

# **How Swedish firms experience trade with emission permits.**

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## Abstract

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The environment has been given extra focus within organisations in recent years. In January 2005, the European Union introduced a system for emission permit trading.

The purpose of our dissertation was to explain Swedish firms' experience of emission permit trading system. We wanted to give a new perspective on this issue and explain the implications of firms that are subjected to a new means of control of pollution. Furthermore, our hope was to give suggestions for improvement of the emission permit trading system founded on the firms' experiences.

This research was conducted amongst the Swedish firms that had received the largest amount of emission permits in 2007. Five firms participated in the interviews.

As a result of our research we have reach an understanding of the participating firms' experiences of the emission permit trading system and from these opinions have been able to suggest possible changes of the system.

**Keywords:** Emission trading scheme, greenhouse gas emission, carbon dioxide

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## ***Chapter 1; Introduction***

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*In this first chapter we discuss background, research problem, research questions, purpose and limitations. We also present an outline of the dissertation.*

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### **1.1 Background**

The discussion about climate change and the environment has been going on in the media for a number of years. However, the discussion has truly been heated the last year, ever since the Intergovernmental Panel on Climate Change published a report called *Climate change 2007* in the beginning of 2007. According to the report from IPCC, scientists have established that humans are responsible for the increasing global warming. The biggest contributor to this change is the increase of greenhouse gas emissions. The report also states that the carbon dioxide emissions from fossil fuel combustions are responsible for more than 75 per cent of the emissions caused by human activity (IPCC, 2007). The report, alongside with the movie *An inconvenient truth* by former vice president of the USA, Al Gore globalised the environmental issue.

In 1997 the United Nations Framework Convention on Climate Change (UNFCCC) developed the Kyoto protocol. The ratified protocol by the European Union introduced emission permits trading as an economic tool to reduce the greenhouse gas emissions in the atmosphere. In January 2005, the European Union applied a system of emission permits on greenhouse gas emissions that is called the Emission Trading Scheme, ETS. A market is created and thereby a market price for the right to pollute (Hanley, Shogren & White, 1997).

The inspiration for this dissertation came from a short newspaper article we stumbled upon during our quest for a topic. A preliminary interview was conducted at a firm affected by the emission permit trading system with the ambition to perform a study on how firms handle the administration of emission permits. The preliminary interview provided an insight that firms might have opinions about the system that

the authorities have not considered. After taking part of a report by the Swedish National Environmental Protection Agency (NEPA) and the Swedish Energy Agency (SEA), a decision was taken to get an understanding of how the emission permits are experienced by the affected firms. The Agencies' report focused on the changes that they wanted to establish in the legislation but not on the actual opinions of the firms. The changes suggested in the report are based on the NEPA's and the SEA's experiences and not the experiences of the firms. This dissertation will research how a number of firms experience the system of emission permit trading.

## **1.2 Research problems**

The research problem of this dissertation is that there is a lack of theories that take the experiences of the Swedish firms' regarding the emission permit trading system into account. The emission permit issue is only covered from an economics perspective. There is no theories yet established for the firms' experience of emission permits and the trading system. Also, emission permit trading is a new phenomenon in Sweden and few norms are established within this field of business administration. Reports performed on the subject are focused on if the environmental and national goals are fulfilled. The report from the NEPA and the SEA only covers the experience of the authorities and not those of the firms. A review has been conducted by the European Union about the experiences from the system but in this review only a part of the respondents consists of firms that are actually participants in the emission permits system. The review includes all the countries that are affected by the emission permit system in the European Union (EU 1, 2006). The conducted review does not cover the same aspects that we want to evaluate. Also this review was conducted in the midst of 2005; hence a full year of using these permits had not yet had its course.

## **1.3 Research questions**

The following questions are guidelines for this dissertation:

- How do firms in Sweden experience the introduction of a new means of control of pollution?
- How can this system be improved?

### **1.4 Purpose**

The purpose of this dissertation is to explain how the emission permit trading system is experienced by participating Swedish firms. The dissertation aims at giving a new perspective on this current issue and to give the reader an insight into the experience of firms that is subjected to the emission permits. It will also examine if there are any differences in the experiences between the firms in the different industry sectors.

### **1.5 Limitations**

The research presented in this dissertation was limited to only consider how the firms experience the emission permits and the trade with these permits. We limited our research to Swedish firms as we focused on what the emission permit trading system implies for firms. The research was limited to the fifty largest receivers of emission permits.

### **1.6 Outline**

The dissertation has the following outline.

- Chapter 2 covers choice of methodology, data collection and the scientific approach.
- Chapter 3 presents an introduction to emission permit trading. It presents the background of emission permits in the European Union and in Sweden.
- In chapter 4 the theories that can explain the firms' experiences of the emission permit trading system are presented.
- In chapter 5 the dissertation explains the empirical method. In this chapter the research strategy and sample is discussed. The process of the dissertation is presented. We also cover validity, reliability, generalisability and grounded theory in this chapter.
- In chapter 6 the interviews is analysed and clustered. Also highlights of the analysis, suggestions for improvement of the system and propositions are presented.
- Chapter 7 presents a summary of the dissertation. We also present relevance, self criticism and suggestions for future research.

## ***Chapter 2; Method***

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*The second chapter explains the choice of methodology, data collection and the scientific approach.*

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### **2.1 Choice of methodology**

Our aim is to understand and explain the experiences of carbon dioxide emission permits within Swedish firms. We research the phenomenon of emission permits and trade with these based on firms' experiences.

In the book *Research Methods for Business Students* the authors find that business situations are not only "complex, they are also unique. They are a function of a particular set of circumstances and individuals" (Saunders, Lewis & Thornhill, 2007, p. 107). How firms experience the permit trading system depends on how people within the organisation see the problem. Differences between people suggest that we cannot make law like generalisations like a positivistic philosophy would try to make. We do not see the need for law like generalisation of the research result since we are building an understanding of the firms' experiences. A positivistic philosophy most often will test a hypothesis that has been created from a theory. Since there are no theories on firms' experiences of the permit system, a theory could not be tested. A realist philosophy claims that the research conducted with such a philosophy will generate a result that is the truth. The result in this dissertation does not aim at or claim that it is portraying the absolute truth. The interpretivistic philosophy is the philosophy that provides us with the best description of our aim with this dissertation. We use an interpretivistic philosophy where we are so to speak standing in another mans shoes and we try to understand the firms from their point of view. The firms' reality is interpreted as the firms see it (Saunders *et al.*, 2007).

No theories on firms' experiences from a new means of control of pollution have been established before; therefore a research approach that will lean more towards an inductive approach rather than a deductive was adopted.

## **2.2 Data collection**

Our data consists of both secondary and primary data. The secondary data is first and foremost earlier collected data for another purpose than this dissertation but this data can be reanalysed. Primary data is data that we as researchers have collected ourselves for the purpose of this dissertation (Saunders *et al.*, 2007).

### *2.2.1 Secondary data*

The secondary data gave us knowledge about research conducted by other researchers. It gave us a wider understanding of the subject. We first studied the phenomenon of emission permits and the trade with these permits. By studying the phenomenon from the Kyoto protocol to implementation in the Swedish environmental policy we aimed at comprehending the system of emission permits for Swedish firms. Second we studied the economic theories that lead to the creation of emission permits in order to understand the economic background and the reason for such a system. In addition we studied a theory that perhaps could explain the firms' experience, for example organisational control.

Research on an economics level had to be covered in order to understand the means of control of pollution that are affecting the Swedish firms. We also investigated governmental reports to learn what has so far been studied and evaluated.

### *2.2.2 Primary data*

The primary data were collected in form of interviews. The first interview at a participating firm was conducted as a preliminary study to give us more insight in the subject and an understanding of how a firm handles and trades with the emission permits. After that, interviews were conducted with participating firms within the system of emission permits. Since there are no theories on firms' experiences of emission permit trading system, these interviews will be the foundation of our dissertation.

## **2.3 Scientific approach**

The research is conducted with an abductive approach which implies not only a clear inductive approach but a mix between inductive and deductive approach. The

abductive approach lean more towards inductive research approach rather than deductive. An inductive approach implies that a specific theory is not tested in the research but a theory or propositions are created from the research. If using a deductive approach we would start with existing theories, create a hypothesis, which we would test in order to confirm or reject it (Saunders *et al.*, 2007). Because of the lack of theories we did not have the opportunity to create and test a hypothesis. Instead we used the data collected from the conducted interviews to build a theory or propositions. The propositions explain how the emission permits and the trade with these are experienced by a number of firms.

The research strategy is similar to the strategy of grounded theory. A grounded theory implies a building of a theory from a series of observations that are later tested in additional investigations. However, the theory or the propositions will not be developed further. The research will be conducted as a cross-sectional study. This mean that the experiences of firms regarding the emission permit system will be studied at a certain time (Saunders *et al.*, 2007).

A research can be either quantitative or qualitative. A quantitative research will usually contain some form of numerical and standardised information that explains the research. The results are usually measured and are often presented as tables, diagrams and charts or other. A qualitative research consists of non-numerical data that needs to be analysed in order to be understood. The result is presented as texts and is focused on an understanding of the context (Saunders *et al.*, 2007). We chose to conduct our research in a qualitative manner. It will give us an in-depth knowledge of the phenomenon and provide us with a context understanding of the underlying meanings.

## ***Chapter 3; Introduction to Emission Permits***

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*Following chapter gives an introduction to emission permit trading. The chapter also provides an insight in the emission permit trading system in Sweden and the established legislation.*

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### **3.1 Introduction to Emission Trading**

#### ***3.1.1 Definitions***

Ison, Peake and Wall state that “the term ‘pollution’ is most commonly applied to situations in which way man-made activities reduce the ambient quality of a particular environment. In this view the introduction of any substance or energy form that lowers the ambient quality of the environment can be regarded as ‘pollution’” (Ison, Peake & Wall, 2002, p. 133). Hanley, Shogren and White point out that inadequate private property rights of environmental resources are the consequential economic justification for pollution (Hanley, Shogren & White, 1997).

#### ***3.1.2 Origin***

In *An inquiry into the nature and causes of the wealth of nations* Adam Smith claim that the price mechanism of market acts as an invisible hand that will lead to a price that is best for all parties (Smith, 1776; cited by Perman, Ma, McGilvray & Common, 2003). Pigou developed this theory further when he embodied negative external factors as disturbances in the price mechanism. “Pigou suggested that environmental policy instruments, taxes, might adjust or correct distorted control signals (price)” (Pigou, 1920; cited by Cerin & Karlsson, 2002). This means that a tax will offset the negative effect that the pollution will imply. Coase argued, during his Nobel Prize lecture in 1991 that the best scenario is to give property rights to the actors so that incentives are given to encourage a productive factor use (Coase, 1960, 1991; cited by Cerin *et al.*, 2002).

In the 1960’s the economist J.H. Dales presented the solution of tradable emission permits in Ontario, Canada in an attempt to control a water-pollution problem in the

region. He said that it is not actually about an *optimum* solution to social problems but rather to do things better than they are being done now. He also suggested that one of the most difficult aspects to handle is information and only with all the correct information can the externalities be fairly controlled. His suggestion was that in some cases tradable emissions can be a suitable solution (Dales, 1968).

### 3.1.3 *The USA*

The USA is a pioneer in the emission permit trading development since introducing tradable permits in the 1970's. The government had had standards for emissions of sulphur dioxide, ozone and benzene. Actions were taken by the Environmental Protection Agency (EPA) through the Congress since several states exceeded the levels of pollution and tradable permits were introduced (Hanley *et al.*, 1997).

Perman, Ma, McGilvray and Common describe the Emission Reduction Credit system, the system that is currently used in the USA in their book *Natural Resource and Environmental Economics* (2003). They say that the EPA set standards for air and water quality and controls in the form of technology updates or a ceiling on emissions are forced on firms. However, if firms are able to abate their emissions more than the standard, they acquire tradable emission reduction credits (ERC) for that quantity of emission reduction. These ERC's can then be considered as transferable permits. The American ERC system also uses the offset, the bubble and the banking policy (Perman, Ma, McGilvray & Common, 2003). The different varieties of the system will be explained further in the following part of the dissertation.

### 3.1.4 *Varieties of tradable permits system*

A variety of systems for tradable permits has been tested throughout its existence. One of them is the *credit-and-trade system*. With this system a performance standard rate is established for each homogenous industry and indicates the accepted amount of emissions per unit of production or fuel. *Credit-and-trade* is a system that has been implemented in the Netherlands for their nitrogen oxide emissions (Peeters, Weishaar & de Cendra de Larragán, 2007). The term benchmarking is sometimes used when referring to *credit-and-trade*. Another option is *netting* where polluters can increase pollution from one source while they decrease pollution from another source; a

requirement is that the net amount of emissions stays at the same level. A third option is *off-set* which means that firms that are being established can only buy permits from older firms. *Banking* is when a firm can limit its emissions and save this right to emit and the firm has the opportunity to later either increase its emissions or sell the right to emit. The system of *averaging* has also been tested and can be applied to the transportation sector that will give the firm a permit for a specific engine and that it has to be fulfilled by an average. *Cap-and-trade* is the most common system today and implies that a level of emissions is set and that a region or a firm can not exceed this level. A firm in such a region can either abate its emissions from another source in order to emit more from another or it could choose to buy emission permits from another firm that then has to abate its emissions. This system is sometimes also called *bubbles* (Pihl, 2007). The *cap-and-trade system* is the system currently used by Sweden and the European Union (Peeters *et al.*, 2007).

### 3.1.5 *Kyoto Protocol*

In 1997 the Kyoto Protocol was produced to reduce greenhouse gas emissions in developed countries. The Kyoto Protocol will bind the countries to lower their greenhouse gas emissions, mainly carbon dioxide, in the period of 2008-2012 (Hill & Kriström, 2005). The Kyoto protocol is a legally binding contract that came into effect in 2005 (Brännlund & Lundgren, 2007). Six gases are regulated in the protocol and the main concern is carbon dioxide. The protocol includes three flexible mechanisms; clean development, joint implementation and emission permits trading. These mechanisms are developed to decrease greenhouse gas emissions on an international level (Ison *et al.*, 2002). Emission permits trading is the part of the protocol that has led to the permit system that is used in the European Union. Ison, Peake and Wall points out that “The most important aspect of the Kyoto Protocol is that it puts a negative economic value on greenhouse gas emissions and positive economic value on greenhouse gas reductions” (Ison *et al.*, 2002, p.178). The world’s collected emissions are set out to be reduced by 5% of the 1990 emission level by 2012 (Ison *et al.*, 2002).

### 3.1.6 *The European Union’s commitment to the Kyoto Protocol*

The European Commission started their environmental work in the early 1990’s. In 1991 a strategy to abate the carbon dioxide emissions and enhance energy efficiency

in the European Union was presented. The strategy included among other things a directive to promote electricity from renewable energy, voluntary commitments by car makers to reduce carbon dioxide emissions by 25% and proposals on the taxation of energy products. Since the European Union committed to the Kyoto protocol in 1997 and thereby became compelled to lower the greenhouse gas emissions by 8% compared to the 1990's levels in the years between 2008 and 2012 the European Community made additional efforts to meet this level of emission (EU 3, 2007).

In June 2000 the European Commission presented the European Climate Change Programme (ECCP). The aim with the ECCP is to establish and develop the essential tools for a common strategy in order to apply the Kyoto protocol to the European community (EU 3, 2007). Within the ECCP there exist eleven environmental areas, where emission trading is one. The European Unions emission trading scheme, ETS, for carbon dioxide, covers about 45% of the European Unions carbon dioxide emissions (Hill *et al.*, 2005). The scheme covers almost 12,000 installations in energy intensive industrial sectors. A first period with its start in 2005 will last until the end of 2007. From 2008 the periods will be in five-year intervals and follow the Kyoto Protocol (FlexMex2, 2005).

## **3.2 The Swedish Emission Trading System**

### *3.2.1 Swedish environmental policy*

In Sweden the current environmental policy emanates from sixteen different environmental goals. Each of these goals has a number of different intermediate goals. These goals were developed in April 1999, and one of them is *Limited effect on the environment*. The long-term environmental goal is that Sweden should strive towards a content stabilisation of the six Kyoto based greenhouse gases at the level of 550 parts per million carbon dioxide equivalents (for a definition see appendix 1) in the atmosphere at the most (Report 2, 2007). In other words, by year 2050 the Swedish emissions have to decrease to a yearly level lower than 4.5 tonnes of carbon dioxide equivalents per inhabitant. In 2003 this level was 7.9 per inhabitant in Sweden. The Swedish environmental intermediate goal is that the emissions of greenhouse gases between year 2008-2012 should be four percent lower than the emissions year 1990 (Swedish Environmental Institute, 2007). In order to reach the environmental goals the Swedish government has applied a carbon dioxide tax and

electricity certificates that collaborates with the emission trading system (Report 2, 2007). The purpose of the electricity certificates is to increase the use of electricity from renewable sources (SEA 1, 2007).

### *3.2.2 Introduction to the Swedish trading system*

The EU system is controlled by Article 9 in the European Parliament and Council directive (2003/87/EG) about a system for tradable emission permits for greenhouse gas emissions within the community. This directive states that all the countries in the community shall establish a national allocation plan that is compatible with the criteria's in appendix III to the directive. The system includes emissions from combustion installations and some energy-intensive industry. The EU countries has through the Kyoto protocol committed themselves to in the 2008-2012 period abate their emissions by an average of 8 per cent compared to the 1990 year level of emissions. The EU countries have agreed upon a division of the abatement. Sweden has agreed to emit no more then 104 per cent compared to its 1990 year level of the greenhouse gases that are stated in the Kyoto protocol (Government 1, 2006).

The Swedish installations are divided into six categories. They are; combustion installations, mineral oil refineries, coking plants, iron- and steel installations, mineral industry and paper pulp, paper and board industrial plants. The mineral industry category includes; cement clinker or lime in rotary kilns or other furnaces and installations for manufacturing ceramic products by fire and glass manufacturing installations (SFS 2004:1199). We will refer to these six categories as sectors in the dissertation from now on. In Sweden about 700 installations will be affected by the emission permit trading system (FlexMex2, 2005).

The allocation for the period 2005 to 2007 is based upon the average of the historical emissions between 1998 and 2001. Similar allocation will be used for the period 2008 to 2012 (NEPA 1, 2007). The information about next period's allocation to each installation will be announced in December 2007 (NEPA 2, 2007).

A mandatory report that Sweden handed in to the EU in 2006, concludes that 71.8 million tonnes of carbon dioxide equivalent was emitted in 1990 in Sweden. Since the assigned amount is calculated from the 1990 base year, Sweden is allowed to emit

no more than 75.3 million tonnes of carbon dioxide equivalents each year in the period of 2008-2012. Sweden showed abatement in greenhouse gas emissions of 2.6 per cent in 2003 compared to the 1990 level of emissions. The countries also have the opportunity to account for their use of sinks of carbon dioxide. This means that carbon is tied up in vegetation to the advantage of air quality. Because of this possibility to tie up carbon dioxide with sinks of carbon dioxide, Sweden can emit 2.1 million tonnes of carbon dioxide equivalents per year more than the assigned amount. It means that Sweden can emit a total of 77.5 million tonnes of carbon dioxide a year (Government 1, 2006).

If the project based instruments joint implementation (JI) and clean development mechanism (CDM) is included in the calculations of assigned amount Sweden can emit 1.1 million tonnes of carbon dioxide equivalents more in the next-coming period than otherwise possible. It implies that the non-trading sector, the sector that emits carbon dioxide but is not a part of the emission permit system, can emit 33-34 million tonnes without Sweden breaking the assigned amount that the EU has set in accordance with the Kyoto protocol (Government 1, 2006).

The Swedish parliament decided in June 2006 that the amounts of permits allocated in the next period, 2008-2012, should not exceed the amount of permits that was distributed in the first period given that it is adapted to the inclusion of new emissions or sources of emission into the system. The emission permits for the period of 2005-2007 is not transferable to the next period and is therefore cancelled before the next period. However, the permits for the next period, 2008-2012, can be transferred into the following periods. There is also a difference in the governance of the system, which is that after 2008 the EU has the obligation to lower its greenhouse gas emissions to a set level according to the Kyoto protocol. The countries then have to allocate the right amount of permits to keep the levels of emissions at the set level. The permits can be transferred from one installation to another with the help of trade within the system that will reduce the emissions with cost-efficiency (Government 1, 2006).

It has been estimated that the Swedish emissions will be about 71.7 million tonnes carbon dioxide equivalents in the year of 2010. The volume of emissions in Sweden

in 2010 is therefore expected to be below the amount of emissions that Sweden has been assigned by the EU. The Swedish National Allocation Plan states that the allocation of permits should not exceed the projected level of emissions during the period (Government 1, 2006).

The estimations have given a limit of 27.1 million tonnes carbon dioxide in emission permits a year. The planned amount of allocation is 25.2 million tonne carbon dioxide in emission permits a year. It therefore means that Sweden has decided to allocate fewer permits than required by the directive. The next period will include new sources of emissions due to a change in regulation (2004:1205) about trade with emission permits, which will broaden the definition of combustion installations. The broadening of the definition will mean that all combustion installations with an installed effect of at least 20MW will be included. 35 installations in Sweden will be affected by this change and that about 2 million more tonnes of carbon dioxide of emissions a year will be included in the emission permit system. The projection for greenhouse gas emissions for the emitters that is not included in the system is 43.5 million tonne of carbon dioxide equivalents (Government 1, 2006).

The Swedish parliament decide in 2002 and 2006 that the Swedish emissions should be abated by no less than 4 per cent compared to the 1990 level and this goal should be reached without the help of sinks of carbon dioxide or flexible mechanisms. The Swedish National Allocation Plan states that the emission permits only at a minimal level affect the actual emissions. The allocation will mainly imply an affect on the price on emission permits and a relative difference in the marginal abatement cost curve for the installations (Government 1, 2006).

### *3.2.3 Means of control that spans over sectors*

In order for us to understand the situations of the firms we need to comprehend what other kinds of means of control they are subjected to at the same time as the emission permits system. The Swedish carbon dioxide tax has been in effect since 1991. The 2000 decision about tax shifting meant that the tax on environmentally disrupting activities was raised and the tax on labour was lowered. The general level of tax on carbon dioxide is 910 Swedish Kronor per tonne carbon dioxide (as per 2006-08-31). In the proposition for 2006 budget the government suggested a decrease in the carbon

dioxide tax for the installations that is included in the emission permit system. The National Allocation Plan suggests that this double means of control for firms does not lead to any further reduction of emissions but rather distorted competition and an allocation of emissions between the installations (Government 1, 2006).

### 3.2.4 Allocation to new participants

About 15 million tonnes carbon dioxide of the total amount of emission permits is set aside during the period 2008-2012 mainly to the benefit of new participants.

The amount of emissions covered by allocated permits accounts for 36 per cent of the projected emissions for Sweden in 2008-2012 and can be compared with the projected emissions for the Swedish trading sector that is 38 per cent of total emissions. In Table 3.1 you can see that the allocation to existing installations will be less the coming period than in the previous since much more permits only will be available to new participants and because the change in definition will mean that more of the existing installations have to share emission permits (Government 1, 2006).

Table 3.1 Allocation for the periods 2005-2007 and 2008-2012

	2005-2007	2008-2012
	Million tonnes/year	Million tonnes/year
Total allocation	23.2	25.2
New participants	-0.7	-3.0
Broadening of definition		-2.0
Existing installations	22.5	20.2

Source: Government 1, 2006

### 3.2.5 The Process

The first step to take to be a participant in the trading system is to apply for a permit to emit carbon dioxide at the county administrative board. The second step is to apply for allocation of emission allowances at the Swedish National Environmental Protection Agency (NEPA). A board of representatives from the NEPA, the Swedish Energy Agency (SEA) and the Swedish Agency for Economic and Regional Growth (Nutek) gives suggestions of allocation but the NEPA takes the final decision on the allocation of the allowances for the individual companies. The decision can be appealed at the Administrative court. The NEPA is the permission authority and the

SEA is the register responsible authority (FlexMex2, 2005). The SEA is responsible for the electronic transaction system that each country within the EU is required to have; the Swedish system is called the Swedish emission permit system (SUS) (SEA 2, 2007).

A year with permits starts when the firms receive permits in their transaction account at the SUS not later than the 28th February. A verified emission report regarding last year's emissions has to be handed in to the NEPA by the 31<sup>st</sup> March. Those companies that have not yet handed in their verified report will on the 1<sup>st</sup> April have all their outgoing transactions from their account blocked. On the 31<sup>st</sup> April there has to be the same amount of emission permits in the account as stated in the verified report. The 15<sup>th</sup> May a scheme of all companies' emissions is published. The government annuls the amount of emission permits that is in accordance with the report and deletes them from the trading system (SEA 3, 2007).

To have an incentive to make sure the regulations are followed a punishment is induced on those that do not follow the regulations. If a firm does not hand in the correct amount of emission permits it will be fined with 100€ per tonne exceeded carbon dioxide. It also has to hand in emission permits for these exceeded tonnes of carbon dioxide the next year (SFS 2004:1199).

### **3.3 Legislation**

#### *3.3.1 The European Union Directives*

The European emission trading scheme was originally based on the directive *2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC*. The directive regulates the allocation, the transfer, the control and the member states reports of the emission permits (Directive 1, 2003). To make the directive more consistent with the Kyoto protocol the European Parliament and the Council introduced directive *2004/7101/EC of 27 October 2004 amending directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms*. The latest directive is an additional regulation

of the emission trading with the purpose to facilitate the use of the other two flexible mechanisms (Directive 2, 2004).

### 3.3.2 *Swedish Law*

The Swedish law is based on European Community directives. The *Law (2004:1199) on trading with emission permits* states that:

Through this law the conditions of the system with rights to emit carbon dioxide (emission permits) is regulated. The law consists of regulations about allowance to emit carbon dioxide and of allocation, registration and registration of emission permits.

## ***Chapter 4; Theories***

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*In this chapter we introduce theories that can explain the firms' experiences from the emission permit trading system.*

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### **4.1 Theories on means of control of pollution**

To explain the emission permit system we tried to use economic theories concerning means of control of pollution. The theories could have provided us with a good understanding of the emission permits system. In this section we have tried to use those economic theories of means of control to explain the emission permit system.

Hill and Kriström (2005) state that when the public finance cost for production is larger than the private finance cost it can indicate that emissions from the production influence other firms or individuals in the society. In figure 4.1, Hill and Kriström has described the supply curve as the private finance cost and it has been simplified to a horizontal curve which mean that the firms' revenues is not affected and the firms are not making profit. A competitive market will imply the  $Q^*$  equilibrium quantity and the  $P^*$  equilibrium price. From societies point of view this quantity means an excessive production and the emissions from this production will imply a cost that is not reflected in the price. This cost can be added to the private cost which then creates the society's marginal cost for producing the good. In this model Hill and Kriström has assumed that emissions are proportional to production (Hill *et al.*, 2005).

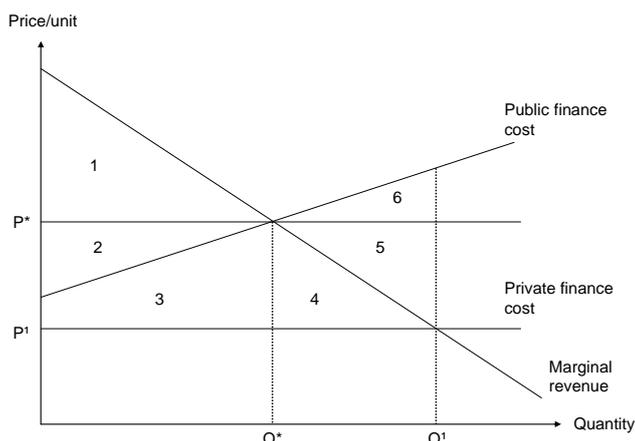


Figure 4.1

Source; Hill & Kriström, 2005, p.22

Hill and Kriström (2005) suggest that it is in the society's best interest to reduce the production from  $Q^*$  to  $Q_1$  to reduce the emissions to the level where the marginal revenue meets the marginal cost of the society (Figure 4.1). This level of emissions can be attained with the help of different means of control. However, the price of the good will rise and the quantity turnover will decrease no matter what mean of control is used. Thus there will always be a cost when abating the emissions. Depending on what means of control that is used, different gains and losses will be implied for different players on the market (Hill *et al.*, 2005). In order to achieve abatement in pollution emitted in the most cost-effective way, there are different instruments to choose from (Tietenberg, 2001). According to the authors of *Natural Resource and Environmental Economics* pollution control instruments are usually divided into three categories. They are institutional approaches, command and control instruments and economic incentive (market-based) instruments. Both emission taxes and marketable permits are classified as economic incentive instruments. Incentive-based instruments aim at making firms and individuals change their pollution behaviour voluntarily. The economic incentive instruments create markets for the externality. Opportunity costs are generated by the prices that exist in these markets and these opportunity costs will be considered by profit-maximising firms (Perman *et al.*, 2003). Tietenberg writes in his book *Environmental Economics & Policy* that "[t]he cost of achieving a given reduction in emissions will be minimized if and only if the marginal cost of control are equalized for all emitters" (Tietenberg 2001, p. 251). Perman, Ma, McGilvray and Common (2003) also state that the problem with these instruments is that the

equilibrium between control cost and pollution emitted has to be known for each polluter. The value of damage that is created by such an emission as carbon dioxide is independent of the location of its source (Perman *et al.*, 2003).

#### 4.1.1 Emission taxes

Since the Swedish control of pollution is not only controlled by the emission permits but also taxes, we needed to understand how taxes affect the firms' situation. The following section will give a presentation of taxes with the help of economic theories of means of control.

By looking at Figure 4.1 by Hill and Kriström (2005) we can first explain what and to whom losses and gains are produced under a tax regime. An environmental tax will raise the price from  $P^*$  to  $P_1$  and will imply that areas 2+3+4 in figure 4.1 will be a loss to the consumer. Area 2+3 is a cost increase to consume the good and area 4 in this case is the loss of benefit the consumer experience when it lowers his or hers consumption. Area 2+3 is tax revenues and area 4+5+6 is the environmental profit. The public finance net profit will be areas 5+6 if the tax revenues are returned to consumers in a lump sum (Hill *et al.*, 2005).

Perman, Ma, McGilvray and Common (2003) points out that an emission tax will not have the same effect as a tax on output of the final product or a tax on input. An emission tax aims specifically at meeting the pollution target. There are three kinds of pollution targets. One of them is that the pollution target is the economically efficient level of pollution. A specific pollution target can also be set according to other criteria than economic efficiency. A pollution target can also be just an emission reduction that is an unspecified amount (Perman *et al.*, 2003).

Perman, Ma, McGilvray and Common (2003) suggest that when an efficient pollution target is set it has to meet net benefit maximisation. This will present a tax rate per unit of emissions that is equal to the monetary value of marginal damage at the efficient level of pollution. Firms will produce a high level of pollution if there is no tax and they will not consider the pollution they produce. At the same level of pollution the private marginal benefit of emissions is zero. A tax per unit emission is introduced at the constant level and is the value of marginal damage at the efficient

pollution level. When the tax is introduced profit-maximising firms will pollute at a lower level where the marginal benefits of additional pollution after the tax is zero. Therefore, the tax level leads to the right amount of incentive to reach the targeted efficient emission level. Perman, Ma, McGilvray and Common (2003) also imply that without an emission tax, firms have no economic incentive to abate their emissions. Since the emission tax that firms can avoid is the incentive to lower their emissions it is only profitable for firms to abate emissions as long as their marginal abatement costs are less than the value of the tax rate per unit of pollution (Perman *et al.*, 2003).

Perman, Ma, McGilvray and Common (2003) states that “[t]he tax ‘internalises the externality’ by inducing the pollution generator to behave as if pollution costs entered its private cost functions” (Perman *et al.*, 2003, p. 218). This suggest that the tax will be embodied in all the other costs that a firm has to consider and the decisions that a firm makes based on these costs will also reflect the tax. This efficient level will also mean that firms will work their way towards this target with cost-efficiency. With a tax, all firms will adapt their marginal cost by lowering their emissions to the level where the cost equates with the tax rate (Perman *et al.*, 2003).

Without sufficient information, an Environmental Protection Agency (EPA) cannot set an efficient pollution target. It could set a pollution target based on some criterion other than economic efficiency. For this target, EPA need to know the aggregate marginal cost of abatement function in order to calculate the tax rate that would lead to the right incentive that induces the result. Even though this target is not economically efficient it is cost-efficient in the way that firms reach this target. That means that the EPA does not need to know every firm’s marginal abatement cost function. This is required if the EPA would use a command-and-control system as for example a ban or a quota and will impose a higher degree of information attainment. The discussion of insufficient information can be referred to J.H. Dales that in his discussion about pollution, property and prices pointed out the problem of the lack of information when controlling the externalities (Perman *et al.*, 2003).

Tietenberg (2001) point out that the important issue here is to determine the level of the tax. Each tax level will have some positive effect on emission levels. When authorities do not know the cost of control for the firms the easiest way to find the

right tax level is by a trial-and-error process. With this process a tax rate is chosen and the result of the emission reductions will reveal if it is the right level (Tietenberg, 2001). If the EPA does not have any information about abatement costs and benefits, they could select a random emission tax level. However much the emissions are reduced they are reduced in a cost-effective way. What Perman, Ma, McGilvray and Common (2003) have shown us with this discussion is that one of the tax instrument's best qualities is its cost-efficient way to reduce emissions (Perman *et al.*, 2003).

#### 4.1.2 Marketable permits

In the following part we have tried to explain the firms' situation with the help of economic theories on marketable permits like those used in the Emission Trading Scheme, ETS. First part explains the basics of marketable permits are explained then the second section explains the implications of a free-of-charge distribution of the permits are explained and the last part explains the affects on distribution of income and wealth.

With a marketable permit system all polluters are required to have permits to emit. The authorities allocate permits that are equivalent to the desired level of emission (Tietenberg, 2001). Perman, Ma, McGilvray and Common (2003) say that “[m]arketable permit systems are based on the principle that any increase in emissions must be offset by an equivalent decrease elsewhere” (Perman *et al.*, 2003, p. 219). There are two kinds of such marketable permits, the *cap-and-trade* system and emission reduction credit (ERC) (Perman *et al.*, 2003).

When the emission reduction credit method is used, a baseline volume on the emissions is estimated. An emission above a firm's baseline will imply a penalty to that firm. If a firm emits less than this baseline level, the firm receives emission reduction credits for that amount of emissions. These credits are transferable. If a firm has bought credits from another firm, the firm can then emit that much above their baseline. The *cap-and-trade* system means that a cap is set on the emissions (Perman *et al.*, 2003). This cap is a limit on the emissions allowed for firms.

Perman, Ma, McGilvray and Common (2003) claim that to establish a cap-and-trade scheme, such as the ETS in the EU, for a uniformly mixing pollutant it involves some issues. The amount of permits issued should be equal to the pollution target. It has to be legislated that the amount of pollution should not exceed the level of permits possessed. A monitoring and penalising system that deters and supervises the excess emitters has to be established. Also, a decision has to be taken on how the permits should be allocated amongst the firms. It has to be guaranteed that firms can trade emissions permits between themselves at the price that they have agreed upon. Command and control instruments and marketable permits both work through quantities and not prices like a tax does (Perman *et al.*, 2003).

The transferability of the permits creates a market which in its turn puts a value and price on the right to pollute. This value will also generate an opportunity cost to firms. For each permit a firm uses it perceives a cost as this permit could have been sold to another firm (Perman *et al.*, 2003). When permits have been allocated firms will estimate the marginal worth of the permits to themselves. Firms that have an insufficient number of permits will consider the marginal worth based upon their emission abatement costs. This marginal worth can then vary from one firm to another. Some firms will chose to abate their emissions instead of buying more permits, other firms will chose to abate their emissions even if they have permits to cover these emissions and sell the permits if the price of the permits exceeds the marginal cost at which they abate (Perman *et al.*, 2003). Perman, Ma, McGilvray and Common (2003) explain why a market can emerge from this. “In any situation where many units of a homogeneous product are held by individuals with substantially differing marginal valuations, a market for that product will emerge” (Perman *et al.*, 2003, p. 224). On the market that is created an equilibrium market price will emerge. In this equilibrium, the marginal abatement costs will be the same for all firms. This will predict that transferable marketable permits achieve any given target at the lowest possible cost, like it also would with a tax. Permits will be similar to a tax if the emission level achieved by the amount of issued permits is equivalent to the emission level that would rule during a tax (Perman *et al.*, 2003).

When the Environmental Protection Agency (EPA) allocates the permits, there are two methods of allocation available. One is to allocate the permits free of charge and

the other is to allocate them by auction (Perman *et al.*, 2003). Other options can occur or a mix of the two is also possible; however, to explain how these two methods work we explain them one at a time, also these two allocation methods are the two methods that are currently used in Sweden.

Perman, Ma, McGilvray and Common (2003) suggest that when permits are allocated free of charge they are not likely to be distributed as firms would desire. Some will be willing to buy more permits and others will want to sell some of their permits. Buyers will most likely have a high marginal abatement cost and will want to buy more permits at a lower price than their marginal abatement cost. Sellers will have the opposite situation. With fair competition, a market price on such a market will be the same as for the market that occurs when the permits are allocated through auction. The quantity of permits traded will be less than the quantity that will be auctioned off since some of the free of charge allocated permits will not be traded at all (Perman *et al.*, 2003). The way in which the permits are allocated does clearly not influence the level of abatement of the emissions and has no effect on the equilibrium permit price. The level of abatement is influenced by the amount of permits distributed (Perman *et al.*, 2003). Hill and Kriström (2005) use their method of cost and revenue when suggesting that if the government chose to allocate the permits free of charge the firms get to keep the areas 2+3 in Figure 4.1 (Hill *et al.*, 2005). The discussion about allocation is based on the assumption that perfect competition rules. The impact of strategic behaviour could alter the market price to a non-competitive level (Perman *et al.*, 2003).

If the permits are allocated by auction, the bids that the EPA receives can be considered as a market demand curve for permits. If the firms bid without strategic behaviour, the demand curve will be equal to the aggregate marginal abatement cost function. If all permits are sold at one price, the aggregate marginal abatement cost at the abatement cost given by the total number of issued permits suggests the market equilibrium price. Even if the permits are auctioned off to firms, the firms will still face a real resource cost of abatement (Perman *et al.*, 2003).

Hill and Kriström (2005) say that the difference between the means of control of the pollution is the difference in effects of distribution of income (Hill *et al.*, 2005).

Perman, Ma, McGilvray and Common (2003) point out that assuming that firms are required to abate their total emissions it will create a real resource cost. This is the sum of marginal abatement costs. If firms have to buy the permits from the government, the firms will suffer a cost and a transfer of income will occur but this is not a real resource cost to the economy. If the permits are allocated free of charge there is no transfer of income from firms to government. On the secondary market there is a transfer of income between firms. This means that some of these firms will gain and other firms will lose (Perman *et al.*, 2003). Hill & Kriström (2005) point out that if the government were to auction off emission permits to firms, it would give the same result as if a tax or a regulation is implemented (Hill *et al.*, 2005). Perman, Ma, McGilvray and Common (2003) suggests that polluting firms will prefer a free allocation over an auction when the government is distributing the permits (Perman *et al.*, 2003).

The economic theories provided us with a good basic knowledge of how taxes and emission permits work on an economic level. Although the economic theories provided us with a good understanding of how emission permits work in economic terms it did not explain to us how the emission permits are experienced by firms. So the economic theories on means of control will not provide us with the answer to our research questions.

#### **4.2 Evaluative Criteria for Economic Incentives**

Since we were lacking theories that could explain the experiences of the firms in regards to a means of control of pollution we tried using Hanley, Shogren and White's evaluative criteria for economic incentives. According to the authors of *Environmental Economics* effectiveness, efficiency, equity and flexibility is the four criteria that can be used in order to evaluate how useful and practical the economics incentives are. The economic incentives will not work if it is ineffective in abating pollution, inefficient in doing so, defile social norms of equity or miss the flexibility to follow shifts in economy, technology and environment (Hanley, Shogren & White, 1997).

The effectiveness of the emission permits system is determined by how well it fulfils the goal of emission reduction. According to the author there has not been enough of

evidence that different means of control of emissions actually have increased the technology development that aims to reduce pollution. The reason for this is that the costs of emission reduction are not high enough to motivate the firms (Hanley *et al.*, 1997).

Hanley, Shogren and White points out that a system is efficient when the goals of emission reduction are reached at lowest possible cost. In theory there is no difference in efficiency between a quantity rationing system with emission permits and a price rationing system; however it could vary a lot in reality (Hanley *et al.*, 1997).

Experiences show that emission permits provides more cost savings than price rationing. One advantage of price rationing is that most countries already have some form of taxation authority and would not have to implement a new organisational authority of the marketable permits (Hanley *et al.*, 1997).

Hanley, Shogren and White states that with systems like the emission permit system regulators must identify the winners and losers of the system, who benefits of the purer environment and who must take the financial cost for the system. The emission permit system follows the principle of 'polluter pays', which means that a firm does not have the right to pollute and must pay for the damage it causes. The cost for the firms is seen in decreased profits and less competitiveness. The issue with a system's equity also concerns the consumers. How much of the firms' additional costs due to the system could be transferred to the consumers or affect suppliers and employees through lower incomes (Hanley *et al.*, 1997).

According to the authors "an economic incentive system should adapt to changes in markets, technology, knowledge and social, political and environmental conditions". The price on the emission permits have the possibility to adjust to the economy, technology and inflation through supply and demand in the market. The power of markets gives the flexibility in the price of emission permits that emission charges does not have. Emission permits are however less flexible when adjusting the level of emissions (Hanley *et al.*, 1997).

These criteria did not explain the objective of the dissertation since the effectiveness of the emission permit system is not our main concern. The objective is to find out how firms experience the emission permit trading system. The goal with the dissertation was not to evaluate if the permit system is economical efficient. We are also not looking for an absolute truth to who the winners or losers are and who gains from the purer environment. Opinions from the firms about whom they think the winners and losers are might be discovered but this might not be the reality outside of the firms. We did not think that these criteria gave us any theory that could be tested and directly applied to what we wanted to know about the firms experiences.

### **4.3 The External Control of organisations**

Because the economic theory and the theory on economic incentives did not provide an explanation of the firms' experiences of the emission permit trading system an attempt at using a third theory was made.

According to Pfeffer and Salancik's book about *The external control of organisations* (1978), one organisation's actions may create problems for other organisations or individuals. The possibility for organising interests during these situations and the likelihood of cooperation is gone. During a third party intervention such as the permit market implementation there are two major features. One is that when establishing a negotiated environment such as the emission trading market the political decision maker most often do not directly experience the impacts of the actions however the establishers do. The other is that the decisions often include more organisations beyond the original problem. A political decision is not adaptable and has low flexibility and has the possibility to spread the disadvantages and advantages amongst a lot of organisations (Pfeffer & Salancik, 1978).

It could be in the best interest of the organisation to have the capability to be a part of the social structure of norms to make sure that its interests are taking into account. This can mean that by following the current concerns of the people, in this instance their concern for the environment, firms can ensure their interests. The author also suggests that the decisions have to be well argued for and rational in order for them to have an affect. The decisions also have to benefit the common good (Pfeffer *et al.*,

1978). The emission permit market can easily be justified considering the big engagement of the population's attention to environmental issues.

Pfeffer and Salancik's (1978) theories of external control of organisations did not explain the firm's experiences. When the two authors talk about external control it seems like they mean that the organisations or in this case the firms have a choice when this control is implemented. When it comes to the firms that is participants of the emission permit system, these firms did not have a choice when the emission permit system was implemented. The theories that the authors discuss does not directly apply to the experiences of firms that have been introduced to a new means of control.

## ***Chapter 5; Empirical method***

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*In this fifth chapter we discuss the empirical method that is used in the dissertation. The chapter contains a presentation of the research strategy and sample. The process of the dissertation is also presented. It also covers validity, reliability, generalisability and grounded theory.*

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### **5.1 Research strategy**

As our research approach is abductive, we will not test any theories or hypotheses, the aim is to try to develop a possible explanation or a theory. This approach will lead us to a research strategy that is close to grounded theory. A strategy that follows the grounded theory starts without a theoretical framework. A theory or explanation is instead developed from the primary data collected. This theory/explanation is tested in further data collection (Saunders *et al.*, 2007). In our research a preliminary interview provided us with both insight and further questions regarding the emission permit system. These questions developed the idea to evaluate firms' experiences of the emission permit trading system.

We only had the opportunity to perform the study during a short period of time and it implies that we performed an ad hoc study (Christensen, Andersson, Carlsson & Haglund, 2001). A quantitative research would not be able to capture the context and the complexity of the emission permits phenomenon. A qualitative research was able to capture the interaction and the complexity that a phenomenon like the emission permits system demands. The qualitative study is connected to exploration where a greater understanding of the subject is required (Alvesson & Sköldberg, 1994).

In order to easier see patterns and connections between the experiences we developed dimensions from the basis of the preliminary interview, two reports that has been written about the emission permit trading system and other aspects that we wanted to evaluate. The research was based on these dimensions that aimed at describing the experience of the representative respondent of each firm. From these dimensions,

questions were drawn to better explain to the respondent what we wanted to know. These questions worked as an interview guide in the interviews and were the primary research.

Our primary data collection form was interviews. This form fitted our purpose of a deeper understanding of the firms' experiences. The nature of the questions is fairly complex and we had the possibility to ask suitable follow-up questions to each respondent. Interviews generally also have a higher respond rate than questionnaires. We wanted to know what the respondents thought of the system. We did not only want them to put a value on how much they thought that something was bad or good, as they could have done if we had sent out a questionnaire with rating questions. Interviews gave us the opportunity to change the questions in between the interviews so that they suited each respondent.

We chose telephone interviews as our form of interview. Reasons to why we chose telephone interviews are due to geographical matters in which we had neither time nor the finances to visit firms that are not in the proximity of Kristianstad. Telephone interviews generally take less time than for example face to face interviews. This could increase the possibility of booking interviews as it was easier for the respondents to fit it into their schedule. The interviews are conducted in a semi-structured way. This means that a guide was used and in our case the guide consists of different dimension, to guide us through the interview. Since the interview is semi-structured, it implies an exploratory research.

## **5.2 Sample**

In our dissertation we want the opinions and thoughts of firms handling a big amount of emission permits. We looked at the *allocation per installation* that we found through the Swedish Energy Agency's website, and chose the firms from the top fifty when it comes to amount of permits. For us it meant that we were sure that they had a good understanding of what the emission permit trading system is. It also ensured us that there was a greater chance that the firms had taken part in the trade of the permits and therefore understood the full implications of the emission permit system.

There are two selection methods to choose from when you have a need for sampling your research objectives and these are probability or non-probability sampling. Within these two selection methods there are different subgroups. The selection method of these firms is a non-probability selection method which suggests that the respondents are not randomly selected. The non-probability selection method, purposive sampling suited the research the best since we were explaining and evaluating firm's experiences (Saunders *et al.*, 2007). By using this method it implied a deeper knowledge of the firms' experience. When choosing this method we were aware of that the samples cannot represent the population from a statistical point of view. We chose the purposive sampling method because we do not appreciate the need for generalisation of the experiences of the firms.

The Swedish installations are divided into categories. The law regarding the trade with emission permits states six categories of firms bound to the system. According to the National Allocation Plan for 2008-2012 the installations receiving permits are from five categories. No installation from the coking plant category will receive permits for this period. Therefore, we chose to exclude the coking plant category from our research.

### **5.3 The process of the dissertation**

#### *5.3.1 Starting up*

Our first idea for this dissertation's research questions was to describe how firms administrate the emission permits. We constructed questions mainly in regards to this administrative process. The questions were based on basic economic theories and basic knowledge about the emission permits of which some literature had been reviewed before the conducted interview. To get more insight in how the system works for firms we conducted a preliminary interview. The interview opened up our eyes to the reality that some of these firms face and that this reality contains intriguing aspects to investigate. The respondent had to us, some interesting opinions about the implications of the system.

After the interview we were looking for a new direction for our dissertation and we started to review some literature and scientific articles again. We also called the Swedish Natural Environmental Protection Agency (NEPA) to ask if it had

conducted reports on the experiences of the firms that are affected by the system. The Agency sent us the report *Experiences of EU's system of trade with emission permits*. The report was an account of the two Swedish agency's experiences which are the handlers of the system, the National Environmental Protection Agency and the Energy Agency. This report suggests several legislation changes.

The report *Review of EU Emissions Trading Scheme* had been performed to give the European Commission's Directorate General of Environment insights in how organisations, firms and associations had experienced the emission permit system. This report was based on a questionnaire that the respondents had responded to in 2005.

None of these reports gave us the information needed. We wanted to find out how the firms experience the system which the report from NEPA does not explain. It was also important to get a view of the system that was solely based on the firms' opinions and that this view was based on the knowledge of what this system implied for the firms. Since the report *Review of EU Emissions Trading Scheme* was based on a questionnaire that was sent out to several different types of organisations and that it was sent out in 2005 it did not give us the answers we were looking for. We thought that the firms' experiences and impressions of the system could give these two reports a complementing view to the emission permit system.

### 5.3.2 *Previous reports and the preliminary interview*

The phenomenon with emission permits trading is relatively new. The system was taken into use the 1<sup>st</sup> of January 2005. Two reports have been made on the subject, one on a European level and one on a national level.

The report *Review of EU Emissions Trading Scheme* was conducted on behalf of the European Commission's Directorate General of Environment. The results came from a web-based survey conducted in the period from June to September 2005. The report was an evaluation of the emission trading scheme from the view of firms, government bodies, industry associations, market intermediaries and non-governmental organisations. The response rate was approximately 60 per cent. Of the total 517 emails that had been send out, 169 firms responded, and 66 per cent of these firms

were actually included in the trading scheme (EU 1, 2006). This means that only 110 firms was a part of this survey, divided on all Member States it was 4.4 firms per country. Three firms, at the lowest, with offices in Sweden were discovered. The European survey was of quantitative nature with structured answers.

The questions in the report from the EU did not give any room for firms involved to give free opinions and we felt that this was lacking in the report. We wanted to know the firms experiences of the system. Firms are just one of five groups of participants in the EU report. The report was also conducted very early after the implementation of the emission permit system which meant that the firms had been a part of the emission permits system only a few months. That fact may influence the survey result due to that the firms had not yet experienced a whole year with the system. This indicates that they had probably not traded with the permits to a large extent and that the process of handing in the verified report and the annulment of the permits had not yet taken place. We thought that these issues also needed to be evaluated. Firms found that the most important aspects of the system was allocation periods and allocation methods and rules. The general opinion amongst the firms is that allocation periods of ten or more years would be preferable and that the national allocation plans would be announced two or three years in advance. This would decrease the long-term uncertainty and secure a more stable investment climate. Regarding the allocation method the results can not provide a statistically based answer on what method is preferable. 60 per cent of the firms think benchmarking should be a possible alternative to grandfathering. Two sectors are more sceptical towards benchmarking, mineral oil refineries and paper pulp, paper and board industries. When it comes to the option of auctioning most firms oppose it. The rules that the survey covered was concerning the issues when closing an installation and the new entrants' policy. Another general opinion amongst the participating firms was that the implementation of the emission permits system was conducted under a lot of time pressure.

The second report we read was the *Experiences of EU's system of trade with emission permits* from the Swedish National Environmental Protection Agency and the Swedish Energy Agency. The aim with the report was to "report experiences from emission licensing, allocation procedures, supervision, verification and report

procedure, control and registration within the EU system of trade with emission permits as it is applied in Sweden” (Report 1, 2007, p. 4) These experiences came from the Swedish National Environmental Protection Agency, the Swedish Energy Agency, the Swedish Agency for Economic and Regional Growth and the Administrative courts. The report mostly highlights recommended changes in laws and regulations. The conclusions of this report could be compiled into four points. The first is that implementation of the system went well but that it had to be made under a lot of time pressure. Second it shows that the laws and regulations partly have been seen as indistinct and hard to apply. The third point states that the administrative costs have been significant for some firms. Finally suggestions for law changes are made. We think that the report did not take the firms experiences and opinions into consideration when conducting the report. Of course some of the suggested changes have in some way sprung from firms, but after reading the report our opinion was that it mostly was changes based on experiences from authorities. The answer that we got from NEPA when we called them and asked if they had conducted an evaluation of the firms’ experiences of the emission permits system, the answer was no, but that the report *Experiences of EU’s system of trade with emission permits* had incorporated the firms experiences but that it was first and foremost based on the perspective of authorities (Report 1, 2007).

These reports gave us more insight of the functions of the system, both on a European and National level but did not emphasise what the firms’ perceptions of the emission permit system was.

Even though the preliminary interview did not have the purpose of providing a research result it provided insights in the reality of a firm’s experience of the emission permit trading system. The respondent introduced us to some issues about the system that we did not know before. Our perception was that the respondent considered the system as smooth in regards to allocation and that the price of permits was low and that competition is affected. The respondent also said that there was no information problem during the implementation. The respondent meant that the power generating industry that is included in the system had an advantage because if the system influenced the price on electricity they will benefit both from an increase in the price of permits and the price of electricity. We thought that the respondent’s impression of

the system was that very little administration was demanded and that this was not that firms' main issue.

### 5.3.3 *Creating the dimensions*

When creating the dimensions we thought about what we would like to know about firms' experiences from the emission permit system. After we had conducted the preliminary interview and reviewed previous reports, we developed some ideas of what could be of importance to highlight. First we developed categories from subjects that we felt was interesting to evaluate. We used the categories;

- general category
- environment
- costs, rules/regulations and competition.

When the categories had been developed we tried to highlight what we considered to be important issues within each of these categories. These issues were simplified by the use of dimensions. In total we had created twenty-three dimensions (for a table of the dimensions see appendix 2). The comparison made in the dimensions always refers to the situation the firm was in before the emission permit system was implemented. The primary data collection is therefore always referring to what the impact has been since the implementation of the system and what the system has implied to firms. After developing the dimensions, questions were created with the purpose to reflect the dimensions. The questions were used in the interview guide that we used when we conducted the interviews (for the interview guide see appendix 3). Each dimension will be explained below.

Within the general category we created seven dimensions. The first dimension was *buy / sell*. We wanted to know if the firms at any point bought or sold emission permits. We found it interesting to know if the firms had ever taken part in trade with emission permits. It seemed important to us so that we could know that the firm in question had actually experienced the full implications of the system. The first dimension can not be referred to any specific source of information as this is a fundamental question. The second dimension; *cheap / expensive* reflects the firms' opinions about the price on the emission permits at the secondary market. We recognised the importance to hear how firms experience the price on the emission

permits because if the firms felt that the price was low the firms might have a more positive experience of the system than otherwise. This dimension was based on the opinion of the respondent in the preliminary interview that suggested that the price of permits was low. The third dimension was *information / non-information*; this aimed at giving us an insight in how the firms experienced the information given to them or sought by them when the system was implemented. It will also answer the question of what the firms think about any new information or non-information regarding changes in the system. This dimension was also based on the preliminary interview but here we wanted to confirm or reject the answers in the preliminary interview and add the aspect of information about changes in the system. The report from NEPA suggested that the NEPA had performed great information effort in the form of seminars, information leaflets and a web page. We wanted to verify that the firms had recognised the information efforts. Another dimension was *fair / unfair* that regards the firms' thoughts about the fairness of the system. This dimension was created because there has been some discussion on whether or not some sectors should be included or excluded from the system and we wanted to hear what the firms had to say about this but at the same time opened up for any other suggestions. For example in the Swedish National Allocation Plan they state that the transport sector is by far the largest emitters of carbon dioxide and this sector is not included in the emission permit system. Next dimension was *smooth running / unsmooth running*. We wanted to know what the firms thought about the smoothness of the emission system when it comes to sales, allocation and the final handing in of the emission permits. During our preliminary interview the respondent gave us some indication of that the system was rather smooth running and therefore we wanted to see if this was unique to this firm or something that other firms also had experienced. The sixth dimension concerns the legislations. This dimension was *clear / unclear legislation* and sprung from the report from the NEPA where it gave several suggestions for legislation corrections which also indicated that firms had had difficulties understanding the legislation and/or following. The last dimension in the general category was *increased administration / no change*. We wanted to know if the administration in the firms had increased since the implementation of the permit system and if that was the case how firms had dealt with this increased workload. It was our understanding after we had understood the yearly process of the emission permit system that it must have meant some increase of administration for the firms. This idea was backed by

the report from NEPA that stated that smaller firms had a harder time dealing with the increased administration than the larger firms.

Within the second category, environment, we created five dimensions. The first one, *environmentally efficient / not environmentally efficient*, refers to the firms' view of the national system being efficient or not. With this dimension we aimed at getting a wider view of what the firms knew about the system, if the firms thought that the aggregated emissions had actually reached the set targets. According to the Swedish National Allocation Plan the emission permits had little effect on the emission levels. The second dimension created was *decreased emissions / no affect on emission level*. The purpose with this dimension was to find out if there had been a change in emissions within the firm and if it had and did the firms think it was the implementation of the permit system or something else that had influenced this affect. We thought that it would be interesting to compare this dimension with the dimension about the national levels of emissions. Because if the firms had not lowered their emissions but thought that the overall emissions was abated how could this be. Next dimension is similar to the previous, *increased awareness of environment / no affect*, the difference is that here we meant the general environmental interest among the employees. The power to influence the firm is not only held by the firm itself. The employees are stakeholders in firms, the trading system are creating headlines and articles in the media that can influence the employees that in their turn can influence firms. This dimension was developed from our own experience and perception that is that emission permits trading system issues have been extra highlighted in the media. The fourth dimension highlighted the issue of the systems possible influence in the firms environmental interest, *increased the firms environmental interest / no affect*. We wanted to know if the issue of environment had become more important to the firm. This dimension also came from our own perception and ideas that the trading system could have implied that some firms think it is more important to be environmental friendly than before. The last dimension reflected over the question if the firms had seen any affect on the environmentally related investments since the introduction of the system, we therefore called this dimension; *increased environmental related investments / no change*. These environmental dimensions concerns issues that are among the first that we thought of when we started discussing emission permits. We thought that the

introduction of a new means of control could have meant an increase in investments and we wanted to find out if that was the case.

In the third category, ten dimensions regarding different kinds of costs, rules/regulations and competition are included. The first was *increased costs / no change*. What kinds of cost have increased, administrative, bought emission permits or any other cost. This dimension was brought on by the report from the NEPA that state that the emission permit system induced high administration costs to some firms. By creating a dimension that was open to any suggested increased costs we let the respondents give their own suggestions. Second dimension in this category was *free allocation (grandfathering) – auction*. With this dimension we aimed at getting answers to what of the two allocation methods the firms would prefer. Today in Sweden we have free allocation of the emission permits, but starting with next period ten percent of the permits could be auctioned off to firms if the government wishes to do so. There is also a possibility that the government in the future will have the opportunity to auction off more of the total number of permits. The next dimension also reflects the basics of a trading system in regards to the different varieties of tradable permits system, *credit-and-trade (benchmarking) – cap-and-trade*. We thought it would be interesting to know how the firms perceive the different varieties of permit systems that exist. We chose two systems that was the foundation of the dimension, but decided to also have an open question in the interview guide to which the firms could suggest any other system. Cap-and-trade is the existing system within the European Union today and Credit-and-Trade is a system that we have stumbled upon several times through our research. The inspiration for the fourth dimension, *sees the possibility to transfer the cost to consumer / does not see the possibility to transfer the cost to consumer*, we got after conducting the preliminary interview. The respondent suggested that some sectors could have the possibility to pass on the cost of emission permits to the consumer that other sectors do not have and that this has and will create inequalities in the system. In next period, 2008-2012, the allocation of emission permits has decreased which may force firms to buy additional permits. These permits increase the costs for the firms and have to be compensated some how and some firms may choose to balance the cost by increasing the price of the good. The fifth dimension concerns the legislation and rules of the system; *room/able to deceive / no room to deceive*. In the report from the Swedish National Environmental

Protection Agency and the Swedish Energy Agency there are a number of suggestions for changes in laws and regulations concerning the permit system. We wanted to know if these suggested changes had been induced because of the possibility for the firms to deceive. The next dimension came naturally from the former question and concerned the consequences when breaking the regulations or rules, *effective punishments / not effective punishments*. We wanted to know if firms think that the punishments for conducting an illegal action are enough to discourage from such an action. The fines for not handing over the correct amount of emission permits will rise from 40 to 100 euro per tonne carbon dioxide that is emitted but is not covered by the permits handed in (SFS 2004:1199). A Swedish article inspired the seventh dimension; *affects the price on electricity / no affect*. The article *Swedish industry and Kyoto / An assessment of the effects of the European CO2 emission trading system* highlighted the issue that the emission permits system may affect the electricity price. The article concludes that not only will the Emission Trading Scheme imply a price increase on fuels that leads to a carbon dioxide emission but could also have an indirect impact on the electricity price that can have an affect on the Swedish industry (Brännlund & Lundgren, 2007). We also got an indication that it was a relevant dimension after we had conducted our preliminary interview. Another important aspect of the system is the affect it has on competition for the industries involved. The emission system is not a global system and only affects some industries which raise the question of fair competition. The dimension for this issue was *partial competition / impartial competition*. The ninth dimension in this category was *national system / European system*. We wanted to investigate if firms would prefer a national system or a European system. In order to sum up the different dimensions and also the questions developed from them, we created one last dimension; *difficulties due to new period / no change due to new period*. This dimension has to do with all the changes that the government has suggested and/or implemented in the next period. In this case the report from the NEPA and the SEA gave us insights in the changes that they had suggested (Report 1, 2007). The next period will also imply that fewer permits are allocated amongst firms and we wanted find out if the firms see any problems for them.

From these dimensions questions to an interview guide was developed.

#### **5.4 Reliability**

Saunders points out that reliability refers to which extent your findings will give the same result on other occasions and to what extent other researchers will get the same result. There exist different threats to a good reliability. One is participant bias, which mean that the respondents express what the firms' want them to say instead of their own thoughts. This is difficult to avoid because it may not be obvious to us as researchers when the respondents give misleading answer. A way to minimise these misleading answers is to ensure the respondents anonymity in the dissertation which we did. An issue that can affect the reliability is observer error. We both conducted interviews separately which mean that there is a risk that we asked the questions slightly different. In an attempt to avoid this we followed a semi-structured interview guide with open ended questions and words of support in order to minimise the risk of being inconsistent when asking the questions. The last threat is the risk of observer bias in form of different interpretations of respondents' answers (Saunders *et al.*, 2007). To minimise the risk of this we have recorded every interview and together we listened to them and discussed our impression of the respondents' experience.

#### **5.5 Validity**

Saunders points out that validity examines the causal relationship between variables and if you really measured what you intended to measure (Saunders *et al.*, 2007). Validity concerns the credibility of the research in consideration to the accordance of the reality. Christensen, Andersson, Carlsson and Haglund conclude that when conducting qualitative research validity is the most important (Christensen *et al.*, 2001). In order to develop questions that could provide us with the information we were looking for, we created categories that highlighted our main objectives. From these categories we developed a number of questions within each area. We also discussed what we wanted to know so that we increased our chance to measure what we intended to measure.

#### **5.6 Generalisability**

Saunders writes that generalisability concerns issues about the results possible attribute to be generalised to a larger population. In order to generalise, a significant number of samples of the population needs to be collected (Saunders *et al.*, 2007). When conducting a qualitative research the result cannot be statistically generalised,

instead a qualitative generalisation can be made. A qualitative generalisation, also called work-hypothesis, is the best overall picture available at the time and is not an absolute truth. The authors of *Market research – a handbook* (translation *Marknadsundersökning – en handbook*) state that the level of generalisability the result reaches depends on the level of information and how complete the research is perceived by the reader. If the results can be applicable to firms that did not participate in the research the level of generalisability could increase. For a qualitative researcher the aim is to reach a qualitative generalisation with the result (Christensen *et al.*, 2001). The aim with our dissertation was not to generalise the results to the whole population of firms in Sweden. Our research was conducted amongst a selection of the fifty highest receiving firms of emission permits in Sweden. There could be a significant difference between firms with a high or low amount of emission permits. We hope that the research result can be a qualitative generalisation within Swedish firms with a considerable amount of emission permits.

### **5.7 Grounded theory**

To make the analyse process easier we recorded the conducted interviews. This procedure gave us the opportunity to replay the interviews in order to improve the transcripts. According to Christensen, Andersson, Carlsson and Haglund the qualitative analyse focus on the totality and connection. It emphasises underlying patterns and processes of the collected material (Christensen *et al.*, 2001). The analyse process is depending on whether the research approach is deductive or inductive. Since our research has more of an inductive approach we chose the inductively-based analytical procedure *grounded theory*. With this procedure, an explanation or propositions can be developed from the data collected. The grounded theory procedure could be used as a strategy or a procedure. The data collected and gradually refined are defined as the theoretical sampling. The sampling enabled the possibility to choose firms that could provide a deep insight in their experiences of the emission trading scheme. Our research categories and questions were refined after conducting the preliminary interview but throughout the interviews some small adjustments were made in order to make the questions more comprehensible. The theoretical sampling will continue until a theoretical saturation is achieved. That saturation is reached when we perceive that an additional interview will probably not provide us with any additional information. The grounded theory gave us the

possibility to develop clusters and search for relationships in the result to be able to build an explanation or propositions (Saunders *et al.*, 2007).

## *Chapter 6; Analysis*

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*In this chapter we present our analysis of the interviews, develop clusters and highlights of the analysis. Furthermore propositions and suggestions for improvement will be discussed.*

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### **6.1 Analysis of each dimension**

By analysing the dimensions one by one we can interpret the firms' answers and create an understanding of how they experience each dimension. The answers in the tables are the answers from each respondent. The respondents are varieties of Environmental Managers in the firms. The answers have been translated from Swedish into English and in some cases been shortened to get the essence of each answer. We will refer to sector A as the Energy sector and sector E as the Paper sector. We will refer to each firm as Firm A, B, C, D and E to ensure the respondents' anonymity.

The first dimension was developed in order for us to know if the firms actually had traded with emission permits. For the first dimension the respondents provided the answers that the question aimed at getting when the dimensions were created. As can be seen in Table 6.1 our result shows that all the firms that we interviewed had traded with the permits. The firm in the mineral industry sector did not see any change in their buying behaviour in the nearest future. The firm in the Energy sector did not say if the firm had bought or sold but relating to later provided answer about revenues that that firm received through permits, it can be assumed that it had sold some permits. The allocation to the firm in the mineral oil refineries industry sector has been satisfactory this period. It only sees an operational expansion as a reason for buying additional permits. The firm from the paper sector has been buying and selling its permits within the company group. It can be assumed that firms that have the chance of doing that will do so. Firms with a large company group that have branches in several countries will have the possibility to transfer the permits from one country to another. We can also assume that if the price would be too high, firms

would search for permits within the company group in hope to at least not pay the higher market price although the sellers might want to sell the permits on an outside market at a price as high as possible. We can at least claim that trade has taken place in these firms. Some firms will have to consider the trade with emission permits every time an investment, expansion, production stop or downsizing occurs. It will add to the economic considerations firms will have to make when contemplating a business venture. We can also state that firms will consider the amount of allocated permits before they can decide on whether or not they will have to buy or sell any permits next year.

Table 6.1

<b>Dimension / Firm</b>	<b>1. Buy / Sell</b>
<b>A Combustion installations / Energy sector</b>	Yes. Have today small emissions within Sweden. Get no free-allocation from next year. A new installation will be in operation a year from now, a risk of additional trade due to this.
<b>B Mineral oil refineries industry sector</b>	Think we have sold. The next-coming years we do not have to buy, allocation will be enough. May need to buy if installations will expand, depends on allocation for new installations.
<b>C Mineral industry sector</b>	We bought. Will probably have to buy in the future as well.
<b>D Iron and steel industry sector</b>	Yes, we have sold 1.4 million emission permits earlier this year. Do evaluations from case to case, the sale this year was due to production error that reduced the calculated emissions.
<b>E Paper pulp, paper and board industry sector</b>	Sold. We have helped each other within the company group and have not bought externally. The situation in the future depends on the allocation.

The second dimension requests the firms' opinions about the price on the emission permits at the secondary market. The price is considered as low amongst most the firms that we interviewed which is to be seen in Table 6.2. It can also be said that the firms considered the price as instable and firms have been observant of the price while the price has fluctuated. It has also been indicated that a respondent from a firm could not give his opinion about the price. According to Nordpool the price is down at about 0.07 euro per tonne which can be considered as low. During the first half of 2007 the price fluctuated but in the second half of 2007 the price landed at about 0.07 euro per tonne (Nordpool, 2007). This can confirm some of the respondents' view of a fluctuating price. On 11 October 2007 the Ministry of the Environment sent out a press release that claimed that the energy sector will not receive any free-of-charge allocated permits and firms are referred to the secondary market when buying permits during the next period. It could be assumed that Firm A

will be one of those companies and the reason for the respondent's evasive answer is because the respondent does not want the price to be considered as low because expectations can influence the price. The fluctuating price can also create a level of uncertainty about the market that in its turn lowers the level of trust in the market. It also seems like the respondents expect that the price will rise during the next period. This opinion is based on the facts that the freely allocated permits will be less, compared to this year and that the energy sector has to buy on the secondary market. We also wanted to use this dimension to see if there could be a connection to the firms' experience of the price and a possible positive view of the system. We could not see any connection between the experience of the price and a positive view of the system. However, since all firms answered that they would prefer a trading system over a tax we can still say that most firms had the experience of a low price of permits whilst an agreeing view of that the system should exist as a means of control. For a discussion about the emission permit system / tax dimension see a later section of the analysis.

Table 6.2

<b>Dimension / Firm</b>	<b>2. Cheap / Expensive</b>
<b>A Combustion installations / Energy sector</b>	Price near zero now, due to a surplus of permits. It will be higher next period. Very complex system and the political decisions affect supply and demand.
<b>B Mineral oil refineries industry sector</b>	Cheap now, will get more expensive next year.
<b>C Mineral industry sector</b>	The first year it was quite high, but now they have been ridiculously low during the latter part of this pre-Kyoto period. There are indications of the price next year and those say that it is a little higher.
<b>D Iron and steel industry sector</b>	The price has been unstable, is not a functioning market. Factors of interruption have affected and it is not trustworthy.
<b>E Paper pulp, paper and board industry sector</b>	Everything is relative, but the price has fluctuated substantially. First it went up more than expected and then fell substantially.

In Table 6.3 the answers for questions about the third dimension are provided. The third dimension highlights the information that the respondents had received and/or sought during the implementation but also when changes had occurred during the use of the systems. With this dimension we also wanted to verify the information in the report from the NEPA and the SEA that they had made big efforts with the information during the implementation. Two of the five firms confirmed that they had been participating in the process of development. Short lead-times have also been raised as an issue and concern about the allocation for next year. One firm

thought that it was not only a problem for participants but also that the Swedish authorities received information about the directive for the system late.

We interpret the respondents' answers as most of the firms experience the information as satisfactory. It also seems like that for some firms the associations for their line of business are important. None of the firms mentioned the NEPA's seminars or leaflets but some of the firms mentioned the NEPA's and the SEA's web page. Our impression was that the firms think it is their obligation to search for information themselves and the web pages from the NEPA and the SEA have been utilized. We cannot say that the impression was that the firms think it is a problem that they have to seek information by themselves.

Table 6.3

<b>Dimension / Firm</b>	<b>3. Information / Non-information</b>
<b>A Combustion installations / Energy sector</b>	Big participant involved in the process early and has tried to affect the design. Well informed. Generally a good perception, hope that the allocation plans could come earlier.
<b>B Mineral oil refineries industry sector</b>	The system was launched with very short notice, stressed through the whole system. The information was enough, understood what to do. Search for new information yourself. Gets help from the association of our line of business. Good web pages.
<b>C Mineral industry sector</b>	Got enough information, was involved in the process of development. We have to keep ourselves updated. Must look at the webpage, contains good information. ( <a href="http://www.utslappshandel.se">www.utslappshandel.se</a> )
<b>D Iron and steel industry sector</b>	Short time for planning. Short lead-times due to that a new EU system should be implemented under a short period of time. Have had contact with NEPA and with the association of our line of business. Good information about changes.
<b>E Paper pulp, paper and board industry sector</b>	It is our obligation to be updated. Got the information late and the regulations were difficult. Think it was a problem both for the authorities and for us. Late information about the allocation for next year, we are still waiting for it.

With the following dimension we wanted to find out if the firms considered the emission permit trading system as fairly designed. The respondents' experience of this dimension is displayed in Table 6.4, in essence suggests that they agree that the system is unfair. Two firms agreed with the report from the NEPA and the SEA that states that smaller firms in the system will suffer from higher administration costs than larger firms (Report 1, 2007). Two firms had opinions on the fairness from a competitive point of view. In this dimension one firm raised the interest of an emission permit trading system on a global level.

Our interpretation of the firms' opinions is that none of the firms think it is completely fair. The different sectors see different reasons to why the system is not fair. What we find as surprising is that some firms even have considered the unfairness that has impacted some other sectors than themselves. We had thought that firms would more or less only consider themselves. One of the firms that have highlighted the competition issue say that it cannot compete on equal terms when there are firms that do not have additional costs due to their emissions. One of the firms highlighted the issue about increasing the sectors involved in the system. Until today the European Commission has not decided if this will happen during the next period. The bigger the system with emission permits is, the more equal and environmentally efficient it will be. If the idea about a world system is considered then the possibility of a truly equal and fair system is possible.

Table 6.4

<b>Dimension / Firm</b>	<b>4. Fair / Unfair</b>
<b>A Combustion installations / Energy sector</b>	A balance. Unnecessary small participants, increased administration for them in relation to the good. We have many small installations. The purpose is that there exists a political decision, more rational way.
<b>B Mineral oil refineries industry sector</b>	It is most important that it is fair from the view of competition. This would include the whole world. We do not notice this due to our special line of business. Think the affect on the paper and steel industry is harder than for us.
<b>C Mineral industry sector</b>	It works ok within the industry. It is harder for the energy sector. Maybe the transport and aviation sector should be involved but then the allocation has to be based on different criteria.
<b>D Iron and steel industry sector</b>	Not fair for the iron & steel industries, even if our allocation next year will be enough. When the allocation will be lower we will get an additional cost that our competitor does not have if they are not a part of the system.
<b>E Paper pulp, paper and board industry sector</b>	Fair for the big installations, that has the competence. It could be more difficult for the smaller firms that do not have the requested resources.

In Table 6.5 the answer to the question based on dimension five is presented. The purpose of this dimension was to inform us about the firms experience about the smoothness of the emission system during sales, allocation and the final handing in of the emission permits. A common opinion seems to be that the system is experienced as smooth running and that there is no major issues concerning the organisation of the system. One firm also points at that the CDM log is not up and running yet. The CDM log is part of the SUS system were firms report their credits for clean development projects in developing countries.

The participants have had the opportunity to use the web page from the Swedish emission permit system (translation Svenskt utsläppsrättssystem, SUS). There were some problems in the beginning, but this can possibly be expected during an implementation of a new system. The overall experience of the firms verified the opinion of the respondent in the preliminary interview that also had the opinion that the system was smooth.

Table 6.5

<b>Dimension / Firm</b>	<b>5. Smooth running / Unsmooth running</b>
<b>A Combustion installations / Energy sector</b>	Works ok. Was problematic during the start-up, took some time. The log for CDM-projects is still not working. Looks like it will be delayed further.
<b>B Mineral oil refineries industry sector</b>	Do not work actively with it that much. Have SUS. Think it works rather smoothly, do not have any experience myself.
<b>C Mineral industry sector</b>	The delivery of permits works well. Buys and sells within the company group (international). Other actions are handled centrally from England. Order emission permits centrally.
<b>D Iron and steel industry sector</b>	Smooth. Small difficulties in the beginning but that could just be because of our lack of experience.
<b>E Paper pulp, paper and board industry sector</b>	Smooth, we have no problems with the trade. Have operations in many countries that also are involved in the trade with emission permits.

The sixth dimension covers the question about legislation. As the answers in Table 6.6 show, the firms differ on the experience of the legislation. Two of the firms think it is clear while two other firms think that it is quite unclear. Firm A cannot say anything about it. The opinions about the legislation differ. The impression we got was that Firm A's answer was due to that the respondent had not considered the legislation because it is not within the respondents responsibilities. Laws are often hard to understand for non-lawyers. Our impression was that some of the firms got some help with the regulations from the association for their line of business. We did not find that these firms overall neither agreed nor disagreed with the report from the NEPA make legislation changes. However, the report did not consider the firms' experiences but rather the experiences of the two Agencies.

Table 6.6

<b>Dimension / Firm</b>	<b>6. Clear legislation / Unclear legislation</b>
<b>A Combustion installations / Energy sector</b>	Cannot say.
<b>B Mineral oil refineries industry sector</b>	Reasonably clear. Big system with a lot of rules. Much to learn. Harder for smaller firms that do not have many employees, requires a specialist.

<b>C Mineral industry sector</b>	Have to read a lot. Maybe there should be more instructions for non-lawyers how to read the law. Is a little late when the accountant comes and gives us instructions.
<b>D Iron and steel industry sector</b>	Clear legislation.
<b>E Paper pulp, paper and board industry sector</b>	The legislation could be a little dubious in some areas. We follow the regulations and directions in our daily work.

In Table 6.7 answers are displayed regarding the dimension about possible increased administration. The overall opinion of the firms is that the administration has increased in some way due to the implementation of the system. Four of five firms mention the importance of measuring the emissions. The firm in sector C was the only firm that could give us an estimation of the amount of working hours actually related to the system. One respondent mentioned that the increased administration meant increased workload for employees. Even though all the firms are not clearly stating that the system implies an increased administration, we find that they agree that it at some point meant an increase. Firm A mentions the increase of administration that the smaller installations suffer from. This is mentioned in the report from the NEPA that claims that the system has induced an administrative cost to firms included in the system, especially to smaller firms. Our findings are that the issues from the report from the NEPA can be confirmed. Two respondents also mention the importance of keeping control over the emissions and that this had meant no difference from before, maybe that it is even more important to report the accurate emission levels now.

Table 6.7

<b>Dimension / Firm</b>	<b>7. Increased administration / No change</b>
<b>A Combustion installations / Energy sector</b>	A part of our business. Some extra work on the installations, have to verify the emissions. Much work for the small installations. Creates business opportunities.
<b>B Mineral oil refineries industry sector</b>	Must have control on the emission gauges. Make sure that they are in operation. Important. Must report every month. During the implementation it took a lot of time, the revision takes a few days a year.
<b>C Mineral industry sector</b>	Not especially, have to be careful with the measurements. We have to be careful in all other aspects then carbon dioxide anyway since we use a lot of energy. Totally 10h/w.
<b>D Iron and steel industry sector</b>	Increased administration, more work for employees with other assignments. No other daily operation is affected. Have to check our emissions anyway.
<b>E Paper pulp, paper and board industry sector</b>	The system has a high administrative cost. Work towards decreasing the use of fossil fuels, this will lower the costs at all levels within the firm, but daily I do not know. The system has a high administrative cost.

Following is the Table 6.8 that presents answers to the possible experienced environmental efficiency that the system could provide. The general opinion among the respondents is that the system, although it is not considered environmental efficient today, it has the potential to be so in the future. Our interpretation of the firms' answers is that Firm A, B and E experience the system as somewhat environmentally efficient. Two of the opinions could need more discussion. The first is the statement that the system for nitrogen oxide (NOx) is more efficient and could replace the current one. The NOx system means that combustion installations for energy production must pay a fee of 40 SEK per kilo NOx emitted. To encourage decreased emissions the system contains a refund. The refund is based on how much used energy that has been produced. The total amount of NOx emissions in Sweden has decreased from 306 000 tonnes in 1990 to 197 000 tonnes in 2004 (NEPA 3, 2207). As understood the current system could be more like the NOx system when auctioning off the emission permits to affected firms. The revenues from the auctions could be refunded to the firms. Another opinion is that a firm thinks that consideration should be taken to what kind of good that is produced while emitting carbon dioxide. However, our opinion is that those kinds of considerations could be rather subjective and would be hard to apply to the system but the respondents answer also suggests that the system is experienced as unfair by the respondent. We can not say that the experiences of the firms agree with the Swedish National Allocation Plan that suggests that the permit trading system has little affect on the emissions since the respondents overall experience was that the permit trading system had an affect on the emissions.

Table 6.8

Dimension / Firm	8. Environmentally efficient (National) / Not environmentally efficient
<b>A Combustion installations / Energy sector</b>	I feel so. As it is constructed now, (with CO2 and sectors) it is good. Could be an efficient system. The system has generated some investments within wind power and expansion of capacity in the nuclear power installations.
<b>B Mineral oil refineries industry sector</b>	Yes, it fulfils its purpose. Other systems like the Nox system are even more efficient. Is reasonable that it exist a system like the current ETS.
<b>C Mineral industry sector</b>	Well, our opinion is, we produce a product that decrease emissions if it is used in the right way, but do not get any credit for that. Do not have any advantage of that we produce the product that we produce, only affected the production. Should look at the product as well.

<b>D Iron and steel industry sector</b>	Not environmentally efficient, since the trade does not work. The system is only environmentally efficient in regards to the energy sector.
<b>E Paper pulp, paper and board industry sector</b>	Has affected the emissions in Sweden but it is difficult to know what has affected what, since other things also has had an affect.

In Table 6.9 we provide the answers for the question on possible decreased emissions. According to three firms it has not mattered at all that a trading system has been introduced. The two firms that claim they have abated their emissions since the implementation of the system but they point out that it is hard to know if it is actually the system that has affected the level of emissions. The system itself does not seem to have been the biggest reason for the firms' emission reductions. Sweden has played a prominent part amongst the developed countries when it comes to environmentally related policies. This is reflected in the firms answers where they state that the emissions continually have decreased. Sweden has both a tax on carbon dioxide in addition to the trade with emission permits. If we compare this dimension with the dimension about the national levels of emissions we can see that only one firm gives a contradicting answer on the previous dimension. That respondent is Firm C and this respondent also raised some issues that they meant that they had such a special product that should be considered.

Table 6.9

<b>Dimension / Firm</b>	<b>9. Decreased emissions / No affect on emission level</b>
<b>A Combustion installations / Energy sector</b>	Yes, but has lowered our emissions continually, especially district heating has increased the use of bio fuel. High CO2 tax on fossil fuel. Also have electricity certificate.
<b>B Mineral oil refineries industry sector</b>	No, not especially. Did much before the system was implemented, that lowered our emissions quite a lot. Had lower emission when the system started than what the historical emissions showed.
<b>C Mineral industry sector</b>	No, we would have produced and used the fuels in the same way.
<b>D Iron and steel industry sector</b>	No, have not lowered the emissions due to the system. We have emissions based upon raw material that means that the only way for us to reduce our emissions is to lower our production.
<b>E Paper pulp, paper and board industry sector</b>	Yes, have reduced emissions continually, not just due to the system.

Our purpose with the following dimension was to see if the system had affected the environmental awareness amongst employees. The answers are to be seen in Table 6.10. Two firms think that the increased awareness is more due to the general debate about the atmosphere, one think that the firm's own efforts is the cause and two think

it is due to the system itself. This is a question that could be very difficult for the firms to know. The issue about global warming has been frequently discussed in the media recently and this fact could have affected the employees as much as the system. Afterwards we also felt that this dimension did not in itself add anything to the experiences of firms since we are aiming at getting the experiences of firm rather than other stakeholders. However, we think that some of the answers actually reflected the respondents' increase of awareness more than the other employees.

Table 6.10

<b>Dimension / Firm</b>	<b>10. Increased awareness of environment / No affect</b>
<b>A Combustion installations / Energy sector</b>	I think it has, among the employees. Is discussed daily. Heated question within the energy sector today.
<b>B Mineral oil refineries industry sector</b>	Yes, since there is a price on carbon dioxide it is more obvious.
<b>C Mineral industry sector</b>	Not due to the system. The general condition of the atmosphere is probably more important than the trade with emission permits.
<b>D Iron and steel industry sector</b>	Difficult for the particular employee to understand the firm's consequences. It is very likely that they had an interest before, think the general debate is important to the employees.
<b>E Paper pulp, paper and board industry sector</b>	Hard to say, but employees get education in energy. Our environment program is design so that even the common man can make a difference.

In the following part the answers to the question about the firms' environmental interest is discussed. These answers are stated in Table 6.11. According to the firms it is both the trading system and the general debate about the environment that has affected the firms' environmental interest. Three firms meant that the trading system had implied an increase in the firm's environmental interest. Two firms had difficulties judging if it was because of the system. The reason for the respondents' answers could be that it is difficult to see the general debate as separate parts. We can possibly assume that the firm that are the most affected by the system also are the one to experience the most experience the most impact on the firm's environmental interest. However, all firms gave the impression of that to be environmental friendly is important and that they are but they do not agree that it has to do with the system. We do see the need to state that we are aware of the respondents own influence on this question, since it is their job to promote their employers as environmental friendly.

Table 6.11

<b>Dimension / Firm</b>	<b>11. Increased the firms environmental interest / No affect</b>
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<b>A Combustion installations / Energy sector</b>	Yes, but much due to the general debate.
<b>B Mineral oil refineries industry sector</b>	I think so, has received a place on the internal agenda.
<b>C Mineral industry sector</b>	Generally not the implementation of the system itself, but the general debate. An issue when having discussions with transporters.
<b>D Iron and steel industry sector</b>	Yes, since the system has put the environment at the highest focus of the management.
<b>E Paper pulp, paper and board industry sector</b>	Existed even before the system. We had environment activities before, e.g. an environmental program.

In Table 6.12 results to the question about environmental related interest are presented. The different firms have different reasons to why the system has not had any affect. Four of the five firms suggest that there has been no change in the environmental related investments and that there are other issues related to this. We got the impression that the respondents' experience of the system probably will affect the environmental related investments more in the future since there are indications that the price on emission permits will increase, this implies that it could be profitable to make an investment that will reduce emissions compared to today's situation. Therefore we can say that the system has not affected the environmental related investments in most of these firms.

Table 6.12

<b>Dimension / Firm</b>	<b>12. Increased environmental related investments / No change</b>
<b>A Combustion installations / Energy sector</b>	Many different factors. The system is an important factor when investments are discussed. More interesting to increase the nuclear power.
<b>B Mineral oil refineries industry sector</b>	Had a large project before we knew about the system. Must include this in the calculations for new investments/projects. Adds a cost to carbon dioxide emissions.
<b>C Mineral industry sector</b>	No, we have not had any investments since the system was implemented.
<b>D Iron and steel industry sector</b>	The system has not affected our investments. Has big investments but not due to the system.
<b>E Paper pulp, paper and board industry sector</b>	Difficult to know if the investments have been affected by the system since we have to make these kinds of investments continually. We cannot invest if competitors outside the system do not.

In Table 6.13 we present the answers to the questions to the dimension about possible increased costs. All firms had experienced some cost increase due to the system. The increased cost first and foremost consists of increased administration

cost. These were considered high when the system was implemented but has decreased over time. The only firm that pointed out the price for the permits as a cost was the firm in the mineral industry sector that earlier stated that they have bought and must buy permits in the future as well. Firm A also pointed out that it had been able to produce a revenue from the permits. If we refer to the dimension about price we can assume that this firm would have had the possibility to produce higher revenue if the price of permits would rise. This can be a reason to why the government chose to refer the Energy sector to the secondary market next year. We can confirm the statement made by the NEPA in their report that some firms have experienced a cost increase due to the system. The respondents also said that the main issue was the administration.

Table 6.13

<b>Dimension / Firm</b>	<b>13. Increased costs / No change</b>
<b>A Combustion installations / Energy sector</b>	Some increased costs but also increased revenues. Not burdensome.
<b>B Mineral oil refineries industry sector</b>	High costs when implementing, but not now. Also many working hours in the beginning but not now.
<b>C Mineral industry sector</b>	Little more working hours, but we would not have had fewer employees without the system. The first year, costs due to the permits were a little high. Next year the price on permits will affect our costs.
<b>D Iron and steel industry sector</b>	Increased costs due to increased administration and revision of the system.
<b>E Paper pulp, paper and board industry sector</b>	The system has a high administrative cost.

Table 6.14 supplies the answers to the question and the dimension on whether the firms prefer free allocation of the permits or an auction. The current system with free allocations is overall considered as a good allocation method. The only firm with another point of view is found in the Energy sector. This firm consider a gradually transformation towards auctioning as a preferable option. A reason for this could be that this sector will not get any free permits for the next period. They must buy all permits from the secondary market and their opinion could then be that it would be fairer if all sectors had to do that. An obvious reason for why the firms are positive regarding the free allocation method is that the only additional cost will in this case only be for the emission permits that are above their free allocation. If the permits should be auctioned off all permits would imply an additional cost for the firms. It was also interesting that Firm A sees auction as the best alternative. This sector is the

sector that can benefit from a higher price of permits. This sector also knows that this is already a reality for them next year; they do not have a choice.

Table 6.14

<b>Dimension / Firm</b>	<b>14. Free allocation (grand-fathering) / Auction</b>
<b>A Combustion installations / Energy sector</b>	Over time, work towards auctioning at least within the energy sector. We believe that you then get a value on emission permits already in the investment stage. In the long-run only auctioning, with a gradual change.
<b>B Mineral oil refineries industry sector</b>	Free allocation is fair, since not all industries are included.
<b>C Mineral industry sector</b>	I think the existing system is good.
<b>D Iron and steel industry sector</b>	Think today's system with free allocation is good. The principles of allocation can be discussed.
<b>E Paper pulp, paper and board industry sector</b>	No answer to the question. However, means that too many changes on the system undermine the reliability of the system.

In Table 6.15 the answers to the questions about if the firms would prefer a credit-and-trade system or a cap-and-trade system is provided. The general impression was that the respondents would prefer an allocation that is based upon benchmarking (credit-and-trade) instead of historically based emissions (cap-and-trade). This benchmarking system should then be consistent within the whole EU. We see two major reasons for why the firms prefer benchmarking. With a benchmarking system you decide upon an emission level per produced amount, for example emission per produced tonne of steel. Every installation within the EU that produces this product will have the same allowed limit for emissions of CO<sup>2</sup> per tonne. With these principles member states cannot facilitate for certain important national industries by giving them a greater part of the free allocated permits. The other reason to why a benchmarking system would be preferable is that the allocation then is not based upon historical emissions. This principle is preferable for firms that emitted a lot during the years from which the allocation is based on. If a firm already had made environmentally related investments before or during this period it means that you receive less permits, and when these firms for example expand the operation will have to buy permits. Firm B and Firm E are more sceptical to the use of benchmarking even though we interpret their answers as they would prefer benchmarking when allocating the permits which can confirm the report from the EU that states that the mineral oil refineries and paper sector are more sceptical towards benchmarking.

Table 6.15

<b>Dimension / Firm</b>	<b>15. Credit-and-Trade (benchmarking) / Cap-and-Trade</b>
<b>A Combustion installations / Energy sector</b>	Benchmarking. Permits due to the production then the ones that produce with less emission will be better of. With today's allocation principles, the installations that have had a lot of heavy emissions get many permits.
<b>B Mineral oil refineries industry sector</b>	Much discussion about benchmarking. That looks at the production, you get rewarded if you can produce with fewer emissions. Have not thought about it that much.
<b>C Mineral industry sector</b>	Used other fuels before and had then less emissions compared to today. Benchmarking at an EU level, due to that we are the only producer of this good in Sweden. Have to have new rules. With a Swedish system the current allocation principles should be kept.
<b>D Iron and steel industry sector</b>	Benchmarking. We have made big improvements before the years that the allocation is based upon. Competitors that had bigger emissions at that time now get more permits. Benchmarking would prevent this. We also feel that we have a unique product in Sweden.
<b>E Paper pulp, paper and board industry sector</b>	If you have benchmarking the whole system must be based on these principles. Allocation based upon historical emissions punishes the ones that made big investments before these years.

The answers to the question for the dimension about if the firms see the possibility to transfer the cost to the consumer are presented in Table 6.16. Three of the five firms say that the cost for emission permits is not a cost that they transfer or have the ability to transfer to customers through higher prices. One of these firms refers to the fact that their allocated emission has been enough and there has not been any reason to transfer any cost to consumers. Two firms say it is impossible to do so within their industries due to that they compete with firms outside of the emission trading scheme. When conducting the interviews and through articles we got the impression that the energy sector is the only industry that has the possibility to transfer this cost to the consumers. The firm in the mineral industry sector has included the cost for emission permits in the cost calculation. It gives us the impression that the firm transfer this cost to consumers. According to the firm within the combustion installations / energy sector they do not transfer the additional cost to the consumers; at the same time some of the other firms say that this sector has the possibility to transfer the cost. Firm A also say that the price of electricity is affected and therefore we interpret it as they transfer their cost since electricity is their product.

Table 6.16

<b>Dimension / Firm</b>	<b>16. Sees the possibility to transfer the cost to consumer ↔ Does not see the possibility to transfer the cost to consumer</b>
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<b>A Combustion installations / Energy sector</b>	Different from one line of business to the other. In our sector no connection to each other, the price comes from the market. We do not transfer this cost to our customer, but the permits affect the price on electricity.
<b>B Mineral oil refineries industry sector</b>	Has not increased our costs since the allocation of permits have been enough. Do not believe that it has occurred since the allocation has been so generous. Could be worse next year. The energy sector may need to transfer costs to their customers due to stricter conditions for them.
<b>C Mineral industry sector</b>	Yes since it is considered as a cost and is a part of the cost-analysis.
<b>D Iron and steel industry sector</b>	No, we do not have that possibility. Competitors outside the emission permits system do not raise their prices, which mean that we cannot do it either.
<b>E Paper pulp, paper and board industry sector</b>	No, in a situation with competition you cannot. The energy sector has that possibility.

Table 6.17 presents the answers to the question about if the firms think there is any room to deceive the system in any way. Firm B and C see the possibility to cheat but believe that no one cheats. The other two are surer that it does not occur. There often exists ways to cheat if you want to. One reason for firms to cheat is if they have emitted more than the emission permits covers and do not want to buy additional permits. We do not perceive that the firms see a reason for a legislation change due to that some firms cheat. The suggested changes in legislation in the report from the NEPA could therefore have been based on other reasons.

Table 6.17

<b>Dimension / Firm</b>	<b>17. Room/Able to deceive / No room to deceive</b>
<b>A Combustion installations / Energy sector</b>	Cannot say. Assume that no one does. The system consists of certified firms. Not more than in any other system.
<b>B Mineral oil refineries industry sector</b>	Could deceive. Must have a certified accountant at the revision, but they are not technicians. May be room for cheating.
<b>C Mineral industry sector</b>	You can probably cheat if you want to. Could deceive by not reporting a source of emission but then you will brake the law.
<b>D Iron and steel industry sector</b>	Do not think it occurs. It is always possible to cheat, but I think it is difficult. Tuff check-ups.
<b>E Paper pulp, paper and board industry sector</b>	Do not think it occurs in Sweden. We are supervised by accountants that know the rules.

The following table (see Table 6.18) provides the answers to the question from the dimension about if the firms think that the punishments for deceiving the system are discouraging from such an act. Three out of the five firms definitely thinks that the punishments are enough. One firm suggest that since firms have the possibility to borrow permits from next coming year, the effects of emitting more than the

allocation will not be present until the end of the period. The penalty for handing in the wrong amount of permits will increase next year. For each tonne of carbon dioxide that is missing at the account at SUS the firms have to pay a fine of 100€ (40€ in previous period), they also have to buy permits for these tonnes. We believe this implies that the additional cost that could arise when cheating is high enough to intimidate such behaviour, at least amongst these firms. Firm C also raised the issue that firms have the possibility to borrow from next coming year's permits and that the economic consequences will not be present until 2013 because of this possibility. This is because at the time being there is no possibility to borrow permits from next period there is only a possibility to borrow from next coming year within the periods.

Table 6.18

<b>Dimension / Firm</b>	<b>18. Effective punishments / Not effective punishments</b>
<b>A Combustion installations / Energy sector</b>	Substantial amount, absolutely. Believe that firms take it seriously.
<b>B Mineral oil refineries industry sector</b>	Do not remember the penalties but they are quite high. Believe that it could be very expensive if you are careless. My opinion is that it is really noticeable.
<b>C Mineral industry sector</b>	Will be published in EU's official journal. Get 07's permits in February, show 06's the 31/3-07. Can borrow from next year's permits, the same procedure next period. Economical consequences will come first in 2013.
<b>D Iron and steel industry sector</b>	Adequate punishment. Financially substantial and punishments that would create negative publicity if a big firm would cheat.
<b>E Paper pulp, paper and board industry sector</b>	Do not believe that the intention is to cheat, errors depend more on mistakes and is not made by purpose.

Table 6.19 provides the answer to the question to the dimension concerning the affect on electricity price. Most of the firms feel that the electricity price is affected by the trading system. Firm A answered that the price on electricity was affected when asked if that firm transferred their cost to the consumer. The only firm that disagreed with the others was Firm B that was not sure but did not believe that it had any affect.

Table 6.19

<b>Dimension / Firm</b>	<b>19. Affects the price on electricity / No affect</b>
<b>A Combustion installations / Energy sector</b>	See earlier answer about transferring cost to consumer (Dimension 16).
<b>B Mineral oil refineries industry sector</b>	Do not know. Maybe the energy producing firms know. Guess that it has not made any difference yet, but it could have an affect from next year and on.

<b>C Mineral industry sector</b>	Affected the price on electricity in a wrong way through the power generated by coal. A huge transfer of money from electricity consumers to the producers, especially if the production is from wind or nuclear power and do not have any CO2 emissions.
<b>D Iron and steel industry sector</b>	Absolutely. If you look at the price graph for both energy and permits, I can imagine that they will be similar.
<b>E Paper pulp, paper and board industry sector</b>	Yes, affects the electricity price and is an unreasonable cost for us. Has also affected the access of raw material, because it could be used as a bio fuel in order to lower the usage of fossil fuel.

Following is Table 6.20 that presents the answers to the questions to the dimension about if competition was effected by the emission permit trading system. Four out of five firms agree that the trading system affects the competition. One firm believe that it will have an effect if the price of permits rises. Most firms point out that it is obvious for firms that compete with firms outside the EU. It is hard to compete when you have additional costs that the competitors do not. This cost is probably not noticeable when the price is as low as it is now but if the price rises it might have a bigger impact. The firm within the mineral industry sector do not think that it has had any affect on competition during the present period but that this can change when the price on emission permits could change.

Table 6.20

<b>Dimension / Firm</b>	<b>20. Partial competition / Impartial competition</b>
<b>A Combustion installations / Energy sector</b>	Affects the competition a lot. A high permit price pushes small participants out of the market. Long term investments towards more efficient installations.
<b>B Mineral oil refineries industry sector</b>	Should not be any difference within Europe. If you do business outside of Europe it could be noticeable, depending on your market situation. It could be a little distorted when there is a cost for some firms.
<b>C Mineral industry sector</b>	Do not think it has any affect. The permits only cost 50öre/t CO2 now. Do not affect the cost calculations this period but it could be different next year when the permits may cost 22-23€. Additional cost compared with competitors that are outside the system.
<b>D Iron and steel industry sector</b>	Competitors outside the system do not have the additional cost that we will have when the allocation in the future decreases.
<b>E Paper pulp, paper and board industry sector</b>	Affects the competition. Increases the cost for firms in the system that firms outside of the system does not have, may be more profitable to produce somewhere else. May get worse in the future.

In Table 6.21 the answers to the questions concerning the dimension about if a national system or a European system is preferable. Here we are subject to self-

criticism. Since we were informed that the firms did not have the possibility to trade the permits with firms in other countries we had created a dimension about a national system or a European system. However, we realised half-way through the interviews that firms already had the possibility to trade across borders. Because the firms also have said that they would prefer a global system, we can assume that the firms would prefer a European system over a national system. Today's system gives firms the possibility to buy permits within the European Union. The goal, at least for firms that compete outside the EU, is a global system.

Table 6.21

<b>Dimension / Firm</b>	<b>21. National system / European system</b>
<b>A Combustion installations / Energy sector</b>	Can trade within the EU today. Same system for all member states in the EU.
<b>B Mineral oil refineries industry sector</b>	Can trade within the EU today. Is a European system. For it to be fair in a competition view it would include the whole world.
<b>C Mineral industry sector</b>	Can trade within the EU today.
<b>D Iron and steel industry sector</b>	A global system would be preferable, then it would be really efficient.
<b>E Paper pulp, paper and board industry sector</b>	It is a European system now. Would prefer a global system, then it would be neutral in the view of competition.

The following dimension was added after the interview was conducted and was answered as a follow-up question via email and all respondents answered the question. After finishing the interviews and transcribed them we realised that we had forgotten to ask them about one of the most important aspects. In this dimension we wanted to know if the respondents would prefer an emission permit trading system or a tax as a means of control on pollution. The answers are presented in Table 6.22. This dimension had to be covered since these are the two means of control that is used in Sweden now. As we stated earlier the National Allocation Plan suggests that this double means of control for firms does not lead to any further reduction of emissions but rather distorted competition and an allocation of emissions between the installations (Government 1, 2006). We therefore assume that the Swedish government at any point in time have to choose one of these two means of control of pollution. All firms agreed that tradable emission permits was preferable over a tax. The reasons for this are for example that it would imply more efficient emission reductions and is fairer from a competition point of view. The firms in sector B, C, D and E also answered that they prefer free allocation before auction as an allocation

method. We conclude that if the firms get enough emission permits their cost for this trading system will only be of an administrative form. With a tax they would have to pay for all emissions. Several reports have suggested that the sectors that are included in the emission system should be excluded from carbon dioxide tax.

Table 6.22

<b>Dimension / Firm</b>	<b>22. Emission permits / Tax</b>
<b>A Combustion installations / Energy sector</b>	Trade with emission permits. Will then have the most efficient emission reductions. Sets a level for the emissions and the market will set the price. With a tax the cost is fixed and the emission reduction is flexible.
<b>B Mineral oil refineries industry sector</b>	So far, we have had an economical advantage because of the trading system. Implies more administration than tax. Easier to design fairly, and have more effects on emission reduction.
<b>C Mineral industry sector</b>	Trade is preferable. Get a connection between emissions and costs. By lowering the emissions the firms costs are lowered, and could generate revenues. A tax is a more anonymous cost, we all complain but we always pay. Emission reductions only imply decreased costs, not more.
<b>D Iron and steel industry sector</b>	Emission permits is preferable, but with longer periods.
<b>E Paper pulp, paper and board industry sector</b>	Emission permits is preferable. The right design would make it a neutral mean of control from a competition point of view.

With the last dimension we wanted to know if the firms see any difficulties due to the period that starts in 2008. The answers to the question concerning this dimension are presented in Table 6.23. The issues that some firms have raised are that the allocation for next period is presented too late and that the allocated permits are probably going to be fewer. The interpretation that we make is that Firm A and E experience difficulties due to the new period next year. This difficulty is that the allocation for next year is presented late in the year. One of the biggest concerns at the prospect of next period is that the allocated permits will be fewer. This has been established by the government, but the allocation to each installation for next period is not finished yet. A reason for that the firm in the combustion installations/energy sector sees the unfinished allocation as a problem could be that they will need to buy their permits on the secondary market next year and that the allocation could affect the price of permits. By not knowing if the price of permits will increase by much they have a harder time planning investments and production.

Table 6.23

<b>Dimension / Firm</b>	<b>23. Difficulties due to new period / No change due to new period</b>
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<b>A Combustion installations / Energy sector</b>	It is a problem that the allocation for next year is not finished. Very uncertain about what will happen after 2012. If you are planning an investment, 2013 is in the near future.
<b>B Mineral oil refineries industry sector</b>	We will get less emissions allocated, but we think it will be enough compared to the production. We may need to buy if we expand the operation.
<b>C Mineral industry sector</b>	Not more difficult from a technical point of view, same rules. A new regulation that will be valid from 2008, but do not think it contains a lot of changes. From 2008 it will affect our costs, the bookkeeping is affected.
<b>D Iron and steel industry sector</b>	Have a more positive view on the next period, but do not know of any changes. The difficulty is that the base year of allocation will change and the permits allocated fewer.
<b>E Paper pulp, paper and board industry sector</b>	Still waiting for next year's allocation, it is delayed.

By providing an overall impression of the individual interviews we can portray the feeling that the interviews gave us. Two firms stood out from the rest of the group. Firm A gave a politically correct impression. Firm E gave a reluctant impression but it is hard to say why. It could be because of internal reasons within the firm, a poor experience of other students or some other unknown reason. However, we do not think that this respondent was reluctant towards the emission trading system based on his answers to the questions.

Because the dimensions mainly confirm the report from the NEPA and the EU, we cannot say that the dimensions individually add anything to previous findings about the emission permit trading system. We find that most of those findings are also experienced by these firms and that these aspects can be added to previous findings. However, we feel that the clustering could possibly add something to the theories on means of control and the experiences that firms can have when such a system is introduced.

## 6.2 Clustering

When we are clustering the dimensions we are trying to determine relationships between the firms in the dimensions. With these clusters we hope to create an explanation or propositions that can explain the experiences of the emission permit trading system within firms.

By putting the firms into one side of each dimension we can compare and find similarities, differences and connections. Here we look at the dimensions and try to fit them into one side or the other. Sometimes we make interpretations of what the respondents said in the interviews. These interpretations were made because of several reasons. One is that we are unaccustomed to conducting these kinds of interviews and sometimes failed at leading our respondents into the correct subject. Another reason was that sometimes it was possible to interpret an answer based on an answer to another question. We listened to the interviews several times to get the overall impression of the interview. When the firms' answers were fitted into one side of each dimension it can be said that we quantified the interview result in order to see possible patterns and clusters. We call the first side of the dimension 1 and the other side 2 (for an outline see appendix 4). There is also some missing values recorded of which we could not interpret an answer. To see these patterns we compare the firms' individual answers to each other for every dimension and first we try to cluster them together by comparing how many times they agree with each other in each category. After that we try to cluster the firms based on all the dimensions. We have also tried to create groups based on the level of negativity towards the emission permit trading system. We would like to point out that the clustering is not statistically generalisable.

### *6.2.1 General category*

In the general category there is little disagreement amongst the firms. The firms agree overall on four out of six dimensions. We disregard the first dimension because it was used so that we would know if the firm had participated in trade with permits. We can say that these firms are likely to have the same experience when it comes to the price of permits, fairness, smoothness and administration induced by a new means of control no matter what sector these firms belong to. It can also be said that almost all of these firms will experience the information as enough during the introduction of a new means of control of pollution. Even though we cannot generalise these assumptions we can say that some firms are likely to agree with the respondents experience about the general factors of the system. Here we see a pattern that is common for some of these firms. We can cluster all of these firms together but there are some uncertainty about Firm C and E that are disagreeing with the other respondents on the sixth dimension about clear legislation. Firm E also disagree with

the others on the third dimension about information. For Firm A on dimension six about clear legislation we reported a missing value because the respondent did not feel enough informed to respond to the question on this matter. However we still think that Firm A can be clustered with the remaining respondents as the firm agreed with the others on all other dimensions in this category. So in the general category we can cluster Firm A, B, and D together with Firm C. Firm E can doubtfully be in the same cluster as the other firms, this is shown in Figure 6.1.

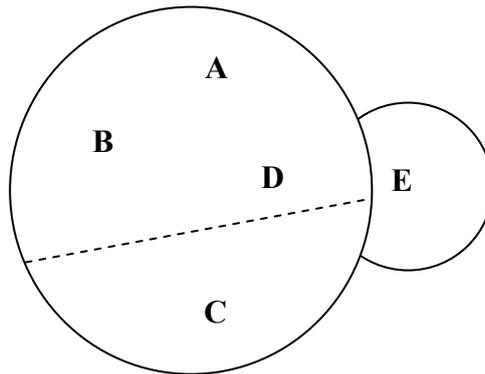


Figure 6.1

### 6.2.2 Environmental category

Of the five dimensions in the environment category there is no dimension on which everyone agrees. It could be said that it is not likely that these firms will experience a new means of control in the same way when it comes to the environment. Firm A and Firm C do not agree at all in this category. Firm A seems to be very positive towards the system's attempts at affecting the environment. Firm B are predominantly positive to the environmental effects. Firm C appears to have a negative or indifferent view of the same attempts. Firm D and E are also predominantly negative to the environmental effects of the system. The connections in regards to the environment between the respondents can be seen in Figure 6.2. We created a cluster based on how positive or negative the firms are towards the emission trading system's attempts at affecting the environment. A majority of the respondents suggest that the implementation of the emission permit trading system has not lead to any effect on emission levels, has not increased the environmental awareness and has not affected the environmental related investments. The majority opinion in this category of the firms is that the system provides no environmental effect.

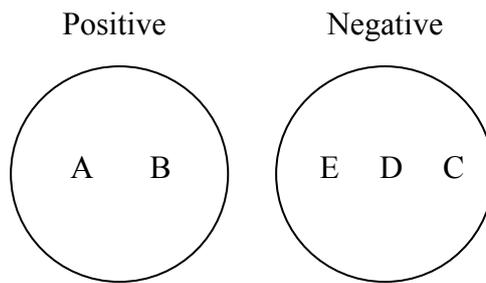


Figure 6.2

### 6.2.3 The costs, rules/regulations and competition category

Within the category of costs, rules/regulations and competition it was difficult to identify clusters. This probably depends on the fact that this category contains questions within quite separate areas. When looking at the whole category, a pattern could be seen between the experiences of Firm A, D and E. These three firms agree on seven of the questions within this category. We can assume that the majority of these firms are likely to agree on cost increase, the base of allocation, possibility to deceive, effects on electricity price, view of competition, span of the system and means of control preferred when a new means of control is introduced. Firm C is the firm that agrees the least with the other firms. The cluster developed from these experiences is shown in Figure 6.3. If we divide this category into five subdivisions; costs, design, rules, competition and next year we can compare the firms' opinions within these subdivisions. In the cost division the dimensions regarding increased costs, the possibility to transfer the cost to consumers and the effect on the electricity price are included. The dimensions concerning the allocation method, the extent of the system and choice of means of control are all included in the design division. If using these divisions when comparing the firms' experiences we find that Firm B, C, D and E have similar thoughts about the costs and design of the system. It also seems like all firms, except Firm C, have similar opinions regarding the systems effect on competition.

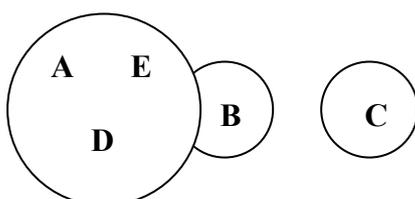


Figure 6.3

#### *6.2.4 A comparison from a negative point of view*

We also tried to figure out which of these firms had a more negative view of the system as a whole. In order to do this comparison we valued which side of the dimension that was more negative. We excluded some of the dimensions from this comparison since we could not determine a positive and a negative side. For example, the side unfair was considered to be the negative side in the dimension fair/unfair. We included twenty dimensions in this comparison. The dimension buy/sell was excluded and also the dimension cheap/expensive. Both the determining of which side the respondent belongs to and the decision of which side is positive or negative are founded on our interpretations and that the current design of the system is considered as positive. This comparison shows that Firm C is the firm that is most negative towards the system. Firm D and C are also rather negative. Of the twenty dimensions that were taken into consideration in this comparison, Firm C, D and E responded in a more negative way in half or more of these questions. The dimensions that all respondents consider to be negative are; that the system is unfair, that it increases the costs for the participants and that the present allocation principle is not the preferred one.

#### *6.2.5 All categories*

When comparing the clusters found within each of the categories an overall cluster could not be seen. However, we can see that Firm B and D agree with each other the most and Firm A and C disagree with each other the most.

### **6.3 Highlights of our analysis and clustering**

In this section some highlights from the analysis is presented.

Our result showed that all the firms that we asked had traded with permits. The price is considered as low amongst most the firms that we interviewed. It can also be said that the firms considered the price as instable. The respondents' experience suggests that they consider the system as unfair. A common opinion seems to be that the system is running smoothly and that there is no major issues concerning the organisation of the system. The overall opinion of the firms is that the administration has increased in some way due to the implementation of the system.

The general opinion among the respondents is that the system, if it is not considered environmental efficient today it has the potential to be that in the future. According to three firms it has not abated its emissions due to the trading system. Two firms point out that it is hard to know if it is actually the system that has affected the level of emissions. Four of the five firms suggest that there has been no change in the environmental related investments and that there are other issues related to this.

All firms had experienced some cost increase due to the system. A majority of the firms consider the current system with free allocation as a good allocation method. The general impression was that the respondents would prefer an allocation that is based on benchmarking (credit-and-trade) instead of historically based emissions (cap-and-trade). Most of the firms feel that the electricity price is affected by the trading system. Four out of five firms agree that the trading system affects the competition. One firm believes that it will have an effect if the price of permits rises. Because the firms also have said that they would prefer a global system, we can assume that the firms would prefer a European system over a national system. All firms agreed that tradable emission permits were preferable over a tax. The issues due to the new period are that some firms think that the allocation for next period is presented too late and that the allocated permits are probably going to be fewer.

We also have some highlights from the cluster creation section. In the general category there is little disagreement amongst the firms. The firms agree overall on four out of six dimensions. Of the five dimensions in the environment category there is no dimension on which everyone agrees. The majority opinion in this category of the firms is that the system provides no environmental affect. Firm A that belongs to the Energy sector and Firm C that belongs to the Mineral industry sector are disagreeing in this category. Within the costs, rules/regulations and competition category it was difficult to identify clusters.

#### **6.4 Propositions**

Proposition 1;

We can assume that these firms are likely to have the same experience when it comes to the price of permits, fairness, smoothness and administration induced by a new means of control no matter what sector these firms belong to. It can also be said that

almost all of these firms will experience the information as enough. Even though we cannot generalise these assumptions we can say that some firms are likely to agree with the respondents experience about the general factors of the system.

Proposition 2;

It could be assumed that it is not likely that these firms will experience a new means of control in the same way when it comes to the environment.

Proposition 3;

The majority of these firms are likely to agree on cost increase, the base of allocation, possibility to deceive, effects on electricity price, view of competition, span of the system and means of control preferred when a new means of control is introduced.

### **6.5 Suggestions for improvement of the means of control of pollution**

Following are suggestions that are based on the overall impression of the interviews and the interpretations of the respondents' experiences from and opinions on the system.

Based on the opinions of the respondents we can also say that the main concern is not that more sectors should be included but rather that the participating countries in the emission permit trading scheme should work hard at globalising the system whilst ensuring a sound and stable market that has reliable institutions.

All the firms in our research have indicated that benchmarking would be a preferable allocation principle. This should then be settled at least on an EU level. This allocation principle is seen as more fair. Nations will then not be able to patronize national industries by allocate more permits to them. A benchmarking system is designed so that is not favouring installations that have high emissions.

## ***Chapter 7; Inference***

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*In this last chapter we summarise the dissertation, relevance, issues such as criticism and ideas for further research are discussed.*

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### **7.1 Summary of the dissertation**

In January 2005 the Emission Trading Scheme was introduced in the European Union as a part of the ratified Kyoto protocol from 1997 (Hill & Kriström, 2005). The Emission Trading Scheme implies that a cap is set on carbon dioxide emissions and that a market is created and thereby a market price on the right to pollute (Hanley *et al.*, 1997). In Sweden about 700 combustion installations and energy-intensive installations are affected by the emission permit trading system (FlexMex2, 2005).

Two reports were studied in order to understand the implications for the affected firms. These two reports were *Review of EU Emissions Trading Scheme* and *Experiences of the EU's system of trade with emission permits*. The first report was based on a web based survey that was sent out to several different organisations in 2005 (EU 1, 2006). This report did not provide us with the experiences of Swedish firms. The other report was a report that was conducted by the Swedish National Environmental Protection Agency and the Swedish Energy Agency (Report 2, 2007). This report did not explain the firms' experiences either. Based on the lack of information of these two reports, we decided that we wanted to explain the Swedish firms' experiences of the trading system.

Since there is a lack of theory that explain the firms' experiences about the emission permit trading system we used an inductive approach that implies the building of a theory or propositions. We began our qualitative research with a preliminary interview that helped us get insight in a firm's experience. After creating dimensions on three categories we developed questions for an interview guide. With the help of this interview guide we conducted interviews with five affected Swedish firms.

An analysis and interpretation of the five interviews was made and we tried to develop clusters from each category in the dimensions. We also developed clusters based on all three categories. Some assumptions could be made. In the general category there is little disagreement amongst the firms. The firms agree overall on four out of six dimensions. Of the five dimensions in the environment category there is no dimension on which everyone agrees. We found that Firm B, C, D and E have similar experiences about the costs and design of the system. It also seems like all firms, except Firm C, have similar opinions regarding the system's effect on competition. We also gave some suggestions for further development of a new mean of control of pollution.

## **7.2 Relevance**

Our findings can be used in organisations and government bodies that are implementing or have implemented a new means of control of pollution in order to consider the aspect of these firms' experiences. However, we think that to generalise and apply our findings to a larger population than these firms further testing of the findings should be made.

## **7.3 Self criticism**

Our purpose with this dissertation was to evaluate Swedish firms' experience of the system of emission permit trading. This purpose has been fulfilled but there may be some things we could have done differently. The result could have been more generalisable if we conducted more interviews. If we would have conducted more interviews the questions or dimensions would have to be more precise and fewer.

After analysing our findings we realised that some questions could have been excluded and/or some questions more highlighted. One question that could have been highlighted more is the one that concerns the emission permit systems effect on the electricity price.

The Kyoto Protocol is based on three flexible mechanisms, emission permits trading, joint implementation and clean development mechanisms. We only evaluated firms' experiences of one of these. One option could have been to look at these three mechanisms that work together as a whole. The reason to why we did not consider

this is because it is only the emission permit trading that has been implemented as a mandatory part to affected firms. The other two flexible mechanisms are considered as project mechanisms for emission reduction and are voluntary projects.

Our research is also only conducted within firms that receive a large amount of permits. During the interviews some of the respondents indicated that smaller firms and installations could experience the emission permit system in another way than they did. This indicates that our result could have been different if we also interviewed firms with fewer allocated emission permits. However, we think that this changes the focus of our dissertation since our questions were based on that the responding firms had taken part in the trade. We did not conduct interviews with firms that receive a small amount of permits because we thought that in order to answer some of our questions firms should have taken part in the trade with permits.

#### **7.4 Future research**

In our research we create propositions regarding Swedish firms' experiences of the emission permit system. In this section we supply suggestions to future research that could be conducted within the emission permit trading system.

- Our research was conducted on five of the fifty firms that received the biggest amount of emission permits in 2007. It would be interesting to do this research with a larger number of firms participating.
- If doing a larger research, questions could be reconstructed from our assumptions and findings to suit a questionnaire. This way a result that could be statistically established may be reached.
- Since this research was only conducted within Swedish firms it could be interesting to see how the emission trading scheme is experienced by firms in other countries within the European Union.

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## Appendix 1

**Definitions**

NEPA	The Swedish National Environmental Protection Agency
SEA	The Swedish Energy Agency
ETS	European Trading Scheme
UNFCCC	United Nations Framework Convention on Climate Change
EPA	Environmental Protection Agency
ERC	Emission reduction credits
ECCP	European Climate Change Programme
JI	Joint implementation
CDM	Clean development mechanism
Nutek	The Swedish Agency for Economic and Regional Growth
SUS	Swedish emission permit system
NOx	Nitrogen oxide

Carbon dioxide equivalents is “[a] metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential (GWP). Carbon dioxide equivalents are commonly expressed as 'million metric tonnes of carbon dioxide equivalents (MMTCDE)'. For example, the GWP for methane is 21 and for nitrous oxide 310. This means that emissions of 1million metric tonnes of methane and nitrous oxide respectively is equivalent to emissions of 21 and 310 million metric tonnes of carbon dioxide (EEA, 2001).

## Appendix 2

**Dimensions****General**

- |                             |                       |
|-----------------------------|-----------------------|
| 1. Buy                      | ↔ Sell                |
| 2. Cheap                    | ↔ Expensive           |
| 3. Information              | ↔ Non-information     |
| 4. Fair                     | ↔ Unfair              |
| 5. Smooth running           | ↔ Unsmooth running    |
| 6. Clear legislation        | ↔ Unclear legislation |
| 7. Increased administration | ↔ No change           |

**Environment**

- |  |                                 |
|--|---------------------------------|
| 8. Environmentally efficient<br>(National level)   | ↔ Not environmentally efficient |
| 9. Decreased emissions                             | ↔ No affect on emission level   |
| 10. Increased awareness of environment             | ↔ No affect                     |
| 11. Increased the firms environmental<br>interest  | ↔ No affect                     |
| 12. Increased environmental related<br>investments | ↔ No change                     |

**Costs, rules/regulations and competition**

- |  |   |
|--|---|
| 13. Increased costs  | ↔ No change   |
| 14. Free allocation (grand-fathering)                        | ↔ Auction   |
| 15. Credit-and-Trade (benchmarking)                          | ↔ Cap-and-Trade   |
| 16. Sees the possibility to transfer the<br>cost to consumer | ↔ Does not see the possibility transfer<br>the cost to consumer |
| 17. Room/Able to deceive                                     | ↔ No room to deceive  |

- |                                      |                               |
|--------------------------------------|-------------------------------|
| 18. Effective punishments            | ↔ Not effective punishments   |
| 19. Affects the price on electricity | ↔ No affect                   |
| 20. Partial competition              | ↔ Impartial competition       |
| 21. National system                  | ↔ European system             |
| 22. Emission permits                 | ↔ Tax                         |
| 23. Difficulties due to new period   | ↔ No change due to new period |

## Appendix 3

**Interview guide**When booking the interview

Are you a part of the emission permit trading system?

Introduction

Record

Title?

Within parenthesis are supporting words for interviewer.

Questions*General*

Have you ever bought or sold emission permits?

Do you believe that you will buy or sell (more) emission permits in the future?

How do you perceive the price of the emission permits?

(cheap/expensive)

When the system first was implemented, what was your experience about the information?

When there are changes in the system, what is your opinion considering the information about this?

(assigned, sought/seek yourself, new rules)

What is your opinion about the system's fairness?

(allocation, control, participants)

How do you perceive the smoothness of the system?

(sale, allocation, delivering)

How do you perceive the legislation?

(clear/unclear, division, the rules for your industry?)

How do you feel that the daily operations within your firm are affected by the system?

(more work, certain things take longer time)

Have you any idea about how much time is being spent on the emission permit system?

(place, h/week)

*Environment*

Do you consider the system environmentally efficient?

(the whole system)

How has your emission levels been affected since the implementation of the system?

How has the implementation of the system affected the firm's awareness of the environment?

-in what way?

How has the emission permit system affected the general awareness of the environment in the firm?

(amongst employees, environmental policy)

Have you experienced an affect on the environmental related investments since the implementation?

(Increase/decrease)

#### *Costs*

Has the system implied any additional costs for your firm?

What kind of costs? (administrative, bought permits, revision)

Has the implementation of the emission permit system implied increased administration?

(may skip this depending on above answer)

Do you consider that the emission permits should be freely allocated to the firms or that they should be auctioned off?

What is your opinion regarding the allocation method, that it is based upon historical emissions? Is there any other solution?

What about specific emissions levels per unit produced?

(emission levels per line of business)

Do you feel that the system is designed so that firms easily could transfer the cost of emission permits to their customers?

#### *Legislation/Rules/Competition*

Do you think that there is a possibility to cheat within this system?

Do you believe that the punishment related to the system is adequate and will discourage from cheating?

(40€/100€ per tonne CO<sub>2</sub> that you do not have permits for.)

(fine or prison for other crimes, handing in false information at allocation and report)

How do you feel that the system has affected the price on electricity?

(price up or down)

How do you perceive the system's effect on competition?

(partial/impartial)

What would you prefer a national system or a system that enables you to buy emission permits within the whole EU?

(same rules, from cost/competition point of view)

A new period will begin in January 2008, has this implied any difficulties for you?

## Appendix 4

## Comparing with dimensions

	A	B	C	D	E
1	2	2	1	2	2
2	1	1	1	1	1
3	1	1	1	1	2
4	2	2	2	2	2
5	1	1	1	1	1
6		1	2	1	2
7	1	1	1	1	1
8	1	1	2	2	1
9	1	2	2	2	1
10	1	1	2	2	2
11	1	1	2	1	2
12	1	2	2	2	2
13	1	1	1	1	1
14	2	1	1	1	1
15	1	1	1	1	1
16	1	2	1	2	2
17	2	1	1	2	2
18	1	1	2	1	
19	1	2	1	1	1
20	1	1	2	1	1
21	2	2	2	2	2
22	1	1	1	1	1
23	1	2	2	2	1