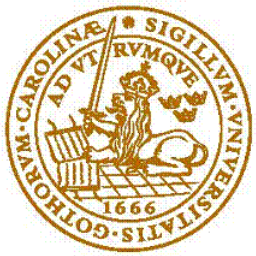

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Is emissions trading a solution to climate change?
- A study with the focus on the European Union Emissions Trading Scheme

Bachelor thesis – January 2010

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Abstract

Climate change affects us all through rising sea levels, environmental degradation and rising temperatures. The issue with climate change emerges from the fact that the discharge of carbon dioxide creates negative externalities, which causes the market to reach an inefficient allocation. The European Union has chosen to respond to the problem with a market-based policy and established an emissions trading scheme (ETS) to create a market for carbon dioxide. The market puts a price on the right to emit and therefore creates an incentive for companies to reduce their emissions. Whether this market has had any impact on the emissions of carbon dioxide and can therefore be a solution to climate change is the question being treated in my report. The question is addressed through a qualitative approach where environmental economic theory is compared with the reality of emissions trading. The progress towards emission reductions is determined based on current reports from leading organizations such as the European Environmental Agency.

The market for carbon dioxide in the European Union has so far exhibited some proof of contributing to emission reductions, but has the at the same time encountered issues such as a loose cap put on the carbon dioxide emissions, which has led to an unstable price on the emission allowances. The excessive lobbying from companies for these allowances is also a problem with the marked-based policy. On the other hand, the EU ETS has in some periods successfully put a price on carbon dioxide and companies have responded to the policy.

Based on the current report from the European Environmental Agency, small emission reductions will be reached through the EU ETS. But the target of an emission reduction of 8% relative to the base year 1990 to which the EU-15 has common committed to in the Kyoto Protocol, will probably not be reached. Based on my findings, the EU ETS in its current form is not the solution to climate change, however may together in a policy mix with other policies targeting individual behavior, technical change and clean energy be a part of the solution to climate change.

Key words: European Union Emission Trading Scheme (EU ETS), Emission allowances, The Kyoto Protocol

List of Abbreviations

CCPM - Common and Coordinated Policies and Measures

CDM - Clean Development Mechanism

ECCP - European Climate Change Programme

EPA - Environmental Protection Agency

EU-12 - Bulgaria, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, The Slovak Republic, Slovenia.

EU-15 - Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, The United Kingdom.

EU-27 - EU-15 and EU-12

EUA - European Union Allowance

EU ETS - European Union Emissions Trading Scheme

GHG - Greenhouse gas

IETA - International Emissions Trading Association

IPCC - Intergovernmental Panel on Climate Change

JI - Joint Implementation

NAP - National Allocation Plan

OECD - Organization for Economic Co-operation and Development

Contents

1. Introduction

"*Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs"*[1].

This is a famous quote presented in the Report of the World Commission on Environment and Development: "Our Common Future" also known as "Brundtland report", in 1987[2]. More than 20 years after the publication of the report we are still in the introductory phase of trying to cope with environmental degradation and climate change characterized by severe drought, increasing risk for forest fires and rising temperatures. To that we can add rising sea levels as well as increased precipitation that can cause flooding and landslides. These events represent some of the major climate threats for Europe. One of the biggest contributors to climate change is the rising emission discharge of greenhouse gases into the atmosphere. Carbon dioxide, which is formed when fossil fuels are burned, stands for the largest part of the global discharge of greenhouse gases. This gas represented 77% of total anthropogenic greenhouse gas emissions in 2004 according to IPCC (Intergovernmental Panel on Climate Change)[3].

In an attempt to mitigate the negative externalities derived from the excess level of carbon dioxide in the atmosphere, emissions trading schemes[4] have emerged around the world, in the EU, in New Zealand as well as in the United States. At present, the largest emissions trading scheme is the European Union Emissions Trading Scheme (EU ETS). The EU ETS puts a cap over the emissions from energy intense sectors and emitters are given the right to emit carbon dioxide through coverage by emission allowances[5].

1.1. Question at issue

Can the European Union policy for emissions trading, also known as cap and trade, be a solution to climate change? The scheme is favored because of its cost-effectiveness but there are also several issues connected with the scheme, such as setting the cap over the emissions

[1] The United Nations, Our Common Future, Chapter 2: Towards Sustainable Development

[2] The United Nations, Our Common Future, Chapter 2: Towards Sustainable Development

[3] IPCC (2007), Climate Change 2007: Synthesis Report

[4] Scheme; synonyms are plan or system

[5] IETA (2009), Facing the challenge of global climate change

and the non-inclusion of high emitting sectors and countries currently. In order to asses whether the EU ETS is a solution to climate change, I will present the emission trading schemes as a policy approach for dealing with climate change and the reasons for the European Union for implementing it. In addition, I will discuss the advantages and disadvantages of the scheme and investigate the question of whether it has had any impact on the emission discharge of carbon dioxide so far in the European Union. In order to asses if the scheme has had any impact on the emission discharge of carbon dioxide I will investigate if it has contributed to the fulfilling of the Kyoto targets. The purpose of this paper is to make the reader aware that, although emission trading is well backed up by economic theory, the EU ETS in its current form has significant flaws.

1.2. Methodology

The research methodology is conducted in a qualitative approach. The two methods used are qualitative interviews as well as review and qualitative analysis of articles and reports. In order to understand the empirical material collected, a literature study is conducted which presents the model of emissions trading. Empirical material is collected in order to asses any divergence from the model presented in the theory section. In order to asses if the scheme has had any impact on the emission discharge of carbon dioxide I use a report from the European Environmental Agency and refer to the European Union's progress towards the Kyoto targets. Studying the empirical discharges of carbon dioxide from the covered installations is not covered empirically as this involves the highly complex task of investigating what the emission discharge would be *without* the scheme, which is beyond the reach of this thesis.

The study mostly relies on secondary data from literature as well as on information from the European Environmental Agency, the European Commission, the Intergovernmental Panel on Climate Change as well as the United Nations. To be able to determine the current state of the EU ETS, reports from the World Bank have been used as well as several articles from Financial Times and the Guardian. As primary data, interviews have been conducted with Paul McAleavey from the European Environment Agency, an agency that works to provide independent information about the environment as well as with David Lunsford and Simone Ruiz from the International Emission Trading Association (IETA), an independent non-profit organization working for promoting the EU ETS and dedicated to the establishment of effective systems for trading in greenhouse gas emissions by businesses.

1.3. Disposition

Following the introduction, the paper is divided into six sections. In section two I will describe the background of the emissions trading schemes and why there is need for climate action in the first place. The third section presents economic theory from models in environmental economics which explains the advantages and disadvantages of an emissions trading scheme. In the fourth section I make an empirical study of the EU ETS and present the EU ETS and the directive established behind it as well as the issues that have arisen around the emissions trading scheme in practice. In the fifth section I will asses positive as well as negative aspects concerning the EU ETS. Thereafter I investigate whether the scheme actually leads to emission reduction based on current reports on greenhouse gas emission trends and projections. Based on these findings I will in the last section give an answer to my question at issue, if emissions trading is a solution to climate change.

1.4. Delimitations

The paper is limited to the emissions trading scheme implemented in the European Union. It does not asses the flexible mechanisms, Joint Implementation (JI) or Clean Development Mechanism (CDM) presented in the Kyoto Protocol, to which the scheme is linked to. This paper is based on the underlying assumption that the increase in anthropogenic greenhouse gas concentration is causing climate change, a premises supported by the IPCC.

2. Background

This part is dedicated to explain why the European Union decided to implement an emissions trading scheme for the greenhouse gas carbon dioxide. The starting point is the source of the problem, climate change.

2.1. Climate change

Greenhouse gases belong to the global pollutants, global in the sense that the damage they cause affects the whole planet. They are uniformly mixed pollutants, which means, that the damage they cause depends on the amount entering the atmosphere whereas on the other hand the pollutants are relatively insensitive to where the emissions enter into the atmosphere. In the atmosphere greenhouse gases absorb the long-wavelength radiation from the earth and trapping this heat is an essential part for making the earth livable. When humans burn fossil fuels, cut down tropical forest and emit more of the greenhouse gases into the atmosphere we change the mix of these gases making them trap more heat than necessary. The result is called global warming. Carbon dioxide is one of these greenhouse gases, but there are several other gases with the same characteristic as for example methane[6]. The Intergovernmental Panel on Climate Change (IPCC) was established by the United Nation Environment Program (UNEP) with the purpose of assessing the effects of climate change and its current state[7]. It has provided four assessment reports on the state of the climate change and the fourth report was released 2007. In the reports the relationship between global warming and its impact on natural systems has grown stronger for each report.

"*The Working Group I Fourth Assessment concluded that most of the observed increase in the globally averaged temperature since the mid-20th century is very likely due to the observed increase in anthropogenic[8] greenhouse gas concentrations*"[9].

[6] Tietenberg & Lewis (2009)

[7] IPCC; http://www.ipcc.ch/organization/organization.htm

[8] caused by humans

[9] IPCC (2007), Summary for policymakers, page 9

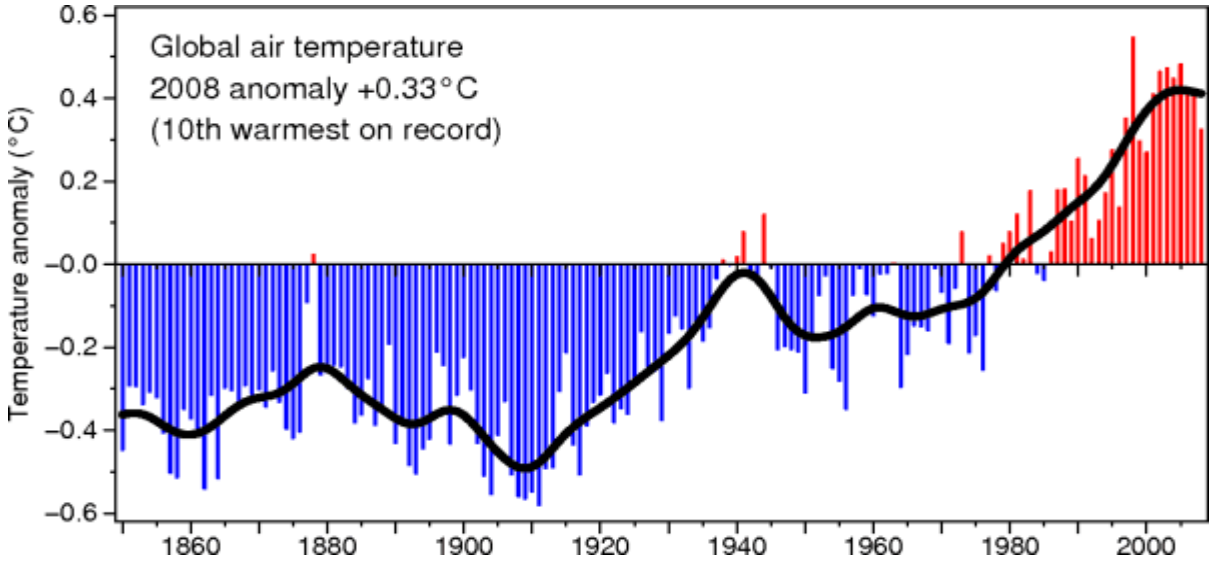

Figure 1 - Red piles shows higher and blue piles show lower temperatures than average temperature (average temperature for the period 1961-1990). The black line shows the trend. Source: Climate Research Unit, University of East Angila

By this statement the IPCC points out human activity as the cause for increased greenhouse gas concentration and thus climate change. Further, the report presents the consequences of climate change; there is a high confidence that natural systems are affected by climate change mentioning the enlargements and increased number of glacial lakes as well as the warming of lakes and rivers. The report also mentions specific information on climate change consequences for different regions and in Europe nearly all regions are anticipated to be negatively affected by climate change which will be a huge challenge for many economic sectors[10]. As the cause of climate change they point out the global greenhouse gas emissions due to human activities. The greenhouse gas (GHG) emissions have increased by 70% between 1970 and 2004 as depicted in figure 2. The study points out carbon dioxide (CO_2) as the most important anthropogenic greenhouse gas and its annual emissions have increased from 21 to 38 gigatons between 1970 and 2004, an increase of approximately 80%. Energy supply, transport and industry are the sectors with the largest growth in greenhouse gas emissions between 1970 and 2004[11]. According to IPCC, the change in global CO_2 emissions in 2050 in percent of 2000 emission level needs to decrease with 50 to 85% in order stabilize the global average temperature around 2,0 – 2,4 degrees above pre industrial equilibrium[12].

[10] IPCC: Summary for Policymakers

[11] IPCC (2007), Climate Change 2007: Synthesis Report

[12] IPCC (2007), Summary for policymakers

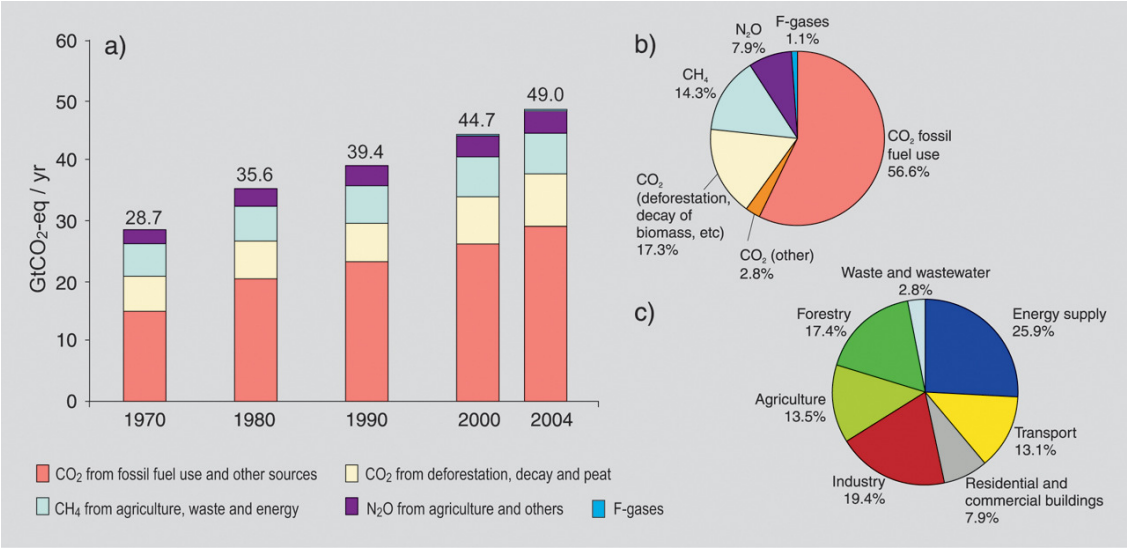

Figure 2 – Global anthropogenic GHG emissions. a) Global annual emissions of anthropogenic GHGs from 1970 to 2004. b) Share of different anthropogenic GHGs in total emissions in 2004 in terms of CO_2-equivalence. c) Share of different sectors in total anthropogenic GHGs in total emissions in 2004 in terms of CO_2-equivalence. Source: IPCC (2007,) Climate Change 2007: Synthesis Report

How do we address this rising global problem with climate change? There are several issues the world has to overcome when solving it. One problem is that any action taken against the global warming problem creates benefits even for those who do nothing. The probability for free rider behavior is thus great and opportunities are plentiful. The second issue is that the damage caused by the carbon dioxide emissions is an externality in both space and time. Two mitigation strategies to reduce the emissions of greenhouse gases have been considered, emission charges and emission trading, since these are the most cost-effective strategies. In the beginning of the climate-change policy option negotiations, Europe favored emission charges, while the United States favored emissions trading. In the end the choice fell on emissions trading which now is a tool incorporated in the Kyoto Protocol, an international agreement on controlling greenhouse gases. Although this tool was favored by the United States in the beginning, theUS have still failed to ratify the agreement which could be seen as a possible free-rider effect[13].

[13] Tietenberg & Lewis (2009)

2.2. The evolution of the emission allowances market

The United States was the first country to introduce the market-based policy with trading with emission allowances. The idea was born at the University of Toronto in 1960 by J.H Dale[14]. The first major program for emissions trading was introduced in 1976 by the US Environmental Protection Agency (EPA). In 1990, "The Clean Air Act Amendments" introduced a trading program for sulfur dioxide with the purpose of reducing acid rain and smog, which were followed by several other trading programs for emission allowances in the United States[15]. The same year scientists started to warn about consequences from global warming and an international movement began to emerge requiring countries to lower their emission discharges of greenhouse gases.

2.2.1. The United Nations Climate Process

Since it does not matter where greenhouse gases enter the atmosphere, an answer to the climate change problem needs to be global. After the first report released by IPCC in 1990, which highlighted the rising problem with climate change, the world gathered in Rio de Janeiro in 1992 to find a solution. A climate convention, United Nations Framework Convention on Climate Change (UNFCCC) was the result which can be seen as the framework for the United Nations climate process[16].

"*The ultimate objective of the Convention is to stabilize greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system*"[17].

Since the climate convention is a frame convention it did not include any binding targets for emission reductions, it simply encourages reductions. Non-binding targets were presented for the industrialized countries in Appendix 1, therefore also called the Annex-1 countries, to stabilize their emissions discharge by the year 2000 so that they did not exceed the emission discharge level present in 1990. The European Union promoted binding targets but the United States, at the same time opposed such binding targets. The UNFCCC entered into force in

[14] Phil (2007)

[15] Lohmann (2006)

[16] Warlenius (2008)

[17] UNFCCC; http://unfccc.int/press/fact_sheets/items/4978.php

1994 and since then summit meetings under the convention are held every year called conference of the parties (COP), and the latest meeting was held in Copenhagen 2009.

2.2.2. The Kyoto Protocol

During the conference of the parties in Kyoto, Japan, in 1997 the parties agreed to add the Kyoto Protocol to the United Nations Framework Convention on Climate Change. The Protocol contains quantified and binding targets for emission reductions for 38 countries presented in Appendix B, therefore also called the Annex-B countries. In total, these countries were to reduce the emission discharge of greenhouse gases with 5.2% below 1990 levels between 2008-2012. The United States did not accept the protocol, but after Russia ratified the protocol in 2005 it entered into force[18]. The protocol has so far been ratified by 184 parties compared to the 192 parties supporting UNFCCC[19]. Under the Kyoto Protocol the EU-15, the 15 member states pre 2004 in the European Union, committed to reduce emissions between 2008-2012 by 8% below the emissions in 1990. The target has been divided into differentiated national emission targets which are binding under the EU law. The whole European Union, EU-27, does not have a common target since the Kyoto Protocol was ratified before these additional countries, also called EU-12, joined the European Union[20].The Kyoto protocol has established three market based mechanisms as means for countries to reduce their greenhouse gas emissions alongside with national measures. A country can either buy emission allowances or invest in special UN-approved projects abroad which are assumed to reduce the emissions of greenhouse gases or increase the absorption of carbon dioxide. These foreign-based projects fall within two categories, Clean Development Mechanism (CDM) and Joint Implementation (JI). CDM-projects are carried out in countries not participating in the emission trading system, often developing countries. JI-projects on the other hand, are carried out in industrialized countries with the focus on Eastern Europe[21]. These mechanisms are said to promote green investment as well as being a cost-effective way for the parties to reach their emission reduction targets. The Kyoto Protocol commitment period ends in 2012 and after that new negotiations are required to establish a new international agreement[22].

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[18] Warlenius (2008)

[19] UNFCCC; http://unfccc.int/press/fact_sheets/items/4978.php

[20] EEA (2009), GHG emission trends and projections in Europe 2009

[21] Lohmann (2006)

[22] UNFCCC; http://unfccc.int/kyoto_protocol/items/2830.php

3. Theory – Why trading with emission allowances?

The aim of this section is to explain in an economical context why environmental problems exist and introduce the market-based policy solution to the problem. This knowledge derived here will be used to explain why trading with emission allowances is the chosen policy to deal with climate change in the EU.

3.1. Public Goods

Clean air is an environmental resource that is a public good. The chief characteristics of public goods are "non–excludability" and "indivisible consumption". Non-excludability means that once the resource is provided, even those who fail to pay for the good cannot be excluded from its consumption. It is either very expensive or very difficult to exclude someone from consuming. Indivisible consumption means that one person's consumption of the good does not diminish the amount available for others[23]. Public goods are hard to handle in a market economy. Since the public has free access to these resources there are behaviors that lead to excessive use of them. This phenomenon is called "The tragedy of the commons" - a phenomenon which is too often observable in society and is exactly what happened when clean air became a dump for greenhouse gases. When the capacity for greenhouse gases in the atmosphere is reached the emissions should be limited. But because the individual rational is opposed to the collective rational the resource is consumed until it is totally exhausted. This is because the benefit of emitting additional greenhouse gases falls on the emitter while the costs are shared by others and these costs are difficult to estimate. The tragedy of the commons leads to mismanagement of environmental resources such as clean air. One solution to the problem is to install a superior institution which will limit the individuals' use of the resource when the resource capacity is reached[24].

3.2. Negative externalities

The costs that are shared by others and do not fall on the individual emitter when producing or consuming the good are called negative externalities. A negative externality is a market failure since the market allocation is not efficient. A negative externality arises when one agent's welfare in the market does not depend only on the agent's own actions, but also on

[23] Tietenberg & Lewis (2009)

[24] Phil (2007)

other agents' actions. The agent is thus negatively affected by other agents' actions. Externalities often exist when property rights are poorly defined or absent, for example as with public goods as mentioned above. Resources such as air, to which the public has free access and where no one owns or controls the resource, create opportunities that can produce negative externalities. External costs arise when the producer on the market maximizes the producer surplus without taking into account the social cost for the production, the negative externality of emission discharges. Since the cost is external there are no incentives to reduce the emissions[25]. Historical property rights have been introduced to mitigate the effect of the tragedy of the commons[26].

3.3. Property rights

The purpose with introducing property rights is to change the incentive structure that arises in the tragedy of the commons dilemma with public goods which leads to mismanagement of resources. When individuals or companies are given property rights, the incentives are changed since now it is only the individual or the company who carries both the benefits and costs for the resource. The private decision makers will choose to solve the problem on their own. Since individuals are assumed to act rational they will take better care of the resources than they would if they acted collectively[27].Three main characteristics are required for a property right to be able to produce an efficient allocation:

- *Excludability* – All benefits and costs accrued as a result from owning and using the resource should fall on the owner
- *Transferability* – All property rights should be transferable from one owner to another in voluntary exchange.
- *Enforceability*– Property rights should be secured from involuntary seizure[28].

But property rights are not always the best solution to the tragedy of the commons. Widely spread environmental damages such as those arising from carbon dioxide emission are characterized by special features which may introduce disadvantages to the property rights-solution.

[25] Tietenberg & Lewis (2009)

[26] Phil (2007)

[27] Phil (2007)

[28] Tietenberg & Lewis (2009)

3.3.1. Drawbacks with property rights

Phil (2007) describes three drawbacks with private property rights which are issues related to their distribution, transaction and implementation costs, and their long-term sustainability:

- *Fair distribution* – The initial distribution of the property rights is a potential source of conflicts since is not taken as given how this initial distribution should look like. When the owner structure is made some individuals may loose on it even if the society at large comes out as a winner. Public goods such as natural resources are especially tricky to distribute although the Coase-theorem says that from an effective point of view it does not matter who receives the right to the resource; the emitter or the ones being negatively affected by the emissions. Many countries use a principle called the "Polluter Pay Principle" (PPP), which says that it is the emitter who should compensate the ones being damaged. But how this principle is going to be implemented in practice is still not always clear.

- *Transaction and implementation costs* – Transaction costs and implementation costs are costs associated with the establishment of property rights and the negotiations around them. Worth mentioning are obstacles preventing agreements such as the cost of identifying effects from different sources, the costs of negotiations and the cost of sanctions enforcing the agreement. Even though there has been a superior third party brought in to handle the problems, these costs can represent a substantial cost. The ones that are given the property rights should be protected so that they can use the resource effectively. The users of the resources should be able to be identified and equally should the effects from using the resource and the respective responsible ones be able to be identified. According to Phil (2007), for natural resources such as air the transaction and implementation costs are probably too high to be able to promote the private property system as a solution to the problem. Information asymmetry as well as strategic behavior can increase the transaction costs.

- *Long-term sustainability* – Private property as a solution to the tragedy of the commons involves yet another issue. Individuals given the property rights might put short-term goals before long-term goals which will cause a mismanagement of the resource. The owner values benefits that arise in the close present time higher than costs arising in the

distant future. Since the participant on the market often has a positive time preference, biased to the present, an asymmetry arises which will cause the tragedy of the commons between generations[29].

3.3.2. The Coase-theorem

According to the Coase-theorem, environmental problems can be solved without the involvement of a third party if the right to pollute is defined clearly. For example, if one part is given the right to pollute a resource such as a river, the affected parties thereafter can negotiate and regulate the emissions by themselves. When the entitlement has been clearly defined the problem will be solved through voluntary transfers between the affected parties[30]. From a social-economical point of view it does not matter which party gets the entitlement. As long as negotiation costs are small and affected parties can negotiate freely with each other the entitlement could be allocated to either party and an efficient allocation would result. The underlying assumptions for these results are that the negotiation costs are negligible and the number of affected parties is small. The only effects the distribution of entitlements has would be to change the distribution of costs and benefits among the affected parties. The result is that an inefficiency triggers pressures for improvements; and these mechanisms do not depend on the entitlements[31].

3.4. Trading with emission allowances

An emission cap is said to be the safest way to reduce the global discharges of greenhouse gas emissions. The emission cap will decrease over time to a sustainable level of emissions. Which policy will keep the emissions under the cap? The policy which keeps the emissions under the cap with the greatest certainty is trading with emission allowances[32]. The principle of an emissions trading scheme is that a cap is put over the emissions from the participating emitters (firms) and thereafter allowances, “emission rights”, are distributed to these emitters. Therefore the system is often referred to as “cap-and-trade”. The sum of the emission allowances is the cap which limits the total emissions during the period, therefore the system

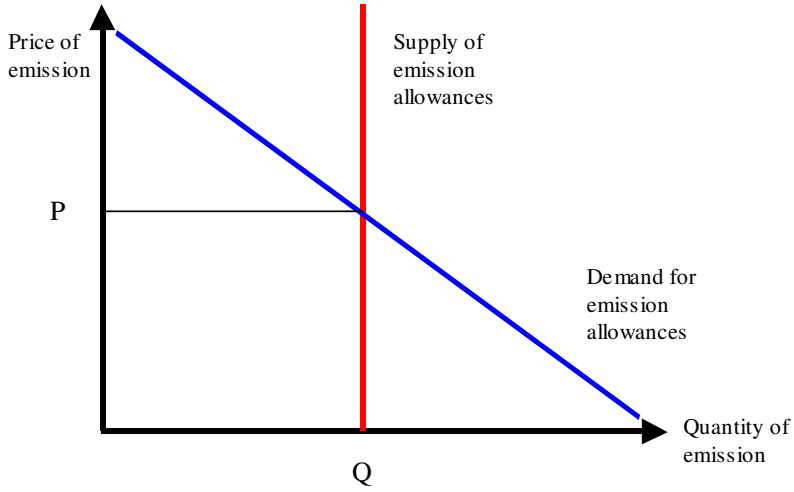
[29] Phil (2007)

[30] Phil (2007)

[31] Tietenberg & Lewis (2009)

[32] Warlenius (2008)

is also referred to be the most certain[33]. An emissions trading scheme uses some of the features of the property rights mentioned above since the participating emitters are allocated allowances to emit. Each allowance gives the emitter the authority to emit a specific amount of emissions. For the system to work the control authority should issue exactly the number of allowances needed to produce the aggregated emission level, the cap. The cap needs to be tight so that the emission allowances get scarce and demand is created.



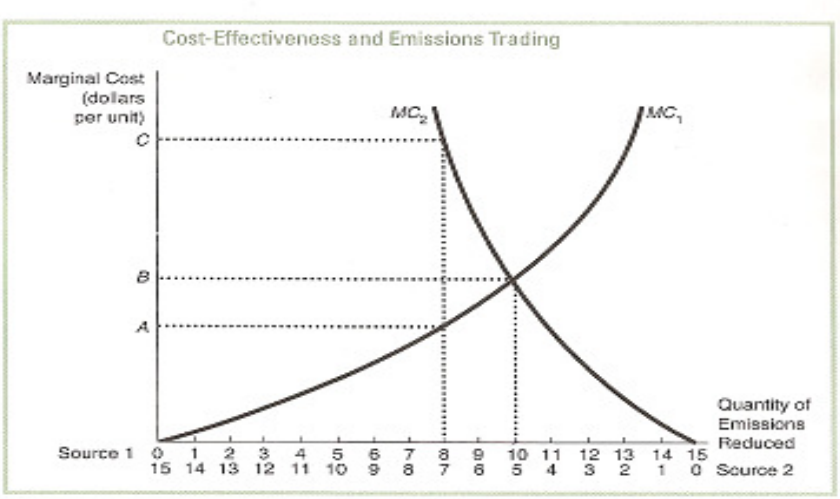
Graph 1 – Emission allowances set the quantity of emission. The demand curve determines the price of emission. Source: Mankiw (2007)

As with the property rights the allowances are freely transferable[34]. It is important that the emission allowances can be bought and sold after the initial distribution because a resale market creates the possibilities of cost-effective reductions and puts a price on the emission allowances and thus the emissions. The emitters can redistribute the emission allowances between each other and these redistributions lower the costs for the emission reductions. If the authority initially distributes the emission allowances and fails to find a cost-effective allocation the market can correct this through the redistribution. This is consistent with the Coase-theorem, as outlined above. Therefore the system is favorable compared to other policies (see table 1) since it automatically leads to a cost effective allocation and to the desired aggregated level of emissions. The demand for emission allowances is the firms' willingness to pay for the emission allowance which is equivalent to the marginal cost of emission reduction, the alternative cost for not emitting. The creation of emission allowances implies an alternative cost for the emission, since if the firm reduces its emission it can sell

[33] Naturvårdsverket, Energimyndigheten (2004)

[34] Tietenberg & Lewis (2009)

the emission allowances on the emission trading market to a company that needs to cover its own emissions. This alternative cost creates incentives for the emitters to reduce their emission level if the marginal cost for reduction is lower than the price of the emission allowance on the market. The emitters who can lower their emission levels at the lowest internal reduction cost will do so, and the emitters struggling to hold down their emissions to the entitled level, covered by allowances, can buy excess allowances on the market[35]. At the end of each trading period, the emitter with emissions not covered by allowances will face sanctions[36].



Graph 2- Cost-effectiveness and emissions trading. MC_1 and MC_2 represent the marginal cost of emissions reduction for two sources. Suppose a cap is put over the emissions so that 15 units of emissions are allowed. The first source receives 7 allowances and the second ends up with 8, which means that the first source needs to control 8 units of emissions and the second source 7 units (Point A).At this allocation there is an incentive to trade since the marginal cost of controlling the emissions is higher for the second source (C) than for the first source (A) The second source would be better off buying an allowance from the first source to a price lower than C. At the same time the first source would be better off selling the allowance for a price higher than A . Trade would occur until we reach point B were the first source controls 10 units (and has 5 allowances) and the second source controls 5 (and has 10 allowances). The marginal cost of control is equalized for all emitters Source: Tietenberg & Lewis (2009)

[35] Phil (2007)

[36] Tietenberg & Lewis (2009)

3.4.1. Emissions trading compared to other policies

Emission trading is in favor since it leads to quantifiable emission reductions through the cap and the policy is cost-effective because of the tradable emission allowances. The tradable emission allowances also imply that the lower-cost abatements happen first. Emission standards, a legal limit on the amount each company is allowed to emit, is not cost-effective since the policy does not minimize the total cost of emission reduction. The emission reduction has to occur for each company until it reaches the legal limit no matter how costly (instead of buying an emission allowances and let another company reduce their emissions at a lower cost). Emission charges on the other hand is a cost-effective approach since each company will control its emissions as long as this cost is lower than the emission charge. As long as the control authority imposes the same emission charge on all companies the resulting emission reductions are made with the least cost. Each company will control its emissions until the marginal cost of reduction is equal to the emission charge. The drawback with emission charges is that each level of emission charge leads to some emission reduction but it is impossible to know the quantity of this reduction, unless the control authority knows all companies' cost of emission reductions[37].

Policy	*Quantifiable emissions reductions*	*Cost-effective*
Emission standards – "command and control"	*Yes*	*No*
Emission charges - tax	*No*	*Yes*
Emissions trading	*Yes*	*Yes*

Table 1 - Overview of different policy measures to fight climate change. Source: Tietenberg & Lewis (2009)

3.4.2. Putting a price on emission allowances

What will the price on an emission allowance be? The possibility to trade the emission allowance in the resale market puts a price on the right to emit a specific amount. As with other markets the price on the emission allowance will be determined through supply and demand as depicted in graph 1. The price on the emission allowances is important since the higher the price, the higher the incentives become for the companies to cut their emissions,

[37] Tietenberg & Lewis (2009)

since investing in green technology and reducing emissions will be cheaper than buying extra allowances covering emissions. If the marginal cost of reduction is lower than the alternative cost, selling the emission allowance makes economic sense. The supply of emission allowances has to be lower than the demand for emission reductions to become reality, e.g. the cap has to be lower than current emissions[38]. If firms are awarded exactly the amount of emission allowances they need to cover all their emission discharges, the demand will be zero. The scarcity of emission allowances increases the price on goods and services requiring large emissions, which leads to decreased demand for these goods and services. This also causes competitive advantages for carbon efficient goods and services[39]. In the market, the price of the emission right will be the marginal reduction cost for the emission (see graph 2). The relevant question is then what determines the marginal reduction cost of emissions? There are several determinants but one key factor concerns the technological aspects. In the EU ETS, the price of emission allowance is also influenced by the other mechanisms in the trading scheme, Joint Implementation and Clean Development Mechanism, since these mechanisms affect the choices of the emitting firms, whether to emit or not. The price of the emission allowance is furthermore affected by the general economic condition[40].

3.4.3. Allocation methodologies

There are several advantages with emissions trading and the associated resale market for the emission allowances. But how should these emission allowances be distributed initially? The biggest difference between different emission trading schemes is often a question about the allocation of the emission allowances[41].There are two main principles for allocating: "free distribution" also called the soft version or grand fathering[42], or "auctioning" also called the hard version.

In the soft version the authority distributes the emission allowances to the polluter for free, often based on historic emission levels. Free distribution thus violates the Polluter Pays Principle (PPP) in the initial allocation. The companies who get the allowances can thereafter

[38] Naturvårdsverket, Energimyndigheten (2004)

[39] Warlenius (2008)

[40] Hill & Kriström (2005)

[41] Warlenius (2008)

[42] Lohmann (2006)

pollute for free while others need to buy allowances. Once the allowances are resold in the resale market the system gradually transforms to the Polluter Pays Principle.

In the hard version the authority sells the emission allowances through an auction and the polluters have to initially pay for their allowances. The auction itself can be conducted in different ways: the authority can sell the allowances for one unit price or alternatively price discriminate. The auction allocation method fulfils the Polluter Pays Principle more precisely. There are several other arguments speaking for auctioning. Auctioning is said to be more cost-effective since the ones buying the emission allowances initially are the ones with the highest marginal cost for emission reductions. Their willingness to pay for the emission allowances is higher than the ones not bidding for the allowances. The marginal cost for the ones not bidding is lower, indicating that for them it is less expensive to actually cut emissions than buying allowances.

With the free allocation version, the allowances first have to be distributed in the resale market to become a cost effective approach. If the transaction costs in the resale market are high this also speaks for the auctioning allocation method. With auctioning the polluter gets an actual cost for the emissions upfront, which can lead to greater incentives to actually reduce the emissions. With the free allocation, the price mechanism is slower since the price of an emission allowance is merely an alternative costs and there are no costs involved directly. Further, free allocation may also reduce the dynamic in the market. Old polluters tend to be the ones ending up with emission rights and the future new polluters need to buy their allowances on the resale market to be able to enter the market. This barrier to enter the market might disturb the development of the sector, if old polluters do not want to sell their allowances[43]. The lobbying from the companies side to get as many emission allowances as possible and thus create a monopoly position on the emission allowance market attracts resources and efforts[44]. The opportunity cost of these resources and efforts are the social cost of the implementation of an emissions trading scheme. Auctioning also changes the structure in the polluting sectors, since the final cost for emitting is higher. With auctioning, less profitable companies would be forced to leave the market and thus promote the expansion of other less polluting sectors. A last argument for auctioning is that the authority can use the

[43] Phil (2007)

[44] R. A Posner (1974), "The social costs of monopoly and regulation"

income earned from the auctions to reduce other taxes in the society and consequently reduce the welfare loss they cause.

In sum, free allocation favors the old polluters, who would otherwise – with great certainty – lobby against the emission trading solution. Therefore you can suspect that the method of free allocation has been chosen because it is easier to implement politically[45]. Auctioning on the other hand fulfills the Polluter Pay Principle more accurately and is more effective. It also promotes less intense carbon productions since it pushes heavy polluters who cannot pay for their allowances initially out of the market.

[45] Phil (2007)

4. The European Union Emissions Trading Scheme

The two major advantages speaking for emission trading are the cost-effectiveness of the policy and the cap put over the emissions, which allows regulators to control the exact emission discharge into the atmosphere. Based on these advantages the European Union decided to implement an emissions trading scheme to fulfill the commitments made in the Kyoto Protocol and the climate goals set by the European Union.

4.1. Directive 2003/87/EC

In June 2000, the European Commission launched the first European Climate Change Program (ECCP 1) which includes a number of EU-wide policies and measures to implement the Kyoto Protocol, such as the Carbon Capture and Storage Directive and the Effort Sharing Directive. Most of these Common and Coordinated Policies and Measures (CCPM) take the form of directives and one of these CCPMs is the EU ETS[46]. The proposal for trading with emission allowances for greenhouse gases was placed by the European Commission in the autumn of 2001 and the Directive (2003/87/EC) entered into force in the summer of 2003[47]. Since it was adopted as a directive it had to be translated into national legislation by all member states in the European Union[48]. The directive is compatible with the United Nations Framework Convention on Climate Change and the Kyoto Protocol. The subject at matter is presented as follows:

"This Directive establishes a scheme for greenhouse gas emission allowance trading within the Community in order to promote reductions of greenhouse gas emissions in a cost-effective and economically efficient manner"[49].

The directive aims to contribute to the fulfilling of the Kyoto Protocol where the EU-15 made the binding commitment to reduce the aggregated anthropogenic emissions of greenhouse gases by 8% compared to 1990 levels in the period 2008-2012. Further, the directive states that a European emission trading market will achieve this more effectively with the least

[46] EEA (2009), GHG emission trends and projections in Europe 2009

[47] Kågeson (2008)

[48] EEA (2009), GHG emission trends and projections in Europe 2009

[49] Directive 2003/87/EC of the European Parliament and of the Council, page 5-6

possible diminution of economic development and employment and that it will encourage the use of more energy-efficient technologies.

"*The EU ETS should allow the European Union to achieve its emission reduction target under the Kyoto Protocol at a cost of below 0,1% of GDP, significantly less than would otherwise be the case*[50]"

The directive defines an allowance as the right to emit one ton carbon dioxide equivalent. One ton carbon dioxide equivalent is one metric ton of carbon dioxide or any other greenhouse gas with the equivalent global warming potential. The greenhouse gases included in the scheme are presented in Annex II to the Directive, and these are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride[51].

The EU ETS started its operations in January 2005. The scheme's first trading period was between 2005-2007, which was viewed as a trial phase, a phase of learning by doing. The second trading period started in 2008 and ends in 2012. The second trade period coincides with the first commitment period of the Kyoto Protocol. The EU ETS only covers carbon dioxide emissions at the moment, and thus not all greenhouse gases referred to in the Directive[52]. About 10'000 installations in the energy and industrial sector are covered in the EU ETS, which collectively corresponds to approximately half of the European Union's total carbon dioxide emissions in 2008[53]. The included sectors are large stationary sources including power and heat generators, oil refineries and installations for the production of cement, ceramic and pulp and paper among others. Residential, agriculture, transport and waste sectors are not covered in the emissions trading system[54]. As a result of the Directive, the installations in the mentioned sectors above need a permit for its emissions of all six greenhouse gases covered by the Directive. The permit states that the installation can monitor and report the plant's emissions. National Allocation Plans (NAPs) need to be prepared by each member state before each trading period. The allocation plans include the total quantity of allowances that will be available during the trading period and the rules for allocating them

[50] European Commission (2008), EU action against climate change, page 5

[51] Directive 2003/87/EC of the European Parliament and of the Council

[52] Kågeson (2008)

[53] The European Union (2008), Press release: Questions and Answers on the revised EU Emissions Trading System

[54] EEA (2009), GHG emission trends and projections in Europe 2009

among the installations (e.g. using benchmarks, historic emissions or projected emissions)[55]. The plans need to be approved by the commission.

The operators need to report their emission discharge of carbon dioxide each year. An emission allowance can be saved to the next phase, and this mechanism is called banking. If an operator does not have sufficient allowances to cover the emission discharges, it will be liable for an excess emissions penalty. Since 2008, the excess emissions penalty is 100 Euro per ton of carbon dioxide equivalent. In the upcoming period the installation needs to obtain the extra amount of allowances it lacked in the previous period to cover its shortfall. An installation that manages to reduce its emissions can sell any excess allowances and installations unable to reduce can buy these emission rights. As presented above, the resale market creates the possibility of cost-effective reductions[56]. Directive 2004/101/EC links the EU ETS with the flexible mechanisms presented in the Kyoto Protocol[57]. This means that the EU ETS is a hybrid pollution trading system which consists of both emissions trading and trading in project based credits obtained from JI and CDM. The system is trying to make these two mechanisms mutually exchangeable which ultimately leads to an extremely complex trading system[58].

4.1.1. Emissions Trading in Practice

The European Union Emissions Trading Scheme is the largest market in the world for emissions trading covering several countries and sectors[59]. Only businesses are covered in the scheme but individuals, institutions and non-governmental organizations are free to buy and sell emission allowances in the market[60]. The transactions in the system are either conducted by a broker, through an exchange, or directly between a seller and a buyer. Most of the trades are covered by brokers. The leading stock exchange is the European Climate Exchange in London, but there are other exchange places such as NordPool in Oslo. The emissions

[55] EEA (2009), GHG emission trends and projections in Europe 2009

[56] Kågeson (2008)

[57] EEA (2009), GHG emission trends and projections in Europe 2009

[58] Lohmann (2006)

[59] Kågeson (2008)

[60] European Commission (2008), EU action against climate change

allowances are traded in the spot market, as well as the future market where most of the trades occur[61].

4.1.2. Lessons learned from Phase 1 (2005-2007)

The EU ETS is being implemented in phases also called trading periods with the first period starting from 1 January 2005 to 31 December 2007. This first phase was viewed as a trial phase of "learning by doing" and its purpose was to establish the necessary infrastructure for monitoring, reporting and verifying the actual emissions from the installations covered to prepare for the second phase coinciding with the Kyoto commitment[62]. Several issues were encountered during the first phase of the EU ETS.

The National Allocation Plans (NAPs) are made by each member state according to criteria determined by European Commission guidelines. This gives countries great freedom in the allocation process and in the first period the allocation of emission allowances varied widely between countries, especially in regard to the treatment of new sources. The differences in the way the allocation of emission allowances was treated may have resulted in competitive disadvantages between new entrants and current installations in the trading scheme as well as between installations outside the trading scheme.

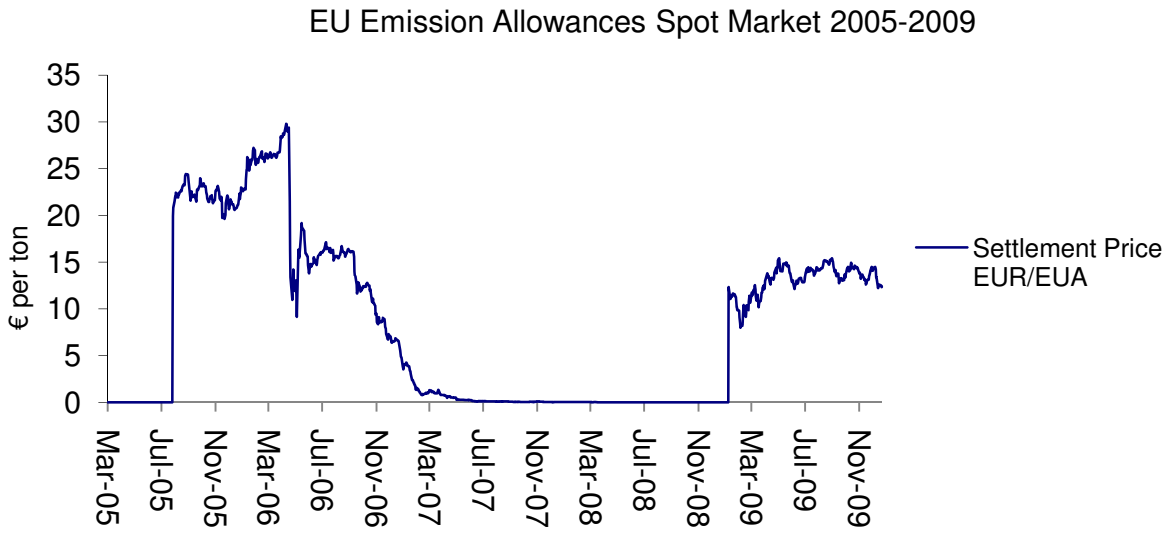
The total allocation of emission allowances is important since it defines the cap. Therefore it is important that emission allowances are scarce so that a resale market is established which forces emission reduction activities. During the first phase there were several indicators showing that the allocation of emission allowances was too generous. One of these indicators is the price development on emission allowances, which can be seen in graph 3 which shows the development of the EU Emission Allowance spot market between 2005 and 2009. When the first report on verified emission data was published in 2006, the price on the emission allowances fell from 30 to 10 Euros in the spot market. Shortly after, the price fell to under 1 Euro which indicates an excess supply of emission allowances. Emission allowances also became worthless since they could not be saved to the next trading period. The price fall could be seen as an indication of successful reductions which had been forced by the market, however most researchers agree that the allocation was too generous. On the other hand the

[61] Kågeson (2008)

[62] European Commission (2008), EU action against climate change

price fall is an indication that the market worked and reacted correctly to an over-supply of emission allowances.

A reason for the excess supply is that the member states are responsible for the initial allocation of emission allowances. The industries in the countries were lobbying for emission allowances and since emission allowances are not an actual cost for the government there are no strong reasons to keep the emission allowances scarce. It is a prisoners' dilemma, there is always the suspicion that other governments reward their industry with a high number of emission allowances making it the best option for every government to do so as well. The initial allocation has in the first phase often been based on emissions predictions, which means the companies obtained the emission allowances they needed, since no adequate monitoring system was in place[63]. These arbitrary decisions tend to make the companies overestimate their need for emission allowances which results in an excessive amount of emission allowances on the market[64].



Graph 3- EU Emission Allowance Spot market between 2005 and 2009. In 2006 the price fell rapidly from 30 Euros to 10 Euros and shortly thereafter from 10 Euros to under 1 Euro indicating the excess supply of allowances in the market. Source: European Energy Exchange.

[63] Kågeson (2008)

[64] Warlenius (2008)

Another issue encountered in the first phase is the emission allowances' effect on the energy price and the windfall profits in this sector. The emission allowances lead to an increase in the energy price which is a problem for energy intense industries in the European Union since this directly affects their international competitiveness. On the other hand, it is also a desired effect that the true production cost is visible in the price and if we tried to neutralize this effect the system would be useless. The debate about the windfall profits mostly focuses on the fact that the energy producers received the emission allowances for free yet they increase the price on energy. The solution would be to shift the allocation methodology towards auctioning.[65] In phase three of the EU ETS a greater fraction of the allowances will be auctioned out, see 4.1.1 The evolution of the EU ETS.

4.1.3. Lessons learned from phase 2 (2008-2012)

The European Commission has pointed out that the first phase was a trial phase and in the second period stricter caps than in the first trading period were enforced which is anticipated to lead to a stabilization of the carbon price. The volume of emissions allowances emitted was cut to 6.5% below the 2005 levels, ensuring emission reductions will take place[66]. The availability of verified emission data from the first phase also ensures that the cap on National Allocation Plans will not be set too high[67]. Banking, i.e. to be able to save emissions rights to the third period, will also be allowed, which prevents the emission rights from becoming worthless at the end of the period[68]. So far, the spot price on emission allowances in the second phase has been fairly stable at around 15 Euros, according to graph 3. Three countries not belonging to the European Union entered the emission trading system in 2008; these countries were Norway, Iceland and Liechtenstein[69].

4.1.4. The evolution of the EU ETS

The European Union has agreed on stricter emission reduction targets, to cut the overall GHG emissions by 20% compared to 1990 by 2020. The emission trading scheme is viewed as a

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[65] Kågeson (2008)

[66] European Commission (2008), EU action against climate change

[67] The European Union (2008), Press release: Questions and Answers on the revised EU Emissions Trading System,

[68] Kågeson (2008)

[69] EEA (2009), GHG emission trends and projections in Europe 2009

means to fulfill this agreement[70]. Amendments have been made to the emission trading directive covering the third period after the 1st of January 2013 to 31st of December 2020 with the goal of more harmonized rules which will offer greater predictability to market operators, which is necessary for encouraging long-term investments in emission reduction. The main difference compared to the previous two periods is that a EU-wide cap will replace the 27 national caps and that half of the allowances are going to be auctioned out instead of being given away for free. Auctioning complies better with the Polluter Pays Principle and will create stronger incentives to reduce emissions at an earlier stage according to the European Commission. Auctioning will be conducted in the whole power generations sector to prevent windfall profits. Only in sectors were the risk of carbon leakage is great, the operators will continue to receive their allowances for free. Carbon leakage refers to the relocation of Europe-based industries to less carbon constrained jurisdictions which would lead to the loss of European jobs as well as increased emissions[71]. This can be compared with phase 2 were less than 4% of the allowances were auctioned out. The EU-wide cap, compared to the national allocation plans that will now disappear, will reduce the complexity of the scheme. Since the member states do not determine the number of allowances issued anymore, allocation rules will now be harmonized and member states can no longer favor their own industry.[72] The EU-wide cap is going to decline annually as of 2013 to meet the agreed reduction of 20% by 2020. The aviation sector responsible for 3% of carbon dioxide emissions in EU-27, 2007, will be covered in the emission trading scheme staring from the 1st of January 2012. This is an important step since emissions from international aviation have increased by 110% between 1990 and 2007, which is the highest increase of all sectors[73]. Increased efficiency is also to be achieved by the longer trading period of 8 years compared to phase 2 with 5 years[74]. According to IETA, there are also discussions of either having a cap and a floor on the price of emission rights or making the governments intervene whenever the price is too high or too low to prevent price volatility and help stabilize the market[75].

[70] EEA (2009), GHG emission trends and projections in Europe 2009

[71] European Commission (2008), EU action against climate change

[72] The European Union (2008), Press release: Questions and Answers on the revised EU Emissions Trading System

[73] EEA (2009), GHG emission trends and projections in Europe 2009

[74] The European Union (2008), Press release: Questions and Answers on the revised EU Emissions Trading System

[75] Simone Ruiz, IETA (2009)

The EU ETS can be extended to include further gases, sectors as well as geographical areas. At the moment, the EU ETS is the largest trading scheme in the world for greenhouse gases but other schemes have arisen, for example in New Zealand and United States[76]. The EU´s vision is to extend the scheme and link domestic carbon markets to a global market by creating a carbon market for members of the OECD (Organization for Economic Co-operation and Development) by 2015 and include major economies around 2020[77]. The efficiency of a trading scheme will rise with the inclusion of further gases, sectors and geographical areas. Another argument for extending the EU ETS is that cost-reductions are most likely to occur when the marginal cost for emissions reductions vary strongly between installations since this will increase the trading between installations (see graph 2). Extending the EU ETS can further increase the liquidity in the market as well as prevent carbon leakage[78]. It is also desirable to include further gases, sectors as well as geographical areas due to the fact that carbon dioxide is a global pollutant and the EU ETS only covers around 7% of the global emissions of carbon dioxide. It is crucial for major economies to join emission trading schemes since they stand for huge amounts of the global emission discharge.

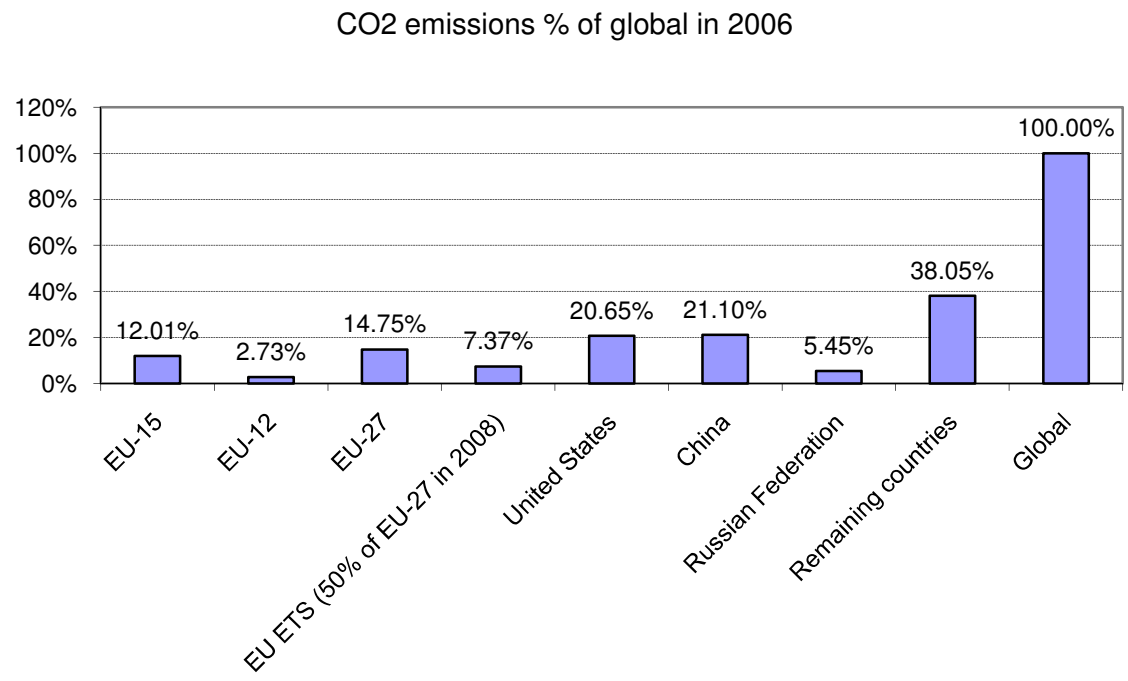

Figure 3- CO_2 emissions by country and regions as a percentage of global emissions in 2006. Source: United Nations Statistics Division

[76] IETA (2009), Facing the challenge of global climate change

[77] European Commission (2008), EU action against climate change

[78] Kågeson (2008)

5. Discussion: Is EU ETS a solution to climate change?

The EU ETS was implemented based on advantages found in economic theory. However, the implementation of the scheme has not been frictionless. This section will assess advantages and disadvantages of the EU ETS as well as the divergence from economic theory.

5.1. Arguments for the EU ETS

In the report "States and trends in the carbon market 2008" the World Bank writes that the biggest success of carbon markets so far has been to send market signals on the price of emitting carbon dioxide which have stimulated innovation and abatement of carbon dioxide. The report describes the EU ETS as the laboratory of carbon markets and describes its greatest achievement to successfully put a price on GHG emissions. Further the report states that the:

"*EU ETS market has been successful in its mission of reducing emissions through internal abatement at home*"[79]

This statement is based on a research study covering the emission trading scheme's first phase. The study finds that, although some over-allocation of allowances occurred in phase 1, abatement was still made in the EU ETS in the range of an estimated 50-100 million tons of CO_2 equivalence[80]. The study argues that the EU ETS has successfully reduced CO_2 based on three findings: 1) The price on the European Union allowances has been positive, 2) Real output in the EU has been rising while at the same time the CO_2 intensity has declined and 3) Historical emissions data indicates a reduction of emissions. The report connects the sharp price drop in 2006 to the fact that market observers had underestimated the abatement occurring under the first year of the EU ETS. The authors argue that market-based instruments such as the EU ETS give incentives to small incremental changes in production, which they call pedestrian changes, and not only to large installations to reduce emissions. The cumulative pedestrian changes lead to substantial abatement and this abatement was not expected from the policymakers, probably since it was hard to assess before the implementation[81]. The IETA (International Emission Trading Association) confirms the

[79] The World Bank (2008), States and trends in the carbon market 2008, page 2

[80] The World Bank (2008), States and trends in the carbon market 2008

[81] Buchner & Ellerman (2006), Over-Allocation or Abatement?

abatement and says that most of it occurred because of a switch from coal to gas as energy source[82]. The World Bank argues that better linking across carbon markets would increase the mitigation potential:

"*A more efficient and inclusive global carbon market could also encourage nations to take tougher targets while allowing for more flexibility through trading*"[83].

A glance at figure 3 confirms that a market linked to the United States or China would be favorable since these countries together stand for 40% of the global emission discharge of carbon dioxide in 2006.

5.1.1. The business sectors' attitude

In an article in Financial Times, Fiona Harvey, Financial Times environment correspondent, argues that "an emission trading system is the best incentive for companies to reduce carbon outputs" [84]. Further it states that trading with emission rights is accepted in the business world as the best way of ensuring emission cuts and trading is said to have a key place in environmental regulations[85]. The EU ETS has received response from the business sector. Based on a review of the EU ETS made by the European Commission in 2005 the EU ETS is proven to have an impact on corporate behavior. The review included a survey sent out to companies, governments, industry associations, market intermediaries and NGOs. Of the 167 companies responding, 66% fall within the sectors covered by the EU ETS. The survey result shows that based on the scheme, carbon dioxide involves a real cost and that 70% of the responding companies are planning on pricing-in the value of CO_2 allowances in the future marginal pricing decisions; the remaining companies are already incorporating it. Around half of the companies view EU ETS as one of the key issues in long-term decisions and that the EU ETS has a strong or medium impact on decisions to develop innovative technologies. The companies, industry associations and governments also prioritize topics related to long term uncertainty, such as emission targets and allocation rules as the most important topics. A majority of the companies want to extend the trading period to ten years or longer[86].

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[82] David Lunsford, IETA (2010)

[83] The World Bank (2008), States and trends in the carbon market 2008, page 63

[84] Harvey, Fiona, Financial Times (3rd of December 2009)

[85] Harvey, Fiona, Financial Times (3rd of December 2009)

[86] European Commission Directorate General for Environment, McKinsey & Company and Ecofys (2005)

According to a study made by Point Carbon in 2006, 65% of the responding companies claim to have taken internal measures to reduce the emissions of carbon dioxide as compared to 15% in 2005[87].

Nevertheless, not all parts of the business sector are enthusiastic about the emission trading scheme. In Switzerland, where they are discussing a new law to force vast polluters to take part in the EU ETS, trade associations are worried about the competitive disadvantages the scheme could bring[88]. This discussion can also be seen in other countries planning on implementing an emission trading scheme, for example in the United States where the proposal for emission trading was criticized by the American Chamber of Commerce to be harmful for the American economy as well as for the American companies' competitiveness[89]. IETA says that trading is comfortable for some companies, for example power installations, which have trading included in their business models, but for other companies trading is a whole new activity. Therefore the EU ETS has been accepted with mixed response[90].

5.2. Critics towards the EU ETS

5.2.1. The need for structural change

An emission trading scheme treats the global warming problem as a business and public-relations problems put in the hands of the market where it will be handled in the most cost-effective way. As long as the companies can pay for their emissions, emissions are justified. This signals that the problem is not a social or environmental problem and that a fundamental and structural change is not necessary. Since climate change is an anthropogenic problem, which means it is caused by humans, a solution to the problem needs to involve individual behavior directly instead of relying on economic and technical solutions; an argument which was presented in the Financial Times[91]. Around 40% of the greenhouse gases emitted in the EU-27 in 2007 resulted from individual behavior, from the production of public electricity and heat, the residential sector and aviation[92].

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[87] Kågeson (2008)

[88] Gnehm, Claudia, Handelszeitung (9-15 December 2009)

[89] Anderberg, Johan, Sydsvenskan (8h of November 2009)

[90] David Lunsford, IETA (2010)

[91] Mackenzie, Kate, Financial times (28th of December 2009)

[92] EEA (2009), GHG emission trends and projections in Europe 2009

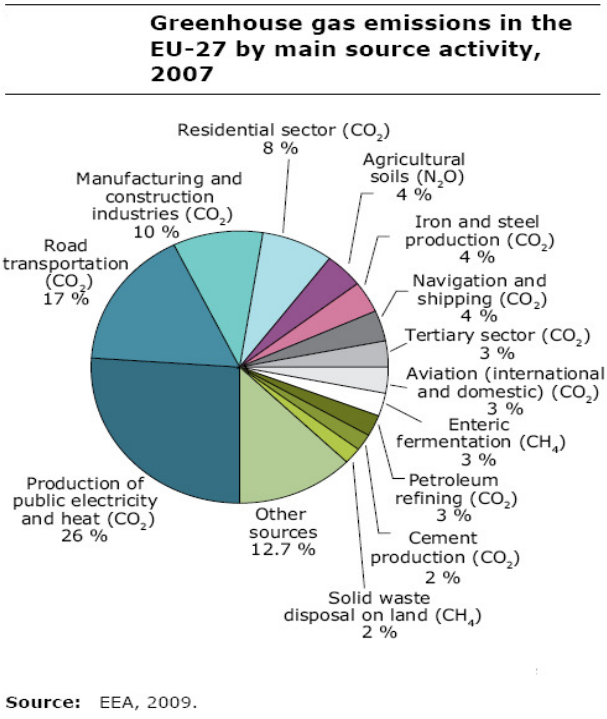

Figure 4 – Individual behaviour result in emissions from productions of public electricity and heat as well as from the residential sector and aviation.

Lohmann (2006) argues against the cost-effectiveness of an emission trading scheme and the fact that the emission reductions are said to be made where they are the cheapest. According to Lohmann (2006) this way of thinking ignores the fact that it actually matters where and why the emissions are cut and that it will delay the transition away from fossil fuels. There is a difference whether the emissions are cut because of new green technology or changes is the social life through, for example, less dependence on cars, or if emissions are reduced simply through an efficiency improvement in production that should have been made years ago. The first reason will probably cut emissions more in the future than the latter reason, yet the two are equally treated in an emissions trading scheme. Lohmann (2006) argues that this feature of the market does not encourage innovation or long-term investment and the structural change needed in the society to cope with the global warming problem in a timely manner, since it slows and blocks the technological development by wasting resources on minor refinements. These changes may come too late, when all the minor efficiency improvements have been done. Lohmann (2006) views the EU ETS as an expensive and difficult policy, based on the legal, institutional and technological stage-setting as well as the excessive lobbying from companies. However, all policy options for dealing with emissions require verifying and monitoring systems for emissions. Further he blames the EU ETS to create lucrative work for financial centers which might have been one of the attractions of the scheme, while the public

has to pay the bill[93]. Other sources also indicate that the EU ETS may not have been adopted because of its cost-effectiveness but rather as a response towards the United States who failed to ratify the Kyoto agreement[94]. In this case the EU ETS is used as an objective for the European Union to demonstrate its independence and power.

The length of the phases is another debatable issues since companies, as mentioned above, prefer longer trading periods in order to increase the predictability of the price. Since many of the companies included in the scheme need to plan their capacity investment over long time periods, sometimes up to 30-years, Lohmann (2006) questions if the price of the allowances is not too uncertain to be a driver of systematic technological change.

5.2.2. The Kyoto Protocol

The EU ETS was implemented to contribute to the fulfilling of the Kyoto Protocol, where the EU-15 committed to reduce the aggregated anthropogenic emissions of greenhouse gases by 8% compared to 1990 levels in the period 2008-2012. But if the targets in the Kyoto protocols are set too low, the EU ETS will not be productive either. According to Warlenius (2008) the biggest problem with the Kyoto Protocol and its flexible mechanisms, including emission trading, is that it will not lead to emission reductions. He highlights a number of reasons: the first reason is that the Annex-B countries only stand for one third of the global emission discharges. The agreed emission reductions will not be enough to offset the increasing emissions in other countries. As a second reason he mentions the reference year 1990 and that several countries previously under "planned economy" were included in Annex B. Since the fall of the Berlin Wall most of these countries were able to reduce their emissions drastically below 1990 emission levels mainly through technological progress and closure of outdated facilities as a result of opening markets, which means that they already made the emissions reduction they needed to do between 1990 and 2008-2012. Since the allowances are allocated based on reaching the Kyoto Target for the participating countries in the EU ETS these countries received too many allowances. These countries reduced their emissions discharges because of efficiency improvements and not because of emission trading[95]. In the case of Eastern Europe, which achieved the Kyoto targets earlier than expected, the cap for emissions could and probably should have been lowered in order to further increase efforts to reduce

[93] Lohmann (2006)

[94] Paul McAleavey, EEA (2009)

[95] Warlenius (2008)

carbon dioxide emissions. On the other hand a flexible cap decreases the predictability in the system. According to a report from the European Environmental Agency nine of the ten EU-12 countries with a Kyoto target (Malta and Cyprus have no Kyoto targets) have already reached emission levels below the Kyoto target for several years, based on emission reductions taking place in the 1990s[96]. The difference between what they are allowed to emit and what they actually emitted, they can sell to other countries unable to reach their target. Since this causes an oversupply of allowances in the market this means that the emission levels can actually increase[97].

5.3. Divergence from economic theory

Which features do the EU emission trading scheme's allowances share with the property rights solution? It is important to assess this since the tradable allowances are often viewed as hybrid property rights and the more features they share with property rights the closer we will get to an efficient allocation[98]. Under the economic theory section three main characteristics were presented that are required for a property right to be able to produce an efficient allocation. These three main characteristics were: enforceability, excludability, and transferability.

- *Enforceability* – describes the feature of property rights that they should be secured from involuntary seizure and encroachment. For the emissions trading scheme to work the traders need to own what they sell and "interest in allowances must be sufficiently protected to protect investment"[99]. At the same time a certain amount of emission allowances needs to be taken away in every trading period in order to tighten the cap and smoothly cut the emissions towards the target emission level. Emission allowances are not just valuable because they free companies from pollution control but also because they have a market value and can enable companies to borrow money. The value of the European Union Allowances in 2007 was 50,097 million US dollars[100]. Companies will not give up the allowances for free and will spend a lot of time lobbying for the emission allowances and try to get as many as they can instead of finding efficient ways to reduce

[96] EEA (2009), GHG emission trends and projections in Europe 2009

[97] Warlenius (2008)

[98] Lohmann (2006)

[99] Lohmann (2006), p. 80

[100] The World Bank (2008), States and trends in the carbon market 2008

carbon usage. In this case, the emission allowances have not fulfilled the third criteria of enforceability. The emission allowance is not secured from involuntary seizure from the government, since the allowances are just distributed in phases and returned when the trading period ends. This non-permanent distribution creates the rent-seeking behavior from the companies. Because of this lobbying and if the government is under strong corporate pressure it may be hard for the government to tighten the cap which will ultimately lead the government to hand out too many emission allowances. This is exactly the phenomenon we saw in phase one and this does not lead to an efficient allocation in the market. This lobbying, rent seeking behavior as well as the governments' role in allocating the emission allowances points out the fact that an emission trading scheme might not be a less "political" form of climate action than any other policy approach. With too many emission allowances handed out, the government creates a market with too "little" scarcity to work[101]. The EU is aware of this flaw and will in the third period tighten the cap (see 4.1.1 The Evolution of the EU ETS).

- *Excludability* – Are the emission allowances excludable? The definition of excludability is that all benefits and costs accrued as a result from owning and using the resource fall on the owner. When it comes to emissions reductions or emission discharges this is not true since carbon dioxide is a global pollutant. The damage caused by emission discharges affects the whole planet and the emission reductions benefit the whole planet. The purpose of the first phase of the EU ETS was to establish the verifying and monitoring system required to track the emissions from the different installations. But the system mainly allows us to quantify the emissions from each installation. It is impossible to verify the damage caused by each emission of carbon dioxide and with or without the EU ETS the cost of emission discharges will fall on the whole planet. The citizens as well as the companies of the European Union pay a high price for implementing the scheme while the benefits fall on others as well. Only with a global system we can address this free-rider problem, since then we are all paying for emission reductions and we all will benefit from them.

- *Transferability* **-** The emission allowances are transferable in EU ETS just as a property rights should be, allowing to create an efficient allocation in the market. It is the trade mechanism creating the possibilities for cost-effective emission reductions in the EU ETS.

[101] Lohmann (2006)

5.3.1. Drawbacks with property rights revisited

Three drawbacks were presented with private property rights and these were issues related to their distribution, transaction and implementation costs and their long-term sustainability. How do the emission allowances and the EU ETS fall in these categories?

- *Fair distribution* – The initial distribution of the emission allowances has been a source of conflict. In the first phase too many allowances were handed out because of lobbying from companies as well as due to uncertainty from the governments' side. Since the allowances were given away for free, some sectors could enjoy windfall profits. The European Union has addressed these issues by auctioning out a greater proportion of the allowances moving towards the "Polluter Pay Principle" (PPP). On the other hand, the Coase-theorem states that the initial allocation of emission allowances does not matter. As long as negotiation costs are small and affected parties can negotiate freely with each other the entitlement could be allocated to either party and an efficient allocation would result. This is why the emission allowances are transferable and traded. The initial distribution will continue to be a debatable point because it affects the distribution of costs and benefits among the companies.

- *Transaction costs and implementation costs* – The implementation costs of the EU ETS's monitoring and verifying system are necessary for any kind of policy (since we need to know how much each installation emits). The transaction costs I judge as fairly small since there are many possibilities to conduct a trade, by a broker, through an exchange, or directly between a seller and a buyer. Through the exchanges the buyer or seller can easily and quickly find a counterpart. The trade volume has increased since the implementation in 2005 which may indicate easy access to the market[102]. However, the EU ETS has resulted in social costs from lobbying which arise from the issues concerning the excludability criteria and the initial distribution of the allowances mentioned above.

- *Long-term sustainability* – It is obvious that the companies lobbying for the allowances have a positive time preference and are biased towards the present. The over-allocation of allowances may indicate this, questioning if the EU ETS is too biased towards the present

[102] European Climate Exchange: http://www.ecx.eu/ECX-Historical-Data

time and fails to cut emissions in the rapid pace needed. Since there is no natural demand for emission allowances it is crucial that the governments as well as the European Union set expectations about the long-term price with a tight cap. It is the policymakers' task to make the solution sustainable in the long-term.

6. Does EU ETS lead to emission reduction?

We have now addressed the economic theory behind a market based policy response to the climate change as well as advantages and disadvantages of the policy. Cost-effectiveness is the key driver behind the choice of an emission trading scheme. The implementation of the emission trading scheme has not been frictionless and, cost-effective or not, the ultimate test still remains: does it lead to emission reductions?

6.1. European Environmental Agency Report

The European Environment Agency (EEA) has written a report, Greenhouse gas emission trends and projections in Europe 2009, which presents an analysis of historic and projected trends of greenhouse gas emissions in Europe. The report assesses how the European Union Member States have and will achieve their emission reduction targets under the Kyoto Protocol as well as the EU commitment for 2020 to reduce emission by 20% compared to 1990. The report states that the greenhouse gas emissions in the European Union are decreasing and that in 2008 the total greenhouse gas emissions in the EU-15[103] and EU-27 were 6,2% respective 10,7% below the levels in 1990. According to the report this is the lowest emissions level by the EU-15 and EU-27 since 1990. Further the report states that:

"*EU-wide policies are expected to contribute towards most of the planned emissions savings by the end of the period 2008-2012 in particular the European Union Emission Trading Scheme, the promotion of renewable energy sources, policies targeting the energy performance of buildings and internal energy market policies*"[104]

It is important to note that the implementation of an emission trading scheme in the EU is just one of many policy responses dealing with climate change. This can be explained by the fact that is not cost-effective to let all discharges of greenhouse gases be a part of an emission trading scheme. The discharge from fossil fuels stands for 60% of the global discharge of greenhouse gases. The remaining 40% (from devastation of forest, methane leaking from dumps, etc) is harder to control and for these emissions other policy responses targeting the energy performance as well as technology investments provide a better option than emissions

[103] the 15 member states pre 2004 in the European Union

[104] EEA (2009), GHG emission trends and projections in Europe 2009, page 10

trading[105]. Further the report states that the quantitative estimates from the member states so far lack consistency and completeness to be able to estimate the emission savings at EU levels accurately, especially for newly adopted policies. The EU estimates the emission reduction potential in 2010 from the EU ETS to be the highest followed by the Kyoto Project Mechanisms, based on existing implemented measures. In 2020, the EU ETS Directive is one of the existing measures implemented expected to contribute the most to total emissions savings. In addition, the European Commission expects the inclusion of aviation in the EU ETS to have significant effects in 2020[106]. However, academic papers suggest that the inclusion of aviation will have insignificant impacts considering its relatively low share of total global carbon dioxide emissions[107].

"*Looking at Member States projections, if all domestic emission reductions take place as a result of the existing measures, greenhouse gas emissions in the EU-15 will be reduced to 6,8% below Kyoto Base year levels*[108]"

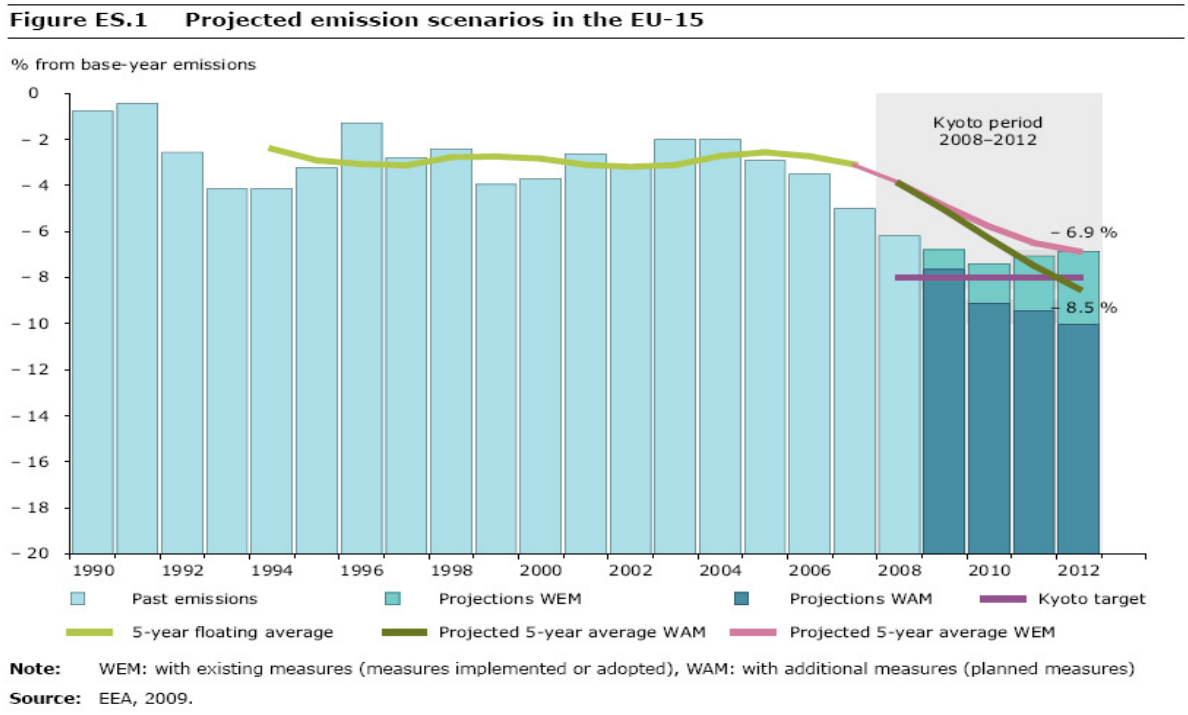

Figure 5- WEM, With Existing Measures, includes the EU ETS indicating that the Kyoto target will not be reached. Source:EEA, GHG emission trends and projections in Europe 2009.

[105] Warlenius (2008)

[106] EEA (2009), GHG emission trends and projections in Europe 2009

[107] Anger, Annela & Köhler, Jonathan (2010), Including aviation emissions in the EU ETS: Much ado about nothing? A review

[108] EEA (2009), GHG emission trends and projections in Europe 2009, page 9

The EU-15 has under the Kyoto Protocol taken on the common commitment to reduce the emissions by 8% between 2008-2012 relative to the base year 1990. The statement above indicates this goal will not be reached including the EU ETS (EU ETS is an existing measure). The report indicates that the EU ETS may work since its goal was only to contribute towards the Kyoto targets work but it fails to describe how much it contributes to emission reductions and its overall importance. The policy approach might be too new to be able to evaluate its impact on emission discharges. We are after all just in the second trading period. It is also hard to separate different policy responses' effects from each other. This can also be seen as a sign of weakness of the emission trading scheme, as its effects seem to be difficult to measure in a reliable way.

Through the National Allocation Plans, the caps, the Member States have fixed the overall emission reduction that the EU ETS will provide towards reaching the Kyoto target at national level for the period 2008-2012. Therefore the report recommends the governments to focus emission reduction measures on the sectors not covered by the EU ETS as for example the transport-, residential- and agricultural sectors[109]. This statement may actually indicate that the EU ETS discourages the covered sectors to do emission reductions in addition to the cap; they will do what they need to and not more. The participating sectors could be able to cut emissions more than the cap but are not encouraged to do so and the cap works as a protective shell leaving the hard work to the sectors not covered in the trading scheme to reach the Kyoto target. The statement is supported by Lohmann(2006) who states that if the government fails to take away emission allowances it has temporarily granted the polluters the reduction burden will be put over other sectors such as transportation, individuals and government institutions[110]. It is important to mention that this is a static view of the model. The model is in fact dynamic with a cap decreasing in every phase to push emission reductions to new levels[111]. There are two conflicting goals with the length of the phases. On one hand, we would like to have a cap that decreases fast and cuts emissions at a high speed, which implies short phases. On the other hand longer trading periods offer greater predictability to market operators, which is necessary for encouraging long-term investments in emission reducing technology[112].

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[109] EEA (2009), GHG emission trends and projections in Europe 2009

[110] Lohmann (2006)

[111] Paul McAleavey, EEA (2009)

[112] European Commission (2008), EU action against climate change

7. Conclusion

In theory an emission trading scheme is to deliver emission reductions in a cost-effective and reliable way. But in practice the establishment of the scheme has encountered several difficulties. In this final section I will answer the question posed in the introduction:" Is emission trading a solution to climate change?"

7.1. Arguments for EU ETS

The European Union has made important improvements of the EU ETS and has responded to the difficulties arising in the first phase of the trading scheme, such as tightening of the cap to prevent an unstable price. The EU ETS has been extended both geographically and over sectors with the joining of Norway, Iceland and Liechtenstein in 2008 and the inclusion of the aviation sector in 2012. The inclusion of aviation is an important step since the aviation sector is the sector with the largest growth in emissions and it is a sector in which the scheme reach individual behavior more directly. On the other hand the sector only stands for 3% of total carbon dioxide emissions in 2007. From the first phase the European Union now has verified emission data from all installations covered by the EU ETS which will lead to emissions allowances being distributed less arbitrarily by the governments. In the third phase the National Allocation Plans will be substituted by a central distribution system which may prevent the distribution of excess allowances as well as reduce the lobbying from companies. The EU ETS is slowly moving towards auctioning which will prevent companies from making wind-fall profits. Although the price of the emission allowances has been unstable and even zero for a period, the EU ETS has achieved to put a price on carbon dioxide emissions, something that has been for free before.

There are two main arguments for the EU ETS from the theory: the first that it is a cost-effective approach to deal with climate change and the second is that the trading scheme involves a cap which allows certain volume reductions in emissions. The idea behind the EU ETS is to create an open market for carbon dioxide and through the market economics, incentives for companies will arise to reduce their emissions. Economic incentives are necessary to encourage reductions, and therefore this is an argument for the EU ETS. Another "advantage" which can not be overseen is that the policy actually was adopted among all 27 member states. The fact that the policy was implemented deserves some credit, and in the case of a failure, the policy has at least signaled that climate change is on the agenda. Another positive aspect is the fact that the companies covered by the EU ETS have responded to the

policy and are incorporating the cost of CO_2 allowances in their marginal pricing decision. The companies also expect EU ETS to have impact on the development of innovative technology which is a positive aspect.

7.2. Arguments against the EU ETS

Despite the advantages mentioned above, the EU ETS in practice has so far delivered a poor result. Whether the market leads to emissions reductions is yet to be revealed after the second phase of emission trading between 2008-2012 which is coinciding with the first commitment period of the Kyoto Protocol. The reports released so far show that even by including the European Union emission trading scheme, the Kyoto Target for the EU-15 will not be reached. But this result does not allow me to state that the EU ETS is useless. After all its goal was mainly to contribute to the fulfillment of the Kyoto Protocol (see directive Directive 2003/87/EC), something which can not be assessed through current reports but, as indicated in section 5.1 the scheme has contributed to some emission reduction. And the fact that it has not lead to huge emission reduction is not a market failure but more a political failure since any emission reductions depend on the cap put over the emissions which have been determined by the governments. The question is if our governments and the European Union are too infected and infiltrated by the companies to actually cut the cap and the emissions.

Another drawback with the EU ETS is that it leaves out the fact that households (individual behavior) contribute to 40% of the CO_2 emissions in the European Union. The households do not play an active role in the EU ETS which leads to yet another disadvantage that the scheme does not promote structural change. If we are to cut emissions in the long-run we need more than efficiency improvements, we need fundamental change in individual behavior. The solution needs to lie closer to individuals and not in the hands of a market. Therefore the EU ETS fails to cover this important group of emitters and different measures are needed to address the emissions made by households.

I also question the cost-effectiveness of the scheme based on the lobbying from the companies for emission allowances. The initial allocation of allowances will continue to be a debatable issue drawing attention and costs from other solutions (although in theory the initial allocation does not matter). If the EU ETS is not extended to include further geographical areas the scheme risks becoming a substantial cost to the EU citizens. After all, carbon dioxide is a global pollutant which signals that the trading scheme needs to be global as well. It is further

debatable if the scheme actually was implemented because of its cost-effectiveness and not just as a political reaction towards the fact that the United States decided not to join the Kyoto Protocol and commit to binding emission targets. The phases have so far shown that it is a complex task to distribute the allowances and the market has been characterized by an unstable price. It is questionable if the unstable price reflects the true social cost of emitting carbon dioxide, since the price in the first period was zero during a long time. In fact it is debatable if we can ever assess the true social cost of emitting carbon dioxide.

"Roll up for the great pollution fire sale, the ultimate chance to wreck the climate on the cheap. You sir, over there, from the power company - look at this lovely tonne of freshly made, sulphur-rich carbon dioxide. Last summer it cost an eyewatering €31 to throw up your smokestack, but in our give-away global recession sale, that's been slashed to a crazy €8.20. Dump plans for the wind turbine! Compare our offer with costly solar energy! At this low, low price you can't afford not to burn coal![113]"

The Guardian

If the costs of the allowances are too low, the EU ETS makes it economically rational to emit and invites companies to pollute more. It is crucial that the system cuts supply to a level which creates a price high enough to encourage emission reductions. To do this, the system needs strong governments who are not afraid to tighten the cap, instead of handing out too many allowances justified by growth predictions because in the moments we fall into a recession the price will fall, signaling that polluting is okay.

"The markets can be a conduit, but not a substitute, for political will"[114]

The Guardian

I fear that the market will relax the governments' approach towards climate change, since "after all" they created a market to handle the problem. I believe the market is not a substitute for political will and if we leave climate change in the hands of the market the result may be fatal. It is important to continue promoting low carbon products and services as well as stimulating solar energy or other sustainable energy sources, because markets can crash, something we have witnessed during the financial crises in 2008 and 2001 when the real estate and internet bubbles respectively burst. After all we cannot be sure that the markets are

[113] Glover, Julian , The Guardian (23rd of February 2009

[114] Glover, Julian , The Guardian (23rd of February 2009)

more stable solutions than government interventions. And if the carbon market will be subject for speculative trading, the main purpose of cutting emissions will be put in the dark for the mere purpose of making money.

7.3. Last words…

The purpose of this paper is to make the reader aware that, although emissions trading is well backed up by economic theory, the EU ETS in it current form has significant flaws. I hope that the reader is now aware of the complex task of implementing and relying on an emissions trading scheme. Based on my findings I want to conclude that the EU ETS is not *the* solution to the climate change. The market failed to internalize the social cost of emitting carbon dioxide into the atmosphere, yet we want to put the solution back on the market that created the problem in the first place. When we put the climate change in the hands of the market I fear we forget the real purpose to cut emissions and prevent climate change and focus on making money. There is also the question if our governments and the European Union are under too strong influence from the companies to actually cut the cap and the emissions.

To end the conclusion whether emission trading is a solution to climate change, I want to give a policy recommendation: For the EU ETS to be a win-win situation, to cut emissions and make it profitable:

a) The scheme has to be further extended geographically, since the problem is global.
b) The cap needs to be tighter to cut the oversupply of allowances and to create economic incentives to actually reduce emissions. The cap needs further tightening to cut emissions more rapidly in response to the alarming reports from IPCC about climate change.
c) Therefore we need stronger governments and political leadership and a clearer dialogue has to be held with the business sector to reduce long-term uncertainty regarding the changes in the scheme.
d) The market has to be regulated to avoid speculation.

Only then, together in a policy mix with other policies targeting individual behavior, technical changes and clean energy the EU ETS may be a part of the solution to climate change.

8. Appendix

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