients"); (2) good for health (e.g., "Product non-toxic towards health"); (3) socially responsible (e.g., "Product made locally"); (4) good for the planet (e.g., "Product with minor impact on environment"). The Cronbach alpha values for the four factors were calculated as 0.925, 0.850, 0.865, and 0.786. These values are much higher than the usually suggested alpha value of 0.70 which seem to indicate a good internal consistency of the dimensions of the scale.

Table 5. Total variance explained and rotated factor loading matrix (VARIMAX)

Item	Factor				Commonalities
	Factor 1	Factor 2	Factor 3	Factor 4	
Product which preserves natural resources	0.806				0.808
Product without petroleum-derivatives	0.768				0.807
Product without phosphate	0.758				0.867
Product made of recyclable content	0.710				0.620
Product non-toxic for nature	0.658				0.646
Product without ammonia	0.639				0.708
Product made with natural or organic ingredients	0.503				0.519
Hypoallergenic product		0.747			0.734

Table 5 (cont.). Total variance explained and rotated factor loading matrix (VARIMAX)

Item	Factor				Commonalities
	Factor 1	Factor 2	Factor 3	Factor 4	
Product certified by the manufacturer		0.721			0.638
Product non toxic towards health		0.694			0.597
Product without dye or scent		0.659			0.741
Product certified by an independent entity		0.613			0.519
Product not tested on animals		0.549			0.532
Product made locally			0.781		0.755
Product which uses less water to be manufactured			0.722		0.716
Fair trade product			0.641		0.628
Energy saving product			0.640		0.803
Product made by a socially responsible enterprise			0.626		0.714
Product with minor impact on the environment				0.685	0.684
Product safe for the planet				0.662	0.578
Product with no modified enzymes				0.645	0.815
Biological product				0.634	0.714
					Total
Sum of squares (eigenvalues). Percentage of trace	4.642	3.958	3.420	3.123	15.143
Percentage of trace	21.101	17.990	15.545	14.195	68.831

It is interesting to note that the two items related to certification ("Product certified by the manufacturer" and "Product certified by an independent entity") are loading on factor 2 (good for health). These results may indicate that consumers do not look for certification per se but see certification as a proof that the products are good for their health.

Discussion and conclusion

The results of this exploratory research reveal a problem of concordance between the perspectives of academic researchers, industrials and consumers on the definition of a green product. This comparison of three different perspectives, thus, confirms the conclusion of authors such as Rivera-Camino (2007), Hartmann and Ibanez (2006) that the definition of green product is unclear and particularly complex.

In effect, the codification of 35 academic definitions of a green product resulted in the following definition: "A green product is a product whose design and/or attributes (and/or production and/or strategy) uses recycling (renewable/toxic-free/biodegradable) resources and which improves environmental impact or reduces environmental toxic damage throughout its entire life cycle". Certification does not seem to be important in the academic literature as the word "certification" only appears in one of the 35 compiled definitions. According to the industrial perspective, a green product is a product that must respect the "3 R": "reduce", "reuse" and "recycle"; that is certified by an official entity; and that is not tested on animals. Biodegradability is also a main component of a green product. For consumers, a green household cleaning product is (1) non-toxic for nature; (2) good for health; (3) socially responsible; and (4) good for the planet. The results of the consumer survey suggest that they may be more concerned with the tangible attributes of a green product, particularly those that may have an impact on the preservation of the environment and on personal health. This is consistent with the literature on perceived risks of green products (D'Souza, Taghian and Lamb, 2007; Mahenc, 2007; Ginsberg and Bloom, 2004). As shown in Durif et al. (2009), consumers do not associate physical risks to green products. This could explain why consumers in our survey consider that a green product is good for health. However, from the consumers' perspective, certification is not a sine qua none condition in the definition of a green product.

The results of this research raise many crucial elements. Academic research on the green product concept is underdeveloped (Pickett-Baker and Ozaki, 2008). The meta-analysis only identified 179 references over a 30-year period in a database covering more than 3000 scientific journals. Furthermore, the industrial sector seems to have jumped the green bandwagon without waiting for the necessarily business processes associated with green products to be made available by academic research. Often accused of greenwashing, firms would benefit from educating consumers of the environmental impact of their products as well as of the meaning of ecolabels put on their products by providing sufficient, appropriate and clear (D'Souza, Taghian and Lamb, 2006). Finally, two results concerning consumers are surprising. First, given the low correlation between the item "Product biodegradable" and the other items measuring the greenness of a product, further research should be undertaken regarding how biodegradability is defined by consumers. Second, the topic of certification should be further investigated. Many professional studies reveal that certification is crucial for consumers while, in our study, certification does not seem as important to define a green product. Are consumers too sceptical?

References

1. Albino, V., Balice, A., R. Dangelico. Environmental strategies and green product development: an overview on sustainability-driven companies // *Business Strategy and the Environment*, 2009. № 18. – pp. 83-96.
2. Athavaley, A. What do labels really tell you? Household products start to come clean on ingredients // *The Wall Street Journal*, 2009. – April 2 2009, pp. D.1.
3. Berman, E. The market for green products and public policy // Environments, 1993. – Vol. 22. – № 1. – pp. 75-84.
4. Chan, T.S. Concerns for environmental issues and consumer purchase preferences: A two-country study // *Journal of International Consumer Marketing*, 1996. – Vol. 9, № 1. – pp. 43-55.
5. Chen, Y-S. The driver of green innovation and green image – Green core competence. // *Journal of Business Ethics*, 2008. – Vol. 81. – pp. 531-543.
6. Chen, Y-S., Lai, S-B., C-T. Wen. The Influence of Green Innovation Performance on Corporate Advantage in Taiwan // *Journal of Business Ethics*, 2006. – Vol. 67. – pp. 331-339.
7. Chung, C., H. Wee. Green-component life-cycle value on design and reverse manufacturing in semi-closed supply chain // *International Journal of Production Economics*, 2008. – Vol. 113, pp. 528-545.
8. D'Souza, C., Taghian, M., R. Khosla. Examination of environmental beliefs and its impact on the influence of price, quality and demographic characteristics with respect to green purchase intention // *Journal of Targeting, Measurement and Analysis for Marketing*, 2007. – Vol. 15. – № 2. – pp. 69-78.
9. D'Souza, C., Taghian, M., P. Lamb. An empirical study on the influence of environmental labels on consumers // *Corporate Communications*, 2006. – Vol. 11. – № 2. – pp. 162-173.
10. Durif, F., Roy, J., Dube, F., K. Lebrun. Towards a better understanding of consumer's reluctance to buy green products: An exploratory study on perceived risks // Proceedings of the International Nonprofit and Social Marketing (INSM) Conference, Melbourne (Australia), July 14-15, 2009. – pp. 9.
11. Eerola, E., A. Huhtala. Voting for Environmental Policy Under Income and Preference Heterogeneity // American Journal of Agricultural Economics, 2008. – Vol. 90. – № 1. – pp. 256-266.
12. Eichner, T., R. Pethig. (2006). Corrective Taxation for Curbing Pollution and Promoting Green Product Design and Recycling // *Environmental and Resource Economics*, 2006. – Vol. 25. – № 4. – pp. 477-500.
13. Ferraro, P., Uchida, T., J. Conrad. 2005, Price Premiums for Eco-friendly Commodities: Are 'Green' Markets the Best Way to Protect Endangered Ecosystems? // Environmental and Resource Economics, 2005. – 32. – pp. 419-438.
14. Ginsberg, J., P. Bloom. Choosing the Right Green-Marketing Strategy // *MIT Sloan Management Review*, 2004. – Vol. 46. – pp. 79-84.
15. Gurau, C., A. Ranchhod. International green marketing: A comparative study of British and Romanian firms // International Marketing Review, 2005. – Vol. 22. – № 5. – pp. 547-561.
16. Glass, G. Integrating Findings: The Meta-Analysis of Research // *Journal of Research in Science Teaching*, 1977. – Vol. 9. – pp. 3-18.
17. Glass, G., McGaw, B., M. Smith. *Meta-analysis in social research,* 1981 – Sage publications. Hair, J.F., Black, W.C., Andersen, R.E., R.L., Tatham. (2006). Multivariate Data Analysis, 6th edition, Pearson Prentice Hall, 2006.
18. Hartmann, P., V.A. Ibanez, (2006). Green value added. *Marketing Intelligence & Planning,* 2006. – 24(7), 673-680.
19. Harmon, R. Incorporating Enviromental Product Costs into a Shortage Economy // Business and Society, 1977. – Vol. 17. – № 2. – pp. 19-26.
20. Herberger, R. The Ecological Product Buying Motive: A Challenge For Consumer Education // The Journal of Consumer Affairs, 1975. – Vol. 9. – № 2. – pp. 187-195.
21. Huang, H-L., Gumley, L., Strabala, K., Li, J., et al. International Modis and Airs Processing Package (IMAPP) // Bulletin of the American Meteorological Society, 2004. – Vol. 85. – № 2. – pp. 159-161.
22. Janssen, M., W. Jager. 2002, Stimulating diffusion of green products // Journal of Evolutionary Economics, 2002. – 12. – pp. 283-306.
23. Kleindorfer, P., Singhal, K., L. Van Wassenhove. Sustainable Operations Management // Production and Operations Management, 2005. – Vol. 14. – № 4. – pp. 482-492.
24. Laufer, W.S. Social Accountability and Corporate Greenwashing // *Journal of Business Ethics*, 2003. – Vol. 43. – № 3. – pp. 253-261. Magerholm, A. Eco-efficiency reporting exemplified by case studies // *Clean Technologies and Environmental Policy*, 1996. – Vol. 5/ – № 3-4. – pp. 232-239.
25. Liu, M-S., S-D. Wu. Green Supplier Assessment: A Case Study of the Fire Extinguisher Industry // Journal of American Academy of Business, 2009. – Vol. 14. – № 2. – pp. 104-111.
26. Magerholm, A. Eco-efficiency reporting exemplified by case studies // Clean Technologies and Environmental Policy, 2003. – Vol. 5ю – № 3-4. – pp. 232-239.
27. Mahenc, P. Are green products over-priced? // *Environmental and Resource Economics*, 2007. – Vol.38. – pp. 461-473.
28. Marron, D. Buying green: Government procurement as an instrument of environmental policy // Public Finance Review, 1997. – Vol. 25. – № 3. – pp. 285-305.
29. Mebratu, D. Environmental competitiveness: Green" purchasing // International Trade Forum, 2001. – 2. – pp. 11-13.
30. Nyborg, K., Howarth, R. K. Brekke. Green consumers and public policy: On socially contingent moral motivation // *Resource and Energy Economics*, 2006. – Vol. 28. – pp. 351- 366.
31. Osada, H. New Product Planning for Environment //Quality Congress, 2003. – 57. – pp. 257-262.

32. Ottman, J.A. Green Marketing: Opportunity for Innovation. Second Edition, BookSurge, 1998.
33. Ottman, J.A., Stafford, E.R., C.L. Hartman. Avoiding green marketing myopia: ways to improve consumer appeal for environmentally preferable products // *Environment*, 2006. – Vol. 48.– No.5, pp. 22-36.
34. Parthasarathy, G., Hart, R., Jamro E., L. Miner. Value of sustainability: perspectives of a chemical manufacturing site // *Clean Technologies and Environmental Policy*, 2005. – Vol. 7. – pp. 219-229.
35. Peattie, K., A. Crane. Green marketing: legend, myth, farce or prophesy? // *Qualitative Market Research: An International Journal*, 2005. – Vol. 8. – № .4, pp. 357-370.
36. Pickett-Baker, J., R. Ozaki. Pro-environmental products: Marketing influence on consumer purchase decision // *Journal of Consumer Marketing*, 2008. – Vol. 25. – №.5. – pp. 281-293.
37. Pujari, D., Peattie, K.,G. Wright. Green and competitive: Influences on environmental new product development performance // Journal of Business Research, 2003. – Vol. 56. – № 8. – pp. 657.
38. Rivera-Camino, J. Re-evaluating green marketing strategy: a stakeholder perspective // *European Journal of Marketing*, 2006. – Vol. 41. – №. 11/12. – pp. 1328-1358.
39. Sammer, K., R. Wiistenhagen. The influence of eco-labelling on consumer behaviour – Results of a discrete choice analysis for washing machines // *Business Strategy and the Environment*, 2006. – Vol. 15. – pp. 185-189.
40. Schorsch, J. Are Corporations Playing Clean with Green? // Business and Society Review, 1990. – 1. – pp. 6-9.
41. Schuhwerk, M., R. Lefkoff-Hagius. Green or non-green? Does type of appeal matter when advertising a green product? // Journal of Advertising, 1995. – Vol. 24. – № 2. – pp. 45-54.
42. Stafford, E., Polonsky, M., C. Hartman. Environmental NGO-business collaboration and strategic bridging: a case analysis of the Greenpeace-Foron Alliance // Business Strategy and the Environment, 2000. – Vol. 9. – № 2. – pp. 122-145.
43. Tanner, C., S.W. Kast. Promoting sustainable consumption: Determinants of green purchases by Swiss consumers // Psychology & Marketing, 2003. – Vol. 20. – № 10. – pp. 883–892.
44. Triebswetter, U., J. Wackerbauer, J. Integrated environmental product innovation and impacts on company competitiveness: a case study of the automotive industry in the region of Munich European Environment, 2008. – 18. – pp. 30-44.
45. Turker, D. Measuring Corporate Social Responsibility: A Scale Development Study // *Journal of Business Ethics*, 2009. – Vol. 85. – pp. 411-427.
46. Wagner, M. National culture, regulation and country interaction effects on the association of environmental management systems with environmentally beneficial innovation // *Business Strategy and the Environment*, 2009. – Vol. 18. – pp. 122-136.
47. Weber, L. Behind the Green Veil // Alternatives, 1991. – Vol. 17. – № 4. – 11.
48. Wee, Y.S., H. Quazi. Development and validation of critical factors of environmental management // Industrial Management and Data Systems, 2005. – 105. – pp. 96-114.