



# Master Thesis in Business Administration

2<sup>nd</sup> June 2008

## Title: Cleantech Industry; Heresy in Industrial Categorization

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### Abstract

The following research will have a look on business links between cleantech industry's categories. Apparently there are eleven sub-industries within the cleantech industry. The research looks at different companies in these sub-industries and figures out how they are related. The relations would be buyer and seller relationships. A number of 20 companies from Swedish cleantech industry have been selected for this purpose. For each company products have been studied to allocate the company in one of the eleven sub-industry of cleantech industry. The customers for each company were needed to know where these clean products are consumed. Also for each customer the proper class in cleantech industry should be designated. In the conclusion, the links between the eleven sub-industries of cleantech industries are recognized and remarkable points are pointed out.

## **Acknowledgement**

By the end of our education in MDH we found it necessary to thank all the people who helped us and made effort to prepare a suitable ground for academic improvements. From all the university officials to personnel in helpdesk who from the first day did a lot to all international students.

Nevertheless we see our obligation to pay tribute to all people who helped us in the course of writing the final thesis. Peter Dahlin as tutor, our group mates and companies have all contributed with their valuable comments and instructions.

We hope the research done could prove to be useful for the companies, students and all other people who may be interested in it.

Authors,

May 2008

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## 1 Introduction

The concept of cleantech poses differences with the traditional terms environmental technology or "green tech" popularized in the 1970's and 80's. Genentech or Envirotech represents highly strict and regulated technology which had limited promises for attractive returns, but cleantech is offering bright financial landscape and is in line with market economics (Cleantech defined, 2008).

The basic need of the Cleantech (Clean Technology) is to use technology to reduce pollution, waste and the use of natural resources to provide products and services that compete favorably on price and performance compared to other products that are manufactured without the cleantech concept. This term (cleantech) covers a broad horizon from industries that generate energy to wastewater treatment to environmentally sensitive consumer products (James Stack 2007, p.6).

The area of cleantech especially wind power, solar power and air pollution control equipment have long pedigrees boasting research worth billions of dollars and hundreds of successful companies.

The eleven cleantech categories (areas) are defined below (James Stack 2007, p.6):

- Energy Generation
- Energy Storage
- Energy Infrastructure
- Energy Efficiency
- Transportation
- Water & Wastewater
- Air & Environment
- Materials
- Manufacturing/Industrial
- Agriculture
- Recycling & Waste

Companies active in these categories may not always market themselves specifically as “cleantech,” and investors who place capital into these firms likewise may not necessarily consider themselves to be “cleantech” investors. For example Alcasol Nordic Ltd located in Västerås, Sweden offers a broad assortment of high-quality products for heating and energy reserves. This firm can be placed under the category of energy generation area of the Cleantech Industry, although it has not been mentioned clearly in its scope.

Cleantech – also known as “clean technology” or “green tech” – is an industry whose phenomenal growth in the last three years has captured the attention of investors, the media, and policymakers alike. In 2006 in Europe around 680 million dollars in venture capital were invested in Cleantech Industry (James Stack 2007, p.19). But 2006 belonged to the U.S., as its 88 percent growth over 2005 far outpaced the performances of Canada (which grew by a comparatively modest 37 percent last year) and Europe (which actually saw a 20 percent decline in investment) (James Stack 2007, p.18).

Some influencing factors for the investment in cleantech industry could be high energy prices, growing public awareness and global warming etc (James Stack 2007, p.24).

As could be understood from the above distribution of the CTI, it could incorporate a wide variety of sub-industries (waste management, recycling technologies, biofuels and etc). Therefore the authors have become curious about how the connection between all sub-industries could be formed and in which sub-industries the connections are stronger.

## 2 Problem Statement

As could be understood from the introduction segment, companies' activity in the cleantech industry may not always be obviously stated in their scope. It has been always a discussion between cleantech specialists on how to measure business relationships within the cleantech industries (cleantech forum 2008). Apparently there has been criterion defined for each cleantech area to classify the business transactions within them.

The products and services developed in the cleantech industry may be consumed in other industrial sectors or within the cleantech industry. The question here lies on the ground that how the eleven categories of CTI (Cleantech Industry) are related to each other or how are products and services exchanged between the companies in the CTI?

## 3 Purpose

The purpose of this study would be to display business links among firms in the sub-industries of cleantech industry.

Business link is meant to be a buyer and seller relationship between firms in the sub-industries of Swedish cleantech industry.

This research will look to the issue of cleantech from 3 angles:

- The eleven sub-industries (categories) of cleantech industry
- Companies in the sub-industries
- Products and Services dealt within these sub-industries

Therefore the research could be useful for:

- companies wishing to invest in green technologies
- CTI companies who would like to understand more about the cleantech by knowing the destination of clean products
- any marketer who is interested in knowing about the green products

Our audiences can use this study as a reference for understanding and getting informed about areas of cleantech industries and how the different products and services are exchanged among companies in the areas.



## 4 Theoretical Framework

A model which could be best suitable for the purpose of our study should contain elements and factors effective in industrial categorization. By studying of models available and literature review it seemed there have been several researches done in order to recognize how industrial sectors are categorized and how business links between companies within these sectors are constituted. Here we would like to describe the most relevant models which have been already researched on and we noticed them while studying the relevant researches.

### **4.1 Business Network View**

The purpose of this model would be to put forward a basis for analyzing the roles of actors (firms) in formation of an industrial network. The main variables classified in the model are actors, resources and activities as discussed by Håkansson (2001, P144). The variables all together form the structure of a network. Considering the intangibility of industrial networks nature this structure could be defined in several ways. From the perspective of actors, an industrial network can be defined as a set of firms which by performing their activities control the resources available in the network. Looking through activities framework, in a network activities are used by actors to transform the resources and finally considering the resources as an axis in analyzing industrial networks, resources are the means which actors manipulate to perform their activities (Håkansson 2001, P.144).

The aim of business networking is to establish mutually beneficial interactions between firms involved. In this process there are no classification done based on the products or services the firms are offering (Business Networking, 2008). The idea of business networking is to go beyond standard and conventional business mindset of just increasing revenue. The crucial matter is to think long term by exchanging business information, ideas and supports (Business Networking, 2008). Nevertheless there should always be in mind that how a firm can be helpful to its potential clients and customers.

Therefore in this view there are no classifications done based on the productions of the firms or the industry that they belong to and every firm is analyzed based on the network of the relationships which it has built.

#### ***4.2 Porter's Industry Model***

Based on Porter's definition of industry every industry consists of a series of firms that offer products or services that can be closely substituted to each other. For example car industry and motorcycle industry. In defining an industry Porter has paid the most focus on product (Defining an Industry, 2008).

All the companies which their products are more or less of the same usage are categorized in the same industry. Maybe that could be considered being a very conventional or outdated model in comparison with the previous model (Industrial Network) but it still has its application in analyzing the profitability and understanding the dynamics of competition structure in an industry (Defining an Industry, 2008).

#### ***4.3 The linking point between Business Network View and Porter Model of Industry***

It is worthy to mention that since interplay between different sectors of industries has been intensified during past decades therefore it is not always easy to draw clear boundaries between different industries. For example usage of IT-based options in automotive industry has increased by more cars using GPS systems or automation control systems used for controlling production machines in factories. In fact in today's industrial world every end-use product is a consequence of collaboration between several industry sectors in their highest level of specialty, for example in automotive industry, lots of efforts have been made towards reducing the weight of the body and at the same time intensifying its strength against impacts. This requirement from the automotive industry claims serious researches and investments in Steel industry and researches in steel industries demand high-tech laboratories which can meter mechanical characteristics of composite materials in precise and

delicate dimensions. Therefore every end-use product can be seen as a consequence of collaboration between a number of industries through sharing their resources and performing activities. Through collaborations between these the actors (firms) in industrial sectors, the final products are produced.

The above example clarifies the necessity of collaborations between firms in different industrial sectors. The collaborations could be best explained by the definition of industrial network as already mentioned. Therefore the relationship between these two views could be explained by the view that although firms are competing with each other in their industry (e.g. car producers ) but today's highly specialized products claims establishment of relationships between firms to exchange idea, support and solutions with each other in a long term basis.

## 5 Method

Based on our research purpose and theoretical framework, the data we are looking for should contain the CTI firms, sub-industry (area of activity in CTI) that the firms belong to, their business links with firms in other sub-industries of the CTI and their products or services which has been purchased within these links.

(As explained in the purpose by business link we mean any buyer-seller relationship which has been occurred between CTI firms).

20 firms had been thought to be suitable to be included in the research. The companies were decided to be Swedish because of accessibility and contractibility.

By doing the literature review about the previous researches in CTI in Sweden useful data have been revealed about business databases which had been used in those researches for identifying the CTI firms. (The Environment Industry in Sweden, 1999)

Some of the major data bases which had been used for identifying Firms were Företagsfakta.se, PAR/Bizbook and Business calendar. By going through the websites we noticed that all of them were in Swedish and the searching options were based on the geographical distribution, products or firms' title. The database's structure could not put forward any reliable and reckonable solution for us to search and to identify the 20 companies that we had decided to include in the research.

Therefore we had to embark on some other way to identify the firms that we would research on. By doing more research about Swedish cleantech industry, asking people involved and aids we received from our tutor we found out that the data base of Swentec, Swedish Environmental Technology Council propose quite reliable resource. In the following part a brief introduction about this database is presented.

### **5.1 Swentec, Swedish Environmental Technology Council**

Swentec, Swedish Environmental Technology Council has been assigned by the Swedish government to improve business opportunities about the cleantech industry. The institute is assigned to assess and map the areas of competence within Sweden cleantech industry. In the website the company has categorized different sectors of cleantech industries and allocated the relevant companies in the categories. There are also reports about the latest news in cleantech industry in Sweden.

### **5.2 Choice of Companies, Primary and Secondary Data Collection**

By studying the abovementioned data base we found out that there are several Swedish companies who are among the leaders in their area of specialty in the cleantech industry. (Swentec Reports 2008). By going through the details of the companies introduced in the Web Site we decided to select at least 10 companies from every sub-industry of CTI and email them to ask for the data we required. But after several days passed and around 150 emails we sent to the companies, we could not get the information we needed, since nearly 90% of the companies did not reply to our emails and among the 10 percent who replied only 4 companies were whose replies were thorough and could really be used. The questions we asked in our emails to companies are presented in the appendix 1.

Consequently we decided to rely on companies' websites in order to get the data we required about them. As a consequence of this decision we thought why not to include the most renown and reputable companies for our research. Finally we hand-selected the 19 companies which were introduced in the website as being leaders in their business and enlisted as Ageratec, Bioprocess Control, ChromoGenics Sweden AB, ClimateWell, Compower AB, Ecoil, Econova, Första Närvärmeverket AB, Läckeby Products, Aerodyn AB, Neova AB, Nilar International AB, Opcon Autorotor AB, Laminova AB, Parans Solar Lighting AB, Scandinavian Biogas Fuels AB, SEKAB, Svensk Rökgasenergi, Arboga-Darenth AB. Hence we included only one of the companies (Ramboll Group) who replied us through email in the research to have the total number of 20 companies for the research.

### 5.3 Findings Presentation

In presenting the data in the finding section we had to decide on the companies' categories in the cleantech industry. As can be seen in the introduction section cleantech industry is divided in to 11 sub-industries. This categorization is in accordance with a thorough research which has been done in the US for measuring the venture capital invested in the cleantech industry, the research is titled as 2007 VENTURE CAPITAL: HOW PUBLIC POLICY HAS STIMULATED PRIVATE INVESTMENT May 2007. In this research which had its roots in the Cleantech Venture Network ([www.cleantech.com](http://www.cleantech.com)), the authors have tracked the acts of investors and pioneers and aggregated that information to create a meaningful picture of the industry (James Stack 2007 P. 6). In the mentioned research the scope of every sub-industry is presented in a thorough and inclusive way. (James Stack 2007, P. 7).

The other cleantech industry classification which we could get access of, is suggested by Swedish Environmental Technology Council, Swentec, who is assigned by the Swedish government to assess, develop the opportunities for environmental and cleantech industry investment in Sweden. (About Swentec, 2008). According to this classification, the cleantech industry is consists of twenty sub-industries which in comparison with the classification of the previously mentioned research in the US, is are more detailed (Business Contacts 2008). Especially in environmental services and consultancy the Swedish database has two separated sub-industry there.

By weighting the two mentioned resources of cleantech industry against each other, it seemed that following the same industry categorization as done in the US research could be viable and acceptable for this research since we had definition and details of every category already available (presented in appendix 2) and at the same time it could cover the wide ranges of industries and companies which we have already chosen for the research.

By taking the advantage of clear definition offered for every sub-industry of CTI in the adopted resource (presented in appendix 2), it would be less crucial to allocate the companies in their corresponding sub-industry. Our approach for classifying the companies would be first to study their areas of activities and then classify them in the proper CTI sub-industry according to their products and areas of activity by referring to the definition offered in the mentioned resource. For example suppose

we would like to study Nilar International AB. By referring to the company website it can be noticed that the company is producing membrane batteries. To designate the proper CTI class for the company we will look at the sub-industries definitions and take the most suitable one who has the most relevance to the company's area of activity. Accordingly the CTI sub-industry of energy storage seems suitable for Nilar International AB. Although there is possibility of a company could be classified in two or more classes. In that case the focal company would be analyzed considering all the sub-industries that it belongs to. For example if a company may be found active in both waste management and water treatment, both sub-industries would be considered while analyzing the data about the companies, however with separated customers for each sub-industry.

The same approach is considered for customers listed in the customers' area. In case there may be cases which a company's activity is not covered in the cleantech definition area, we try to use other resources or self justifications for categorizing the focal company.

#### **5.4 Analysis Method**

In the analysis section the data obtained from studying the companies activities in the CTI and their products and customers will be analyzed and presented in the meaningful way to lead us to reach the purpose of the study. The data collected would be looked and organized from the perspective of every sub-industry of CTI and the links to the other sub-industries will be counted and depicted in a web-shaped order. The number of companies in each sub-industry and the number of their customers in other sub-industries are factors which will determine the density of links among sub-industries. Although we have selected 20 companies and our preliminary idea was to obtain the information of at least 5 customers for every company, but this could not be possible because of the above-mentioned reasons.

In the case that a focal company's activity overlaps in more than classes of CTI, the company would be analyzed considering all the sub-industries that it belongs to, however with separated customers for each sub-industry.





## 6 Finding

In the finding part of the research the data about every 20 company is presented in tables. The table has 4 columns. As it can be seen in figure 3, the first column from left designates companies' field of activity in the Cleantech Industry (CTI) which is colored in green for the company under discussion. For example if a company is producing biofuels the sub-industry of *energy generation* in the cleantech industry list will be marked in a green demonstrating that the company will be categorized in this category of CTI.

The second column is the companies' products which will be placed in green arrows pointing to the customers' sub-industry (third column). For example if a company is selling biofuel processor to a car manufacturer firm (customer), the green arrow containing the product title will be placed behind the transportation sub-industry in the CTI list in the 3<sup>rd</sup> column.

And finally the forth column of the tables will contain customers' title or area of activity (For the companies which we could not get access to their customer's title).

CTI	Products	Customers <u>CTI Category</u>	Customer Title Or Area Of ACTIVITY
Energy Generation		Energy Generation	
Energy Storage		Energy Storage	
Energy Infrastructure		Energy Infrastructure	
Energy Efficiency		Energy Efficiency	
Transportation	Biodiesel Processors	Transportation	Perth, Australia Romania
Water & Wastewater		Water & Wastewater	
Air &		Air & Environment	

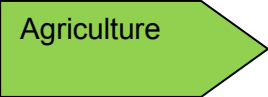
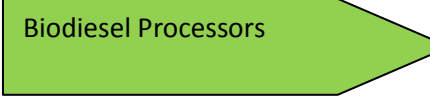

Fig.3 sample of tables in the finding

An important matter which needs to be think of, is that since in the finding collection we noticed that there are lots of products from cleantech companies under research has been targeted toward *construction industry and developers*. Unfortunately in the resources we used for the research there could not be any clue on how to classify them in within the CTI. And from the other side we should have included these sorts of links in the research as well. Therefore we thought maybe it could be best to categorize the mentioned customers in the manufacturing and industrial class (CTI9) in the CTI.

## Firm No. 1 Ageratec

The company is active in the field biodiesel which is a subsidiary of biofuels. The company produces biodiesel processor machines in several different scales and dimensions which use animal and plant fats as the raw material, therefore it looks acceptable to categorize the company in the agricultural class (Ageratec n.d.).

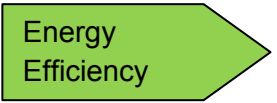
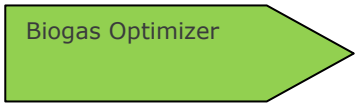
According to the company website the company has had exports to different companies around the globe such as Australia and Romania (Ageratec n.d.). The two company were active in the field of transportation have been categorized in the transportation sub-industry since they have been active as vehicle production and were considering biofuel as an alternative to ordinary fuels. The other two customer (Tvären Gård Skeby Energy and a company in Barcelona Spain) mentioned in the finding section are active in the field of agriculture and planting (Ageratec n.d.).

CTI	Products	Customers  CTI Category	Customer Title Or  Area Of Activity
		Transportation	.Perth, Australia .Romania
		Agriculture	. Tvären Gård . Skeby Energy . Barcelona, Spain

**Firm No. 2 Bioprocess Control**

The company is producing Biogas Control units. The units are used to minimize the wastes and leftovers of the biogas producing machines. The units are designed in a way which can automatically control the process of producing biogas hence will significantly improve productivity and biogas output. Therefore it seems proper to classify the company under energy efficiency field of cleantech industry.

As it can be seen in the finding section the customers are companies which are engaged in biogas production and we could manage to get to know 2 of them which are Swedish Biogas International and Simbiente – Environmental and both of these companies obviously can be put in the energy generation field (Bioprocess Control n.d.).

CTI	Products	Customers	Customer Title Or Area Of Activity
		Energy Generation	.Swedish Biogas International .Simbiente - Environmental

**Firm No. 3 ChromoGenics Sweden AB**

ChromoGenics is a company which is one of the world leaders in development and manufacturing of products based on electrochromic (ChromoGenics n.d.). The technology enables the production of plastic foils with throughputs of light that can be changed by an electrical voltage (ChromoGenics n.d). These products can be used as an alternative for regular windows in order to regulate the amount of light inside the buildings and also for any light sensitive application like visor for motorcycle helmets.

The customers which we could access were through the company website were IHT Technology as a producer of helmet in the United States and Volvo Technology Transfer which is a by-company of Volvo who invested in ChromoGenics Projects (ChromoGenics n.d).

As can be inferred the products can be vastly used in construction industry as a unit which will optimize energy consumption while regulating the sun light inlet.

CTI	Products	Customers	Customer Title Or Area Of Activity
Materials	electrochromic materials	Energy Efficiency	.property and construction industry are main customers
	electrochromic materials	Transportation	.IHT Technology
	electrochromic materials	Manufacturing/Industrial	.Volvo Technology Transfer

**Firm No. 4 ClimateWell**

ClimateWell AB is a supplier of highly efficient solar air conditioner equipment (ClimateWell n.d.). The systems produced in this firm use solar energy as the only energy supply for providing hot water and cold water which can both be used for heating and cleaning during winter and cooling during the summer. Therefore it could be viable to categorize the company under the under both Air & Environment and Energy Generation sub-industries of cleantech industries.

Based on the information provided in the company website it could obviously inferred that the customers are in the mostly the property developers and construction industry. Therefore the customers would be categorized under Manufacturing/Industrial.

CTI	Products	Customers	Customer Title Or Area Of Activity
Energy Generation	Solar air conditioners, hot and cold water	Manufacturing/Industrial	.Construction industry or Developers

**Firm No. 5 Compower AB**

Compower is a company who produces boilers as its main products (Compower AB n.d.). The boilers are vastly used in several industries such as power plants, construction, ship buildings and for domestic applications like the buildings. The boilers are considered being environmentally friendly because of a low noise level and low energy costs and lower emissions of such gases as carbon dioxide. Therefore it can be best suitable for the company to be categorized under energy efficiency sub classes.

Unfortunately we could not get access to the name, but as it has been clarified in the company homepage municipalities in Sweden have been the main customers since they have been responsible for providing the domestic hot water for public usage. Accordingly we thought it would be viable to put the customers under Manufacturing and Industrial section of the cleantech industry.

CTI	Products	Customers	Customer Title Or Area Of Activity
Energy Efficiency	Energy Efficient Boilers	Energy Generation	.Bio Fuel Producers
	Energy Efficiency boilers	Manufacturing/Industrial	.Power stations .Developers

**Firm No. 6 Ecoil**

This company is active in the field of biofuel production and animal meal (Ecoil n.d.). The best category for the company according to the definition would be agricultural class. But there are no data available about the company customers. Based on the similar companies in this class it seems that agriculture would be a destination for the company’s products.

CTI	Products	Customers	Customer Title Or Area Of Activity
Agriculture	Biofuel	Energy Generation	
	Protein Meal for cows	Agriculture	



## Firm No. 7 Econova

The company comprises of two related business areas. Econova Energy (Econova n.d.) utilizes and process waste and by-products from society and the forest industry. *Econova Garden* (Econova n.d.) produces and sells environmentally friendly garden products. Therefore we can categorize the company in two different fields of the cleantech industry i.e. Agriculture and Recycling & Waste.

The Customers of the company are mainly agricultural companies who need to improve their land and product quality as well as forest, paper and mill industry (Econova n.d.). So, it can be practical to put the customers in Agriculture of the cleantech industry.

CTI	Products	Customers	Customer Title Or Area Of Activity
Agriculture	soil, compost and garden products	Agriculture	.soil compost and garden products
Recycling & Waste			

**Firm No. 8 Första Närvärmeverket AB**

Första Närvärmeverket is active in the field of renewable energies in general (FNV n.d.). As stated in the company websites the company would try to design and provide solutions for heating, cooling and ventilation while utilizing green energies like solar instead of traditional fossil fuels. Therefore it could be acceptable to categorize the company in Air & Environment and energy generation at the same time.

In the homepages of the company there are several companies mentioned as the references (FNV n.d.). In general mostly the construction and property developers of different kind are the main suppliers like sport centers, residential buildings. And two other industrial firms like Rawsbury AB and PEFAB are also mentioned as industrial customers.

CTI	Products	Customers	Customer Title Or Area Of Activity
Air & Environment	Sustainable Heating, Cooling, ventilation	Manufacturing/Industrial	.Specialfastigheter AB .SALK Tennis AB .Rawsbury AB .PEFAB

**Firm No. 9 Läckeby Products**

Läckeby Products is an off spring of Läckeby Water Group, an independent, privately-owned group, which offers contracting, products and servicing for water treatment and biogas production (Läckeby n.d.). Läckeby Products develops solutions for mechanical treatment of water and sludge. Läckeby Products designs, manufactures and markets a broad range of products for treatment of wastewater, drinking water and process water, as well as the treatment of sludge. Correspondingly we believe the company can be classified in the Water & Wastewater as well as Energy Generation classes.


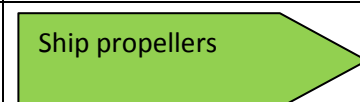
The company customers are located both inside Sweden and abroad (Läckeby n.d.). It cooperates in several projects with National Water Supply and Drainage Board” in Colombo, Sri Lanka, Veolia Water AB in Sweden and another Swedish company called Syvab. As it is obvious the customers are also active in water treatment field.

CTI	Products	Customers	Customer Title Or Area Of Activity
Energy Generation	biogas production	Energy Efficiency	.Syvab .WSP
Water & Wastewater	water treatment	Water & Wastewater	.National Water Supply and Drainage Board” in Colombo, Sri Lanka .Veolia Water AB

**Firm No. 10 Aerodyn AB**

Aerodyne AB is producing ship propeller for shipbuilding companies. The company is located in Karlskoga in Sweden and is a subsidiary of Morphic AB. The company can be put under transportation segment of the cleantech industry (Aerodyn AB n.d.).

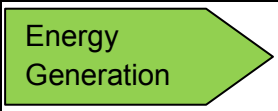
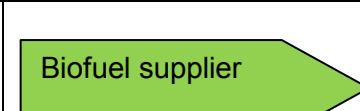
The main customers as stated in the company websites are Rolls Royce, MAN and Berg propulsion all are active in the field of ships and vessels construction (Aerodyn AB n.d.). Therefore it may sound optimal to categorize them under the Transportation class in cleantech industry.

CTI	Products	Customers	Customer Title Or Area Of Activity
		Transportation	.Rolls Royce .MAN .Berg propulsion

**Firm No. 11 Neova AB**

Nevoa is a biofuel supplier. It provides ranges of natural and bio energy fuels (Nevoa n.d.). The company has also closed collaborations with several Swedish research institutes in the fields of energy and cultivation. The company is also producing garden peat, energy peat and wood pallets. Thus we can classify the company under in the category energy generation field.

As stated in the company homepage it can be inferred that the main customers are homeowners, property owners as well as municipalities. And it is though that they can be categorized in the air and environment segment of cleantech industry.

CTI	Products	Customers	Customer Title Or Area Of Activity
		Air & Environment	.Heating and power plants .Private district heating plants

**Firm No. 12 Nilar International AB**

The Nilar team of engineers is highly experienced in industrial and military *battery* development (Nilar International AB n.d.). Nilar has developed the patented Membrane Technology that has enabled performance breakthroughs surpassing the standard Nickel Metal Hydride chemistry in terms of power density, weight, and volume. Therefore it may look viable to categorize the company in the energy storage section of cleantech industry.

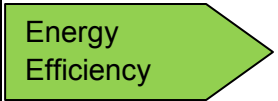
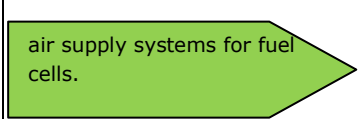
The two company customers that we could get access of them through the company website are Plug-In Conversions Corporation and Cal Cars PHEV Conversions (Nilar International AB n.d.). Both of the companies seem to be active in fields of electronic vehicles. Therefore it clearly signals to classify them under the transportation class in cleantech industry sub industries.

CTI	Products	Customers	Customer Title Or Area Of Activity
Energy Storage	Membrane battery technology	Transportation	.Plug-In Conversions Corporation .Cal Cars PHEV Conversions

**Firm No. 13 Opcon Autorotor AB**

Opcon Autorotor AB is a subsidiary of Opcon group Opcon Autorotor develops and manufactures air systems for use in fuel cell applications (Opcon Autorotor AB n.d.). The company is also active in screw compressors and air supply systems for fuel cells. Accordingly we believe this firm can be categorized under the Energy Efficiency section.

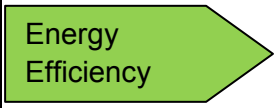
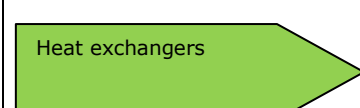
The customers of the company which we could access them through the company website are SAIC and Hyundai which both of them car manufacturers in China and South Korea (Opcon Autorotor AB n.d.). And it looks obvious that they should be put under transportation segment of cleantech industry.

CTI	Products	Customers	Customer Title Or Area Of Activity
		Transportation	.SAIC .Hyundai

**Firm No. 14 Laminova AB**

Laminova AB is a subsidiary of Opcon group. Laminova produces heat exchangers. The products are mainly used in automotive industry but also in other areas. The applications are like Intercoolers and oil coolers (Laminova n.d.). Laminova works with several car manufacturers in their environmentally friendly projects. It looks proper to include the company in the energy efficiency segment in cleantech categorization.

The company customers as mentioned are mostly car manufacturers like Chevrolet Pontiac, Ford, Ultra Light Aeroplanes and Hägglunds Vehicle in Sweden (Laminova n.d.). And we would categorize them under the Transportation area of cleantech industry.

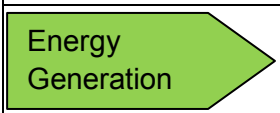

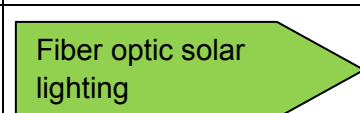
CTI	Products	Customers	Customer Title Or Area Of Activity
		Transportation	.Chevrolet .Pontiac .Ford .Ultra Light Aeroplanes .Hägglunds Vehicle



**Firm No. 15 Parans Solar Lighting AB**

Parans markets and develops patented products in the field of natural lighting (Parans Solar Lighting AB n.d.). The Parans Solar Panel can be installed on roofs or facades and employs an array of optical lenses to collect and concentrate incoming sunlight. The solar lighting systems can applied for any kind of buildings like healthcare centers, galleries, schools and residential purposes. It seems that the company can be categorized under Energy Generation and Air & Environment section of the cleantech industry.

The company has implemented several projects all around Sweden and Europe such, as have been brought up in the company websites like IKEA Bilbao Spain, Museum of Technology in Malmö, Viktoria Arena in Gothenburg and Hospital of Sodertälje. Therefore the company customers can be in construction fields. Therefore we here categorize them under the manufacturing and industrial segment (Parans Solar Lighting AB n.d.).

CTI	Products	Customers	Customer Title Or Area Of Activity
 		Manufacturing/Industrial	.IKEA Bilbao Spain .Museum of Technology in Malmö .Viktoria Arena in Gothenburg .Hospital of Södertälje

**Firm No. 16 Scandinavian Biogas Fuels AB**

Scandinavian Biogas is another Swedish company who is involved in producing biogas from organic materials (Scandinavian Biogas Fuels AB n.d.). As mentioned in the company homepage, biogas production process can use any organic material as a raw material. Another field which the company is active in is waste water treatment solution, however again this product is a preliminary step to produce biogas from. Therefore it can be inferred that the company should be categorized under the Energy Generation and water treatment in cleantech industry categorization.

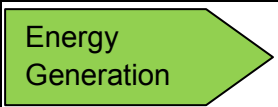
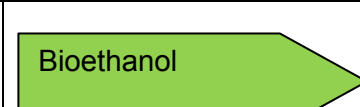
The company customers which could be accessible through the homepage were mostly listed as companies active in the field of water treatment like Yongyun sewage treatment plant (Korea) and sewage treatment plant in Botkyrk (Scandinavian Biogas Fuels AB n.d.). Therefore it was thought that they would be better to be put under Recycling & Waste class in the cleantech list.

CTI	Products	Customers	Customer Title Or Area Of Activity
Energy Generation	Biogas	Energy Storage	.Varberg Energy Company
Water & Wastewater	Wastewater treatment	Recycling & Waste	.Yongyun Sewage Treatment plant(Korea) .Sewage Treatment Plant in Botkyrka

**Firm No. 17 SEKAB**

The company is operating in producing the chemical products through conversion of raw materials like air (oxygen) and ethanol (SEKAB n.d.). According to the company homepages the products have many applications like in water-based paints, pharmaceuticals, perfumes, cleaning products, varnish and inks. However the main product of the company is Bioethanol fuel. Hence it looks mainly appropriate to categorize the company under the sub industry of energy generation.

The company customers as stated in the company website are well-known oil companies like Hydro, Shell, Statoil, Jet, and Preem (SEKAB n.d.). We would rather categorize these companies in the cleantech industry.

CTI	Products	Customers	Customer Title Or Area Of Activity
		Energy Storage	.Hydro .Shell .Statoil .Jet/2 .Preem/2

**Firm No. 18 Svensk Rökgasenergi**

The company markets its products under the Renergi brand title (Svensk Rökgasenergi n.d.). The products are solutions and packages for flue-gas condensation and dust separation as well as for drying of sawdust and other materials for production of biofuels. The company products are vastly used in heating plants, sawmills, pellet producers. It could be considered to put the company in the Air&Environment of cleantech industry list.

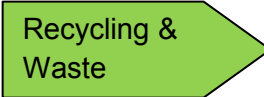
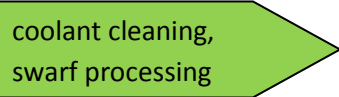
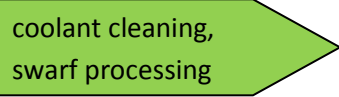
The company customers noted in the homepage of are Sun Select, Naturenergie, Rindi Energy and Mälarenergie (Svensk Rökgasenergi n.d.). Among them Sun select and Naturenergie are mostly in the field of energy generation and operating on renewable energy fields. Rindi energy is producing district heating systems therefore is categorized under air and environment systems.

CTI	Products	Customers	Customer Title Or Area Of Activity
Air & Environment	Heat recovery and flue gas cleaning	Energy Generation	.Sun Select .Mann .Naturenergie
	Heat recovery and flue gas cleaning	Air & Environment	.Rindi Energy
	heat recovery and flue gas cleaning	Agriculture	.Mälarenergi

**Firm No. 19 Arboga-Darenth AB**

The company mainly produces solutions for metal companies in recovering and prolonging the life of coolants and handling the swarf while increasing its values (Arboga-Darenth AB n.d.). The company offers its products as machines in different sizes and flexible designs. We would rather categorize the company in Recycling and Waste class in the cleantech industry field.

The customers which have been brought up in the company website are Volvo Aero which can be put in transportation field of cleantech industry. Sandvik AB, Leax Mekaniska and ITB who all are categorized in industry field in cleantech list.

CTI	Products	Customers	Customer Title Or Area Of Activity
 Recycling & Waste	 coolant cleaning, swarf processing	Transportation	Volvo Aero
	 coolant cleaning, swarf processing	Manufacturing/Industrial	. Sandvik AB .Leax Mekaniska . ITB

**Firm No. 20** Ramboll Group

Ramboll group is huge industrial enterprise who is operating in various fields of industries like Buildings, Infrastructure, Industrial processes, Energy, Water and environment, Telecommunication, Management and IT. According to the information we could catch from one of the company officials (Ramboll Group n.d.), environmental activities of company are mainly selling knowledge through studying and examining environmental effects of industrial operations in different sectors. Therefore we can categorize the company under the field of Air & Environment in cleantech industry list.

The main company customers whom we get access to them are NCC Construction, Södra Cell, SSAB Oxelösund and PEAB. Who are active in different sectors of industries and we categorize them all under the industry section in cleantech list (Ramboll Group n.d.).

CTI	Products	Customers	Customer Title Or Area Of Activity
Air & Environment	Environmental Consultants	Materials	.Södra Cell
	Environmental Consultants	Manufacturing/Industrial	.NCC Construction .SSAB Oxelösund .PEAB

## 7 Analysis

Based on the information provided in the findings, in the analysis we try to summarize and present the data in a meaningful way that would be useful for making a conclusion out of them. The data collected could be analyzed from several views. In Table 1. Sub-industries in the Cleantech industry are placed in the second column from the left number of companies for each of them is presented. In the third column total number of customers for the corresponding sub-industry is inserted in which numbers of customers for all the companies in the different sub-industries are added up together. In the last column frequency of links (business links) between sub-industries are depicted. For example if there are 6 companies in Energy efficiency sub-industry (row one) and totally they have had 3 transactions with Manufacturing/Industrial sub-industry, number 3 will be recorded in the CTI number 9.

For making the text more brief and avoiding unnecessary repetition we would like to assign acronym CTI as cleantech industry and a number for every sub-industry as below.

- Energy Generation      CTI1
- Energy Storage        CTI2
- Energy Infrastructure   CTI3
- Energy Efficiency      CTI4
- Transportation        CTI5
- Water & Wastewater    CTI6
- Air & Environment     CTI7
- Materials              CTI8
- Manufacturing/Industrial CTI9
- Agriculture             CTI10
- Recycling & Waste     CTI11

CTI Sub-Industry	# Of Companies	# Of Customers	Customers' CTI											
			CTI	1	2	3	4	5	6	7	8	9	10	11
CTI1	6	12	Freq	6		2						4		
CTI2	1	2	Freq					2						
CTI3	0	0	Freq											
CTI4	4	9	Freq	2				7						
CTI5	1	3	Freq					3						
CTI6	2	4	Freq						2					2
CTI7	4	17	Freq	3						1	1	1	1	
CTI8	1	2	Freq					1				1		
CTI9	0	0	Freq											
CTI10	3	5	Freq					2					3	
CTI11	2	4	Freq					1				3		

Table.1

As can be seen in the table, six companies were categorized in Energy Generation sub-industry (CTI1) (around 27%). Their products have been sold to areas like Energy Storage (CTI2), Energy Efficiency (CTI4) and Manufacturing/Industrial (CTI 9).

There is just one company active in Energy Storage (CTI2) and the two customers are located in Transportation (CTI5). We could not recognize any company being active in Energy Infrastructure (CTI 3). In Energy Efficiency (CTI4), there are four companies who have links with Energy Generation (CTI1) and Transportation (CTI5). The links to CTI5 is of remarkable number with 7 customers there.



There is only one company recognized in Transportation (CTI5) which sells its products to its own area within three links. There are two companies in Water & Wastewater (CTI6) who are linked to CTI6 and Recycling & Waste (CTI11). The frequency for both classes is two. The four companies in Air & Environment (CTI7) have been in contact with CTI 1,7,8,9 and 10. The frequency of links with customers in class 9 was the most with 11 links. The only company in Materials (CTI8) has had business transactions with Transportation (CTI5) and Manufacturing/Industrial (CTI9). The companies in Agriculture (CTI10) have been linked to Transportation (CTI4) and Agriculture (CTI10) with the frequency of two and three respectively. In the last area there are two companies who are linked to Transportation and Manufacturing/Industrial with the frequency of one and three.

In table 2 main focuses are on the product categorization and links to the customers. And in the last column of the table 2 the frequency of the links between the company and other sub-industries are presented. For example if two customers in CTI 5 have purchased biodiesel processors (first row), number 2 would be seen in corresponding space in the last column. There are 5 companies (ClimateWell, Compower AB, Ecoil, Econova and Neova AB) which the data about their customers name could not be accessible which we drew blank in front of them in the table.

The difference between the two tables is that in the second table the frequencies of the links are counted only according to the customers' title. In the other word, only the links which the names of the customers in them are known are included in the table.

Product	Company/CTI#	Customer/CTI#	Frequency of Links To CTI Sub-Industries											
			CTI	1	2	3	4	5	6	7	8	9	10	11
Biodiesel Processors	Ageratec/10	Tvären Gård/10 Skeby Energy/10 Barcelona/10 Perth/5 Romania/5	Freq.					2					3	
Biogas Optimizer	Bioprocess Control/4	.Swedish Biogas International/1 .Simbiente Environmental/1	Freq.	2										
electrochromic materials	ChromoGenics Sweden AB/8	.JHT Technology/5 .Volvo Technology Transfer	Freq.					1				1		
Solar air conditioners, hot and cold water	ClimateWell/1	No Data	Freq.											
Energy efficient boilers	Compower AB/4	No Data	Freq.											
Protein Meal for cows	Ecoil/10	No Data	Freq.											
soil, compost and garden products	Econova/10 and 11	No Data	Freq.											
Sustainable Heating, Cooling, ventilation Systems	Första Närvärmeverket AB/7	.Specialfastigheter AB/9 .SALK Tennis AB/9 .Rawsbury AB/9 .PEFAB/9	Freq.									4		
biogas production	Läckeby Products/1 and 6	.Syvab/4 .WSP/4	Freq.				2							
water treatment	Läckeby Products/1 and 6	.National Water Supply and Drainage Board" in Colombo, Sri Lanka/6 .Veolia Water AB/6	Freq.					2						
ship propellers	Aerodyn AB/ 5	.Rolls Royce/5 .MAN/5 .Berg propulsion/5	Freq.					3						
Biofuel	Neova AB/1	No Data	Freq.											
Membrane battery technology	Nilar International AB/2	.Plug-In Conversions Corporation/5 .Cal Cars PHEV Conversions/5	Freq.					2						
air supply systems for fuel cells.	Opcon Autorotor AB/4	.SAIC/5 .Hyundai/5	Freq.					2						

			CTI										
			1	2	3	4	5	6	7	8	9	10	11
heat exchangers	Laminova AB/4	.Chevrolet/5 .Pontiac/5 .Ford/5 .Ultra Light Aeroplanes/5 .Hägglunds Vehicle/5	Freq.					5					
Fiber optic solar lighting	Parans Solar Lighting AB/ 1 and 7	.IKEA Bilbao Spain .Museum of Technology in Malmö/9 .Viktoria Arena in Gothenburg/9 .Hospital of Södertälje/9	Freq.								4		
Biogas	Scandinavian Biogas Fuels AB/1 and 6	.Varberg Energy Company/1 .Yongyun Sewage Treatment plant(Korea)/11 .Sewage Treatment Plant in Botkyrka/11	Freq.		1								2
Bioethanol	SEKAB/1	.Hydro/2 .Shell/2 .Statoil/2 .Jet/2 .Preem/2	Freq.		5								
heat recovery and flue gas cleaning	Svensk Rökgasenergi/7	.Sun Select/1 .Mann/1 .Naturenergie/1 .Rindi Energy/7	Freq.	3					1				1
coolant cleaning, swarf processing	Arboga-Darenth AB/11	Volvo Aero/5 .Sandvik AB/9 .LeaxMekaniska/9 .ITB /9	Freq.					1				3	
Environmental Consultants	Ramboll Group/7	.NCC Construction/9 .Södra Cell/9 .SSAB Oxelösund/9 .PEAB/9	Freq.								1	3	

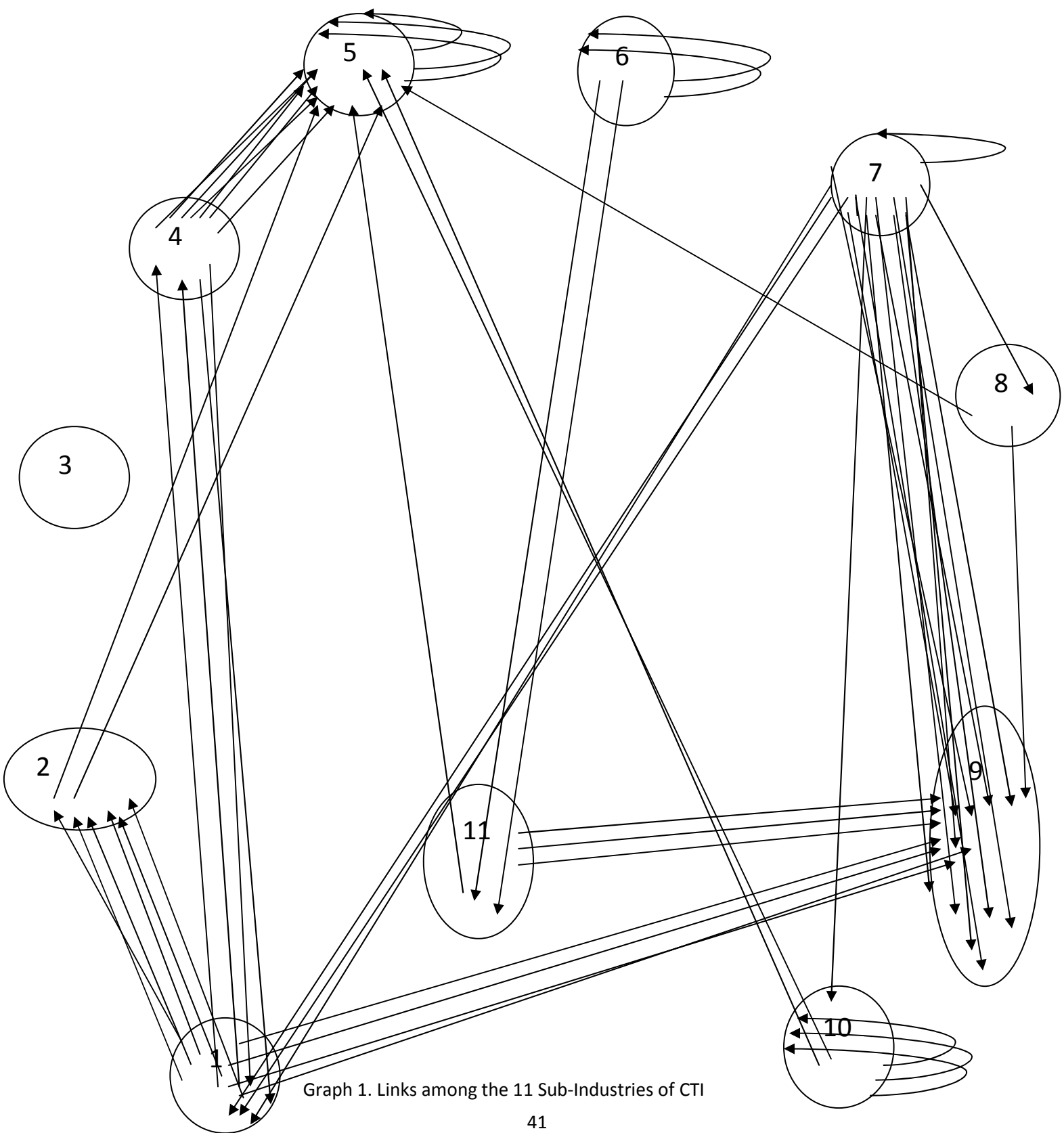
Table2

Based on the information of the two tables in this section we would be able to draw a graph (graph 1) of links among 11 sub-industries of the CTI. In drawing the graph there are some points which need to be considered:

- Each arrow indicates a link between each 2 sub-industry.
- In drawing the lines only the links which the names of customers in the destination sub-industries were known are included. For example about

companies like Climate well and Ecoil which there were no data about their customers' names, no link has been drawn in the graph.

- The arrows have been drawn considering number of customers in the destination sub-industries. For example, if one company from sub-industry 4 sells its products to three customers located in sub-industry 9 then, there would be three arrows drawn from sub-industry 4 to 9.



Graph 1. Links among the 11 Sub-Industries of CTI

In Table 3 facts about the graph are depicted:

	<b>CTI1</b>	<b>CTI2</b>	<b>CTI3</b>	<b>CTI4</b>	<b>CTI5</b>	<b>CTI6</b>	<b>CTI7</b>	<b>CTI8</b>	<b>CTI9</b>	<b>CTI10</b>	<b>CTI11</b>
<b>Input Arrows</b> <b>#from subind.#</b>	3 from 7 2 from 4	6 from 1	0	2 from 1	2 from 2 7 from 4 3 from 5 1 from 8 2 from 10 1 from 11	2 from 6	1 from 7	1 from 7	4 from 1 11 from 7 1 from 8 3 from 11	1 from 7 3 from 10	2 from 6
<b>Output Arrows</b> <b>#from subind.#</b>	1 to 2 3 to 3 2 to 4 5 to 9	2 to 5	0	2 to 1 7 to 5	3 to 5	2 to 6 2 to 11	3 to 1 1 to 7 1 to 8 11 to 9	1 to 9 1 to 7	0	2 to 5 3 to 10	1 to 5 3 to 9

Table 3

## 8 Conclusion

By looking meticulously at the tables and the graph, in this part we try to signify the most significant points that could be inferred. The conclusion would be presented in two levels, CTI Sub-industries, Companies and Products.

### **8.1 CTI Sub-industries**

Perhaps the most noticeable point in the graph would be the number of links(19 links) (as inputs) to sub-industry Manufacturing/Industrial (CTI9). Air & Environment (CTI7) with eleven and Energy Generation (CTI1) with four numbers of links contributed the most to Manufacturing/Industrial (CTI9) inputs. The reason may be categorization of construction companies and developers in Manufacturing/Industrial (CTI9) as customers and from the other side companies working on ventilation and renewable energies for heating, cooling and ventilation in Energy Generation (CTI1) and Air & Environment (CTI7).

Transportation (CTI5) has the highest number of inputs after Manufacturing/Industrial (CTI9). Companies in this area has mostly purchased from Energy Efficiency (CTI4). Energy Storage (CTI2) with two links and Materials (CTI8) with one link as well as CTI11 are the other sellers.

Air & Environment(CTI7) with four companies(which is the highest) has the highest number of customers (17).Among the customers eleven of them are in Manufacturing/Industrial (CTI9),three in energy generation (CTI1), one in area Air & Environment (CTI7) and one Materials (CTI8) one in CTI 10.

After Air & Environment (CTI7) the highest number of customers belongs to Energy Efficiency (CTI4). With four companies as providers, CTI4 has nine customers, seven of them are in are in Transportation (CTI5) and two in Water &Wastewater (CTI1).

Energy Infrastructure (CTI3) and Manufacturing/Industrial (CTI9) are two areas which we could not find any company to allocate in. Ignoring these areas, Energy Storage

(CTI2) and Materials (CTI8), with two customers have the least number of customers. Both companies have only one company categorized in.

## **8.2 Companies and Products**

Ageratec AB, Laminova AB and SEKAB all with five customers have the highest number of customers. SEKAB (CTI1) and Laminova (CTI4) both are in Energy-related areas and the end customers of their products are in transportation area (CTI5).

Parans Solar Lighting AB (CTI 1 and 7) and Första Närvärmeverket AB (CTI7) are selling their products of renewable energy-related fields to buildings and construction customers (CTI9).

The highest number of customers in Manufacturing/Industrial (CTI9), which is the area with the highest amount of purchase, belongs to Parans Solar Lighting and Ramboll Group.

Ramboll Group is the only Consultant Company who sells environmental services to four customers in area Energy Efficiency (CTI4).

To be less conservative, the following outcomes could also be deducted from the research in national level:

- In Sweden most of companies (around 30%) in CTI are active in the Energy-Related fields (CTI 1 to 4).
- Air&Environment products consist the most outputs of CTI in Sweden.
- Industries and Manufacturing as long as transportation industries are the most frequent destination of CTI products and services in Sweden.



## 9 Recommendation

In this section some points will be recommended to the audiences who may be interested in applying the research outcomes. While the authors could have not extracted the whole potential outcomes out of the research findings and analysis, the further conclusions and more courageous or bold deductions will be delegated to the readers. The recommendations will be proposed based on the points already pointed out in the conclusions part. Nevertheless the extent of accuracy of points will be proportional to the findings, analysis method and conclusions of the research.

1. As mentioned in the conclusion sub-industry Manufacturing/Industrial received the most amount of products from the other sub-industries, therefore it looks this category is the most demanding. Therefore it seems any further investor in cleantech industry could consider this category as one of the potential targets of its products. Most of the products sold to Manufacturing/Industrial sub-industry were sold by Air & Environment (CTI7) sub-industry. This fact has its message for all the companies in CTI7 to consider Manufacturing/Industrial sub-industry as the most frequent buyer of their products. And maybe more research on the demands of this group of customers could be promising for them.
2. Transportation (CTI5) has the highest number of customers after Manufacturing/Industrial (CTI9). Companies in the Energy Efficiency (CTI4) sold the most to them. Therefore any potential investors in energy related fields maybe better off to consider the requirements of CTI5 as the major destination of their products.
3. Since Air & Environment (CTI7) has the highest number of customers in total, therefore it looks more sensitive to invest in this area.

4. More Investment in environmental consultancy towards the area CT14 could be considered.
5. Renewable energy solutions(solar, wind and etc) look being very well welcomed by companies in the Manufacturing/Industrial (CT19) area. Therefore investing more according to the requirements of this group could yield more customers in this area.

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## Appendix 1

Some samples of correspondences with companies:

**Hello,**

We are a group of students working on our Master Thesis at Mälardalen University in Västerås. Our thesis is about **cleantech industry** in Sweden. Since part of the thesis is about the cleantech companies in Sweden, we need some information in this regard.

**We would be so grateful if you would put your valuable time (maximum 5 minutes) answering the following questions and help us carrying out this research.**

We should thank you in advance for your cooperation.

**Best Regards,**

Roham Khoshgoo

Address: Gunnilbugatan 2, Västerås

Tel: 0736969982

**(In case you have any sensitivity to reveal your customer names, it will be all right if you just let us know which industry they are in)**

1. Name 5 customers to whom you have sold your cleantech products to.
  2. For each customer please mention the product(S) or service(s) that you have sold to them.
  3. Why do you think these products or services are clean? ( less pollution, less resources used or ...)
- 

Hi!

I'm an environmental consultant, so I just **sell knowledge**.  
Some of my present **costumers** are:

1 NCC Construction - environmental investigation of polluted buildings, before demolition of an old end extremely polluted chemical factory. Environmental advices during the investigations of ground pollution, contacts with the authorities etc.

2 Tjörns kommun (municipality) - environmental and geotechnical investigations and planning for covering an old landfill.

3 Södra Cell - paper mill - testing rest products in the purpose to use green liqueur sludge as a liner on landfills.

4 SSAB Oxelösund - environmental and geotechnical investigations of a landfill and its surroundings. I have also done some investigations of rest products in order to use it as "ground filter" for polluted groundwater from polluted areas.

5 PEAB - environmental investigation of an old house before rebuilding and partly demolition. Environmental advices during the rebuilding.

All my work as an environmental consultant I do in order to help my customers with their environmental issues. The goal is to reduce pollutions to the air, to the water and to the earth.

[www.ramboll.se](http://www.ramboll.se)

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Hi

We sell our TermoDeck system to building projects. We have now over 380 buildings that have installed TermoDeck over the world. See our web site for details.

1. & 2. All our customers are building owners: Office buildings, Schools, Universities, Shopping Centres, etc.

3. The reason for our system being clean: It saves energy without increasing the investment costs as no new material or equipment is added. So there is no energy added in manufacturing some items (such as solar panels, heat pumps, etc).

<http://www.termodeck.com/>

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Dear Students

We are working with advanced, confidential R&D projects with our customers and are not allowed to disclose any information or names related to these projects.

Good luck with your thesis

Per svantesson, President & CEO Effpower AB

[per.svantesson@effpower.com](mailto:per.svantesson@effpower.com)

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Thank you for your interest in Switchpower. Unfortunately we cannot disclose the names of our clients to you as this is against company policy. I wish you best of luck with your research.

Regards,

Andrew Machirant  
Business Development & Communication  
Switchpower | Box 5050 | 102 41 Stockholm | Sweden

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Sorry  
I cannot give away customers names

Best  
Bo  
+46(0)70 7412622

-----Ursprungligt meddelande-----  
Från: rko07001@student.mdh.se [mailto:[rko07001@student.mdh.se](mailto:rko07001@student.mdh.se)]  
Skickat: den 22 april 2008 11:20  
Till: bo.hammarlund@transic.com  
Ämne: cleantech industry

---

Okay

Aviosol sells turnkey Biomass to liquid plants that makes synthetic diesel and jet fuel from renewable sources, to date we have sold one plant that makes fuel from landfill gas and one that makes fuel from wood chips.

Biogas from sewage plants are next

Our customers are based in Europe, outside of Sweden

Best Regards

Lars Hedemalm  
Aviosol AB

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1.Name 5 customers who you have sold your cleantech products to. 2.For each customer please mention the product(S) or service(s) that you have sold to them.

3.Why do you think these products or services are clean? ( less pollution, less resources used or ...)

-----  
Our products make it possible to :

A. Recycle metal chips and compact them for transportation to reduce emissions due to transportation

B. Recycle coolant and prolong the life of coolant used in machining centers, they also reduce bacteria growth which can cause health problems

C. Cleans air from oil mist to improve work environment and reduce hazards, such as fire or accidents due to slippery floors.

-----  
4.If possible please mention the industry which each customer is active in as

well. For example automotive industry or petrochemical industry.

Firm Arboga-Darenth AB



	Name	Products Or Service Sold
Customer 1	Sandvik AB,	Metal Chip Processing system
Customer 2	Volvo Aero, Aerospace cleaning/recycling system.....	Coolant
Customer 3	Uppåkra, Subcontractor and Briquetting Press.....	Metal Chip Crusher
Customer 4	ITB, Subcontractor... system and Metal Chip Processing System.....	Coolant Filtration
Customer 5	Leax Mekaniska, Subcontractor... .....	Oil Mist Separators
<b>Arboga-Darenth AB</b>		

## Appendix 2

<b>Cleantech Segment</b>	<i>Example Technologies</i>
<b>Agriculture</b>	Bio-based materials; farm efficiency technologies; micro-irrigation systems; bioremediation; non-toxic cleaners and natural pesticides. <i>Does not include organic, health food, or natural health products.</i>
<b>Air &amp; Environment</b>	Air purification products and air filtration systems, energy efficient HVAC; universal gas detectors; multi-pollutant controls; fuel additives to increase efficiency and reduce toxic emissions.
<b>Materials</b>	Biodegradable materials derived from seed proteins; micro-fluidics technology for conducting biochemical reactions; nano materials; composite materials; thermal regulating fibers and fabrics; environmentally-friendly solvents; nano-technology components for electronics, sensor applications and energy storage; electrochromic glass; thermoelectric materials.
<b>Energy Generation</b>	Distributed and renewable energy generation and conversion, including wind, solar/photovoltaics, hydro/marine, biofuels, fuel cells, gasification technologies for biomass, and flywheel power systems.
<b>Energy Storage</b>	Batteries e.g. thin film and rechargeable; power quality regulation; flywheels; electro-textiles
<b>Energy Infrastructure</b>	Wireless networks to utilities for advanced metering, power quality monitoring and

	outage management; integrated electronic systems for the management of distributed power; demand response and energy management software.
<b>Energy Efficiency</b>	Energy management systems; systems that improve output of power generating plants; intelligent metering; solid state micro-refrigeration; control technology for HVAC systems; automated energy conservation networks.
<b>Recycling &amp; Waste</b>	Recycling technologies; waste treatment; internet marketplace for materials; hazardous waste remediation; bio-mimetic technology for advance metals separation and extraction.
<b>Manufacturing/ Industrial</b>	Advanced packaging; natural chemistry; sensors; smart construction materials; business process and data flow mapping tools; precision manufacturing instruments & fault detectors; chemical management services.
<b>Transportation</b>	Hybrid vehicle technology; lighter materials for cars; smart logistics software; carsharing; temperature pressure sensors to improve transportation fuel efficiency; telecommuting.
<b>Water &amp;Wastewater</b>	Water recycling and ultra-filtration systems (e.g. UV membrane & ion exchange systems); sensors and automation systems; water utility sub-metering technology desalination equipment.

**CLEANTECH VENTURE CAPITAL:**

**HOW PUBLIC POLICY HAS STIMULATED PRIVATE INVESTMENT**

**May 2007**, *Principal Author*

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