DIŞ TİCARET ENSTİTÜSÜ
WORKING PAPER SERIES

Tartışma Metinleri

WPS NO/ 122 / 2017-07

GREEN MARKETING and CARBON FOOTPRINT in CHEMICAL INDUSTRY

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Abstract

This study is designed to answer various questions relevant to green marketing and carbon footprints in chemical industry. The topic is presently of great concern globally. Several researches are made on green marketing and carbon footprints with the help of significant information provided by the experienced researches which assisted the thesis in deriving conclusion. The study used several quantitative and qualitative methods to ensure how much does green marketing influence carbon footprints in chemical industry. Data is collected primarily with the help of questionnaires that were filled in by the respondents of different genders, age groups and professions. The data was collected using non-probability sampling by calculations and estimations were therefore performed to get quantitative answers. The research also emphasizes upon how chemical industries are contributing to the increasing number of carbon footprints in atmosphere. It finds how well chemical organizations are doing to minimize harmful effects of production of their goods Metrics of carbon footprints are focused. The study concludes its search and data estimations in a generalized way, giving possible solutions to our problem and finding ways to minimizing carbon footprints.

Key Words: Green Marketing; Carbon Footprint; GHG(Green Housegass); Industries; Bio-Technology;

Özet

Bu çalışma, kimya sanayisinde yeşil pazarlama ve karbon ayak izleri ile ilgili çeşitli soruları cevaplandırmak üzere tasarlanmıştır. Konu şu anda küresel çapta büyük endişe kaynağı. Makale sonuçlandırılmasında yardımcı olan deneyimli araştırmacılar tarafından sağlanan önemli bilgiler yardımıyla, yeşil pazarlama ve karbon ayak izleri üzerinde çeşitli araştırmalar yapılmıştır. Çalışma, yeşil pazarlamanın kimya endüstrisinde, karbon ayak izlerini ne kadar etkilediğini sağlamak için çeşitli nicel ve nitel yöntemler kullanıldı. Öncelikle farklı cinsiyet, yaş grupları ve meslek mensuplarının doldurduğu anketlerle toplanmaktadır.Veriler, olasılıksız örnekleme kullanılarak, niceliksel cevaplar elde etmek için hesaplamalar ve tahminler yapılmıştır. Araştırma ayrıca kimya sanayisinin atmosferdeki karbon izlerinin sayısına nasıl katkıda bulunduğuna da dikkat çekiyor. Kimyasal organizasyonların mallarının üretiminin zararlı etkilerini en aza indirgemek için karbon ayak izi ölçüm birimleri alınarak malların ne kadar uyumlu ürettildiklerini bulur. Çalışma, soruna olası çözümler üreten ve karbon ayak izlerini en aza indirmenin yollarını bulan genel bir şekilde arama ve veri tahminlerini sonuçlandırıyor.

Anahtar Kelimeler: Yeşil Pazarlama; Karbon Ayak İzleri; GHG (Green Housegass); Sektörler; Biyoteknoloji;

Introductinon

The problem discussion of the thesis includes the effect of green marketing on the environment. Furthermore, how chemical industries are offering their services to protect environment. Carbon footprints, according to global researches are increasing so the problem increases side by side. The thesis therefore tends to give answers related to such problems caused due to chemical industries.

Green marketing is now becoming topic of great importance due to deterioration of atmosphere and increasing emulsion of greenhouses gases. Chemical industries have been doing green marketing to follow green policies. A number of opportunities are available for the reduction of emissions from this sector. There are around 71 such chemicals found, that contribute to 95% of emissions from chemical industries. The exact/actual amount by which emissions are to be reduced is unknown up till now.

Purpose of the report is to view green marketing and its relation with carbon footprints in chemical industry. The article further talks about purchase of chemicals using eco-friendly techniques. This study may have a vital influence over the readers since two significant practices are inter-linked with each other i.e green marketing and carbon footprints.

The purpose of this study is to identify factors that influence the chemical industries and its customers to buy environment friendly products. The study was to analyze the identified factors from the customers' view that ultimately led them to think in different way. The study focus on few phases and aspects of factors that have influenced the chemical industries and customers to change the style of selling and purchasing. The study also include customers point of view and less focus on sellers' view as it has always remained easier to know customers' view rather than sellers' view. Social sites were largely used to answer the questionnaire. Therefore, people of different regions could submit their responses. Wide variety of products could not be analyzed separately due to a large number of them. However, focus was laid down on basic and essential chemical products though out the study.

1. Effectiveness of Green Marketing in Chemical Industries

Eco-labels act as an essential tool in green marketing which have an ultimate effects on the behavioral activities of the chemical industries. This is a significant step taken by the

chemical industries to highlight the eco-labels on their chemical products. Eco labels show all preferences regarding the environment along with the range of the products. Hence, eco-labels are defined over the products which claim that they have been designed to ensure the safety of our environment. Certain standards have been followed by the company to ensure environmental security. Eco-labels are very important for chemical products like cosmetics, medicines, detergents and pesticides, some raw chemicals ensure that they create less harm to environment and cause minimal carbon footprints in the environment.

Eco-Management is the collection of crucial eco-activities taking place within the management levels of the companies. Eco marketing cannot be known as sustainable in an ecological or economical way if it lacks in eco-management. So it is how important an eco-marketing is. The positive image of a company may easily face a problematic decline if it takes risk of inappropriate, inconsistent, false and inaccurate green marketing management. Hence, eco-marketing and management largely depends on each other and shows the link between company and its products, especially in the case of chemical companies.

Green chemical are manufactured by utilizing environment friendly resources which are sustainable. Product's life span is taken into account along with the consideration of preservation of planet. Eco-friendly productions requires eco-friendly resources at all stages of production; from management to obtaining raw materials, producing chemical products, designing and packaging and distribution to the market.

2. Chemical Industries and reduction in Carbon Footprints

Chemicals are important for the modernization and healthy living standards. At the same time they are essential to deliver less carbon economy. Industries are constantly reducing their GHG emissions. At the same time these industries help out others to reduce carbon emissions from their functions. Many solutions have been produced till now.

The chemical products allow the living standards to get modernized. These products include huge range of goods, starting from computers to fuels, detergents, cleaners, cars, clothes, bulbs, raw materials and construction materials. Global chemical industry has already been found to choose a good track to minimize the GHG emissions from its

sector. In addition to this, it is working to bring more improvements in this department. Chemical energy efficiency has been reported to have a decrease of around 30% in last 20 years' time period. Further researches shows that some known chemical industries usually save 2 tons of GHG emissions for every ton of GHG emitted. If these savings were not made, then world could have faced 11% more greenhouse gas emissions during 2005.

Future utilization of these chemical resources would lead to greening the economy and initialize another percentage of decrease in carbon footprints. According to researches, if global framework policies will be followed, then there will be increase in GHG emission saving. This increase will be around 4 tons for each ton of emission from the chemical industry.

They are more efficient device that act as solar panels. These components are valuable since they become a source for production of renewable industries. In addition to this, they save up to 100 million tons of GHG emissions. Insulator foams are yet another product of chemical industries that allow to reduce carbon emissions from the buildings. They help to save up to 2300 million tons of carbon emissions. This is a huge amount to be considered. Fluorescents lamps are excessively in use today. They have replaced past technological bulbs and lamps and have proven themselves as more efficient. Fluorescents bulbs save up to 700 million tons to carbon emissions. Fertilizers, in a similar way, help to reduce devastations of crops. They increase fertility of the land. They save up to 1600 tons of carbon emissions. These values are represented in the able below:

Chemical Industries' Products	GHG emission savings (million)
Chemical components for vehicles	230
Rotor blades for wind turbines	100
Insulation foams for buildings	2400
Fluorescents lamps	700
Chemical Fertilizers	1600

It is predicted that by 2030, the demand for chemical products will be increased globally. If global agreements are not made, then tremendous carbon emissions will be faced by

the world. The carbon emissions will be doubled. The carbon emissions are ultimately not reduced but are leaked somewhere else. There are improvements made in the sector of chemical industries. All economies are taking measures to minimize carbon footprints. This even cost them too much. Such expensive processes are carbon capture and storage and many more.

3. Industrial Biotechnology

Industrial biotechnology is considered as an effective solution for changes occurring in environment. After the excessive industrial revolution, there has been growth in negative impacts over the environment. Emerging technology breaks down the potential of resource consumption. This is a great challenge that motivate people to re think over traditional methods. In such circumstances, industrial biotechnology provides choices for performances of chemical industries. They could improve their economy and at the same time save energy and decrease production of waste. Carbon dioxide can be reduced its emissions can be reduced, and energy could be saved through biotechnology. Several studies have been conducted in regard of impacts of industrial biotechnology over the chemical industries to help stabilize the climatic changes. For example the OECD report and EuropaBio report of year 2009. They demonstrate the impact of biotechnology on the climatic changes and sustainability. Industrial biotechnology helps to prevent 33 million tones carbon dioxide every year with the help of different kinds of applications.

3.1 Industrial Biotechnology and Bio-based & Greening economy

Industrial biotechnology is also termed as white biotechnology. Enzymes and microbes are used to produce bio-based products. These bio-based products are diverse in a similar way like chemicals, detergents. Effluents, agricultural products and organic waste materials are transferred into other materials. Similarly, crude oil is an essential raw material for the manufacturing of chemicals.

Heavy manufacturing processes in chemical industries use fossil fuels in huge amounts. This consumption releases extensive amounts of carbon emissions. In contrast to it, in bio based production, use of fossil fuels is minimized. Hence, in other words, biotechnology makes promise of preventing fossil fuel resources as raw materials. However, in some situations, it competes with edible feedstock. In order to give a solution to this problem,

second generation bio-fuels have been introduced. Non-edible biomass has been used for the this purpose. It acts as a feedstock. In addition to this, various intermediate products come across the chains. They consequently increases the complexity during the process of examination of biotechnological products.

It is not sufficient to produce products using biotechnology. Besides this production, products' quality and capacity, quantity and market share, all have to be improved and innovations are needed to be made always. Sugar resources often result in building blocks of chemicals. These platforms are illustrated in the figure below:

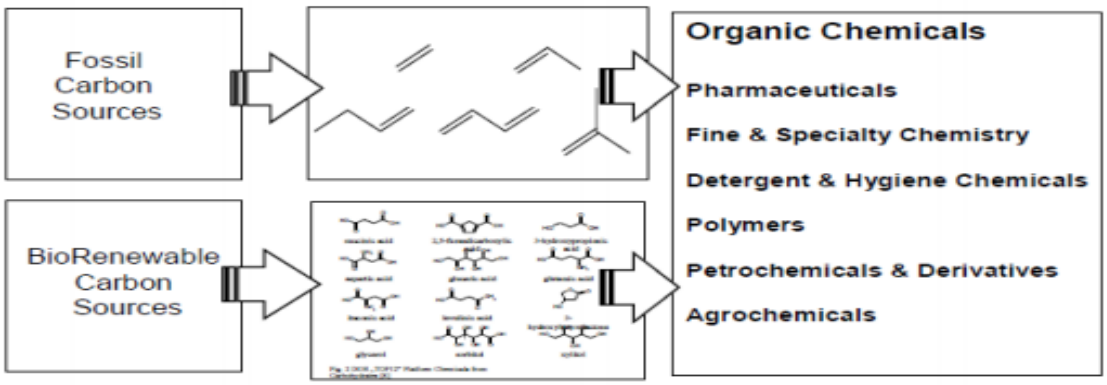


Fig 10: Biological intermediates substituting building blocks of petroleum, (M. Kircher, OECD Workshop on "Outlook on Industrial Biotechnology", 2010).

The combinations of biology and chemistry applications creates the grounds that develop further new applications of this field. As an example, suppose that a certain area is a field of biopolymers. It is expected that sugar consumption is increasing. Hence, there will be a leading competition between bio-chemicals and biofuel industry. It is better for biotechnology not to compete with biomass for manufacturing of food.

3.2 Biotechnology putting impact over the climatic changes and carbon footprint

Climate changes can put dangerous impacts on the weather conditions all over the world. Landscapes could be ruined. There could be extreme disorders in the processes of agriculture all around the world. Moreover, climatic changes can increase the scarcity of valuable resources like fresh drinking water.

In has been proven that biotechnology is vital for decrease in carbon footprints. Novozymes, whether they are branded or not, are a cause of carbon footprints, emitting 1

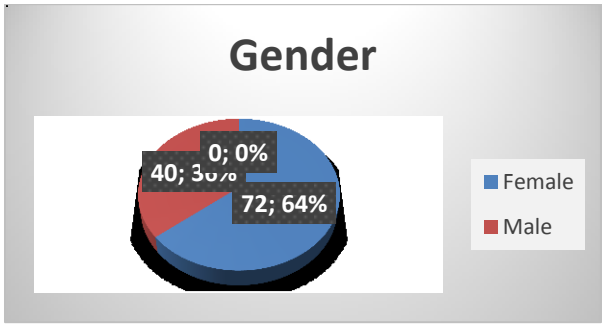
million tones of carbon dioxide during the functions of production. But at the same time, it helps to save 28 million tones of emissions. Hence, very huge emissions have been saved with the help of enzymes during the functions and activities of manufacturing. Consequently, a good, positive balance sheet of environment and climate can be obtained with the passage of time. According to some studies, it has been revealed that biotechnologies holds potential to reduce carbon footprints up to 1 million tones annually. Many products that were manufactured under the influence of biotechnology, are in excessive use today. They are fulfilling our requirements in an effective and sustainable way. Whether the products are fabrics, detergents or chemicals or any other domestic chemical product, the compromises on future are not made using these products if biotechnology has been used. The enhancements in bio-fuels ensures the safety of environment in future, free of carbon footprints. However, efforts and resources, time and capacity is required to develop products under biotechnology. Lesser carbon fuels address the problem of environmental instability. The topic of major sectors of chemical industries are capable of reducing cost and avoid greenhouse effects, is still indisputable. Steam energy is usually used to carry out the processes of synthesizing chemicals. Processes of fermentation require electrical energy. As compared to the chemical processes, electrical energy using processes are more sustainable and saves energy on fossil fuels and non renewable resources. This way volatile organic compounds are also used in less amounts.

4. Data Analysis and Findings

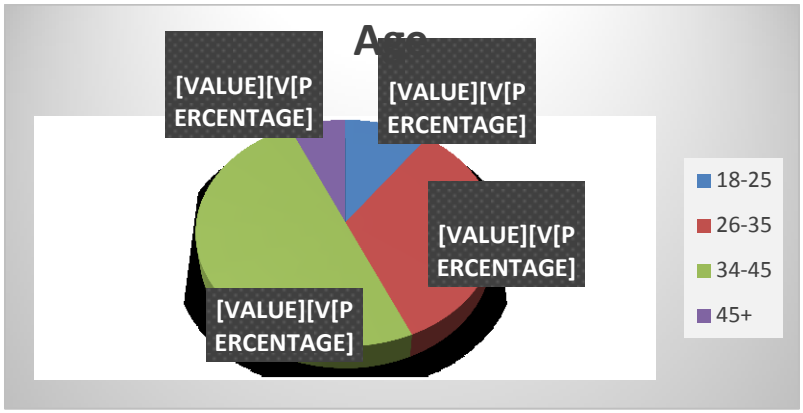
This section reveals the findings and data analysis performed over the survey questionnaire. Questionnaire has been an essential tool for our article (Appendix p.20). It provided us the book compiling views of public and consumers of different status, gender and age. Hence, data analysis performed throughout the research has been shown in the following section.

4.1. Demographic Analysis

120 valid responses have been collected upon which analysis is performed. Number of females participated in questionnaire is greater than those of males. Survey was filled in by 64% females and 36% males as shown in figure below:

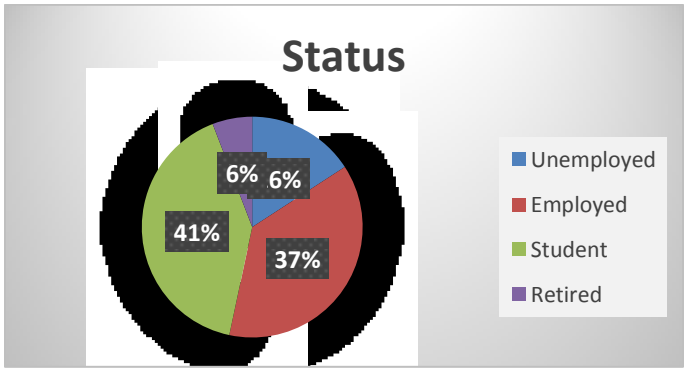


Second demographic question was age of respondents. People of age 26-35 and 36-45 tend to participate more than the people of other age groups. Restriction was applied that people of age less than 18 were not permitted to fill in the questionnaire. The graph below shows the trends of answers of this question:



As shown in the figure above, 10% of the respondents were of age 18-25. 33% of the respondents were of age 26-35. 50% of the respondents were of age 34-45. 7% of respondents were of age 45 plus.

Third question was regarding the status of respondents. Results are shown in diagram below:



The results show that 6% of the respondents were Unemployed. 37% of the respondents were employed. 41% of the respondents were students. 6% of the respondents were retired.

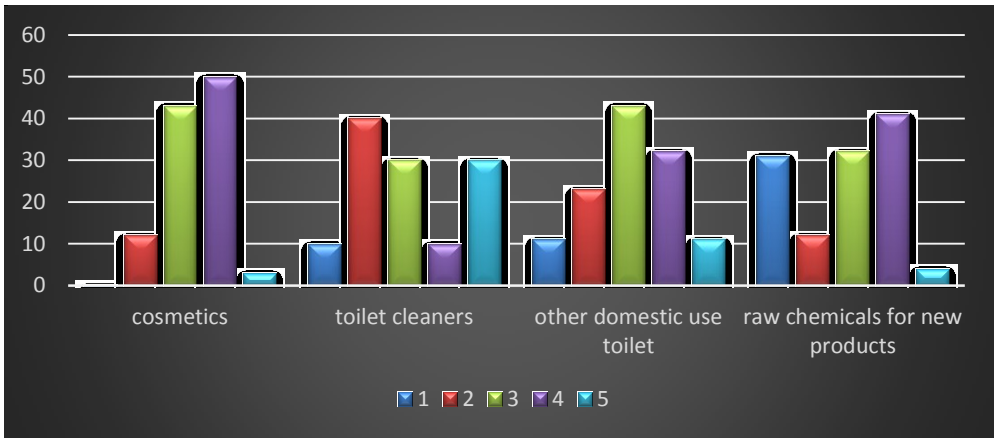
4.2. Analysis on Lifestyle Measure

The section 1 of the questionnaire demonstrates the lifestyle of the public as a whole. How often do they buy products and what kind of chemical products they buy is discussed in this section.

Question 1: How many times (or how often) have you bought chemical products in last 4 months?

Result are shown us, 66% of the respondents buy chemical products at least once a week. 34% of the respondents buy chemical products at least once a month.

Question 2: There are several types of eco-friendly chemical products which you might have bought in last 4 months. According to scale from 1 to 5, mark to what extent you purchased eco-friendly chemical products in last 4 months?



The graph shows the trends how excessively the consumers buy chemical products. Cosmetics, toilet cleaners, domestic use chemical products and raw chemicals are all used on daily basis by a number of people.

4.3. Measure of Perception about Green Marketing and Consumption of Chemical Products

Section 2 of the survey questionnaire demonstrated the perception of the people regarding green marketing and their consumption of chemical products side by side with green marketing. Answers are marked by the respondents according to the extent to which they agree or disagree to the statements being questioned from them. Give below are the questions and analysis performed on them.

Question 1: Green marketing is good for environment.

Result show us: 1% strongly disagree, 1% disagree, 13% neutral, 21% agree and 79% strongly agree.

Question 2: You use paper bags rather than plastic bags?

Result show us: 7% strongly disagree, 13% disagree, 40% neutral, 22% agree and 28% strongly agree.

Question 3: You have intense use of PVC (Polyvinyl Chloride).

Result show us: 46% strongly disagree, 41% disagree, 5% neutral, 4% agree and 4% strongly agree.

Question 4: Green Marketing promotes better quality chemical products than conventional products.

Result show us: 5% strongly disagree, 5% disagree, 28% neutral, 22% agree, 50% strongly agree.

Question 5: Eco-friendly chemical products have reasonable price.

Result show us: 11% strongly disagree, 29% disagree, 5% neutral, 25% agree, 30% strongly agree.

Question 6: You read eco-labels before buying chemicals like carpet cleaners, detergents etc.

Result show us: 13% strongly disagree, 27% agree, 6% neutral, 24% agree, 30% strongly disagree.

Question 7: You prefer to buy eco-friendly food items and cosmetics even if you have to make compromise on your health and skin.

Result show us: 37% of the respondents strongly disagree, 33% disagree, 25% neutral, 5% agree and 0% of the respondents strongly agree.

Question 8: Not only industries, but public is also responsible for increasing carbon footprint in atmosphere.

Result show us: 22% of the respondents strongly disagree, 19% disagree, 13% neutral, 26% agree and 20% of the respondents strongly agree.

4.4. Analysis on Attitude

Section 3 of the survey is named as Attitude Measure. This section helps to demonstrate the attitude and behavior of consumers of chemical products regarding green marketing. This section further show concerns of our respondents towards the carbon footprint, eco-friendly chemicals and their advertisements. Detail is given below.

First of all, respondents were asked whether they appreciate green marketing or not. All the respondents i.e. 120 (100%) respondents gave answer into "YES", they appreciate green marketing. None (0%) of the respondents gave answer of "NO".

In a similar way, respondents were asked would they be ready to pay a premium price (for example +10%) for green marketing products. Responses were collected. 72% respondents gave answer into "YES" while 28% respondents gave answer into "NO".

Last question of this section was whether the respondent was very much concern about the carbon footprints in environment. 89% of the respondents gave answer into "YES" while 11% of the respondents gave answer into "NO".

4.5. Analysis for Reasons of Purchase

In the section 4 of the questionnaire, respondents were collectively asked that why would they prefer to purchase green marketing chemical products. The options set were strongly disagree, disagree, neutral, agree and strongly so as to check the strength of each reason of purchase of green products.

Reason 1: They have created their good image.

Green marketing chemical products have created their good image: 2% of the respondents strongly disagree, 4% disagree, 24% neutral, 22% agree and 48% strongly disagree.

Reason 2: I think chemicals are a HUGE cause of carbon footprints in atmosphere and I want the planet to be preserved.

Respondents think chemicals are a huge cause of carbon footprints in atmosphere and they want the planet to be preserved: 0% strongly disagree, 0% disagree, 10% neutral, 30% agree, 60% strongly agree.

Reason 3: It is unplanned.

It is unplanned: 58% of the respondents strongly disagree, 25% disagree, 2% neutral, 10% agree and 5% strongly agree.

The results for last 2 conclusive questions are estimated and shown below:

Variable	Mean	St.Dev	Variance	Sum	Minimum	Maximum	Mode
Rate (out of 10) how successful you find green marketing of chemicals in fulfilling your desired requirements.	7.84	2.12	4.48	927	2	10	7
Rate (out of 10) to what extent you find green marketing chemical products successful in preserving environment.	8.4	1.69	2.87	913	1	10	6,8

Table 2: Results of two conclusive questions.

Conclusion

The study has gone through many aspects of green marketing and its connection with reduction of carbon footprints in chemical industries. Chemical industries manufactures different products like toilet cleaners, carpet cleaners, cosmetics, detergents and raw materials for other products. Sustainability of Earth is a great topic under discussion globally. To promote sustainability, green marketing is essential. It is playing significant role in promoting sustainability of Earth. Various types of chemicals have various uses. Survey questionnaire revealed that consumers purchase chemical products on regular basis. They are also very much concerned about the preservation of planet and normalization of Earth. This is the reason why they purchase green marketing chemical products.

Analysis show how much people influenced from advertisements, displays and marketing of green chemicals. All these factors help them to formulate their purchasing decisions. Therefore, managers of chemical departments should focus on these areas and bring innovations in strategies of marketing and promotion of green marketing chemical products.

Increase in carbon footprints has remained the matter of concern. Hence, chemical industries should follow such strategies, that promote sustainability and decrease carbon emulsions which occur on daily basis due to these industries. This way they will achieve their customers' satisfaction and support.

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Appendix

Survey Questionnaire

Regarding: Green Marketing and Carbon Footprints in Chemical Industries.

Thank you for your time. It will hardly take 5 minutes to fill in this questionnaire based upon your consumption of chemical products especially that are eco-friendly.

Section 1: Lifestyle Measure

Questions are based upon your consumption of chemical products in routine.

1) How many times (or how often) have you bought chemical products in last 4 months?
    - At least once a week
    - At least once a month

2) There are several types of eco-friendly chemical products which you might have bought in last 4 months. According to scale from 1 to 5, mark to what extent you purchased eco-friendly chemical products in last 4 months?

	Lesser purchased			more purchased
	1	2	3	4	5
Cosmetics					
Toilet Cleaners					
Other domestic use chemicals					
Raw chemicals for new products					

Section 2: Measure of your perception about green marketing and consumption of chemical products

Mark according to the extent to which you agree or disagree to the following statements regarding green marketing.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Green marketing is good for environment.	1	2	3	4	5
You use paper bags rather than plastic bags.	1	2	3	4	5
You have intense use of PVC (Polyvinyl Chloride).	1	2	3	4	5
Green Marketing promotes better quality chemical products than conventional products.	1	2	3	4	5
Eco-friendly chemical products have reasonable price.	1	2	3	4	5
You read eco-labels before buying chemicals like carpet cleaners, detergents etc.	1	2	3	4	5
You prefer to buy eco-friendly food items and cosmetics even if you have to make compromise on your health and skin.	1	2	3	4	5
Not only industries, but public is also responsible for increasing carbon footprint in atmosphere.	1	2	3	4	5

Section 3: Attitude Measure

1) I appreciate green marketing.
    - Yes
    - No
2) I am ready to pay a premium price (for example +10%) for green marketing product.
    - Yes

- No

3) I am very much concern about carbon footprints in environment.
   - Yes
   - No

Section 4: Why would you prefer to purchase green marketing chemical products?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
They have created their good image.	1	2	3	4	5
I think chemicals are a HUGE cause of carbon footprints in atmosphere and I want the planet to be preserved.	1	2	3	4	5
It is unplanned.	1	2	3	4	5

Rate (out of 10) how successful you find green marketing of chemicals in fulfilling your desired requirements.	Rate (out of 10) to what extent you find green marketing chemical products successful in preserving environment.

Section 5: Demographics:

1) Select gender:
   - Male
   - Female
2) Select age:
   - 18-25
   - 26-35
   - 35-45
   - Greater than 45
3) Select status
   - Unemployed
   - Employed

- Student
- Retired