Integration of Green Marketing within the automotive industry

- A case study of four car manufacturers on the Belgian market -

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François De Craecker and Loïc De Wulf
“Take care of the Earth and she will take care of you...”

- Unknown Author
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1. Background

Over the last years, we have noticed some changes in the population amongst product manufacturers and consumers. Indeed, the whole society feels more than ever concerned by a new phenomenon which was first discovered by Joseph Fourier in 1824, first reliably experimented by John Tyndall in 1858 and first quantitatively reported by Svante Arrhenius in his 1896 paper (Weart, 2007). The phenomenon mentioned here is known as the “Greenhouse Effect”. People have been talking about ever since it has been proven that it could have dreadful consequences for the planet Earth. Implications like a notable climate change, a global warming which could be disastrous for the vegetation, the oceans, the wild life... (Held and Soden, 2000).

This consciousness-raising has led the world to many changes in various domains. The easiest and most notable example is the current frequent use of some words like climate change, green energy, sustainable development, ecology, recycling... All these words are now used in everyday conversations.

It has also influenced people’s behaviour, people like consumers, producers, governmental bodies, associations members, and of course marketers. The fact is that nowadays the population has become really conscious that it is a necessity to find some solutions in order to limit the emission of greenhouse gases.

This obligation is also the main reason behind the idea of the Kyoto Protocol which was launched in 1997 to the United Nations Framework Convention on Climate Change. The treaty is intended to achieve “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system” (UNFCCC 2005, p5). Every year it is not less than 28 billion tons of CO2 that are released in the atmosphere. The main responsible source is the production of energy (37%) and the second is transportation (25%). The road transportation represents 18% (10% for cars) while the air and sea transportation is responsible for the other 8% (FEBIAC, 2008).
Moreover, it is definitely not a coincidence that the 2007 Peace Nobel Prize was awarded to the former American Vice-President Al Gore who directed the movie “An Inconvenient Truth” (NobelPrize.org, 2007).

According to those observations it seems that there is a real need for ecological products and of course when the term need is evoked we immediately think to marketing. Indeed, there are many definitions of marketing but the better definitions, the ones commonly accepted, are focused upon customer orientation and satisfaction of customer needs. According to Kotler (1991, p4) the marketing is “the social process by which individuals and groups obtain what they need and want through creating and exchanging products and value with others”. That is by concern for this new world apprehension that the concept of “Green marketing” was developed in order to help the marketers to become more ecological in the use of their marketing strategies but also in order to offer people more environmental friendly products.

Henion and Kinnear were the first to discuss the green marketing in 1975 but according to Polonsky (1994), it is in the late 1980s and early 1990s that there was a prominence of it. In their publications in 1976 Henion and Kinnear defined the ecological marketing as “the study of the positive and negative aspects of marketing activities on pollution, energy depletion and non-energy resource depletion (Henion and Kinnear quoted by Polonsky 1994, p2)”.

Since then authors have been discussing a lot about this concept and the notion of green marketing is now adopted by many people. However it is difficult to find a definition of the green marketing that marketers define as the good one. There are some definitions of the concept but nowadays the most popular is the one proposed by Polonsky (1994): “all activities designed to generate and facilitate any exchanges intended to satisfy human needs or wants, such that the satisfaction of these needs and wants occurs, with minimal detrimental impact on the natural environment” (Polonsky 1994, p2). Some authors agree to say that it is important to focus on customers’ benefits and that the point of view of the consumers is important (Ottman, 2006; Polonsky, 1994; Prakash, 2002). According to Ottman (2006) a strong commitment to environmental sustainability in product design and manufacturing can offer to
companies opportunities to grow their businesses, to innovate or to build brand equity. She also notices that the green marketing can lead to product improvements that can enhance marketability, improve overall performance and become a potential new source of innovation (Ottman, 2006).

Ottman is not the only one to argue that the green marketing can be a benefit for a company. Miller (2008) for instance claims that green marketing is a concept that, when implemented effectively, can improve the customer relationships, image in the market and ability to reach the most targeted audience, while helping grow the bottom line. According to the Queensland Government (2006) this concept is also a benefit for the product as it claims that with equal quality, performance and availability, the environmental benefit product will most likely tip the balance in favour of the more ecological product. Other advantages can be attributed to the green marketing like the fact that it can be an opportunity to achieve its objectives (Keller, 1987; Shearer, 1990), be a way to appear more socially responsible to the society (Davis, 1992; Keller, 1987; Shearer, 1990), to be in accordance with governmental rules (NAAG, 1990), to struggle with competitors (NAAG, 1990), to reduce the cost factors associated with waste disposal or reductions in material usage (Azzone and Manzini, 1994).

In theory, it seems that authors agree on what is the green marketing and on the benefit that we can get in return. In practice however, the opinions seem to be quite divergent. Various theories have been developed in order to implement a green marketing strategy. The first point to take into consideration is from Glorieux-Boutonnat (2004) who advances that implementing a green marketing is not always as easy as it seems to be. According to her, the main issue is that the concept tries to mix two concepts which have diverging goals. She argues that the marketing focuses on seducing consumers and generating profitable sales rapidly and they take the environment into consideration as far as it helps achieving that goals. However, she notices that some brands have made successful use of green marketing (Glorieux-Boutonnat, 2004). Moreover, according to Miller (2008), green businesses continue to evolve, and new companies are joining the trends. She adds that the green economy is valued at more than $209 billion annually and is expected to reach $1 trillion by 2020.
In this hazy and developing phenomenon it is hard to know how to apply an efficient green marketing and what are the rules since authors have various opinions about it. Polonsky (1994) for instance notices that unfortunately a majority of people believes that green marketing refers solely to the promotion or advertising of products with environmental characteristics. This also explains why the concept is often linked with terms like phosphate free, recyclable, refillable, ozone friendly... He also claims that the green marketing incorporates a broad range of activities, including product modification, changes to the production, packaging changes, as well as advertising. Glorieux-Boutonnat (2004) reduces the green marketing to two basics requirements which appear to be the top management involvement and long-term objectives that includes the will to educate consumers.

Ottman (2008) published an article in the Design Management Review where she proposed the 5 simple rules of green marketing. According to her, in order to reach these objectives the companies have to get the right message and to know what is important to customers, empower them to feel they make a difference, be transparent, maintain quality and finally carefully evaluate price concerns. She explains the fact that there are a lot of companies that unsuccessfully tried to use a green marketing, mainly due to a lack of planning and crafted marketing message. She believes that if respecting the five rules, a company must be successful (Ottman, 2008).

Some authors tend to reduce the green marketing to a few elements but others seem to join Polonsky’s opinion and to attribute to the green marketing a lot of elements and consider it like a real and complete strategy. However, while Polonsky (1994) considered a lot of factors in the green marketing, others like Prakash (2002) approach it from the marketing-mix. According to him green marketing subsumes greening products as well as greening firms, in addition to manipulating the 4Ps of the traditional marketing mix.

The first to include the green marketing in the marketing mix was Bradley (1989-2007) in 1989. He was the first to use the term green marketing mix. He included the green marketing inside the marketing mix and developed some studies to measure how green is a company and explained some rules to insert into the marketing strategy. Going deeper in this way, the Environmental Protection Agency of the Queensland
Government (2006) deals with the green marketing like the “classic” marketing with the 4Ps. It is therefore important to understand what specificities have the Ps in the green marketing concept. In this way the green marketing is defined by them as “developing and promoting products and services that satisfy your customers’ wants and needs for quality, performance, affordable pricing and convenience without having a detrimental impact on the environment” (Queensland Government 2006, p1). This organization really created the 4Ps in a green way. As it seems to be the most extensive and complete one, it is going to be the basic theory for developing the theoretical model of this thesis that will be used to analyse the green marketing of some companies.

The main purpose of the green marketing is to provide more ecological marketing strategy by providing more ecological products as well as becoming more environmental friendly while producing those goods. The second biggest actors of the pollution in the world are the car manufacturers, mostly by the use that the consumers do of their products. The cars are responsible of 10% of the CO2 released in the atmosphere. Indeed, the exhausts represent 80% of the total amount of pollution created by a car (FEBIAC, 2008). A car is a complex product. It is the result of a combination of more than 1500 pieces, produced in many different materials like steel, PVC, aluminium... (FEBIAC, 2008). The actual constraints for car producers are to propose an attractive product for people and at the same time to develop this one in accordance with all the rules, rules that we notably find in the domain of security and environmental legislations (FEBIAC, 2008).

The car manufacturers’ behaviour has changed during the last few years as they have understood that people were more concerned by the pollution and became more ecology-oriented. A lot of investments have been done in the Research and Development. In 2007 $100 billion were spent in this domain and this figure should rise to $800 billion in the world before 2015. This figure represents 4% of the total turnover of the sector (FEBIAC, 2008).

For the last 10 years in Europe, which is “the good student”, a reduction of 13% of CO2 emissions was noticed and this figure rises to 16% when it comes to Belgium (FEBIAC, 2008). This phenomenon can be explained by two reasons. The first one is the fact that
the producers are trying to provide less polluting products so it tends to reduce the amount of pollution caused by the cars transport. The second one appears to be the change in consumers’ behaviour. Indeed, by looking at the sales of new cars for the last five years in Belgium we can notice a real mutation. The sales of cars considered as “ecological” (releasing less than 140g/km of CO2 emissions) have doubled. On the other hand the more polluting cars (from 201 to 250g/km of CO emissions) have seen their sales reduced by 50% (FEBIAC 2008).

The Belgian market has been changing recently and we can also notice this phenomenon in the entire Europe. This market is huge compared to the small country that is Belgium (11 million inhabitants). However even the Belgium market only means more than 500,000 new cars put into circulation every year (FEBIAC, 2008). For all those reasons it is really easy to understand why the car manufacturers try to respond to customers’ needs by offering more ecological products.

The easiest way to make it successfully would be of course to implement a well adapted marketing strategy in order to be as effective as possible. In this case it seems logical to think that the best way to do so is to use some elements of green marketing if not a whole strategy based on it.

Since it is obviously one of the main purposes of the car manufacturers nowadays, it seemed really interesting to focus on the strategy developed by these and to figure out how deeply the green marketing strategy is used. The objective of this thesis is therefore double. Firstly it will develop a clearer and deeper green marketing-mix model by mixing the views of different authors on the green marketing. Secondly it will look at the strategies used by the companies within the car sector with the support of the developed model in order to see how deeply they use the green marketing to reach their objectives. This analyze will allow to see if the green marketing is already well implemented in this sector, sector which is one of the most pollutant and of course one of the sectors where managers should be the more concerned about it.
2. Problem

Since the two researchers come from Belgium and are both really concerned with ecology, they wanted to find a link between this concern and their Marketing studies. They therefore decided to focus on their home market, Belgium and to study one of the industries damaging the most the ecology, at least according to the cliché, the car industry.

Nowadays people can see that the market of ecological cars is emerging. Over the last years it has succeeded to become common and now almost every brand focuses on this ‘fashion’ in order to propose more ecological products.

This emerging offer has become very important for many brands not matter where they come from. It appears interesting to have a look on how the different brands deal with this phenomenon, to analyse the similarities but also the differences between the strategies of the different car manufacturers.

Indeed, as this market has become a priority for these manufacturers and it has seen them investing a lot of money in this domain, it sounds interesting to study their management in order to determine how they deal with the phenomenon, to see whether they use particular marketing strategies linked to ecology.
3. Purpose

The purpose of this study is really simple and easily understandable; it will try to answer the question: “do the different cars brands present on the Belgian market apply a strategy based on the Green Marketing?”

To answer to that question, this study will be made through a case study involving famous cars brands on the Belgian market. Indeed the researchers believe that the only way to answer to the previous question is to study the everyday management of the different brands according to the theories related to the Green Marketing.

This thesis will mostly analyse the product development of the brands – the strategy of investment, production... –, but will also determine the impact of the Green Marketing on the communication around the products and the brand name.

It also seems quite important to have a look on the evolution of those brands over the last few years in order to see what improvement they have brought in relation with the Green Marketing and where all those improvement could lead. The different legislations on the environment probably have a responsibility in this phenomenon but it is also important to understand the real objectives of the different brands from an ecological point of view.

In order to analyse the different brands, the authors will first build a model allowing an evaluation of the importance of the Green Marketing for each brand.
4. Limitations

This research focuses only on the main product proposed by the studied manufacturers: the ‘everyday’ cars. The authors decided to leave aside the other activities or products delivered by the brands, such as the motorbikes, the trucks, the racing cars, or even the engines...

Indeed the goal of this research is to keep the focus on the products that affect the whole population, the cars, in order to compare the four brands the same way. However the authors acknowledge that it might be interesting to study the strategic positioning of the brands regarding to their other products and this leaves the door open for further research.
5. Methodology

5.1. Type of method

The two authors had to choose between a quantitative study and a qualitative study. The latter was chosen for multiple reasons. Qualitative study is indeed characterized by flexibility, in opposition to the rigorousness structure of a quantitative study.

A qualitative study is a method increasingly used today to deeply understand certain phenomena in our society. This type of analysis is based on words, on the views of participants and a structural approach that differs from a quantitative study (Bryman & Bell 2007, p426).

A qualitative research can be led following six main steps (Bryman & Bell 2007, p405-407):

- General research questions
- Selection of relevant sites and subjects
- Collection of relevant data
- Interpretation of data
- Conceptual and general framework
- Sum up of the findings/conclusions

This kind of study was chosen in order to get a deeper understanding of the subject. Indeed thanks to the qualitative study the researchers have the possibility to see exactly how the manufacturers behave on the Belgian market by asking precise details to the respondents. This methodology is suitable for this study as it was the best way for the researchers to discover exactly if the car manufacturers are applying a strategy based on the Green marketing on the Belgian market.
5.2. Type of research

The authors decided to conduct an exploratory research. According to Aaker et al (2003), an exploratory research should be used when looking for insights about a specific problem. This kind of research is particularly efficient when there is little preceding knowledge. The method used is very often a qualitative study. (Aaker et al 2003)

In this case, since there was little prior information about the subject, that kind of research was considered as the more suitable solution. By designing the research as an exploratory process, the authors aimed to increase their experience with the problem and therefore fulfil the purpose of the research.

5.3. Research framing

According to Yin (1994), five different methods can be used to collect and analyze data. These methods are case studies, experiments, surveys, multiple histories and analysis of archival information.

The research framing chosen in the study is a multiple case study. The case study is a research strategy which focuses on understanding the dynamics present within single settings (Einsenhardt 1989). Case studies can involve either single or multiple cases (Yin, 1984).

A case study suits to this study as it allows a combination of different data collection methods (papers, interviews, observations...). Indeed, according to Yin (2003), one of the major strengths of a case study is the possibility to deal with many kinds of variables but also to use multiple sources.
5.4. Data collection

The two authors believed that using multiple sources of data is very useful and increases the value of the findings.

Yin (2003) identified six different sources of data:

- Documentation
- Archival records
- Interviews
- Direct observations
- Participant observations
- Physical artefacts

The techniques chosen for this study are the interviews and the documentation. Indeed a field visit was not possible due to the distance between the two countries. And the absence of this field analysis reduced or even suppressed the availability of some sources. These collection methods were chosen because they allowed a direct focus on the subjects of interest: the brands. Both telephone and email interviews were used. The telephone interview was first used to get the maximum input, and the email interview was used afterwards for the additional details.

The documentation was also used. Data was also collected through secondary data such as the official websites of the different brands, websites of non-official organisations, but also through documentation provided by the manufacturers. The researchers paid a great attention to their choice of secondary data. Indeed they were very critical and collected trustworthy data from reliable sources.

It is important to notice that the authors have knowledge in French, English and also basics in Dutch, they were therefore able to collect data from the International websites of the brand but also from the Belgian websites and also from other international websites. However data collected from the Belgian website was translated into English in a way to keep the original ideas.
Here is a little summary explaining how we collected the data and which source was used:

<table>
<thead>
<tr>
<th>Type of data</th>
<th>Source used</th>
</tr>
</thead>
<tbody>
<tr>
<td>History of the company</td>
<td>Company website and independent websites</td>
</tr>
<tr>
<td>Importance of ecology within the company</td>
<td>Interview</td>
</tr>
<tr>
<td>Practical examples of initiatives</td>
<td>Interview</td>
</tr>
<tr>
<td>Future objectives</td>
<td>Interview</td>
</tr>
<tr>
<td>Technical solutions</td>
<td>Company website and company folders</td>
</tr>
</tbody>
</table>

5.5. Sampling

The selection of cases is an important aspect of building theory from case study (Einsenhardt 1989). The authors decided to focus on four different brands. They chose this number because it could give a sufficient overview of the Belgian market but without the risk to be overwhelmed by the amount of information.

The four brands were strategically chosen among all the car manufacturers selling cars on the Belgian market. Those four brands are Volkswagen, BMW, Renault and Toyota.

Volkswagen was first chosen because it is the first brand on the Belgian market with 11.5% of the market share (FEBIAC, 2009).

BMW was also chosen since it is the first brand on the Belgian market that focuses only on luxurious cars (FEBIAC, 2009). Moreover, this brand sounded very interesting for the authors since they had a preconceived notion about the brand which they absolutely did not associate with an ecological strategy. Their idea was also reinforced by a remark made by a fellow student who was surprised by the choice of the company, arguing that BMW cars were all but ecological.

The third brand, Renault was chosen because of the origin of the brand. Indeed, as a French brand, Renault is very close to the Belgian market. Belgium is very important for Renault since almost half of the Belgian population speaks the same language as its home country: France. It is therefore very convenient for the brand that can apply a very
similar strategy in both countries. Renault is also the strongest French brand in the world and is very famous thanks to its implication in racing sports which is quite an opposition to ecological cars.

Last but not least, Toyota was primarily chosen because it was the first brand to launch an ecological car and to promote it worldwide. This “pioneer” car, the Toyota Prius, was first launched in 2003 in Japan and rapidly became popular.

5.6. Interview guide

All interviews have been conducted through telephone and email interviews. If the authors were aware of the lost of the body language analysis, the telephone interview was chosen for practical reasons. Due to the distance, it was indeed not possible for the researchers to interview the different persons in face-to-face interviews. However one advantage of a telephone interview is that it lowers the chance of affecting the respondent.

The contact persons in the companies were either the Marketing Manager or one of his collaborators. Even though the duration of the interviews was not consistent, an average of 25 minutes was needed for one interview. However, it must be said that the respondents already had a general idea about the topics that the interview was supposed to cover. Indeed during the first contacts, the authors informed the different persons that the interview would be about the link between the Green marketing and the marketing strategy of their own brand.

The interviews were led as semi-structured interviews including the main questions but staying open to any new direction occurring through the answers of the respondent. For the interview, the interviewer had a list of general questions on the topics that needed to be covered for the study. This list, the interview guide, provided the interviewer with a support but let a “great deal of leeway in how to reply” (Bryman & Bell 2007, P474).
The interview guide was constructed as following:

- Could you describe in a few words the importance of ecology within your company?

- Besides your cars, which ecological solutions did you set up inside your company (buildings, production chain, waste, employees, everyday life in the company...)?

- Is it essential nowadays to integrate ecology in your communication?

- What is your main strategy for your future products?

- Do hybrid cars represent a large part of your research and development?

- Which alternative solutions do you study for the “after-petrol”? What do you consider as the fuel of the future?

- Do the premiums offered by the Belgian government affect your price and communication strategy?
6. Theoretical framework

6.1. The concept of Green Marketing

A. Introduction

A lot of different and various definitions of the marketing are available but they all tend to put the customer into focus: “Marketing is the delivery of customer satisfaction as a profit” (Kotler et al quoted by Nervi 2008, p19); “Marketing is the whole business seen from its final result, which is from the customer’s point of view” (Charter et al quoted by Nervi 2008, p19). However, the concept of marketing has changed over the years and there is in general little reference to environmental, social and ethical perspectives in the traditional definitions (Kotler et al, 2001; Polonsky, 1994; Charter et al, 2002). The “old school” focuses on concepts of mass consumption and company compartmentalisation as mass sales, mass marketing, standardised products... (Kotler et al, 2001). The “new school” (modern marketing) adopts partially the concept of globalisation, showing a less generalised and customised perspective (Kotler et al, 2001), focusing on concepts such as consumers satisfaction, selected marketing segments, customised products or services. There are no signs of green considerations in all those definitions. It is just in the description of green marketing that we can find some green perspectives.

The concept of green marketing seems to take its foundations into the concept of traditional marketing itself (Polonsky, 1994; Charter et al, 2002). According to Prakash (2002), the relationship between the marketing discipline, the public policy process and the natural environment is important. This relationship is described by many terms: environmental marketing (Coddington, 1993), ecological marketing (Fisk, 1974; Henion and Kinnear, 1976), green marketing (Peattie, 1995; Ottman, 1992), sustainable marketing (Fuler, 1999) and greener marketing (Charter and Polonsky, 1999). Polonsky (1994) notices that unfortunately a majority of people believes that green marketing refers solely to the promotion or advertising of products with environmental
characteristics. The failure of some green marketing strategies happens frequently because companies used the environment as an additional promotional dimension without any attempts to analyse, or modify the underlying product itself and its environmental impact (King, 1985). Polonsky (1994) also claims that the green marketing incorporates a broad range of activities, including product modification, changes to the production, packaging changes, as well as modifying advertising. Yet defining green marketing is not an easy task. The first books on green marketing entitled “Ecological Marketing” by Hennion and Kinnear was published in 1976. Since that time a number of other books on the topic have been published.

The ecological marketing was first defined by Hennion and Kinnear in 1976 as “The study of the positive and negative aspects of marketing activities on pollution, energy depletion and nonenergy resource depletion” (Henion and Kinnear quoted by Polonsky 1994, p2). Polonsky (1994) keeps three key components from this definition. He maintained that the green marketing is a subset of the overall marketing activity examining positives and negatives activities but also examining a narrow range of environmental activities. Polonsky’s definition (1994) is a useful starting point but today no definition or terminology has been universally accepted yet. Polonsky defines the green marketing as: “all activities designed to generate and facilitate any exchanges intended to satisfy human needs or wants, such that the satisfaction of these needs and wants occurs with the minimal detrimental impact on the natural environment” (Polonsky 1994, p2). According to the Queensland Government (2006) the green marketing is: “To develop and promote products and services that satisfy your customers wants and needs for quality, performance, affordable pricing and convenience without having a detrimental impact on the environment” (Polonsky 1994, p1).

Many authors (Polonsky, 1994; Queensland Government, 2006; Prakash, 2002; Menon and Menon, 1997; Bradley 1989) consider the green marketing as implemented and an addition to the traditional marketing mix. In this way, Bradley was the first to speak about Green Marketing Mix. Menon and Menon (1997) go further by claiming that green marketing is a part and a parcel of the overall corporate strategy as it requires an
understanding of public policy processes. On the other hand, some authors have a more restricted point of view on the extent of green marketing. The two basics requirements of green marketing seem to be the top management involvement and long-term objectives that includes the will to educate consumers (Glorieux-Boutonnat, 2004). Moreover, Ottman (2006) brings back the first rule of green marketing to the first rule of ‘traditional’ marketing: to focus on customers’ benefits. She thinks that if the customer sees a benefit in the purchase, he could feel more stimulated to actually buy. Ottman (2006) reduces the green marketing to 5 simple rules. She points out that if played by its rules, green marketing can lead to product improvements that can enhance marketability, improve overall performance and become a potent new source of innovation. By this point of view she focuses mainly on the consumers and the main purpose seems to convince them.

Despite the fact that many authors praise the merit of the green marketing it seems that marketing and environment are not necessarily good friends, as they often have diverging goals. According to Glorieux-Boutonnat (2004), marketing is focused on seducing consumers and generating profitable sales rapidly and generally takes the environment into consideration only as far as it helps achieving that goal. The environmental management tries to reduce the impact of production on natural resources, reducing the amount of material or energy or using more ecological materials. On the other hand, the marketers are focused on convincing and seducing the consumer by all the means such as more sophisticated packaging with more space for communication, or shifting to materials that is more appealing to the consumers, regardless of its impact on the environment (Glorieux-Boutonnat, 2004).

However, various authors notice that some brands have made successful use of green marketing and that it can bring a lot of advantages to companies.

**B. Reasons to adopt Green Marketing**

According to Miller (2008), green businesses continue to evolve, and new companies are joining the trend. She adds that the green economy is valuated at more than $209 billion annually and is expected to reach $1 trillion by 2020. Seeing these figures it
seems interesting to focus on the reasons explaining the behaviour change of those companies. Of course sometimes the change is a deliberate choice of the company, but sometimes not so much. Polonsky (1994) noticed five explanations to the reasons for firms to use green marketing.

**Opportunity**

The first is from Keller (1987) and Shearer (1990) who noticed that organizations perceive green marketing as an opportunity that can be used to achieve its objectives. Since society becomes greener, the demand for greener goods and services will rise. In order to answer to these new needs, marketing will have to become greener, leading companies and other organisations towards sustainable management (Peattie, 1992). Worldwide evidence indicates that people, as well individual as industrial, are more concerned about the environment and change their behaviour in consequence (Queensland Government, 2006; Polonsky, 1994). As result, the market for sustainable and socially responsible products or services is growing (Queensland Government, 2006). Due to this demand change, many firms see opportunities that can be exploited (Polonsky, 1994). People generally want to do the right thing, so the challenge and opportunity for the green marketer is to make it easy for people to do so (Queensland Government, 2006). If there is a product with equal quality, price, performance and availability the consumer will choose the product with environmental benefit, this fact gives goods with environmental characteristics a competitive advantage (Polonsky, 1994).

**Social Responsibility**

The organizations believe that they have a moral obligation to be more socially responsible (Davis, 1992; Keller, 1987; Shearer, 1990). Companies are more and more aware that their corporate responsibility as active members of the society is becoming an important factor in global competition and therefore they must behave in an environmentally responsible way (Glorieux-Boutonnat, 2004; Polonsky, 1994). The society feels really concerned about these issues and now stock exchanges rates companies not only on the immediate financial results as they used to, but also in terms
of corporate responsibility in the social and environmental fields (Glorieux-Boutonnat, 2004). In this way environment manager positions have been created in order to meet requirements of the new sustainability agencies. A lot of companies choose to become green because of their image. Many companies discover the necessity to become green when they are hurt by bad performances or negative rumours. A bad image of the company can lead to a diminution of trust in consumers and sometimes to a loss of consumers, so companies try to care about their image (Louppe, 2006).

**Governmental pressure**

The third reason is that governmental bodies are forcing firms to become more responsible (NAAG, 1990). Some firms choose to green their systems, policies and products due to economic and non-economic pressures from their consumers, business partners, regulators, citizen groups and other stakeholders (Prakash, 2002). The role of the government is to protect consumers and society and this protection has significant green marketing implications (Polonsky, 1994). By introducing governmental regulations the government protects consumers in several ways: reducing or modifying consumption of harmful goods, ensure that the rules are respected, etc (Polonsky, 1994).

**Competitive pressure**

Competitors’ environmental activities press firms to change their environmental marketing activities (NAAG, 1990). The firms have the desire to maintain their competitive position and tend to emulate competitors promoting their environmental behaviours (Polonsky, 1994).

**Cost or profit issues**

The last reason pushing a company to become green is the cost associated with waste disposal or reductions in material usage forcing companies to modify their behaviour (Azzone & Manzini, 1994). Sometimes to modify the process of production can involve investments but it will save money in the long term. For example, the cost of installing solar energy is an investment in future energy cost savings (Queensland Government,
Moreover, according to Miller (2008), the implementation of sustainable marketing practices is good for cost cutting but also for the customer relationship management and the return on investment. Peattie and Crane (2005) also claimed that firms can be enthusiastic about green marketing when it involves short-term cost savings (packaging reduction, cost savings). Polonsky (1994) added that when trying to minimize waste, firms are often forced to re-examine their production processes and it often leads to more effective processes often reducing waste but also raw materials. A company can also try to find another use or market for their waste materials (Polonsky, 1994). Finally a company can develop new industries in two ways: 1) a firm develops a technology reducing waste and sells it to other companies (Polonsky, 1994); or 2) a waste recycling or removal industry develops (Yurman, 1994).

C. Ways to become green

Many theories about the green marketing have been developed. But it is quite confusing since there is not a clear theory explaining how to go green. Everyone gives his piece to the construction by suggesting some elements. For this reason, it is critical to examine how to make it happens in a business environment, and that is not quite so clear. The main problem is that business marketers do not agree exactly on what it means to ‘go green’. However, green businesses continue to evolve, and new companies are joining the trend (Miller, 2008).

In this hazy and developing phenomenon it is hard to know how to apply an efficient green marketing and what are the rules since authors have various opinions about it. Polonsky (1994) claims that the green marketing incorporates a broad range of activities including product modification, changes to the production, packaging changes, as well as advertising. Glorieux-Boutonnat (2004) reduces the green marketing to two basics requirements which appear to be the top management involvement and long-term objectives that includes the will to educate consumers. On her side, Ottman (2008) published the 5 simple rules of green marketing: 1) get the right message and to know what is important to customers; 2) empower them to feel they make a difference; 3) be transparent; 4) maintain quality; and finally 5) carefully evaluate price concerns.
Unsuccessful companies are due to a lack of planning and crafted marketing message. If respecting the five rules a company must succeed (Ottman, 2008).

Some authors like Polonsky attribute to the green marketing a lot of elements and consider it like a real and complete strategy. Polonsky (1994) considered a lot of factors in the green marketing but others like Prakash (2002) approach it from the marketing-mix. According to him green marketing subsumes greening products as well as greening firms, in addition to manipulating the 4Ps of the traditional marketing mix.

In 1989 Bradley (2007) crossed a further step by introducing the term of green marketing mix. Deeper in this way, the Environmental Protection Agency of the Queensland Government (2006) deals with the green marketing like the “classic” marketing with the 4Ps by understanding what specificities have the Ps. It also defined the green marketing as “developing and promoting products and services that satisfy your customers’ wants and needs for quality, performance, affordable pricing and convenience without having a detrimental impact on the environment” (Queensland Government 2006, p1). This organization really created the 4Ps in a green way.
6.2. Product

This first element is probably one of the most important as it is the most tangible to answer to people needs. Products and their marketing are highly visible to the general public (Ottman, 2003). However, as a product is not limited to only the final object but also by other elements such as the production, the package, the materials, etc and because the green marketing focuses a lot on all these, it was decided to divide this P into 3 subcategories. Actually, as it was said by Bradley (2007), the number of Ps is not important, some prefer 4 while others prefer 8. For this thesis it was decided to use the most common model and just to play with 5 Ps, but to make a distinction inside the Product which contains: the product (object), the production and the package.

A. The Product

Companies wanting to exploit emerging green markets have two possibilities. The first one is to identify customers’ environmental needs and to develop products to address these needs. The second consists in developing environmentally responsible products to have less impact than competitors (Queensland Government, 2006). However it is necessary to be careful and to avoid the common error which consists to focus only on making an environmental product but to result in a product that consumers do not want (Peattie and Crane, 2005).

New product

Prakash (2002) proposes in order to offer a more environmental friendly product the “remanufacture”. The remanufacture means to create a new product based on an old one. In this idea of new product, it is also possible to create a totally new product (Louppe, 2006, Queensland Government, 2006). Whatever your choice is, it is important to maintain an idea of improvement for the environment. In this optic, Louppe (2006), the Queensland Government (2006), Prakash (2002) and Bradley (2007) insist on the importance to reduce. The reduction is obtained with products that use fewer raw materials or generates less disposal waste; it delivers more benefits than its former version or competing products. According to Peattie and Crane (2005) the redefinition
of the product is also important as it gives an understanding of the means of production and the broader activities of the producer.

Ottman (2003) raises another very important factor in the conception of a new product which is the product design. Indeed, this is a critical determinant of a corporation's environmental impact as an estimated 75 percent of the environmental impact of a product is determined at the design stage. The development of a product can be quite short, maybe a few months or years, but its impact during and/or after use can last for generations.

Recycle

Recycling is a major part of the green marketing. To recycle means: “to make products that can be reprocessed and converted into raw material to be used in another or the same product” (Prakash 2002, p286). Louppe (2006) and Bradley (2007) argue that it is important to try to develop products that can be recycled. The Queensland Government (2006) also adds that companies can try to make products from recycled goods.

Reuse

Bradley and Prakash (2002) also propose to reuse. This means design a product that can be used multiple times and do not promote a society of consumption where products are used only one single time before being thrown in the garbage.

Labels

People and governments feel more and more concerned about environmental issues. It explains why some regulations have been created in order to protect as much the consumers as the society. These rules have lead to the creation of many labels which are recognised as to be good for the environment. It is necessary to try to produce a product with such kind of labels, as long as they offer substantiation (Queensland Government, 2004). In this way the company must try to propose certified products which meet or exceed environmentally responsible criteria (Queensland Government).
**Extended product life**

Prakash (2002) claims the necessity to extend the product life by repairing and reconditioning the products. To achieve this, it is important to propose an efficient after sales service and to prevent people from throwing up their products. It is on the contrary imperative to encourage them to repair or recondition them.

**New / Multiple use**

Bradley (2007) encourages the companies to find new uses for their products, or to make product which can have a multiple use. Multiple use means looking at the function of any item and considering the implications to the environment and society. If it can be easily modified for simultaneous use as something else, then it should be changed. It may actually perform several functions. The category refers to the use of an item again for another purpose, with some modification that can be either slight or change the entire nature of the product. But it can obviously also permits the use of an item for the exact same purpose with little or no modification.

**B. The production**

Firstly, it is important to notice that to ‘go green’ is for a long-term and it can be expensive to invest on a short-term but very profitable on long-term as it allows a reduction in the costs of production (Glorieux-Boutonnat, 2004). Ottman (1995) encourages companies to green their products before to be forced to. Indeed, legislation is swiftly being enacted on foreign and domestic fronts. Governments implement eco-labelling programs, standards of quality...

Prakash (2002) suggests to green the value addition processes as it could entail redesigning, eliminating, modifying some of the processes of the technology used with the objective of reducing the environment impact at all stages. He also claims that a company can adopt management systems that create conditions for reducing the environmental impact of value-addition processes. Since this particular one is difficult to identify and to quantify the firm needs to have measurable indicators to check the environmental impact of their management systems.
An important thing to search for is the reduction. Generally if a business uses fewer resources, it will have a smaller environmental impact (Mandelbaum, 2008). This reduction can happen directly by different means. One possibility is to reduce the amount of waste materials in the whole production cycle (Louppe, 2006; Bradley, 2007). Louppe (2006) and Miller (2008) also suggest to improve the recycling of the waste materials at the end of the production cycle, and the use of recycled materials. Bradley (2007) recommends to stop using stuff when it is unnecessary (e.g. printing when it can be avoided...), or to use as much electronic communication tools as possible. Finally, Mandelbaum (2008) presents the necessity to upgrade the materials as it provides a better production with less consumption which means lower costs. Indirectly a company can also be more environmental friendly for example by using less electricity which causes air pollution (Mandelbaum, 2008), but also by buying their products from companies perceived as having good environmental track record (Ottman, 2003).

C. The package

A company can take a lot of decisions for the packaging of their products in order to help the environment and to adopt a greener marketing. The Queensland Government (2006) recommends to use the less pollutant materials possible and to change if it is possible. Bradley (2007) praises the use of safe packaging for the environment, like biodegradable packages, but also packages that can be reused or recycled. Moreover, he recommends to avoid the usage of packs with artificial materials (preservatives, colorants, unnecessary additions). Mandelbaum (2008) and Bradley (2007) also suggest to do not oversize the package and to opt for the easiest one to store as it saves costs on the packaging but also on the shipping costs through the fitting of more units in a truck. A final tip is to insert useful advices for environment on the pack.
6.3. Price

In a context of globalization with a free competition, the consumers, as well professionals than individuals, are confronted with the analysis of the important differences between the prices of the products and the services. The fact that consumers become more concerned by the sustainable development reinstates the notion of “fair price” (Louppe, 2006). Pricing is a critical element of the marketing mix, according to Prakash (2002). Except for an expanding number of niche markets, consumers resist paying premium prices for green products. He also adds that the rational customers often want the benefits of a cleaner environment without directly paying for them. However the Queensland Government (2006), Ottman (2003) and Prakash (2002) claim that at the same price, quality, performance and place, the consumer will choose the product with environmental qualities. Indeed, consumers expect green products to function as effectively as non-green products and will not pay much extra or sacrifice quality for greener products (Queensland Government, 2006). Prakash (2002) also notices that if a firm can add green attributes to a product at low costs it gives a competitive advantage. Ottman (1995) brings up another important aspect. According to her green attributes can break a tie between product offerings, but they cannot make up for a second-rate product.

The consumers will only be prepared to pay a premium price if there is a perception of additional product value. This one can be of various kinds such as improved performance, function, design, visual appeal or taste (Queensland Government, 2006). Ottman (2008) explains that if a product is charged more, due to economies of scale and use of higher-quality ingredients or materials, it is important to make sure that consumers are aware of it and that they can afford the premium price and feel it as worthy. Nowadays, many consumers are more careful to prices and cannot afford premium prices for any types of products.
6.4. Place

The decision of the location of the sale of the product, where the company will make it available for the public will have a huge impact on the interest of the consumers. Even if a customer is very much interested in the purchasing of a green product, he will generally not agree to do extra kilometres for it. “Marketers looking to successfully introduce new green products should, in most cases, position them broadly in the market place so they are not just appealing to a small green niche market.” (Queensland Government 2006, p3). An obvious link must also be visible between the image the brand wants to show and the location.

The location is also a good way to differentiate from the competitors. It is essential for a company to have an attractive location, an attractive store with quality displays, promotions inside the store. The use of environmental friendly materials inside the store is also recommended (Queensland Government, 2006). An ecological store is consistent with an ecological product and will reinforce the “green feeling” of the consumer (Louppe, 2006).

Another solution to be noticeable is to propose a recycling facility inside the store, for the conditioning, the recyclable materials... (Louppe, 2006). Indeed according to Derksen and Gartrell (1993), “people having access to recycling programs exhibit higher levels of recycling than those not having such access” (Derksen and Gartrall quoted by Prakash 2002, p291).

The distribution system is also very important and easy changes can make a company greener. First, the distribution vehicles or the distribution channels must be ecological (Louppe, 2006; Bradley, 1989). It is nowadays possible to find vehicles that are ecological and yet practical. It is also essential to “ensure that your distributors are green and will associate this responsibility with your product” (Bradley 1989, p5). A distribution planning to coordinate the transports can reduce the product movement and thus the emission of gases (ibid, 1989). A direct sales system can also avoid the waste of resources (ibid, 1989).
6.5. Promotion

The promotion of products and services includes all kinds of contact with the public: advertising, public relations, promotions, direct marketing... The promotion usually goes side by side with the very-short term use of material, which can even be considered as waste in some occasions. However, new communication tools and practices can be used, such as email instead of mailings, use of recycled materials if a printing is really necessary, more efficient processes like waterless printing... Electronic means of communication should always be privileged (Louppe, 2006; Queensland Government, 2006; Miller, 2008).

Many companies, mostly small, also recognised the interest of alliances with environmental groups when they want to promote their environmental commitment. A good example is the sale of shopping bags produced by environmental groups in some shops (Queensland Government, 2006).

The key in the promotion of green products is credibility. A company should never overstate its implication in environmental protection (Queensland Government, 2006). However, a company should not be afraid to put forward its green achievement of the initiatives of some employees (ibid, 2006).

Firms should also encourage its customers to “act green”. Through its promotion, a company can enhance the responsibility of the consumers but also of its employees, its partners, etc towards the environmental issues (Louppe, 2006; Queensland Government, 2006). The company should also provide these people with access to source of information about these issues (ibid, 2006).

Ottman (2008) identified some basic rules of the green marketing a company should apply to communicate with its consumers:

- “Know your customer”: the only way to sell a green product is to make sure that the people know that the product is green and are concerned by the problem (Ottman, 2008).
A lack of information could inhibit or discourage the consumer to purchase a green product even though they want it. Moreover the consumers must perfectly and easily understand the claims of the firm or there is a risk of over or under reaction (Prakash, 2002).

- “Empower consumers”: the consumers must feel they can make a difference. People will only buy a green product if they have the feeling that their purchase will make a difference in the world. The communication of a green product must be axed on that (Ottman 2008).

- “Be transparent”: people must believe that what is said in the advertisings is true, that the product is what the company claims it is (Ottman, 2008). According to Miller (2008), there is a great scepticism amongst consumers after many companies used the promotion of green as a sale tactic.

- “Reassure the buyer”: consumers must believe that the product can perform the job it is supposed to do. It is a good thing to offer a green product but is this one is not efficient, people will not keep buying (Ottman, 2008). The company should only reinforce the product qualities with its benefits for the environment, such as the use of recycled materials... (Queensland Government, 2006; Ottman 1995). However it is essential that the company keeps in mind that the promotion is there first to inform rather than just impress (Peattie & Cane, 2005).

The people targeted by the promotion are also important. It has been proven that it is more efficient to target women which are most of the time responsible on the buying of products for the whole family. The influence of children on their parents is also a factor that should not be forgotten. Moreover, they are the green consumers of the future, so they must face their responsibilities as soon as possible (Queensland Government, 2006).
6.6. People

To become an environmental friendly company it is essential that the leaders of the company feel concerned about the problem. Once these men/women of influence feel responsible of it, they will be able to spread their concerns to the other employees. Moreover, an involved board of directors may contribute to the creation of an ethic code inside the company. (Louppe, 2006)

The employees must also be formed. The salesmen are obviously the first that need to be aware of the “green stakes” since they are on the front line and in direct contact with the consumers the company wants to convince. However, it is a good thing that all employees feel concerned and responsible. (Louppe, 2006)

If the employees are aware of the stakes they will be able to increase their environmental efforts in their everyday life at work. Simple gestures are indeed the basis of the big changes. According to Bradley (1989) and Ottman (2003), the managers are responsible to ensure that the employees follow simple rules (use of less paper, less transport by car, re-use of items, economies of lights, repair instead of replacing…).
6.7. The Green Marketing Mix Model

A. Presentation

This model built by the researchers will allow an analysis of the current strategy of the companies and a comparison of this strategy with the green marketing mix which has been created by collecting many theories from different authors. Thanks to this comparison we will be able to place the company on a ‘green marketing scale’, in accordance with the level of commitment.

See the figure below:
B. Measure of the Green marketing implication

On the basis of a deep literature review and a collect of empirical data, this model allows an evaluation of how strong or low is the use of the green marketing in a company. Louppe (2006) noticed 5 levels of green marketing use, from the opposition which means that the company is not at all involved in a strategy of green marketing to the integration measured by a strong involvement in the green marketing. These five categories will precisely measure the green marketing implication of all the companies studied.

Opposition

In this category the leaders and managers reject the idea of the existence of any kind of environmental concerns. They do not think that there is a real problem for the society by polluting or adopting a bad behaviour for the environment. They can be so hostile with this idea that sometimes they can show a certain animosity for people defending and claiming environmental problems. The company of course deny all responsibilities for the environmental concerns. This behaviour is easy to detect since for instance no research will be done to produce less pollutant products whatever the mean.

Protection

In this category we can notice that the company is more concerned about the environmental problems and the sustainable development but not in a positive way. Indeed, the protectionists see the sustainable development as a threat for the company and thus adopt a defensive behaviour to fight it. These companies can be recognized by performing actions such as lobbying to oppose or to slow down new laws favouring the reduction of the pollution by giving to the companies more responsibilities for the protection of the environment.

Socialisation

The socialisation is categorized by a company which recognizes social, environmental, ethical problems. However, the company prefers to let it outside its activity. At least we
can notice a first implication of the company appearing as a volunteer contribution for the general interest in order to get the image of a “good citizen”. These actions can be for example the participation in the local life or any cultural or humanitarian activities.

**Cooperation**

The managers consider the sustainable development issues as a professional concern and accept at least the idea of a social and environmental responsibility. However, they adopt at the same time a position of negotiation and a share of responsibilities with other actors like the state or the territorial collectivities. They also claim for them to take charge of at least a part of the costs of these adaptations to wider responsibilities.

**Integration**

The sustainable development issues are broached as stakes characterizing the state of a society and the structure of the markets. It means a particular effort from the company in planning the strategy and the adaptation of methods and processes. The performance in concern of the sustainable development appears like a challenge; challenge which is indispensable to satisfy the necessities of a new consumer more concerned by this environmental issue. This strategy of integration is also important for the company in order to maintain its competition in the future.
7. Empirical data

7.1. The Belgian premiums

Since the Belgian legislation has a particular way of dealing with ecological cars, an introduction of the premium system used in Belgium was necessary before anything else. It will help to understand the influence the premiums can have on the customer’s buying behaviour.

The premium system is one of the means used by the state to encourage people to buy environmental-friendly cars. According to Maloteaux (2009) the manufacturers are aware of the global warming phenomenon but also the different European states. He also claims that this consciousness is at the origin of the reason why these states give premiums to people buying new ecological cars. These premiums are also offered in Belgium and buyers can profit from a lot of advantages whose purpose is to encourage them to buy these particular cars.

The first advantage that people can notice is a reduction on the purchase price. Depending on the level of CO2 emissions a premium is subtracted from the total price of sale. This governmental reduction is only applied for the purchase of a new car and is directly deducted from the purchase bill. The value of the premium changes according to the CO2 emissions rate.

If the rate is below 105g/km, the consumer can get his bill reduced by 15% with a maximal amount of 4350€. For CO2 emissions between 105 and 115g/km the consumer receives a 3% deduction on their purchase bill with a maximal amount of 810€. (Maloteaux 2009)

The second advantage for ecological cars buyers is a 200€ “anti-particle” discount. This one only operates if you buy a new diesel car equipped with a particle filter rejecting less than 130g/km CO2 and is immediately deducted from the purchase bill. (Maloteaux 2009)
These reductions can be added with a “bonus-malus” system allowing advantages or disadvantages to people putting a car into circulation. The bonus can go from 100€ to 1000€ if the amount of CO2 emissions is below 146g/km and the malus can go from 100€ to 1000€ for cars rejecting more than 195g/km of CO2. This system is applicable for new but also for second-hand cars. (Maloteaux 2009)

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“Bonus-malus” system when putting a car into circulation
7.2. Renault

A. History

The first Renault car saw the light in 1898 and was the creation of Louis Renault. One year later he and his two brothers, Marcel and Fernand, opened a factory in Billancourt (France). The company was initially named Renault Frères (Renault Brothers in English). The company rapidly grew and after only one year they had produced more than 70 cars. In 1901 Renault opened its first factory abroad, in Belgium.

The brothers understood that the best way to promote their cars was to take part to cars races. They therefore started to race in many events and were immediately successful. Moreover their participation in competitions abroad increased the notoriety of the Renault brand. However, Marcel died during the Paris-Madrid race in 1903. The Renault brothers stopped racing themselves, but the company remained very involved in racing.

Already at that time Renault was a very innovative brand. They used the innovations tested during races in their commercial models. Renault was also active in the production of other vehicles: taxi cabs, buses,

In 1909 after Fernand’s death, Louis renamed the company in Automobiles Renault. At the time the firm was employing around 3000 employees all over the world and was manufacturing around 5000 cars a year.

During the First World War, Renault actively participated to the war effort, supplying trucks, ambulances, cargo vehicles, etc but also a machine-gun tank.

After the world economy crisis in 1920-21, Renault became a joint-stock company in 1922. That year was also the starting point of the independency process of Renault. The brand slowly started to get rid of all its suppliers and to produce the different parts itself.

In 1935, after André Citroën’s death, the French government asked Louis Renault to manage Citroën factories. However, Renault refused because he did not want to merge
the two companies. The 1930s were also a tough period for Renault because of the increase of unemployment in France and the slow closing of the exportation market. Moreover, since Louis Renault was all but a diplomatic man, the Renault factories were the theatre of many strikes. The Renault factories would even become the symbol of the working class struggle in the country.

During the Second World War, Louis Renault refused to build tanks for the Nazis. These decided then to take the control of the factories. Louis Renault was after convicted of collaboration with the Germans and sent to jail where he died in 1944. His company was nationalized in January 1945.

Then years following the war were quite successful for Renault. The brand manages to rebuild its reputation thanks to popular model but also to success in car races. Aside from the cars, Renault also put a lot of effort in the development of trucks. In 1954, Renault produced its 1,000,000th car since its nationalization. The following decades would be a variation of popular and less popular models. The brand was slowly evolving and growing.

In 1984, Renault innovated again with a new type of vehicle. The Renault Espace was indeed the pioneer of a new category, the MPV (Multi-Purpose Vehicle). However, the financial situation of the company was not very good. After an intervention of the government, the firm started to cut costs, mostly by selling Renault non-core assets, withdrawing from motorsports and eventually firing employees.

After a fresh start, Renault managed to be profitable again. Renault mostly axed its promotion on the high level of security provided by its cars. They used the crash tests in their advertisings to reinforce the message. The mid-nineties also saw the return of Renault in racing sports with many successes, in Formula One for instance.

After many discussions, it was also decided that in order to maximise its growth, Renault had to become private again. The company was thus privatized in 1996 with the government keeping around 15% of the shares. However, this privatization also meant the end of the implication in Formula One. The economies allowed the company to open many factories all over the world in the following years.
In March 1999, Renault acquired 36.8% share of the Japanese brand Nissan. This number rose to 44% in 2002. At the same time Nissan also acquired 15% of Renault’s capital. This acquisition was following the purchase of the Romanian brand Dacia in 1999.

Renault is nowadays the 4th car manufacturer in the world thanks to its alliance with Nissan.

B. Commitment and ecology within the company

Since 1995, Renault has led an environmental policy. The brand considers the environment-related changes that are necessary not as a constraint but as a challenge and sometimes even as an opportunity. The group is trying to think about the impact it can have on the environment and focus on the whole life of a car life cycle. This so-called ‘Life Cycle Management’ (LCM) means that every phase is managed to limit as possible the impact on the environment.

Renault identified 5 phases for this LCM:

- **Design**

  The designers are well aware of their implication in the environmental policy. To help them, Renault developed a few ‘eco-design tools’. Those tools include: Ecorisques, an IT system that can identify the environmental influence of industrial tools; Life Cycle Analysis (LCA), a method to study the impact a vehicle can have on the environment from the start to the end; Material sheets, used to detect the use of risky substances and to provide alternative solutions; Index of Recyclability by Function (IRF), to estimate the recyclability of each part of a car; ECO Index, which evaluates the quality of packaging, to reduce as much as possible the packaging waste.

  Even during the design phase, Renault pays a lot of attention in every detail. The choice of materials for instance is something very important. One material may indeed be lighter and so reducing the pollution from the vehicle, but it could also mean more waste during the manufacturing and once the car is no longer used.
- **Production**

Renault applies an environmental approach at all the manufacturing sites through an Environmental Management System. This system aims to reduce the Group’s impact on the environment during the industrial activity. Since all the sites are connected altogether, they benefit from a coordinated approach. Moreover, this system means that Renault employs specialists in every field linked to the environment (air, water, waste...).

Some tools are also available during the production phase: Ecorisques (see supra); the Renault Production Way, a management tool that defines the best environmental practice for each workstation; the Information System for Environmental Management (ISEM), to collect and archive environmental data.

Renault also tries to reduce the emission of greenhouse gases among the production sites. The brand focuses on increasing the energy efficiency, on reducing the energy consumption, on developing renewable energies. Alternative energies such as solar thermal or wind are used in some plants.

The number one pollutant emission from Renault production plants are the Volatile Organic Compounds (VOC) generated by the solvent used in paint. Renault therefore tries to find solutions to reduce these VOC emissions from the source by reducing the solvent or using new application systems. More efficient incinerators have also been installed.

Renault also pays a lot of attention to respect the water sources surrounding its production sites. In order to achieve that, Renault takes decisions on a case-by-case basis depending on the site’s environment. However in all its production plants, Renault tries to reduce the pollutant liquid waste and uses as many alternative treatments of chemicals as necessary.

The treatment of industrial waste is also something very important for the brand. This treatment is based on a 4R approach (Reduce, Reuse, Recycle and Recover energy): Reduce the impact at the source; recover the material to Reuse it; Recycle the material
from components to be used as raw material for a different purpose; using the waste to recover the energy from the incineration.

It is also interesting to notice that 100% of Renault industrial sites are now ISO 14001 certified. This norm is related to the environmental management. However, it does not mean that the sites do not pollute. It just means that Renault is following some basic rules which should normally help reducing the pollution.

- **Distribution**

All the distribution system pays more and more attention to the environment. All the employees involved are trained to the management system for waste and chemicals.

- **Service Life**

The vehicles are designed to consume reduced amount of fuel. And therefore their emissions of greenhouse gas are decreased. Renault also developed many solutions to propose less pollutant cars (see infra).

Besides, Renault also does its best to change the drivers’ mentality. The company tries to make the users face their responsibilities through campaigns, advices... Renault also proposes eco-driving programs for its customers in order for them to apply an environmentally respectful driving.

- **Recycling**

The recycling of a vehicle is divided into four steps. First, the dangerous and polluting substances are removed and neutralized. Secondly, the car is dismantled and the reusable parts are put aside. Third, the car is shredded and what is left is sorted. Fourth, the portions that can be reused are separated from the waste, which goes to specialised centres.

Many parts of the car are either reused as spare parts or as raw material. Renault focuses a lot in the choice of renewable materials and also in easily dismountable parts. The group believe that a long term objective of 95%-recyclable cars is possible.
C. Future objectives

Renault has a tri-dimensional environmental objective:

- To be one of the top 3 of the car manufacturers emitting the least CO2.
- Offer a broad choice of biofuel cars, such as bio-ethanol and bio-diesel.
- Develop affordable alternative technologies, for instance electric or hybrid cars.

One of the main priorities of Renault in 2009 is the development of strategic programs in research and development. Those programs will include electric vehicles and environment-friendly engines. Renault is hoping to sell its first electric car by 2011.

By the end of 2009, 50% of Renault’s car on sale should be able to run an 85% ethanol mix in their petrol while diesel models should be compatible with a 30% diesel mix.

Another objective which is almost already reached is to produce 95%-recyclable by weight cars.

D. Ecological solutions

Over the last years Renault has developed many solutions, many technologies aiming to reduce the negative impact of the automotive industry on the environment. In May 2007 Renault launched the label eco², used to identify the most ecological cars proposed by the brand. To get the label a car must fulfil three conditions:

- It must have been manufactured in an ISO 14001 certified production plant.
- It must have a CO2 emission rate below 140g/km. Some eco² vehicles can run on biofuels.
- At least 5% of the car must be made from recycled plastic.

All the solutions proposed by Renault can be classified into 4 categories with different targets: fuel consumption, air quality, alternative energies and pollutant emissions.
- **Reducing fuel consumption**

Renault works on two ways to reduce the fuel consumption of its vehicles. First, the design of the cars is studied to be more aerodynamic, to reduce the weight, but also to reduce the air resistance and friction of the car. These three different methods improve the efficiency of the car.

Secondly, engines and gearboxes are specifically studied to reduce the consumption of the car. Estimations are that in the future a car will need 40% less fuel than at the moment. The increasing use of biofuels as energy source helps also to reduce the amount of fuel needed.

One of the solutions proposed by Renault is the Engine Management Unit (EMU). This unit constantly take measures through multiple sensors while the engine is running. All the measurements gather information about the driver’s intentions and the condition of the engine. Then the management unit will take real-time decisions which will influence the engine. The aim of the unit is to regulate the balance between fuel consumption and exhaust emissions.

- **Protecting air quality**

CO2 is the main greenhouse gas. Since it is produced as soon as the engine starts, engineers from Renault are trying to find the best ways to optimize the combustion. They for example developed a system to reuse a part of the exhaust gases to produce a second combustion, a ‘cold’ combustion. Engineers also found a way to reduce the size of the engine (its cubic capacity) without losing any performance. Obviously a smaller engine goes along smaller emissions.

If the engineers are working on the main source of exhaust gases, they are also trying to figure out ways to purify the gases before they are released by the car. A good example is the particulate filter which is an auto-regenerating filter capturing the particulate matters in the exhaust gases. The catalytic converter on the other hand removes some toxic compounds of the exhaust through high-temperature catalysis.
- **Developing alternative energies**

Renault is already preparing the post-petrol future. Many possibilities are still considered and studied by the brand.

First of all, the biofuels, which are already used presently. In Brazil for instance, three quarters of the cars are running on a mix of petrol and ethanol.

Secondly, other fossil energies than petrol are still considered. Liquefied petroleum gas (LPG) is already commonly used and if it is less pollutant than petrol, some gases are still released in the atmosphere. Moreover, LPG is considered as more dangerous than other fuels because of its higher risk of explosion (which is why vehicles running on LPG are rarely admitted in underground car parks).

Thirdly, hybrids cars are also very important for Renault. A hybrid is a car running on a combination of a combustion engine and an electric motor.

- **Toward zero emissions**

Renault aims to sell cars with zero emissions. The brand intends to achieve this goal through two future solutions: the electric car in the near future and the fuel-cell vehicles on the long term.

First of all, Renault and Nissan used their partnership to develop a concept-car entirely electric. Thanks to a strong energy management, the car can run on electricity only. Renault intends to launch a massive launch of electric cars on the Danish and Israeli market by 2011. These electric vehicles will be based on the concept-car, and will not emit any CO2 or pollutant gas.

Second of all, the ‘car for the future’ as seen by Renault is a fuel-cell vehicle. The goal is to produce electricity by combining hydrogen and atmospheric oxygen. This vehicle would only release water vapour in the atmosphere. Renault already tested that technology in a Scenic prototype but the technology should not be on the market before some years.
The Twingo 1.5dCi 85 is the only Renault product offering a 15% reduction thanks to a CO2 emission of 104g/km. As seen previously this reduction can be deducted directly from the purchase price and can be added with others advantages. This car is the smallest Renault car but is unfortunately the only “Ecological” product for the Renault brand. The next Renault model is the Renault Clio, a very famous model, very popular for people looking for a small economic car. The most ecological Clio is the one with the 1.5dCi 85 by RipCurl engine producing 119g/km of CO2. The basic price of this Clio model is 15.950€.

It is important to notice that Renault ecological products do not have a special name to characterize them, so it is difficult for the customer to clearly notice the “ecological” products among the classic ones.
**7.3. BMW**

**A. History**

BMW stands for Bayerische Motoren Werke, which means Bavarian Motor Works. The brand founds its origin in 1913 when Karl Friedrich Rapp established Rapp-Motorenwerke, an aircraft engines factory. In 1916, after a merging with another engine manufacturer, Gustav Otto, a new company sees the light: Bayerische Flugzeug-Werke or BFW (Bavarian Aircraft Works in English). Less than one year later, on July 1917, the company was renamed Bayerische Motoren Werke GmbH. The company took advantage of the war and its manufacturing of engines for military aircrafts to expand rapidly. The company was eventually converted into a stock corporation two months after the end of the war and became BMW AG.

However, two year after, in 1920, the signing of the Treaty of Versailles would prohibit BMW from building aircraft engines. BMW decided then to focus its attention on the rail vehicles brakes. Aside from its new main product, BMW also started to build motorcycles engines. In 1923, BMW started to sell its first motorcycle. And two years later, BMW introduced its first racing machine.

1928 is probably the most important milestone in BMW history. It is indeed the year of the first interest of BMW in the car market. The company bought a car factory and started the production of a small car. This first model was followed by many others during the 1930s. Every model was associated with new evolutions, in the design, the engine... Along with the development of cars, BMW continued to develop motorcycles and aircrafts engines after the lift of the production ban.

During World War Two, BMW had to stop the production of cars and started the production of military motorcycles. BMW also produced rocket engines and jet engines. If the company took advantage of the first war, the second will completely destroy the company. The main plant in Munich was destroyed by air raids in 1944 and the implication of the company in the production of aircraft and rocket engines will result in a three-year ban on production.
BMW had to wait until 1949 to be back on the market with a new motorcycle. In the meantime, the company received the permission to repair the US army automobiles and to produce some cars for Soviet use. In 1951, BMW presented its first post war car model.

In 1959, the financial situation of BMW is critical. The company received an offer from Daimler-Benz. However, the board decided to keep faith in BMW and turned down the offer to remain independent. The years after will prove the board was right. BMW indeed rebounded thanks to some popular cars and motorcycles models. In 1961, BMW started its major expansion into foreign markets.

The year 1972 saw the creation of BMW Motorsports, showing the reinforcement of the implication of BMW in racing sports. Later on the Motorsports division would also develop powerful cars for the everyday life.

In 1979, the company started doing researches on hydrogen engines, an alternative solution for the future which does not reject toxic gases.

BMW was also the first European car manufacturer to enter the Asian market through a new subsidiary in Japan in 1981. And in 1989, BMW reached for the first time the half a million cars sold.

In order to keep its growing rate, BMW acquired in 1994 the Rover Group. The deal includes brands such as Rover, Land Rover, Mini and MG. Four years later another famous brand is bought by BMW: Rolls-Royce. However, as a consequence of the purchasing battle with Volkswagen, BMW did not get the rights to built new Rolls-Royce cars before 2003. Volkswagen took care of the production and development of the cars between 1998 and 2003.

In 2000, six years after its purchase, Rover is sold again for the symbolic amount of ten British pounds. However, BMW decided to keep the ownership of the Mini brand. BMW indeed developed a successor of the very popular Mini and started the production in 2001.
B. Commitment and ecology within the company

The BMW Group has an integrated approach towards environment protection. The Groups developed environmental guidelines which are the base of the environmental policy inside the company and influence all the operations of the brand. These 10 guidelines are:

- Objectives: resources are used in an efficient manner destined to protect the environment with a long-term vision.
- Corporate commitment and responsibility: all members and employees of the Group are aware of the responsibility they have to protect the environment.
- Responsible implementation of objectives: all the measures taken to protect the environment will constantly be reviewed to maximise their performance.
- Group-wide environmental protection: all the areas of the operations are covered and involved in the limitation of the impact on the environment, through the use of appropriate technologies.
- Emergency precautions: if an emergency should occur, BMW developed plans to protect the surrounding environment.
- Recycling: to avoid waste generation several solutions to recycle old vehicles are used every day.
- Alternative propulsion concepts: BMW keeps in mind the post-petrol future and is developing alternative propulsion technologies, far less pollutant than the ones actually used.
- Mobility for the future: BMW is cooperating with many associations, government bodies... to offer environment-friendly transportation perspectives for the future.
- Suppliers: the brand also considers its suppliers as part of the process. All the suppliers must adhere to the Group standards regarding the environmental respect.

These guidelines involve all the production process but BMW goes deeper and focuses on every step independently. Indeed since 1996, BMW has been using certified
environmental management systems involving all the business processes. This management implies that BMW controls all the factors that could have an impact on the environment or considerably consume resources in its production network. The environmental effects are so monitored and reduced in all the company sites. Every month, an evaluation of the site is done (regarding to water and energy consumption, CO2 and volatile organic compounds (VOC) emissions...). This evaluation is then compared to the previous month evaluation and decisions are taken accordingly.

It must also be pointed out that all the production plants were also certified ISO 14001 by 1999. This can partially be explained by the fact that all production sites have a manager, or a managerial team responsible for the environmental protection issues. Moreover, all the employees whose work has an impact on the environment are specifically educated about the environment management system as well as environmental topics.

Furthermore BMW launched a program to share across the Group all the experience gain in its production sites. An expertise centre analyse the successes or failures and tries to determine how good solutions could be applied elsewhere.

BMW increased its effort to improve the resource efficiency from the early stage of the development. This is why the environment protection experts at the BMW Group are involved in the preparation stages for decisions regarding projects or investments.

Thanks to all the efforts that have been made over that last years, BMW consumes now 26% less energy than a decade ago. To lower its consumption, BMW used among other things energy-saving buildings and combined heat and power generation. Using one facility to create both heat and power has a higher level of efficiency (80%) than regular power generation (35%).

At the Munich Research and Innovation Centre (FIZ) BMW also installed a revolutionary ground water-cooling system. This system cools down parts of the building and saves every year huge amount of electricity and helps to reduce the CO2 emissions.
In other plants, BMW also uses alternative energy sources. While one plant is for instance powered through methane gas coming from a local landfill, another is using the heat from the exhausts as source of energy. Some more traditional systems such as solar equipments are also widely used in the different sites.

The IT system has also been studied to use fewer resources and is constantly renewed with new and more efficient technologies. Moreover the employees are educated to make an ecological use of their computers (switch-off the computer when not used...).

BMW also pays a lot of attention to its solvent emissions and chemical consumption which have been substantially reduced. All the sites are using water-based paints with low-solvent content. These particular paints release less VOC into the atmosphere. BMW teams also worked hard to find solutions to make possible the use of water-based clear paint on plastics components. The use of that kind of paint reduced by 85% the solvents in the exhaust air.

The respectful use of water is also something BMW worries about. The Group has a basic rule to only use as much ground water as it can be reproduced naturally. The water management strategy focuses on a sustainable handling of water, but also on a careful use of materials that could be a harmful for the water.

BMW also tries to use closed water cycles, by reusing its own wastewater for the production, once this water has been treated. Each year, the amount of water used for the production cycle is reduced (25% less than 5 years ago for each vehicle produced).

Consistently avoiding waste is also one of the basic policies within the Group. Preventive measures are taken in all the sites, as much in the production as in the administration. When waste cannot be avoided, alternative measures are considered, such as recycling or energy recovery. To reduce the amount of waste, BMW is using an electronically supported waste information system. The company also prefers reusable packaging over disposable packaging. Reusable plastic containers are also disposed all over the sites.

Since BMW is a company operating all over the world, the company has to transport large amount of materials and products. To optimise its transportation flows, and
therefore to limit their impact on the environment, BMW permanently analyse the delivery system. The employees responsible of the logistics planning focus on finding the best ways to optimize the transportation: better container utilisation, simultaneous order of spare parts, payment of agent according to the volume and not the distance...

BMW also uses transportation means that are ecologically advantageous. For instance, almost all the production plants of the group are linked to the rail network. More than half of the vehicles leave the plant via rail. The air shipping of goods is avoided because too pollutant.

The transport packaging is also studied. Until now, all the vehicles were protected with adhesive film, covers, wax... However, the Group is now trying to use more closed transport and therefore is slowly removing all transport protections from the vehicles. This change, economically advantageous, is also preventing almost 80% of CO2 emissions.

Finally, if BMW thinks to the environmental implication at the very beginning of a car’s life, it brand also takes the responsibility at the end of a car’s life. Indeed, BMW considers as highly important the recycling of old vehicles. BMW ensures that its vehicles are disposed without harming the environment. The recycling of the products begins in the design phase of the car which anticipates the possibilities of recycling. BMW’s designers must follow a simple approach: ‘Design for Recycling’. For example, parts containing hazardous products are designed to be easily removable... Moreover BMW is using recycled material in the new cars. About 15% of the car plastics are made from recycled materials.

Apart from the car life cycle, BMW also encourages its employees to find better transportation ways from and to work. In Germany for instance, BMW set up a bus system in many production plants. Every day thousands of workers are carried from their home to their work and the other way around.

BMW also does everything to help the car sharing. Through the intranet of the company, employees can find co-workers interested in sharing a ride to work. BMW rewards the employees using that system with parking spots, fuel discounts...
C. Future objectives

The long-term goal of BMW is to produce cars with zero-emissions. Hydrogen is considered as the alternative number one to the petrol and BMW is one of the pioneers in this field. They already have a fleet of more than one hundred cars running on hydrogen. The brand expects to build 1000 hydrogen-running cars per year starting from 2010.

However, BMW is also considering other alternatives, such as electric cars. Engineers are working on a battery-powered city-car than could be launched by 2012.

D. Ecological solutions

BMW developed the Efficient Dynamics technology package to reduce fuel consumption of its vehicles but also improve performances. Efficient Dynamics is a global strategy affecting the whole vehicle. It is the combination of various measures which reduces the CO2 emissions. The three main measures are: engine improvement, lightweight construction, improved aerodynamics.

- **Engine improvement**

BMW developed a new high precision petrol injection technology, a jet-guided direct fuel injection system reducing the petrol consumption. This system ensure that the combustion is controlled and cleaner, making it more efficient. BMW introduced this technology in the end of 2007 and it is now installed on the majority of BMW cars.

BMW also introduced an Auto Start/Stop function. This innovation switches off the engine when the vehicle stops moving and restarts it very quick when the driver wants to move again. This technology saves a large amount of fuel, even more in an urban traffic.

The third technology is the Brake Energy Regeneration System. Electrical energy is produced during the braking phases and can be used in the on-board electrical system. This system has a double advantage. First it obviously reduces the fuel consumption. Second, since no electricity has to be produced during the load phases, more power is
available during the acceleration. So not only is the vehicle more economical, it is also more dynamic.

The engine management system within the BMW cars also informs the driver of the best shift point. The electronic system calculates this shift point by evaluating the fuel economy while taking into account the driving situation.

- **Lightweight construction**

Each kilo of a vehicle has an impact on the fuel consumption and on the car dynamics. Innovative use of lighter materials is therefore very important in BMW strategy. Every model has to be specifically studied, since one solution can be effective for one car but not for another. Moreover, if a lighter material is an advantage, BMW keeps in mind the importance of the quality of the materials. A balance between the two has therefore to be found.

The chassis and suspensions are now in aluminium. This lighter chassis will also improve the repartition of axle loads and favour a dynamic driving.

The drivetrain is composed with a composite magnesium/aluminium and is half lighter than a usual unit made of aluminium of iron.

The body of the car has also been studied. Side panels are no longer made of steel, but of thermoplastic. Besides being lighter, it also gives more freedom to the designer since decorative elements can easily be added.

- **Improved aerodynamics**

One of the main driving resistances a car has to overcome is air resistance. If the air resistance is stronger, a car has to use more power, and so more fuel. Particular attention is given to the aerodynamics of BMW cars. The flow of air is controlled in many ways and improved as much as possible, sometimes by very small details.

For instance, a constant airflow through the radiators situated at the front of a vehicle will increase the air resistance. Electrically controlled vents have therefore been installed and open the vents only when cooling air is required.
### E. Products

#### BMW Série 1 Hatch 118d 143

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#### Mini Cooper D

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The German brand BMW is famous for proposing luxurious and powerful cars. They have no products enough ecological to give their consumers the opportunity to get a premium from the state but it is very interesting to see that they did a lot of efforts in order to try to reduce the pollution created by the use of their products. The Série 1 only rejects 119g/km of CO2 but offers a quite powerful engine to its user.

With its Mini which is a subdivision of BMW the consumer can get a very small sporty car rejecting only 104g/km and so giving its consumers a 15% premium. The brand tries to be very innovative by proposing less pollutant products without disturbing the pleasure of driving a sporty and luxurious car.
7.4. Volkswagen

A. History

People tend to forget it, but it is an Adolf Hitler’s idea that is behind the creation of the German brand Volkswagen. Literally the word means “people’s car”. In the early 1930s it was an idea that was not totally new in Germany, but was not yet on the market. Adolf Hitler then had a meeting with Ferdinand Porsche, the owner of an automotive design company. His goal was to create an automobile that almost everyone could buy and that would be able to carry five persons. Ferdinand Porsche worked on a small car and put all his ideas in it to reduce the price and the costs of use.

On May 1937 was founded the Gesellschaft zur Vorbereitung des Deutschen Volkswagen's GmbH. The company was renamed Volkswagenwerk GmbH a few months later. The same year a factory was built in what is now known as Wolfsburg. However, the factory just produced a few cars. Indeed when the war started, the production was changed into military vehicles, including an amphibious car.

However, the plant was a strategic target during the war and was therefore partially destroyed. Once the war over, the British army took possession of the factory. The British soldiers partially rebuilt the factory and used it to produce cars again. Shortly after, they renamed the company Volkswagen and the city Wolfsburg. The main product at that time was the still world famous Beetle which had been developed from the spare parts of the old model produced in the factory before the war.

In 1949 the British government was relieved to give back the company to the German government. From that year, Volkswagen became a symbol and an economic model of the regeneration of Western Germany. The cars started to be exported, to close countries at first and then worldwide. The total of Beetle sold reached the million in 1955. And by 1973, the car became the most popular ever after more than 16 million Beetle cars were sold in the world.

In the late 1950s Volkswagen started to expand its product range with the introduction of new models.
In 1964 VW purchased Auto Union, the owner of the former brand Audi. Audi had disappeared after the World War Two, but was relaunched by Volkswagen as a luxury vehicle brand.

By 1973, even though the company held the record of sales of one model, the company was in trouble. A few unsuccessful models had brought a public doubt on Volkswagen abilities. The sales were decreasing all over the world. The company then took the decision to shut down the production of its key product, the Beetle. It was a risky decision, feared by all the directors. As a reaction, Volkswagen launched three models: Polo, Passat and Golf. If the two first were just evolutions of previous models, the last one, a revolutionary car, would quickly become the central product of the brand and its second mythical car.

While Volkswagen started to expand its product line, they started to offer the same amount of choice than the other European car manufacturers. However, the company based most of its models on the mechanical basis of the Golf.

In the 1980s sales started to fall again in North America. The American and Japanese competitors were able to compete with products of the same quality, but for a cheaper price. The second generation of Golf in 1984 restored Volkswagen position.

In the early 1990s, Volkswagen acquired the Spanish brand Seat and one year later bought the Czech manufacturer Skoda. These two brands gave Volkswagen the opportunity to sell cheap cars again like during its first years of existence. Indeed Audi had slowly moved to a higher class segment (close to BMW) and Volkswagen had taken Audi’s place.

Between 2005 and 2008, Porsche slowly acquired shares of Volkswagen. The brand now hold 42,6% of VW. The main idea behind those acquisitions was to prevent a hostile takeover by foreign investors.
B. Commitment and ecology within the company

Volkswagen, and more widely the VW Group (including Audi), has a long-term agenda to reduce its vehicles negative effect on the environment. Volkswagen is nowadays one of the leaders in the field of low-consumption and low-emissions.

Volkswagen also considers as very important to communicate about the environmental issues. The communications are addressed to the stakeholders, the staff, the directors, the partners, the consumers... any person involved in the life of a vehicle. The aim is to raise awareness among all these persons. Using the slogan “Taking Responsibility. Volkswagen and CO2”, the Group provides general information about all the environmental issues but also gives education to the drivers through its program ‘Eco-Driver’.

The brand also organizes training lessons about the environment for its salespeople. Furthermore, Volkswagen rewards employees taking efficient initiatives within their own sector (e.g. using a videoconference instead of moving to different places...). The brand also encourages ecological transportation behaviour among its staff, such as co-driving, train...

Volkswagen also created its own label of quality called ‘Environmental Commendation’. For all cars certified with this label Volkswagen will provide transparent information about the impact of those cars throughout their whole life cycle.

Volkswagen completely integrates the environmental protection in its production. A systematic improvement process is implemented in all the areas of the production. The whole life cycle is concerned and Volkswagen starts thinking about the environment from the very beginning of a car development.

The environmental management inside Volkswagen is based on four principles, four issues: saving water, avoiding waste, respecting air, economizing energy.
- **Saving water**

You need water to produce a car, it is inevitable. Large quantities of water are therefore used in the automotive industry. However, Volkswagen does everything to reduce the use of fresh drinking water. All the Volkswagen production plants are equipped with high level technologies to reduce water consumption but also to treat wastewater efficiently. More and more sites are equipped with closed-loop systems to reuse wastewater during the production process. Other techniques are also set up to use rain water. All the measures taken have reduced the amount of water from a third in the last 5 years.

The flow of wastewater is also constantly managed through IT solutions. This real-time information improves the rapidity of reaction in case of emergency of inefficiency. Moreover these solutions allow the simulations of treatment processes. The simulations show the relations between the different parts involved in the treatment of wastewater. Once these interactions are known they can be optimized.

- **Avoiding waste**

Volkswagen is well aware that if high-quality materials are expected in the cars, those have a price, and not only from a financial point of view. The production of these materials can have a large impact on the environment. Volkswagen tries therefore to maximize the efficiency of the materials used to limit the environmental damage. The cutting of the materials for example has been optimized. Only the minimum required surface is now cut in order to avoid any waste.

The consumption of packaging can also be reduced through an efficient use of materials. Some useless packaging has therefore been removed. The choice of packaging was also revised. Polyethylene sheeting is now used instead of wax paper. Volkswagen also introduced standardized containers that can fulfil different uses. A special process to optimize the use of packaging space was also developed.

Volkswagen finally considers that its responsibility does not end when a Volkswagen is no longer on the road. This is why the brand is constantly researching new recycling
methods. They for example developed a method to obtain raw material from shredder residues. Moreover, the VW Eos was the first car to be certified at 95% recyclable in 2007.

- **Respecting air**

The main responsible of the air pollution caused by the automotive industry are the Volatile Organic Compounds (VOC) released by the solvent used in painting. To reduce the release of these VOC, Volkswagen pays extreme attention to the use of the solvents and when possible copes without.

Research teams within the VW Group (Audi and Volkswagen teams working together) are trying to find alternative solutions, such as the use of UV-curing clear coats. The use of that method would substantially reduce the solvent content.

Many sites are currently using water-based paints, which involves a very low level of solvents. However, even when water-based paints are used, the waste air must still be purified. In order to do that, Volkswagen uses a process called afterburning. This means that a thermal afterburner will burn the VOC present in the waste air. The hot air is also used to dry the vehicles.

- **Economizing energy**

Energy consumption also means CO2 emissions. Assuming a service life of 150.000 km, the production of a VW Passat accounts for 22% of the total energy consumption during the life cycle of the vehicle. Volkswagen takes therefore particularly into account the energy used during the production process and tries to minimize it.

One of the main stone of the energy management within the Group is the in-house power generation by Volkswagen Kraftwerk. This semi-independent entity runs a number of power stations at many sites of the Group. The policy of VW Kraftwerk combines an intelligent power generation with environmental protection. A technology combining heat and power is used since it is by far the most efficient way of using resources.
In its main plant (Wolfsburg), Volkswagen is also combining this system with refrigeration. When the temperatures are higher surplus heat is converted into cooling, reinforcing the efficiency of the energy utilization.

Some other measures are applied by Volkswagen to reduce even more the consumption. Some officers inside the Group have as only task to make sure that no energy is unnecessary used. They are for example responsible of turning off unused equipment, lighting, air-conditioning...

C. Future objectives

The long term strategy is based on renewable fuels. Volkswagen sees electric vehicles as the key for the future. Indeed electricity can be generated from many different sources. However, Volkswagen does not want to be stuck with only one option. This is why they constantly invest in research and development for hybrid powertrain. They are also studying the possibility to use a fuel from biomass, called SunFuel. With this fuel, 90% of emissions could be avoided.

D. Ecological solutions

Volkswagen is well aware that if the driver can influence the car consumption by the way he drives, the main responsible of the environmental impact is still the technology he has between his hands: the car. Volkswagen therefore decided to focus its effort on three main problems: fuel consumption, emissions and traffic noise.

- **Fuel consumption**

Lower fuel consumption goes along lower CO2 emissions. This is why Volkswagen offers a wide range of fuel-efficient models, including the VW Polo BlueMotion, one of the very few cars with an emission rate lower than 100g/km (CO2 emissions of 99g/km).

- **Emissions**

When it comes to emissions, Volkswagen wants to act not only on CO2 emissions, but also on other pollutants, such as diesel particulates, nitrogen oxides... To achieve that
goal, Volkswagen improves continuously its engine technologies, with a specific focus on the combustion process.

In the middle of the year 2008, Volkswagen also started the production of its new ‘Clean TDI’ models. The brand presents this technology as the cleanest diesel technology in the industry. These new solutions combine the performance with the environmental respect thanks to improved fuel consumption and a low emissions rate. The emissions are reduced through a new downstream system eliminating most of the emissions from the exhausts. The NOx absorber catalyst reduces nitrogen oxide emissions by 90%.

To reduce the release into the atmosphere of diesel particulates, filters installation are either standardized or optional, but always a possibility for TDI-engined vehicles. These filters have been long studied and developed to fit with the requirements of the vehicle and its engine. Volkswagen also offers some alternative solutions for older vehicles that could not match with the newest filters.

- Traffic noise

Volkswagen considers the traffic noise as a severe issue and assimilates it to an environmental threat. The reduction of the traffic noise is therefore an important objective for the Group. Special ‘acoustics teams’ focus on finding all noise sources from the vehicles. A special attention is given to the main source of noise: the interaction between the road and the tires.

BlueMotion technologies

With its label BlueMotion, Volkswagen intends to show the world the sustainability of its cars. This label identifies cars with an environmental focus in their conception. These products are fuel-efficient, which means that they consume less fuel for the same distance. This low consumption is reached thanks to many innovations: efficient engine management, optimised aerodynamics, specific tires, longer gearbox... Here are a few examples:
- **Start-stop system**: in case the car should be stuck into a traffic jam, or at a red light, the engine is switched off when the driver removes his foot off the clutch to avoid useless fuel consumption.
- **Brake energy regeneration**: the energy released when braking is converted into electrical energy.
- **Cruise control**: it is an electronic aid that regulates the speed of the car. When the driver switches it on, the cruise control maintains a constant speed. The cruise control can easily be switched off by braking or accelerating.

**EcoFuel**

Another response of Volkswagen to the environmental requests is the development of vehicles running on natural gas. While these cars use gas as main power source, they still keep a petrol tank as back-up. The emissions released by the vehicles equipped with such technology are a quarter lower than the same vehicles running on petrol only.
E. Products

<table>
<thead>
<tr>
<th>Polo 1.4TDi BlueMotion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Engine</strong></td>
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<td><strong>Fiscal Power</strong></td>
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<tr>
<td><strong>Engine Power in kilowatts</strong></td>
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<td><strong>Horse Power</strong></td>
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<td><strong>Gearbox</strong></td>
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<tr>
<td><strong>CO2 Emissions</strong></td>
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<tr>
<td><strong>Doors</strong></td>
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<tr>
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<td><strong>Weight</strong></td>
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<td><strong>Length</strong></td>
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<tr>
<td><strong>Width</strong></td>
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<tr>
<td><strong>Price</strong></td>
</tr>
<tr>
<td><strong>Premium</strong></td>
</tr>
</tbody>
</table>

As we have seen, the “ecological” Volkswagen products are characterized by a name. “BlueMotion” is indeed the tag given to the Volkswagen ecological cars. The BlueMotion technology only exists for the Polo at the moment and this one is the more ecological product proposed by the German brand. The Polo is a relatively small urban car very popular on the Belgian market. Some more ecological products are about to be launched. During this summer 2009 for instance, the Belgian market will be provided with a new Golf BlueMotion. The Golf is the most popular and famous model of the brand. The Polo BlueMotion is at the moment the only Volkswagen car to offer premiums from the Belgian state as it is the only car to release an amount of CO2/km below 115g/km.
7.5. Toyota

A. History

We need to go back to 1933 to find the first origin of Toyota. The company was first a part of Toyoda Automatic Loom Works. Thanks to the licensing of one of his design, Sakichi Toyoda got enough money to launch Toyota Motor Company (the name Toyota was chosen instead of Toyoda for pronunciation reasons but also because the Japanese spelling of Toyota was considered to be luckier than Toyoda). He placed his son Kiichiro Toyoda in charge of the management of this new division. The new company was also supported by the Japanese government because of the military applications. The government wanted indeed to start relying on domestic production and was therefore likely to invest money in domestic companies.

The first Toyota engine was produced in 1934 and both the first car and truck in 1935.

In 1937, Toyota Motor Company was established as an independent company. During the first years, the company was more successful in the sales of trucks and busses. Cars were obviously sold, but their success was not significant.

During the World War Two, Toyota focused on the building of trucks for the Imperial Japanese Army. Toyota was lucky enough to avoid the destruction of its production plants during the war. However we learned after the war that armistice happened just shortly before a planned bombing of the Toyota factories.

After the war, the company was allowed by the Americans to reopen the production sites. The company first kept the focus on making trucks. But two years later, Toyota restarted the production of commercial passenger cars. Toyota also launched the first civilian truck, the Land Cruiser.

In 1957, Toyota was the first Japanese brand ever to export a car to the American market. Two years later, the firm opened its first plant abroad, in Brazil.
By 1967, Toyota had become an important player in the American market and was challenging the Volkswagen Beetle. The same year saw the overtaking of Daihatsu even if Toyota did not buy the whole company until 1999.

Even though Toyota was selling some high-class models, the company did not have a truly luxurious car. In the 1980s, most of the luxurious brands present on the American market started to fall from grace, for many different reasons. Toyota saw the opportunity to enter the market. Toyota spent a few years to study the market and to develop its first luxurious car. The car was launched under the brand name Lexus in 1989. It was a direct success.

Toyota is now the largest auto manufacturer in the world.

B. Commitment and ecology within the company

Toyota is well known for having the first hybrid-electric car on sale, the Prius. However, Toyota commitment goes much further. Indeed, since its foundation, Toyota has conducted business with the idea to contribute to the sustainable development of the society and therefore of the Earth. This notion finds its source in the original precepts from Sakichi Toyoda, the founder of Toyota. Toyota has always tried to find the right balance between economic growth and environmental preservation. And the key to keep that balance is the everyday technological innovation.

Since 2003, Toyota has been establishing regional environmental committees to promote environmental initiatives. These committees take initiatives in all Toyota sites but also outside the sites. Altogether, they form the Toyota Environmental Committee.

Toyota also introduced an environmental management system (EMS) to promote environmental action not only by Toyota, but also by all companies linked to Toyota (subsidiaries, distributors...). A total of 586 companies are concerned by this EMS. All these companies must adopt the Toyota Earth Charter and also show the evidence of environmental policies within the company. All the plants of Toyota are also equipped with the EMS to make sure they comply with the internal requirements. This compliance is verified by internal audits.
Toyota has a strong action plan regarding the environment. It is a statement of all the engagements that Toyota must follow to get the expected corporate image. In the plan Toyota identified four main issues expected in the period 2020-2030. These topics are: Energy/Global Warming, Recycling of resources, Substances of concern, Atmospheric quality. For each topic, solutions have been adopted and implemented inside the company in all areas of activity. Among those solutions some key points can be identified: CO2 emissions management, reinforcement of environmental management by business partners, elimination of substances of concern, cooperation to develop a recycling-based society.

Toyota also edited the ‘Toyota Green Purchasing Guidelines’. This very detailed document draws the main green values, rules, expectations regarding to its supply chain. This document is transmitted to all Toyota suppliers around the world and these have to comply with what is written.

All employees of Toyota receive trainings about environmental awareness, and other environment-related topics such as waste disposal, hazardous materials handling, emergency response... Furthermore, Toyota installed within the company an Eco-point system: employees are welcome to make suggestions about how the company could reduce the energy needed, conserve the environment... Employees suggesting good ideas are rewarded with points.

**Global Warming**

The global warming is something Toyota is well aware of. The company considers it as a priority management issue and all stages of the vehicle development are involved to reduce at maximum the energy consumption and CO2 emissions.

The production phase requires the use of a lot of resources and it goes against what Toyota is trying to face. To reduce the problem, Toyota is building eco-friendly buildings. These buildings are using alternative sources of energy, such as wind, solar panels... Getting sustainable plants is the goal Toyota wants to reach in the future. It would mean that this plant would fully use the natural resources, while existing in harmony with the natural environment. To achieve this, three things are necessary: using renewable
energies, afforestation at plant sites to conserve the ecosystem, introduction of innovative technologies.

In the actual plants Toyota is using different measures to limit the environmental impact of the car production.

One of Toyota goals is to reduce the volume of combustible waste generated. To reduce the resource loss, Toyota improved the resource productivity through for instance a recycling and reuse of waste. To reduce waste, Toyota also invested in net-shaping technologies.

Toyota also achieved near zero landfill waste at its production plants. One of the ideas was to recycle the entire volume of fly ashes generated by its incineration furnace into raw material for cement manufacturing. Toyota also evaluates methods to recycle the small quantities of waste difficult to process that used to be directly sent to landfills.

The packaging and wrapping was also carefully studied by the company. Toyota expanded the use of returnable containers. It helped to reduce the total usage volume of packaging by over 90%.

A major problem within the production plants is the use of substance of concern (lead, mercury, cadmium...). Over the last years Toyota has been trying to reduce the use of such substances. Measures have been taken to eliminate these substances from the vehicles.

Toyota has also reviewed the materials and processing methods to limit the amount of Volatile Organic Compounds (VOC) released during the production. Amount of cleaning solvents used at the painting line have been reduce to the necessary. Moreover the solvent used is now composed with 85% of pure water and 15% of alcohol, instead of the 100% solvent solutions previously used.

Other initiatives include the wastewater recycling or the use of special paint for the plant’s exterior that can break down the nitrogen oxides in the air.
To be more environmental friendly the transportation system of goods and products was also changed. Toyota switched to the rail transportation whenever it is possible, and uses high-efficiency ships of bigger size to reduce their amount.

To reduce global warming, Toyota encourages its consumers but also its workers to apply an ‘eco-driving’. The company provides its customers with many advices easy to apply and that could make a huge difference: sharing the car (more passengers in one car = fewer cars on the road), checking the way before leaving (avoid the rush or to get lost), avoiding to carry unnecessary load, checking tire pressure, keeping a smooth running, driving at a constant speed...

*Recycling*

Recycling is very important for Toyota. The brand even establishes a recycling committee in 1990. Toyota has always tried to make easily recyclable cars. The recycling activities take into consideration the whole life cycle of the vehicle.

- Development: the design of the vehicles is made to facilitate the dismantlement of the vehicle. Moreover, materials are developed to be easy to recycle.
- Production: the waste generated is kept to a minimum. Recycling technologies are developed for all kind of materials.
- Use: systems to collect and recycle bumpers or other spare parts are established. Toyota dealers also promote the reuse of automobile parts.
- Disposal: efficient dismantlement technologies are used and the shredder residue is used as raw material.

All stages are coordinated to share information and to improve constantly the recycling methods.

*Initiatives outside the car sector*

Toyota considers as a corporate responsibility to extend its environmental implication outside the automotive industry. The company has taken many actions to make a greener world. Here are some examples:
- Since 1999, Toyota has been planting trees in Australia to prevent the shortage of wood needed for the paper production. These trees also help for the CO2 absorption.
- Toyota encourages the ‘greenification’ of the businesses. Some steps such as roof gardening have helped to improve the urban environment.
- In collaboration with Menicon, Toyota developed a composting process reducing the composting period.
- The Toyota Shirakawa-Go Eco-Institute, situated in Japan provides environmental education to raise the awareness of the citizens.

C. Future objectives

Toyota is developing a third generation of hybrid engines while many manufacturers are only developing their first generation. Besides, Toyota is also developing new hybrid models, including a SUV and a sport car.

Toyota also began a research on a hydrogenated biodiesel fuel, obtained from a second-generation biodiesel fuel.

The group is finally working on the ‘ultimate eco-car’, which will make sustainability mobility a reality. In 2002, Toyota began to work on a hydrogen-powered car. This car was using the original hybrid technology as core technology. The development of this car is still continuing. At the same time Toyota is testing many alternatives, many new sources of energy in order to find the best solution for the future.

D. Ecological solutions

Toyota is committed to develop eco-advanced technology. Since the brand is the first producer of hybrid vehicles the aim is to always provide the consumers with cleaner, greener products. Each model must follow a baseline in 6 categories: fuel efficiency, emissions, noise, disposal recovery rate, synthetic-organic compounds, and overall life cycle environmental impact. The only way to constantly offer better cars is through new technologies.
Toyota developed a new engine with a new fuel system responsible for the optimal control of the dual injection according to operating conditions, but also with an electric motor connected to the air intake system. This motor provides an optimal valve timing control which increases the fuel efficiency. This engine also uses ultra-light pistons and reduces the frictional loss.

A new transmission system was also launched. Not only it offers an improved acceleration performance, but it also optimizes the fuel efficiency. Indeed the transmission will react according to operating conditions. Moreover since the size of the parts of this new transmission system has been reduced, so was the weight.

Toyota also worked a lot on the aerodynamics of its vehicles. The aerodynamic is specifically study to avoid the airflow divisions, but also to increase stability during high-speed operations, avoiding loss of energy.

Toyota also started to install Eco Drive indicators in its cars. This indicator encourages environment-friendly driving. It lights up when the vehicles is being used in a fuel efficient manner. The aim was to increase drivers’ awareness regarding to environmental issues and to give him tools to improve his driving behaviour.

However, the main technology proposed by Toyota is its hybrid system. This hybrid system combines different power sources to maximize each one’s strengths. If we have a look at the main hybrid product, the Prius, we can notice many technological solutions.

- A generator used to charge the battery and supply power to the high-output motor.
- The power split device distributes the power from the engine in two ways: mechanical and electrical.
- The regenerative braking uses the heat from the braking and converts this energy into electricity.
- The battery, source of power for the electrical engine is charged by the generator at cruising speed and by the motor during the braking.
### E. Products

#### iQ 1.4D-4D Linea Luna

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</tr>
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</tr>
<tr>
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<tr>
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#### Aygo 1.4D Plus

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<tr>
<td><strong>Yaris 1.4D-4D Linea Terra</strong></td>
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<table>
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Toyota was the first brand to introduce an ecological car with the Prius which was at the time the first Hybrid car in the world. Today this one is the only familial car giving to the buyer the opportunity to get a 15% premium and to drive ecologically. The Prius is not the only model to give to consumers a 15% premium since the iQ also allows it. This model is a very small economic car. Toyota also proposes 2 other models rejecting less than 115g/km of CO2, the Aygo and the Yaris.
8. Analysis

8.1. First impressions

After the collection of empirical data we can immediately notice a first trend for the four manufacturers that were studied in this thesis. It appears they all are really involved and some environmental strategies are already well implemented for some brands. The four brands have understood that offering environmental friendly product is a real necessity and they all feel concerned about it. This explains why all the manufacturers invest a lot of money in the research and development in order to find some new technologies. Indeed, the four manufacturers agree on the fact that it is through research and new technologies that we will reach the zero pollution objective.

It is also important to notice that in order to be more environmental friendly every company has its own method, some according more importance to some points than others. Still, as the analysis will show up there is also a lot of common points, improvements, which are clearly similar. This observation can be interpreted in two ways. First, it can be explained by the fact that the competition is very high and in the current economy it becomes easy to adapt its strategy to its competitors. Another way to explain can simply be the fact that after taking care of being the less pollutant, the companies have reached the limit of what the actual technology allows, and so they all use it.

However, the analysis will show that if it is true that all the companies are clearly strongly involved in the sustainable development, some companies seem more involved than others.
8.2. Product

A. The product in general

In the transport sector it is important to take care of the product. Indeed, the product is strongly responsible of the pollution caused by the sector. In the case of this thesis, it was noticed that the products are not really created in order to answer to a totally different consumers’ need. A car remains a car but it is true that more people really start to be concerned by the environmental issues and feel more interested in ecological products. However, the main purpose of the car manufacturers is to develop and propose environmentally responsible products to have less impact on the environment than the competitors which is one the two solutions proposed by the Queensland Government (2006). Today, the four manufacturers are engaged in the race to the zero pollution cars, kind of product which is the final objective of the four brands.

B. The global product of the manufacturers

This part is not going to explain what are the different ‘final’ products proposed by the four companies but what means are used by the companies in order to propose more ecological products as such or by use.

The four manufacturers use a strategy of remanufacture. It means that they do not create a totally new product but it is based on an old one which is improved to be more ecological. This solution is similar to one of the solutions suggested by Prakash (2002). To create their products the companies employ different means.

First, if we look at Volkswagen we can notice that the brand does not pay too much attention to the whole life cycle of their products. It mainly focuses on the “eco-use”. By looking at the products, the brand mainly tries to produce more ecological product by use. A product has a life-cycle and the other brands are more concerned about it. If we focus only on the product by use we can see that the four brands have common purposes: they want to reduce the fuel consumption and the emissions of CO2.
Presenting in deep details how they proceed is not the real purpose of this thesis, but we can notice that the four brands work on the aerodynamic, the gear box and the engine, some brands proposing more evolutions than others. Ottman (2003)’s opinion claiming that a very important factor in the conception of a new product is the design is here easily noticeable. The most technological brand in this optic appears to be BMW which proposes the car START/STOP and the brake power system. The cars also have some electronic components improving the aerodynamic, in order to propose more ecological cars but, and this is important, also to improve the performance. The last part is not the case among the other brands. The most innovative one is certainly Toyota which is the only brand to propose a Hybrid-Electric engine. A less common kind of pollution is studied by Volkswagen and Toyota: the noise pollution.

A look at the whole life-cycle immediately shows that the most complete brand is Toyota. They really take care of the whole cycle in order to propose easily recyclable cars, but also to use recycled products. BMW also takes cares of it by using not less than 15% of recycled plastics in their cars for only 5% for Renault. Globally we can say that Renault, Toyota and BMW really take care to the whole life-cycle what Volkswagen should improve.

C. The final products

Of course the four brands propose Eco-products but it seems important to have a concrete look to what kinds of products they offer, how environmental they are during the use and the performances.

It is important to notice that the four brands have focused their environmental products on the small cars sector. Today the more ecological cars, using environment-friendly technology are mainly the small cars. If we take a look at the different products we can notice that the less involved brand is probably Renault. Indeed, the brand only proposes one model releasing less than 105g/km and it is the smallest car of the brand. The Renault Clio which is similar to the Polo, the Mini, or the Yaris is more pollutant than its competitors. The less pollutant car is the Volkswagen Polo, rejecting 99g/km of CO2. But if it is the most ecological car, it remains a small car and is not very powerful. If we look
at Toyota we can notice that the performances are not so good with the Yaris, which is similar to the Polo and rejects 110g/km of CO2, a higher figure. But obviously the real evolution for Toyota is the Prius. This car is the only ecological car that can pretend to be family. It proposes a good size and rejects few CO2. It is explained by the innovative Hybrid engine. A look at the consumption shows that the more fuel efficient cars are the Polo and the Mini with only 3,8 and 3,9L/100km of consumption.

Another interesting thing is to look at the BMW products. The performance proposed by the brand is impressive. For example the Mini is quite powerful with 110 horses against 80 for the Volkswagen Polo and the consumption and emissions are pretty similar. The same trend is noticeable for the BMW Serie 1 which is a powerful and big car but do not consume and reject so much. It tends to confirm what was previously thought about the level of innovation and technology of BMW. The manufacturers focus about maintaining an idea of improvement for the environment and insist on the importance to reduce like some authors advised (Louppe, 2006; Queensland Government, 2006; Prakash, 2002; Bradley, 2007).

To conclude about the product, we can say that probably the most ecological brand is Toyota which clearly focuses on the life-cycle and the use by being the first to propose a Hybrid car, which is also the only family ecological car. After Toyota, we can find BMW which also clearly focuses on the whole life-cycle and which proposes very technological products combining effectively ecology and performance. The third brand is Volkswagen which proposes the most ecological product with the Polo BlueMotion rejecting only 99g/km and consuming only 3,8l/100km, unfortunately the brand does not focus enough on the whole life-cycle but only on the use of the product. The less ecological products are Renault’s. Indeed the brand only proposes one single product consuming less than 115g/km of CO2.

**D. The production**

This point is tough to analyse for several reasons. The first one is that all companies employ different strategies. For example the BMW system is based on a 10 guidelines model while Renault uses 5 phases. Toyota chooses to focus on 4 issues which are quite
similar to Volkswagen: they globally focus on the energy, the respect of the air, the management of waste amount, mainly through recycling and the reducing of substance of concerns. The other brands, through their strategies, tend to be focused on the same concerns.

The second reason is simply the fact that it is almost impossible to measure the exact pollution caused by the whole cycle of production from the start to the end, so it is hard to clearly find out which company is the more ecological during its production.

However, each brand has clearly adopted the environmental protection in its production and has a long-term agenda to reduce its vehicles negative effects on the environment. According to Glorieux-Boutonnat (2004), to go green is for a long-term and it can be expansive to invest on a short-term but very profitable on long-term as it allows a reduction in the costs of production. It is important to point out that for all the four brands the environmental policy influences all the operations during the whole cycle of production. By doing this the manufacturers are in accordance with Prakash (2002) who suggests to green the value addition processes as it could entail redesigning, eliminating, modifying some of the processes of technology used with the objective of reducing the environment impact at all stages.

Renault named it Life Cycle Management; every phase is managed to limit as possible the impact on the environment. Prakash (2002) suggests that it is important to have a measurable system in order to see the performance of the environmental management. According to this, the best brand seems to be Renault which developed different measurement tools for all the stages. Renault with this system can know the environmental influence of its industrial tools, the impact of a vehicle from the start to the end, or measure the amount of risky substances. The brand also developed an Index of recyclability and an Eco-Index for the packaging. The practical details are not precisely given, but BMW proceeds to evaluations every month in order to measure the impact of its production. The aim is to have a constant feedback and to improve the production.

In the way to always improve the efficiency of its production the four brands have adopted the same strategy, they try to reach a systematic improvement process in all
the areas of production. In order to achieve this purpose, Toyota and Renault allow all the sites and stages to be connected together and to share information to improve constantly. The system of production has become during the last years a real centre of interest and is a work of everyday innovations to perform better, mainly by recycling, reducing, avoiding as it was recommended by Louppe (2006), Bradley (2007), and Miller (2008).

Of course, the four brands recycle some products so that they can produce new products. This practice became common in the cycle of production. However, we can notice a particularity for Toyota. Indeed, like the other brands, Toyota recycles and uses recycled products (e.g. plastics) but they go deeper in the recycling process. It is for instance the only brand to recycle for and from another sector of activity. Toyota for example recycles the entire volume of fly ashes for the cement manufacturing. By doing this Toyota follows Louppe (2006) and Miller (2008)'s advices suggesting to improve the recycling of the waste materials at the end of the production cycle, and the use of recycled materials.

The plants of production are also a big concern. All the brands produce in installations respecting the ISO-14001 label, which is a norm related to the environmental management. However, it does not mean that the sites do not pollute, it means that the brands follow some basic rules which should normally reduce the pollution. Some brands like Toyota and BMW also use Eco-friendly buildings, by using alternative energies like solar panels, wind energy. One important issue for the four brands is to economize energy, so they all did strong investments as suggested by Mandelbaum (2008). For example, Volkswagen uses an in-house power system; system which combines intelligent power generation with environmental protection. BMW uses energy saving buildings.

Another very important point discussed a lot by Volkswagen, Renault and BMW is the water saving. The 3 brands really try to reduce the consumption of water by reusing the water. BMW developed for instance a close water cycle. The brand also has a water policy encouraging only the use of as much ground water as it can be reproduced naturally. Renault takes care of the water sources surrounding its production sites; the
brand tries to reduce the pollutant liquid waste and uses as many alternative treatments of chemicals as necessary, and is the only one to propose it. However, it is important to notice that the four brands have as a common goal: the protection of the surrounding environment.

In conclusion, this point is really difficult to analyse and the comparison between the four brands is almost impossible since we cannot get a common system of measure for all of them. It is however true that the actions taken by the four brands seem quite similar and that the difference between the four seem very small. They also try to protect the surrounding environment, to reuse, to recycle, to save. Maybe we can underline the fact that when it comes to recycling Toyota goes very deep by recycling also from and for another activity. One thing is certain, it is the fact that the four brands always try to improve the production and to as ecological as they can. The implication to be environmental friendly is really strong for the four brands.

E. The package

The package is very important for a product since it often gives added-value. The fact is that a package is often very pollutant and this is the reason why the “pro” green advise to take care of the package to strongly reduce the CO2 emissions. When people think about a car they do not really imagine that there is a packaging. Of course, it is true that when you go to the car dealership the car is not packed at all but the fact is that in practice it is not really true. Indeed, the final product is not packed but during the transport from the plant to the dealership the car is protected with many packages.

Volkswagen and Renault have chosen to evaluate the packaging quality in order to reduce as much as possible the packaging waste. To accomplish this, they removed the useless packaging and made some changes in the materials. Toyota also studies the packaging and wrapping carefully. With these changes the two brands are in accordance with the Queensland Government (2006) who recommends to use less pollutant materials and Bradley (2007) who claims the use of safe packaging for the environment.
Another mean to reduce the packaging is the way the products are moved when they have been produced. The container is really important and can be more environmental friendly as it was claimed by Mandelbaum (2008) and Bradley (2007). Indeed, the use of adequate containers allows to fit more units in a truck and to cut the costs. Volkswagen for example uses standardized containers that can fulfil different uses. Toyota expanded the use of returnable containers allowing the company to reduce of 90% the total usage of volume packaging. BMW chose to use closed transport so they were able to remove all the transport protections and do not use packages at all.

About the product it is noticeable that the four brands pay a lot of attention to the whole life cycle and the packaging has not been forgotten by any company. The most ecological is probably BMW which does not use any packages at all anymore. However, we can notice that the three other brands pay attentions to limit the pollution caused by the packaging of their cars.
8.3. Price

As we saw in the literature review Prakash (2002), Ottman (2003) and the Queensland Government (2006) claimed that people were not ready to pay any extra for ecological products if they could not find another advantage, like performance, economy, design... Another important point was that the consumers tend to choose the more ecological product if they are similar in all aspects (Prakash, 2002).

To compare the price between the different brands is not objective since they have different marketing strategies. BMW is the most expansive brand between the four but it is a luxurious brand. However, we can compare the Yaris and the Polo which are quite similar products. We can notice that with the reduction of 15% due to its very ecological behaviour the Polo becomes cheaper than the Yaris. The premium is a real advantage for Volkswagen as its car can benefit from a reduction of at least 2323€. If a comparison of the brands together is not really interesting, to compare the price strategy of each brand for the same model, including the “non-ecological” versions can be enlightening.

Renault

The brand is disappointing because it proposes only one model giving the opportunity to get a premium. This cart is the Twingo which is a very small model. The Clio, the similar model to the Volkswagen Polo and the Toyota Yaris costs 14.150€ and gets no reduction at all since it rejects 120g/km of CO2.

However, the Twingo is quite ecological when equipped with a diesel engine. The special ecological Twingo costs 13.200€; with a reduction of 15%, it becomes a price of 11.220€. The classic Twingo model costs 11.750€; with a reduction of 3%, it becomes: 11.398€. After that you can still remove 1.000€ when you put it into circulation. If more expensive at first, the ecological Twingo becomes cheaper once the reductions have been taken into account. This is a good thing for the consumers and the environment as they can drive more environmentally friendly for less money.

*Environmental products far cheaper after premiums have been deducted.*
**Volkswagen**

At the moment, Volkswagen proposes only one “BlueMotion” product, it is the popular Volkswagen Polo. This car is one of the most environment-friendly due to its low consumption and low CO2 emissions. The Polo BlueMotion is more technologically evolved as it is equipped with new tires, better aerodynamics, more ecological engine and gearbox. However, it is important to have a look at the price and mainly the difference of price between the Polo BlueMotion and the classic Polo.

The classic Polo 1.4Tdi rejects 119g/km of CO2 and costs 13.440€. On the other hand, the purchase of the Polo BlueMotion 1.4Tdi costs 15.490€ - 15%. The price becomes 13.166€ -1000€ when putted into circulation. The Polo BlueMotion is also far cheaper than the classic one after the reductions have been taken into account.

→ *Environmental products far cheaper after premiums have been deducted.*

**Toyota**

Toyota is probably one of the most ecological brands as it proposes the biggest amount of models giving right to the premiums. It is possible to get some premiums with the iQ, the Aygo, the Yaris and the Prius. For Toyota we cannot notice a difference of price between the ecological models and the non ecological since all the Diesel models of the iQ, the Aygo and the Yaris also give rights to premiums. These premiums rise up to 3% for the Aygo and the Yaris and 15% for the iQ. Finally, Toyota is the only brand to offer a family environment-friendly car for 26.830€; a price which is cheaper after reductions than a Toyota Avensis which is a family car and costs 25.330€.

→ *Well developed in the environmental products, only proposes environmental products in the range of car studied, prices similar to the competition in the same range of cars.*
**BMW**

The case of BMW is difficult to study because of a differentiation in the strategy. First, the brand proposes very technological product, with good performance and is recognized as a luxurious brand playing on a strategy of image. Secondly, BMW engaged itself in the research for ecological products and nowadays they offer to consumers very technical products combining good performances and environmental respect. For example, in comparison, the BMW Serie 1 of 143 horses rejects the same amount than a Renault Clio of 86 horses which is a smaller car. The thing is that BMW did not choose to propose ecological product as another kind of product but chose to propose only products equipped with ecological technologies. The brand produce more ecological product and all the cars are like that. The consumer does not take the choice to drive ecologically, he has to.

The only BMW product to get a premium is the Mini COOPER D. This model is new, so is equipped with the latest evolutions and provides the consumers with a powerful car with little consumption and few rejects of CO2. The price is related to the strategy. This product is fashion, luxurious and thus expensive. It is difficult to compare the Mini Cooper D with the other Mini models as it is the only one to use Diesel. However, if we compare the Mini Cooper D 110 horses rejecting 104g/km of CO2 with the Mini Cooper Benzine 115 horses rejecting 129g/km we can notice that the more ecological one becomes cheaper after the reductions. The more environmental friendly car costs 18.190€ against 19.350€ for the more pollutant one.

→ **BMW, as a luxurious brand, is not trying to propose the environment-friendly products as a choice anymore, however when the choice still exists the more ecological one is cheaper.**
8.4. Place

In this part, the distribution system will mainly be studied. Indeed, some small changes in the distribution are enough to be far more ecological and to spare a lot of money (Louppe, 2006; Bradley 1989). It is difficult to analyse every places because even if the licensees get some advices from the licenser, a car dealership remains a licensee and can do more or less what he wants. However, the distribution is far more important as it is a big source of pollution and that concerns all licensees, and is part of the life-cycle process of the product.

Volkswagen does not seem to pay a lot of attention to this point, as not further changes were noticed for the last past years in the distribution. However, Renault tries to develop a distribution system which pays more attention to the environment. The two best brands seem to be Toyota and BMW. The two brands not only take care to be sure that they are environmental friendly but also to do business with environmental companies as it is recommended by Bradley (1989). Toyota developed the Environmental Management System. In this system all companies must adopt the Toyota Earth Charter and also show evidences of environmental policies within the company. BMW in the same way considers its suppliers as a part of the process and all the suppliers must adhere to the Group standards regarding the environmental respect.

BMW and Toyota use recommendations of Bradley (1989) by trying to optimize the transportation flows by being more efficient with a better utilisation of the containers, taking more commands at the same time, paying the agent according to the volume and not the distance. They also try to use more ecological transportation means like Louppe (2006) and Bradley (1989) suggest. They both try to use as much as possible the rail transportation. The BMW plants for example are almost always linked to the rail network.
8.5. Promotion

A. Global promotion

The promotion is an important factor since it gives the company a chance to reach the customers and to show them the new products. Of course the four brands use all kinds of media to promote their products and they all communicate on the axis of the environment. However, some companies go a little deeper by proposing less common and environmental actions.

For example, Volkswagen and Toyota find important to communicate about the environment issues not only to the customers but also to the staff, directors and partners. It means any persons involved in the cycle of life of the vehicle. They promote general information about the environmental issues. Keeping this in mind, Toyota has created some regional environmental committees in order to promote their environmental initiatives. Through its promotion, a company can enhance the responsibility of the consumers but also of its employees, its partners, etc towards the environmental issues (Louppe, 2006; Queensland Government, 2006).

Volkswagen also chose to be transparent, which is advised by Ottman (2008) and Miller (2008), by creating the “Environmental Commendation” label which was settled up in order to give transparent information to the customers.

The purpose of Renault, like the other brands (Toyota and Volkswagen), is to do its best to change drivers mentality, to make users face their responsibilities through campaigns, advices... The three brands propose as well for their consumers as for the employees some eco-driving programs to give to them some skills to drive more ecologically and some advices easy to apply. This behaviour is in concordance with Ottman (2008)’s advice suggesting that it is important to empower its consumers, make them feel they can do a difference.

Toyota still goes deeper in the process of communication as the company does not only focus on the brand but also outside the automotive industry. For example the brand participates to different actions like planting trees in Australia, encouraging
greenification of the businesses, developing composting process, giving environmental education to citizens... The brand also applies a suggestion from the Queensland Government (2006) consisting in providing information about environmental issues to people.

Certainly, Toyota is the most implicated brand in the environmental promotion, as the brand does not only focus on its product but also outside the company. Volkswagen undertakes also a lot of actions as well as Renault while BMW just focuses on the advertising.

**B. Websites**

According to Ozuem, Howell and Lancaster (2008), the explosion of the Internet in recent years has created new marketing spaces. A new form of interactive communication with the customers is born. It was therefore logical to specifically study how the car brands exploit this new and ‘fashion’ tool of communication to show their customers their implication in the protection of the environment. The authors wanted to determine whether the environment has an important space on the website welcome page, if there is any part of the website dedicated to the environment and how important it is, and finally how the ‘ecological cars’ are showed off.
Encircled: “Environment”

On the welcome page of Renault’s website, there is only one reference to the environmental issues. A link to another part of the website about environment is put alongside other links such as product range, security, financing... Since Renault website is really sober we can consider that the environment has a relatively good visibility and is integrated as one important part of the website.

The environmental part of the website is quite well documented. Renault presents the different premiums available in Belgium and its program eco². The program eco² is focused on Renault’s environmental implication (production, recycling...), on the link between eco² and the consumers and finally on the presentation of the eco² cars, with their CO2 emissions and the amount of recycled plastics used.
Encircled on the left: “Consumption and CO2 Emissions – All current BMW models”
Encircled on the right: “Less Emissions. More choices – 20 Models with a CO2-emissions rate below 140g/km”

The BMW website welcome page pays a lot of attention to the environment. The ecological models are well promoted and BMW shows its implication in the environmental issues. The image on the right is almost in the centre of the screen so the user’s look is automatically attracted.

However, if you decide not to click on the direct links or if you are not on the welcome page, finding the part dedicated to the environment is a little bit trickier. There is indeed a link in the bottom centre (always present no matter which part of the website you are in, see green square) but it is not really obvious. It is easy to miss at the first glance.

In its environmental part, BMW presents its recycling concept but also a list of its car models, with the average consumption and the CO2 emissions. We could have expected more after the importance of the environment on the welcome page. If you go deeper
in the website (More about BMW, yellow square in the top right of the welcome page), it is also possible to find information about the different technologies offered by BMW (BMW EfficientDynamics...), with some explanations about how it works.

VW

The Volkswagen welcome page has absolutely no reference to the environment or any similar idea (technologies...). The find the part dedicated to the environment, you have to click on VW World (green square), then on environment (see picture below).

Once you click on this link you reach a single page about environmental issues. This page is a summary of all initiatives taken by Volkswagen but is definitely too short to really present the actions. On this page there is also a link to another website (http://www.mobility-and-sustainability.com/_content/praxis_222.asp) but the link was
not working when the authors tried to use it. However, after a little digging the authors found out that it was supposed to be a link to the environmental part of Volkswagen international website.

When it comes to the presentation of ecological cars, those are among the other versions of each model. The Polo BlueMotion for instance receives no special attention and the user has to really look for it. If a customer is not aware of the existence of such car, there is clearly a lack of attraction.

**Toyota**

![Toyota Website as on March 30th 2009](image)

Encircled on the top: “Environment”

Encircled in the middle: “Prius – From €20.990 with ecological premiums (€19.990 in Wallonia)

We can notice that the environment is a real concern for Toyota. A link to the environmental part of the website is in the top middle of the page, alongside the product range, financing, innovation... But most importantly, the most ecological car, the Prius, is put in front, right in the centre of the welcome page.
The environmental part of the website, the importance of the environment for Toyota is confirmed. The information provided is really complete and broad. All the initiatives taken by Toyota are presented and so is their corporate responsibility, their cleaner technologies (including a special part for their Hybrid Synergy Drive technology) and their future goals. Toyota also proposes driving advices for the user and also explains the premium system.
8.6. People

According to the empirical data we can clearly notice that the four brands are concerned by the environment and they have decided to make their employees concerned too. The four brands give for example training lessons about environmental issues for people to act in a better way for the good of the environment. As it was recommended by Louppe (2006) employees must be formed. It is a good thing that employees feel concerned and responsible about the environment (Louppe, 2006). Toyota and BMW goes deeper in the learning process by editing a guideline in order to help the employees to act in a better and aware way. This last point follows Bradley (1989) and Ottman (2003)’s points of view claiming that managers are responsible to ensure that employees follow simple rules.

A responsible behaviour is also encouraged by the company, as for example the four brands offer to their employees some eco-driving lessons. Some brands reward the employees for taking initiatives, like for example Volkswagen that encourage the car sharing as well as Toyota and BMW. The German brand BMW also rewards people who take the more ecological means of transport, they analyse for each employee what is the most practical and ecological mean of transport to come to work. Volkswagen also encourages people to take part into videoconference as often as possible. Toyota goes one step further by allowing and rewarding people using the ECO-point system. This system gives to employees the opportunity to make suggestions about how the company could reduce the energy needed, conserve the environment and the good ideas are rewarded with points. With all these measures the company makes employees feel concerned about the problem which as said before is a necessity (Louppe, 2006).

The employees are for sure educated in order to be more environment-friendly. What is interesting to see is the fact that some companies have developed some new jobs only in this optic of respecting the environment. Indeed, Louppe (2006) argued that it was important to involve the board of directors and the creation of an ethic code. For example, Volkswagen has some officers who have as only task to make sure that no energy is unnecessary used. They are responsible for turning off unused equipment,
lighting, air conditioning... BMW has developed a team or a manager (depending on the site) responsible for the environmental protection issues. But the most impressive brand is Toyota which created different committees who only focus on some important issues such as the promotion of the environmental initiatives or the recycling. Renault is also concerned since the brand employs specialists in every field in order to be as productive as possible.
8.7. Conclusion of the analysis

The purpose of this analysis was to measure how far the companies used for this case study were involved and to place them on the Green Marketing scale. After a deep analysis of the four brands it is easy to decide where to place them. Indeed, through the analysis it appears that the four brands are deeply concerned about the environment and have adopted a strategy of integration of the Green Marketing.

The four brands feel strongly concerned about the environment and do a lot of efforts in planning the strategy and the adaptation of methods and processes, in order to act in a more environment friendly way. The performance in concern of the sustainable development appears like a challenge for the brands and not as a constraint anymore. It also became a necessity to stay in the competition. It appears that the race to the fully environment-friendly car has been launched.

However, if it is sure that the four companies of this case study have adopted a strategy of integration of the green marketing, it seems that some brands go deeper in the implementation of this strategy. This difference can be noticed by small details, or by extending their behaviour to other domains like for example Toyota who build some eco-buildings and recycle for other products. It clearly seems that Toyota is more involved in the green marketing and more in advance than its competitors in this domain. From the data it appears that the French brand Renault is the less ecological and less advanced.

On the other hand, it is really difficult to make a clear quantitative analysis as it is impossible to clearly measure the impact of each brand on the environment. Indeed they all use different means and it is impossible to know how pollutant a car is from the start to the end. The problem was that this case study is based on a qualitative research and that a quantitative one remains almost impossible to perform.
9. Conclusion and discussion

9.1. Conclusion

As we saw it in this thesis, the environmental issues have become a real preoccupation for the society. The second biggest source of CO2 emissions is the transport sector and more specifically the automotive sector which is responsible of 10% of the total amount of CO2 emissions in the world. So far, it has been really important to first have a better idea of how the marketing could deal with and improve the environment. Secondly it was important to have a look at and analyse the behaviour of the automotive sector since it was one of the most pollutant and was for sure deeply concerned by the environmental issues.

Moreover, it appears that if sometimes the use of some measures supposed to reduce the CO2 emission was established by the Governments, the consumers have become more interested in environmental-friendly products. It is the reason why it was important to develop a model that allows an analysis of the green marketing involvement of the companies but also gives the opportunity to compare the companies together.

While reaching the end of this thesis, the analysis done makes possible to retain some remarks. First of all, it was clear that nowadays the automotive sector is really concerned about the environment. The investments in research and development are huge and the cars industry has really understood that the respect of the environment by their product is really a key to catch the consumers.

From this analysis the authors deducted that the four brands that were analyzed were reaching the highest level of commitment from the green marketing scale of the developed model. However, this scale and this analysis were both based on a qualitative research and it was really difficult to measure exactly which company was the more ecological. Nevertheless the analysis has given a chance to reward Toyota as being the most ecological and innovative brand about the environmental issues. The brand has
got a lot of experience in this practice and has developed skills. Furthermore, the company has got a very wide vision and does not only focus on the automotive industry.

A tool to analyze and to help the companies to get a more ecological behaviour was developed throughout this thesis. It seems like a good starting point since at the moment only a small model of this kind existed with the Queensland Government’s proposal. The model developed during these pages is a deeper and more developed model gathering ideas of different authors. However, for the future this one could certainly be improved. First, this phenomenon is quite new and will for sure still be developed as the technology is improving every day. Secondly, the main problem of this model is that if by proposing 5 subcategories it gives a chance to see how strong the commitment of a company for the green marketing is, it becomes really difficult to clearly measure the difference of commitment between the companies amongst the same subcategory.

In order to be more precise, a quantitative model should be developed but the problem is that actually it is still really difficult to measure the impact of a product during the whole life-cycle. However, it makes no doubt that in the future it may be easier to clearly measure it since the technology is always improving. A quantitative model would be useful to conclude exactly how pollutant a company is by comparing the amount of CO2 emissions of the production, of the product, the level of recyclability...

In conclusion we can notice that the environment has become a big concern and that the companies feel more concerned about this phenomenon. It is certitude that this phenomenon is still new at the moment but will be a key in the future. Indeed, the whole society takes care about the environment in order to protect the planet and a company without ecological involvement will become singular or will probably struggle to survive.

9.2. Further research

For further research it would be interesting to go deeper in the analysis of the four brands. Research could also be led on other vehicles proposed by the four
manufacturers, such as motorcycles, trucks, etc in order to determine whether the green marketing strategy is applied among all products of each brand. An interest could also be to study the implication of these brands in racing sports (Formula One for Renault, Toyota and BMW; Rally-raid for Volkswagen). Does that implication have an impact on the product development, on the environmental brand image (Volkswagen was for example the first brand to win the Paris-Dakar race with a Diesel car)?

It would also be very interesting to study the commitment of the smaller brands of the sector. Indeed, for this thesis it was decided to compare the most popular and biggest brands, and the results show a great involvement of these companies. It would be interesting to extend the researches in order to see whether it is a phenomenon noticeable in the whole industry.

Other researches could also extend the investigation to other industries in order to determine if it is a general trend nowadays, and in which industry the green marketing is the most implemented.
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