Carbon Market Implications for new EU Member States
Empirical analysis for Hungary

Dóra Fazekas
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1. Introduction  
2. Emissions Trading in Climate Change Regulation  
3. Emissions Trading in Hungary  
4. Experiences of the Eu ETS Pilot Phase

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Environmental Economics and Management

Dóra Fazekas

Carbon Market Implications for new EU Member States

Empirical analysis for Hungary

- Ph.D. Dissertation -

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Vice Rector for Academic Affairs

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Budapest
2009
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„If you want to understand today, you have to search yesterday.”

Pearl S. Buck, Nobel laureate in literature

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The author takes sole responsibility for any remaining error or omissions.
I. INTRODUCTION

Scientists from all over the world are recognizing that the Earth is becoming warmer than ever before. The lion’s share of these scientists are worried that increasing temperature is closely related to our use of fossil fuel, and the emissions of anthropocentric greenhouse gases, especially carbon dioxide. The Intergovernmental Panel on Climate Change (IPCC, 2001 and 2007) stated that mankind plays an important role for the climate on Earth. The problem of climate change, its causes and consequences have recently gained international public and political attention. Climate change is considered a new form of externality, which defers from traditional externalities in the sense that it is global; both its causes and consequences have global impacts. Presenting the problem and scale of the climate change issue is however out of the focus of this study. My dissertation aims at presenting and analyzing one of the possible solutions to combat global warming, an economic tool, the trading of emissions allowances.

This dissertation aims at presenting the pilot phase of the European Union Emissions Trading Scheme between 2005 and 2007. The EU ETS is the first cap-and-trade initiative worldwide to mobilize market forces to decrease carbon emissions. From 2005 the carbon trading system is in operation in the twenty-seven Member States of the European Union aiming to comply with the Kyoto targets.

The widespread foreign opinion (Holzinger-Knoepfel, 2000; Baker, 2001; Soversoki, 2001; Homeyer, 2001, 2004; Kramer, 2002; Jehlicka-Tickle, 2002, 2004; Schreurs, 2004; Mullins, 2005; Wilkinson et al, 2004) is that new EU Member States lack the market-based economy necessary for the successful operation of such a system. So looking at the reality is rather interesting. Whether it could be implemented in a country –Hungary– that lacks the necessary institutions, experience with markets and practices?

This doctoral dissertation:
(1) has certified that emissions trading as a market-based environmental tool works well in a country that lacks the necessary institutions, experience with markets and practices.
(2) has analyzed the impacts of the EU CO₂ Emissions Trading Scheme on Hungarian companies during the pilot phase.
(3) has quantified the Hungarian companies involvement into the EU CO₂ emissions allowance market.
Neither the theory nor the empirical assessment of emissions trading for new Member States has been fully examined in the literature. Ürge-Vorsatz and Miladinova (2005) mention some general concerns about the viability of market-based instrument in Eastern Member States, however this dissertation aims to present that such a market-based instrument might work equally efficient in countries lacking market-based experiences and institutions. Moreover until now only projections have been made, analyzing the future. This study analyzes the effectiveness and efficiency of allowance trading ex-post. This is one of the first attempts to examine – both quantitatively and qualitatively – the impacts of allowance trading on one new Member State based on actual market data.

In November, 2007 I joined the international research program, the Association for Promoting Research on Carbon Economy (APREC)\(^1\), which is a non-profit association based in Paris, France. This research program provides the ex-post evaluation of the European CO\(_2\) market; it is aimed at improving the understanding of the EU ETS. The structured database used in this dissertation was due to my participation to the team.

**Research methodology**

The research methodology of this dissertation does not follow previous stochastic, simulator and modeling approaches. For conducting a statistical analysis, the number of Hungarian participants – around two hundred and fifty installations – is not representative. Thus the impacts of the new carbon regulation on Hungarian installations covered by the scheme were revealed by a qualitative analysis. Carbon allowance transactions in Hungary during the pilot phase were examined through quantitative analysis.

The first step of the analysis was to gather data – Hungarian carbon emissions, allocation amounts and allowance transactions needed to be quantified. For this the systems and database of the following institutions were used:

- euets.com carbon stock exchange
- Community Independent Transaction Log (CITL)
- European Environment Agency (EEA)
- Hungarian Ministry of Environment and Water, Climate Change and Energy Unit

\(^1\) APREC has been implemented by an international research team composed of experts at the Center for Energy and Environmental Policy Research (CEEPR) at the Massachusetts Institute of Technology (MIT), the University College Dublin (UCD), and the Mission Climat of Caisse des Dépôts, in collaboration with the Université Paris-Dauphine, the International Energy Agency (IEA), the Öko-Institut in Berlin and the Centre International de Recherche sur l’Environnement et le Développement (CIRED) in Paris.
Two database contain transactions data for Hungarian emission allowances: The EU’s central transaction log and the Hungarian emission registry. The EU classifies its logs for five years, whereas the national registry is not searchable. These made reconstructing and analyzing emission transactions rather complicated.

The second step of the analysis was to study gathered data. The Hungarian carbon emission allowance market was examined by the following indicators:

- Position of sectors and installations
- Relative allocation
- Volume and value of emission allowance transfers
- Volume, value and proportion of emission allowance transfers from Hungary
- Volume, value and proportion of emission allowance transfers to Hungary
- Proportion of surrendered emission allowances

The third step of the analysis was to interview the representatives of installations, which received the majority (more than 55%) of the pilot phase allocation. The author of this dissertation personally interviewed representatives of the following sectors: energy- (72%), cement- (9,5%), iron and steel production (7,3%) and oil refinery (4,6%). Sectors (construction material-, ceramics-, glass-, coking and paper production) accounting for less than 6,5% of pilot phase allocation were not included in the analysis.

<table>
<thead>
<tr>
<th>Allocation in the pilot phase</th>
<th>EUA</th>
<th>EUA (%)</th>
<th>Cumulative (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mátrai Erőmű Rt. Visontai Erőmű</td>
<td>20,382,318</td>
<td>22,47%</td>
<td>22,47%</td>
</tr>
<tr>
<td>Dunamenti Erőmű Zrt.</td>
<td>7,930,539</td>
<td>8,74%</td>
<td>31,21%</td>
</tr>
<tr>
<td>Dunaferrt Zrt.</td>
<td>5,769,828</td>
<td>6,36%</td>
<td>37,57%</td>
</tr>
<tr>
<td>Vértesi Erőmű Zrt. Oroszlányi Erőmű</td>
<td>5,185,509</td>
<td>5,72%</td>
<td>43,29%</td>
</tr>
<tr>
<td>AES Tisza Erőmű Kft.</td>
<td>4,307,580</td>
<td>4,75%</td>
<td>48,04%</td>
</tr>
<tr>
<td>MOL Rt. Dunai Finomító</td>
<td>4,149,510</td>
<td>4,57%</td>
<td>52,61%</td>
</tr>
<tr>
<td>Csepel II. Erőmű</td>
<td>2,432,598</td>
<td>2,68%</td>
<td>55,3%</td>
</tr>
<tr>
<td>Other installations</td>
<td>40,550,616</td>
<td>44,7%</td>
<td>100%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>90,708,498</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>
Before the personal interviews were conducted the author of the thesis sent the questionnaire (see Annex I.) to the interviewees, then the followings were addressed in informal discussions:

- Impacts of the regulation on the installation
- Impacts of the allocation on the installation
- Impacts of the regulation on their competitiveness
- Decision making in the installation
- Position and role of the decision maker in the installation
- Has there been any emission abatement, if yes, to what extent
- Has there been any allowance exchanges, if yes, to what extent
- Has there been any new investments because of the new regulation
- Has there been any closures because of the new regulation
- Has there been any innovation induced by the new regulation
- Cost effects of the regulation on the installation
- Human resource effects of the regulation on the installation
- Evaluation of the national infrastructure
- Production and GHG emission after the new regulation

This table below summarizes the interviewees for this thesis. It is interesting to look at the different departments, units and decision-making levels of those responsible for the EU ETS at various installations.

<table>
<thead>
<tr>
<th>Installation</th>
<th>Representative</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>AES Tisza Erőmű Kft.</td>
<td>Hohol Gábor</td>
<td>Solid fuel Manager</td>
</tr>
<tr>
<td>Bakonyi Erőmű Zrt.</td>
<td>Trenka Ervin</td>
<td>Consultant</td>
</tr>
<tr>
<td>Budapesti Erőmű Zrt.</td>
<td>Rudolf Viktor</td>
<td>Director Senior Engineer</td>
</tr>
<tr>
<td>Csepel II. KCGT Erőmű (Csepeli Áramtermelő Kft.)</td>
<td>Briglovics Gábor</td>
<td>Group Trading Director</td>
</tr>
<tr>
<td>Dunamenti Erőmű Zrt.</td>
<td>Kuhl Tibor</td>
<td>Managing Director</td>
</tr>
<tr>
<td>E.ON Hungária Zrt.</td>
<td>Horváth Dániel</td>
<td>Energy trader</td>
</tr>
<tr>
<td>ISD Dunaférr Dunai Vasmű Zrt.</td>
<td>Lukács Péter</td>
<td>Strategic-Technical Deputy CEO</td>
</tr>
<tr>
<td>Magyar Cementipari Szövetség</td>
<td>Dr. Hilger Miklós</td>
<td>Deputy CEO</td>
</tr>
<tr>
<td>Magyar Vas és Acélipari Egyesülés</td>
<td>Dr. Tardy Pál</td>
<td>President</td>
</tr>
<tr>
<td>Magyar Villamos Művek Zrt.</td>
<td>Civin Vilmos</td>
<td>Environmental Officer</td>
</tr>
<tr>
<td>Installation</td>
<td>Representative</td>
<td>Position</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Mátrai Erőmű Zrt. Visontai Erőmű</td>
<td>Wilner Lilla</td>
<td>Deputy Head of Technology-Supervisory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Department Chemical and Environmental Unit</td>
</tr>
<tr>
<td>MOL Nyrt. Dunai Finomító</td>
<td>Varró László</td>
<td>Chief Economist</td>
</tr>
<tr>
<td>Vértesi Erőmű Rt. Oroszlányi Erőmű</td>
<td>Berki Ferenc</td>
<td>Energy Director</td>
</tr>
<tr>
<td></td>
<td>Nagy László</td>
<td>Trade Officer</td>
</tr>
</tbody>
</table>

Table 2. Interviewed installations

The study explored not only experiences of the installations covered by the scheme, but also of verifier bodies, and personal interviews were conducted with one civil servant at the Environmental Department and with foreign experts from the international research group, APREC.

<table>
<thead>
<tr>
<th>Verifier</th>
<th>Representative</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deloitte</td>
<td>Reiniger Róbert</td>
<td>Director of Environmental Services</td>
</tr>
<tr>
<td>SGS Hungária</td>
<td>Bodroghelyi Csaba</td>
<td>Chief verifier</td>
</tr>
<tr>
<td>Independent verifier</td>
<td>Juhász András</td>
<td>JI consultant</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Authority</th>
<th>Representative</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hungarian Ministry of Environment and Water Climate Change and Energy Unit</td>
<td>Feiler József</td>
<td>Head of Department</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Foreign experts</th>
<th>Representative</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricité de France (EDF)</td>
<td>Caneill, Jean-Yves Dr.</td>
<td>Head of Environmental Affairs</td>
</tr>
<tr>
<td>CEZ Group</td>
<td>Chmelik, Tomas</td>
<td>Environmental Products Manager</td>
</tr>
<tr>
<td>Massachusetts Institute of Technology (MIT)</td>
<td>Ellerman, A. Denny</td>
<td>Senior Lecturer</td>
</tr>
<tr>
<td>Warsaw University</td>
<td>Zylicz, Tomasz</td>
<td>Professor</td>
</tr>
</tbody>
</table>

Table 3. Others interviewed

**Structure of the thesis**

The dissertation comprises two parts: first, the theoretical background of the topic is presented; second, the results of the empirical research are shown.

The **first chapter** of the **theoretical background** reviews the policy options for environmental regulation in the context of climate change, introducing market-based means for regulating air pollution. The **second chapter** presents the introduction, operation and practical experiences with tradeable permit schemes. The **third chapter** presents previous empirical work assessing the pilot phase of the EU ETS.

The second part presenting the **empirical research** describes Hungarian experiences with carbon emissions trading. The **first chapter** discusses previous studies on the EU ETS in Hungary and deals with Hungarian GHG emission. The **second chapter** focuses on the implementation of the EU ETS,
both on national and corporate level. The *third chapter* analyses Hungarian participants covered by the scheme; examines what effects the new regulation had on them and quantifies carbon allowance transactions.
“If it is feasible to establish a market to implement a policy, no policy maker can afford to do without one”

John H. Dales, Professor Emeritus (1968)

II. EMISSIONS TRADING IN CLIMATE CHANGE REGULATION

1. Climate Change Regulation
   1.1. Environmental Policy Tools for Emissions Reductions
   1.2. Tradeable Permits Schemes

2. Practical Experiences and Implementation of Tradeable Permits Schemes
   2.1. The Kyoto Protocol
   2.2. Flexibility Mechanisms
   2.3. Emission Trading Schemes

3. Pilot phase of the EU Emission Trading Scheme
   3.1. Emission Trading in the old EU Member States
   3.2. Emission Trading in the new EU Member States
1. Climate Change Regulation

The field of environmental economics has been developing quickly over the last few decades. This chapter presents tools for environmental policy regulation. Although environmental awareness is increasing day by day, and improvements in environmental policy are taking place, it will take a long time to solve these problems in a satisfying way. The tool kit of environmental protection policies in the field of climate change is diverse. The range of possible environmental policy instruments is as wide as the range of concerns they intend to address, and they are grouped in different ways in the economics and policy literatures. Economists frequently divide environmental policy instruments into two categories:

(1) those that provide firms with little flexibility in achieving goals, the so-called command-and-control approaches (C&C), and

(2) those that provide firms with greater flexibility and incentives to look for more effective ways of making sustained environmental progress, the so-called market-based or incentive-based instruments.

Other scientists use different categorizations but there is a consensus on the divide between the two main streams. A simple and widely used approach (Cassils, 1991) is to consider that environmental policy instruments can be grouped into three broad categories, besides the above two:

(3) decentralized policies or voluntary measures (see table below).

Other scientists use different categorizations but there is a consensus on the divide between the two main streams. A simple and widely used approach (Cassils, 1991) is to consider that environmental policy instruments can be grouped into three broad categories, besides the above two:

(3) decentralized policies or voluntary measures (see table below).

<table>
<thead>
<tr>
<th>Direct regulation Command-and-control measures</th>
<th>Indirect regulation Economic / Market-based / Incentive-based instruments</th>
<th>Decentralized regulation Negotiated compliance Suasive instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>- norms</td>
<td>- taxes, charges, levies duties, effluent charges</td>
<td>- unilateral firm statements</td>
</tr>
<tr>
<td>- limits</td>
<td>- incentives</td>
<td>- voluntary agreements</td>
</tr>
<tr>
<td>- licensing</td>
<td>- fiscal and budgetary subsidies</td>
<td>- environmental marketing</td>
</tr>
<tr>
<td>- liability</td>
<td>(tax credits, exemptions and allowances, direct transfers, R&amp;D)</td>
<td>- ISO, EMAS and other environmental certifications</td>
</tr>
<tr>
<td>- fines</td>
<td>- tradeable permits</td>
<td>- ecolabelling</td>
</tr>
<tr>
<td>- bans</td>
<td></td>
<td>- ecoaudit</td>
</tr>
<tr>
<td>- standards</td>
<td></td>
<td>- BAT, BATNEC²</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- enforcement incentives</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- environmental liability insurance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- information-based measures</td>
</tr>
</tbody>
</table>

Table 4. Environmental policy instruments
Source: Kerekes – Szlávik, 2001

1.1. Environmental Policy Tools for Emissions Reductions

Before focusing on tradeable permit schemes let us review the three major types of environmental policy instruments in more detail.

² BAT: Best Available Technology, BATNEC: Best Available Technology Not Entailing Excessive Cost
(1) **Command and control** measures are those activities imposed on industry through government legislation, particularly for pollution abatement purposes. In command and control measures authorities establish the behavior that should be adopted by the actors, by making it mandatory, allowing for little flexibility in the means of achieving policy goals. Command-and-control regulations tend to force firms to take on similar shares of the pollution-control burden, regardless of the cost. They often do this by setting uniform standards for firms, the most prevalent of which are performance- and technology-based standards.

(2) **Market based instruments** allow more freedom for actors to respond in ways they deem most beneficial to themselves. Robert Stavins (2001) defines market-based instruments as "regulations that encourage behavior through market signals rather than through explicit directives regarding pollution control levels or methods (p. 358.). Economic instruments encourage behavior through price signals rather than through explicit directives regarding pollution control levels or methods. These instruments are based on the correction of prices in existing markets, which present distortions, or in the creation of new markets that enable the internalization of environmental externalities. In theory, if properly designed and implemented, market-based instruments allow any desired level of pollution cleanup to be realized at the lowest overall cost to society, by providing incentives for the greatest reductions in pollution by those firms that can achieve reductions with least cost (Stavins, 2003).

Two main groups of these instruments are quantity-based instruments, like standards and tradable permits on the one hand, and price-based instruments, like taxes or subsidies and fees, on the other hand. Both types of instruments are cost effective, but they differ in what is fixed and what is variable. For permits, the quantitative target is fixed, which provides a straightforward measure of environmental progress as well as compliance, and the price of the permits is variable. For price-based instruments the monetary incentive is fixed for a certain period of time, reducing uncertainty for investors, but taxes/subsidies offer no guarantee that the environmental impact will be limited to a certain level or a certain amount of permits used.

Market based instruments are of vital importance from the point of view of this dissertation as the European Union is aiming at reducing GHG emissions by establishing a market for emissions allowances. There has been an important shift in policy towards the use of market mechanisms, the key argument for the use of market mechanisms is now widely recognized, namely that in comparison with conventional C&C regulation, they have the potential to reduce the economic costs associated with a given level of environmental protection (OECD, 1999).

(3) **Decentralized approaches** rely on policies that allow the individuals involved in environmental pollution to work it out. This category of instruments includes mainly the so-called voluntary
approaches, activities that are not previously mandated by government through legislation, or are not the result of market forces (O’Brien, 1998). In other words agents voluntarily adopt a commitment of improving their environmental performance, going beyond simple compliance with existing regulations. Voluntary agreements are politically attractive, raise awareness among stakeholders, and have played a role in the evolution of many national policies. Voluntary agreements can vary significantly from one another in terms of their design, legally binding or not, include sanctions for non-compliance, or allow companies to use offsets.

Among emissions reduction policy aims the most important is mitigating climate change by reducing carbon dioxide emissions. According to the IPCC report, *Climate change 2007: Mitigation* the following policy instruments are suitable to combat climate change:

**Regulations and standards** specify abatement technologies (technology standard) or minimum requirements for pollution output (performance standard) to reduce emissions. They generally provide some certainty of emissions levels, but their environmental effectiveness depends on their stringency. They may be preferable when information or other barriers prevent firms and consumers from responding to price signals.

**Taxes and charges** impose a levy on each unit of undesirable activity by a source. They are generally cost effective, but they cannot guarantee a particular level of emissions, they may be politically difficult to implement and, if necessary, adjust. As with regulations, their environmental effectiveness depends on stringency.

** Tradable permits**, also know as marketable permits or cap-and-trade systems, establish a limit on aggregate emissions by specified sources, require each source to hold permits equal to its actual emissions, and allows permits to be traded among sources. The volume of allowed emissions determines carbon price and the environmental effectiveness of this instrument, while the distribution of allowances can affect cost effectiveness and competitiveness. Experience has shown that banking provisions can provide significant temporal flexibility. Uncertainty in the price of carbon makes it difficult to estimate the total cost of meeting emission reduction targets.

**Subsidies and incentives** are direct payments, tax reductions, price supports, or the equivalent from a government to an entity for implementing a practice or performing a specified action. Direct and indirect subsidies for fossil fuel use and agriculture remain common practice, although those for coal have declined over the past decade in many OECD and in some developing countries.

**Information instruments** require public disclosure of environmentally related information, generally by industry to consumers. Includes labeling programs, rating, and certification; may affect
environmental quality by promoting better-informed choices and lead to support for government policy.

**Research and development (R&D)** is direct government spending and investment to generate innovation on mitigation, or physical and social infrastructure to reduce emissions. Includes prizes and incentives for technological advances.

**Financial incentives** are frequently used by governments to stimulate the diffusion of new, less GHG-emitting technologies. While economic costs are generally higher than for other instruments, they are often critical to overcome barriers to the penetration of new technologies.

**Government support** through financial contributions, taxation measures, standard setting and market creation is important to promote technology development, innovations and transfer. Substantial additional investments in, and policies for, R&D are needed to ensure that technologies are ready for commercialization in order to arrive at stabilization of GHGs in the atmosphere, along with economic and regulatory instruments to promote their deployment and diffusion.

There is no simple answer to decide which regulatory tool is more efficient to decrease pollution, conventional regulation or tradable permits. Jaffe argues that it all depends on the context; and that it is not the tool in itself (tradable permits, or command-and-control, or environmental tax, or voluntary program) what makes a scheme environmentally efficient but the ambition of the target. “If the emissions do not decrease quickly enough, do not blame the ETS but the decision-makers who set too lenient an objective for the cap.” (Jaffe et al, 2002)

Given that the focus of my dissertation is the EU ETS as an economic tool targeting at reducing GHG in the atmosphere responsible for climate change hereinafter the study focuses only on tradeable permits schemes. Comparing market-based instruments to command-and-control measures is already well developed in the literature and does not require another contribution.

### 1.2. Tradeable Permits Schemes

Tradeable permits in environmental policy are a relatively new instrument, in theory as well as in actual policy. J.H. Dales developed the idea in 1968. Environmental economists have pointed out that economic instruments are suitable for implementing a policy of reducing emissions of greenhouse gases. Since the early 1970s the theoretical literature on tradable emission permits (Montgomery, 1972; Hahn, 1984; Tietenberg, 1985; Cropper and Oates, 1992; in Hungarian: Kerekes, 1995; Kerekes and Szlávik, 2001) has discussed the efficiency and properties of their use. In the United States they have been in use since the mid-1970s. Since the early 1990s emissions trading has gathered attention as an effective instrument of pollution control (Ellerman et al, 2003).
In Europe the United Kingdom and Denmark pioneered domestic GHG trading since the early 2000s.

With economic instruments, emissions will be reduced in an efficient manner, according to the theory. This has been argued and illustrated in a large number of studies which deal with economic instruments like taxes, charges and tradeable emissions permits (e.g. Barrett, 1992; UNCTAD, 1992). Tradeable quota systems have also been extensively studied in the literature. Kerekes (2007) describes the fundamentals in his book (pp.128-131); here only the basic idea is represented graphically. Figure 1. shows the optimal pollution level, which is always reached according to Coase. With the assumption that everyone has a right to clean air, the polluter pays to the aggrieved party (moving from point d to Q* on the figure). In contrast, with the assumption that everyone has a right to pollute, the aggrieved party pays the polluter (moving from point f to Q*).

![Figure 1. Optimal level of pollution](image)


Emissions trading is based on the concept on equalizing the Marginal Abatement Cost (MAC) of each participant within the emissions trading scheme at a price where the market will reach an equilibrium and the emission target will be fulfilled. The MAC represents the expenses required in order to reduce one extra tonne of CO₂. According to the trading principle, each installation will try to reduce its CO₂ emissions up to a point where the MAC is equal to the price of the allowance. Installations with lower MAC than the (expected) price level for allowances, thus lower emission reduction costs, will reduce their emissions and sell their allowances to the sources that cannot afford the extra reduction burden, due to a higher MAC. At this point of equilibrium, the price of CO₂ as determined by the supply and demand will lead to a Pareto optimum and clearance of the markets (Oikonomou, 2004). The differentiation of MAC can be due to different technologies or to regional differences of installations. An alternative representation of the MAC concept is through the use of shadow prices of CO₂, which actually reflect the opportunity cost of reducing one tonne
of CO₂ or buying an allowance instead. The shadow prices rise as an increasing function of emissions reduction (Ellerman and Decaux, 1998). If installations with different MAC achieve emission reductions, the aggregate cost of meeting the cap is relatively lower than the case where every installation had to reduce its own. The aggregate CO₂ reduction in a country is achieved in the least cost possible, as long as the installations trade until their MAC are equal to the market clearing price of the allowances, where the Pareto optimum is achieved.

Montgomery (1972) was the first to develop a theoretical approach for a permit trading of non-uniformly mixed assimilative pollutants reflecting spatial considerations of damages. He shows that in a competitive market of permits, cost-effectiveness is achieved regardless of the initial allocation. Classical theory (Montgomery, 1972) of course predicts that initial allocation should have no effect on emissions decisions of firms. This statement is particularly important for this dissertation as my findings contradict Montgomery. From the point of view of Hungarian installations there has been a clear difference regarding initial allocation. As presented later operators not always took opportunity costs of free allowances into account.

Ellerman (2005) argues, „environmental concerns are as old as Man, but tradeable permits are a relatively recent innovation in dealing with these problems”. Only in the last decades have tradeable permits been implemented and declared a success, mostly in the US, where they are still the exception, but also increasingly in Europe. A tradeable permit is “a transferable right to emit a substance that can create pollution” (Ellerman, 2005). Tradeable permits differ from conventional permits mainly in focusing on a single discharge and being transferable.

Many economists favor transferable emission permits because they rely on market forces to seek out the least cost reductions, and require no knowledge on the part of the control authority with respect to where these least costly abatement opportunities exist (Tietenberg, 2000). Rather, the main task of the control authority is to issue the appropriate number of emission permits. In fact, a tradable permit system allows the policy maker to effectively separate efficiency and equity issues, allocating permits on the basis of equity, or perhaps as an incentive for political support of the control policy, and letting the permit market seek out where the most cost-effective reductions can be achieved.

Ellerman (2005) identifies three requirements for an effective system of tradeable permits, which are present in EU ETS:

(1) Measuring emissions and continuous monitoring of the regulated emissions, otherwise there is no way to determine compliance or to define what is to be traded.
(2) Allocating emission rights is deciding who is entitled to receive allowances. Allocation involves a two-level decision, first, whether to auction the permits or grant them gratis to various entities, and then how to distribute the auction revenues or permits.

(3) Defining pollution means that „not only must the potentially polluting discharge be separately identified, but at least in theory the amount constituting pollution must be determined, as well as the spatial and temporal relation of discharges to the harmful effects.”

Barrett and Stavins (2003) point out that a significant feature of the climate change problem is that it occurs worldwide, irrespective of the place where CO₂ is emitted. Koutstaal (1996) declares that a system of tradeable emission permits is both an efficient and effective instrument to control CO₂ emissions. He argues that other instrument types are either not as effective (e.g. a carbon tax) or not as efficient (e.g. emission standards). Tradeable permits system offers the possibility of reaching environmental goals at lower cost because it separates the issue of who pays for control from who implements control, it facilitates transboundary cost-sharing. The distinctive advantage of tradable permits lies in their ability to deliver higher levels of environmental effectiveness.

Characteristics of tradable permits schemes are:

1. guaranteed environmental effectiveness: tradable permit schemes have the ability to achieve a definite pollution or abatement target;
2. cost-minimizing distribution of the burden of abatement between different sources: tradable permit schemes allow firms facing higher costs of abatement to do less abatement, than those firms for which pollution control is cheaper.

The direct advantage for industrial companies of emissions trading is the flexible management of emissions allowances. For example, it is possible to implement emissions reduction investments with other companies instead of expensive own technology developments for the reduction of emissions. Emissions trading is advantageous for both parties and is a lot more efficient than the system of emissions taxes and sanctions. It is of global benefit that during the introduction of the trading of emission rights, total emissions shall not increase while the seller and the buyer shall be encouraged to generate revenue and to save costs and thus to emit less pollutants (Hajdú, 2005).

Another conclusion is that this method realizes the polluter-pays principle since it is the person burdening the environment that bears responsibility and actually pays for pollution exceeding the allocated allowance. However, successful introduction and operation of the emissions trading system and the achievement of expected environmental and economic results requires the cooperation of industry.

UNEP’s classification of emissions trading types is the distinction between (1) cap-and-trade, (2) baseline-and-credit, and (3) offset (UNEP, 2002). Most of the emissions trading systems used are
based on these three forms. Based on EPA’s guide *Tools of the Trade* emissions trading can take
different forms and may be used in different sectors to meet regulatory requirements. EPA (2003)
differentiates three general types of emissions trading programs: (1) cap-and-trade programs, (2)
project-based or credit programs, and (3) rate-based or averaging programs. Egenhofer (2003)
states, it is well known that emissions trading schemes can be either cap-and-trade or credit-based.
Johnstone (2003) finds that previous emission trading programs have taken one of two forms, either
credit trading or allowance trading. Already from these classifications, it can be clearly stated that
there is no general standpoint on neither the classification, nor the names of types of emissions
trading schemes. In the followings, two types important for the dissertation are presented. The
founding cap-and-trade approach for EU ETS and project-based approach give basis for the
Flexibility Mechanisms.

**Cap-and-trade systems**

Allowance trading or cap-and-trade refers to the absolute cap on emissions and the ability to trade
emissions under the cap. In a cap-and-trade program, sources are allocated a fixed number of
allowances. Polluters hold property rights for all allowances under the cap. Each allowance
represents an authorization to emit a specific quantity of a pollutant. The number of allowances is
capped in order to reduce emissions to the desired level, and sources are required to meet stringent,
comprehensive emission monitoring requirements. Cap-and-trade is a policy approach to control
large amounts of emissions from a group of sources or individual sources at costs that are lower
than if sources were regulated individually through other stringent policies. The idea behind the
trading is equalizing the marginal abatement costs of participants.

Firms are required to surrender a permit for every unit of discharge, they must obtain and surrender
an allowance that can be readily bought or sold in the market. Sources that do not have a sufficient
number of allowances to cover emissions must purchase allowances from sources that have excess
allowances from reducing emissions. At the end of the compliance period, emission sources must
hold sufficient allowances to cover their emissions during the period. Ellerman (2005) argues that
allowances have become essential inputs into production subject to the same marginal cost
calculations as other inputs.
A defining feature of cap-and-trade trading is that, assuming adequate enforcement and full compliance, there is certainty that total emissions will be less than or equal to the aggregate cap. A second feature of a cap-and-trade scheme is that, under a standard set of assumptions regarding the competitive operation of the allowance market; the trading scheme will allow the target to be met at least cost. In the equilibrium, marginal abatement costs will be equalized across sources and equal to the allowance price.

The SO₂ trading program has become an international model for cap-and-trade programs, it has achieved cost savings, resulted in innovation, has been administratively transparent; moreover the trading has resulted in greater benefits than expected. The EU ETS, the focus of my dissertation, is another example of an implemented cap-and-trade system.

**Project-based mechanisms**

In a project-based program, also referred to as a credit or offset program, sources earn credit for projects that reduce emissions more than is required by a regulation. These credits can then be traded to other facilities where they can be used for compliance with a conventional regulatory requirement. The decision to generate these credits is usually voluntary; however, credits must be certified, certification is a distinctive feature of credit trading, the regulator determines that credit-worthy activity has occurred and that the credit can be transferred. This system requires a process of verification and government approval, as well as continued monitoring; as a result, transaction costs and uncertainty are high. In addition, certification has been a problem in that the regulator usually
seeks to ensure that a facility will not receive credit for what it would have done anyway, since granting credit in this case would lead to higher emissions by the firm to whom the credit is transferred. Offset programs are used to compensate the emissions due to new built sources, or expansion of old sources (Oikonomou, 2004).

Credit trading has originally been developed in the eighties in the US in the EPA emissions trading program to introduce flexibility in a stringent scheme of direct regulation of emission standards for sources. According to Boom and Svendsen (2000) the major advantage of credit trading is that it has a high political acceptability. On the other hand, Boom and Nentjes list two disadvantages of credit trading: low effectiveness and low efficiency (Boom - Nentjes, 2003). Ellerman states that in practice transaction costs associated with certification have been high and have often overwhelmed the cost savings from the proposed trades, so only few trades have been observed. As noted by Shabman et al. (2002), credit trading is an extension of conventional command-and-control regulation that keeps firm-level abatement decisions in the hands of the regulator. (Ellerman, 2005) According to the Kyoto Protocol, credit-trading schemes are the prerequisite for the Flexibility Mechanisms of the Kyoto Protocol.

* * *

For all types of emissions trading, the basic concept is similar: trading provides companies with the incentive to develop cost effective emission reduction strategies. Companies may control emissions more than required and sell surplus allowances or credits to other facilities that may face more expensive options to reduce emissions. Table 5. compares these programs.
Tietenberg et al. (1999, p. 31) states, “allowance trading programmes have proven superior to credit trading systems in terms of both economic and environmental results”. First, transaction costs play a key role in the success of an emissions trading system. Credit trading infers higher transaction costs due to regulatory authority approval and complex certification. Cap-and-trade however infers lower transaction costs, as certification is not required. Second, the level of government involvement in trading is a significant difference. Credit trading requires approvals, in contrast with cap-and-trade, which requires no government involvement.

* * *

This chapter has reviewed theoretical background to emissions trading, the theory of equalizing marginal abatement costs, tradeable permit schemes, and project based mechanisms. The next chapter builds on these concepts and describes practical experiences: the European carbon market and other schemes established outside Europe.
2. Practical Experiences and Implementation of Tradeable Permits Schemes

Emissions allowance markets became mainstream in the 1990s with the start of sulfur dioxide trading in the US (MacKenzie, 2007). Denmark launched a carbon market among its big electricity producers in 2001; the UK began an experimental voluntary scheme in 2002. The biggest scheme has been the EU’s carbon market, launched in January 2005. This chapter focuses on carbon markets, and studies practical experiences and implementation of the above-discussed theory.

The carbon market is composed of (1) voluntary markets, and (2) compliance markets. Compliance markets are discussed in detail in the followings; voluntary markets could be the topic of a separate study, here only a brief overview is given. Voluntary markets have no formal interaction with compliance markets; they have emerged in order to satisfy the need of corporations and individuals to offset their emissions for marketing and social reasons. The importance of the voluntary market is that it puts a price on carbon, creates motivation for support within companies, it provides companies with a mechanism to take part in carbon reductions.

Also compliance markets have two types: (2a) the Kyoto Protocol Market and (2b) the EU ETS. Credits traded are: Voluntary Emissions Credits (VER), Certified Emissions Reductions (CER), Emissions Reduction Unit (ERU), Assigned Amount Unit (AAU), and EU Allowance (EUA).

Worldbank’s State and Trends of the Carbon Market (2007) defines carbon markets as the sum of all transactions in which one or several parties pay another party in exchange for a given quantity of emission credits. Payments for the allowances can be cash, equity, debt, convertible debt, warrant, in-kind contributions such as providing technologies to abate GHGs or technology transfer. Carbon markets set either a level of cap or a level of intensity improvement, only allowances can be traded or the system is supplemented by a baseline-and-credit scheme. Carbon markets also differ in size,
value, sectoral and spatial coverage, permit allocation, trading organization aspects, monitoring and enforcement, and temporal and spatial flexibility, that is whether they allow external offsets, and banking. Regulated carbon markets can only achieve environmental goals when policymakers set scientifically credible emission reduction targets while giving companies maximum flexibility to achieve those goals.

In 1998, Joshua concluded that in terms of whether sub-national entities are eligible for trading, two types of emissions trading models can be distinguished: (1) Intergovernmental emissions trading; and (2) Inter-source trading. Ten years later, we may conclude that he was right - both types of emissions trading have emerged:

(1) Intergovernmental emissions trading: among Annex B Parties of the Kyoto Protocol: the legal basis for such trading has been provided by article 17 of the Kyoto Protocol, which states that Parties included in Annex B to the Protocol are eligible for emissions trading; and

(2) Inter-source trading: within the framework of the EU ETS governments only set the rules rather than undertaking emissions trading themselves, and individual companies have the freedom to choose how to comply with the regulation.

Hereinafter let me present the Kyoto Protocol, the EU ETS with its Burden Sharing Agreement (BSA), which differentiates abatement commitments among Member States according to their level of development.
2.1. The Kyoto Protocol

Worldwide carbon emissions in our days are roughly 30 billion tonnes. Annex I countries, which are industrialized countries that accepted an emissions target for the Kyoto compliance period, starting from 2008 until 2012, represent more than half of world total CO₂ emissions. Only half of these emissions come from those countries that have ratified the Kyoto Protocol. And the EU ETS, the world’s biggest carbon market covers only around 10% of total emissions, as figure 4. shows.

The Kyoto Protocol (KP) was born in 1997, with signing countries undertaking to reduce greenhouse gas emissions by 5.2% by 2012. Targets are shown in table below:

<table>
<thead>
<tr>
<th>Country</th>
<th>Target (1990³ - 2008/2012)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU-15, Bulgaria, Czech Republic, Estonia, Latvia, Liechtenstein,</td>
<td>-8%</td>
</tr>
<tr>
<td>Lithuania, Monaco, Romania, Slovakia, Slovenia, Switzerland</td>
<td></td>
</tr>
<tr>
<td>USA (Finally did not ratify)</td>
<td>-7%</td>
</tr>
<tr>
<td>Canada, Hungary, Japan, Poland</td>
<td>-6%</td>
</tr>
<tr>
<td>Croatia</td>
<td>-5%</td>
</tr>
<tr>
<td>New Zealand, Russian Federation, Ukraine</td>
<td>0</td>
</tr>
<tr>
<td>Norway</td>
<td>+1%</td>
</tr>
<tr>
<td>Australia</td>
<td>+8%</td>
</tr>
<tr>
<td>Iceland</td>
<td>+10%</td>
</tr>
</tbody>
</table>

Table 6. Reduction targets of the Kyoto Protocol signatories
Source: author’s own table based on the Kyoto Protocol

However, some of the biggest polluters, such as the USA, have still not adopted the Protocol. In contrast, the European Union shows a good example, having approved total annual greenhouse gas emission quotas for its Member States based on their individual undertakings under the Kyoto Protocol. Annex A to KP defines covered sectors, and GHGs under the KP regulation: carbon dioxide, methane, nitrous oxide, hydro fluorocarbons (HFCs), per fluorocarbons (PFCs) and sulfur hexafluoride (SF₆). In accordance with Article 5.3, 100-year Global Warming Potentials (GWP) are used to convert gases into a common unit, the CO₂ equivalent (CO₂e). Annex B lists countries

³ Some Central and Eastern European countries have a baseline other than 1990, e.g. Hungary’s baseline is the period of 1985-87.
with their quantified reduction targets. Annex I countries, referring to the UNFCCC, have reduction commitments, while Annex II countries are developed countries.

Article 3.3 of the UNFCCC states, “policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost.” The Kyoto Protocol allows a group of countries to fulfill their commitments jointly, in order to minimize the costs of emissions reduction. Meaning that if one country can abate at a lower cost outside its borders or in coordination with other countries than within its borders, then this country may be eligible – if certain criteria are met – to take measures in other countries, which can then be accounted for within the same country. Although the adoption of the Kyoto Protocol dates back to 1997, it was only in November 2001 that essential guiding rules for the Kyoto Mechanisms were adopted as part of the Marrakesh Accords.

### 2.2 The Flexibility Mechanisms

Article 17 of the Kyoto Protocol includes three innovative market mechanisms, the so-called Flexibility Mechanisms: the cap-and-trade (1) International Emissions Trading (IET, Article 17 KP), and the project-based (2) Joint Implementation (JI, Article 6 KP), and (3) Clean Development Mechanism (CDM, Article 12 KP). All three are based on the concept determined by the European Climate Change Programme that reduction in emissions must be effected where the greatest reductions may be expected with the least input. All flexibility mechanisms aim at lowering the implementation costs of policies. There is an extensive literature in climate change economics assessing the potential economic gains from emission trading under the Kyoto Protocol; this literature emphasizes that the aggregate economic cost of achieving the Kyoto target might be reduced if marginal abatement costs are equalized across countries. Hoffmann (2007) argues that the introduction of the flexible mechanisms as new environmental policy tools to combat climate change has been one of the most important outcomes of the Kyoto Protocol.

*(1) Allowance-based transactions*

Allowance based transactions include trading among industrialized countries with emissions allowances, so that reductions are achieved at the least possible cost.

*(a) International Emissions Trading*

The Kyoto Protocol accepts the concept of emissions trading under article 17: Annex B countries may purchase rights to emit greenhouse gases from each other by transferring Assigned Amount Units. Emission trading is cap-and-trade based, where developed countries are allocated emissions allowances based on their reduction target. At the end of the compliance period, each country has to
hold an amount of AAUs equivalent to how much GHG it has emitted during the period. Countries, which have reduced their emissions below their allocated allowances, will be able to trade the surplus allowances to others that have exceeded their cap (Carbon Trust, 2006).

Hungary, Japan and New Zealand have been the first countries to achieve eligibility by the first day of the Kyoto commitment period, on January 1, 2008. Therefore, they can participate in the international transaction of UN regulated carbon credits.

(2) Project-based transactions
In the case of project-based transactions, industrialized countries are allowed to take credit for actions done offshore. The flexibility in the geographical dimension of the actions taken by industrialized countries to reduce GHGs is justified by the scientific fact that in the case of climate change the concentration of GHGs in the upper atmosphere is what matters.

(a) Joint Implementation
The Kyoto Protocol allows Joint Implementation between Annex I countries (article 6), which is supplemental to domestic actions (article 6 (1d)), voluntary, and which contributes to emissions reduction projects in other Annex B countries. Emissions reduced by JI projects need to be additional in order to receive emissions credits called Emissions Reduction Units. In 1995, the Berlin Conference of the Parties decided on a pilot phase for Joint Implementation without crediting called Activities Implemented Jointly. This program was intended to explore the design of emission reduction and sequestration projects situated in developing countries and countries in transition; and was financed through funds from Annex I Governments or private entities.

(b) Clean Development Mechanism
The Kyoto Protocol includes a new way of linking emission reduction with economic development. The CDM promotes sustainable development and helps developed countries meet their commitments; contributes to emissions reduction projects in non Annex B countries; and leads to the creation of Certified Emission Reductions (article 12 (3)). Article 12 (3) states that countries that fund projects through the CDM get credit for certified emission reductions from these projects provided benefits accrue to the host country. Besides countries, companies are allowed to invest and execute projects (article 12 (9)). In contrast to the other flexibility mechanisms, CERs accrue for the whole period 2000-2012, not just for the commitment period (article 12 (10)). Developed countries with legally binding targets to achieve compliance can use CERs. A condition for the issue of credits is that projects generate emissions reductions that are additional to what would have happened in the absence of the project, a condition referred to as additionality. Emissions reductions need to be verified and certified by an authorised third party called the Designated Operational Entity.
Several authors (Hahn and Stavins, 1999, pp.4-5; Janssen, 2000) argue that IET constitute a form of an international cap-and-trade system, while JI can be regarded as international baseline-and-credit trading. Allowance based and project based transactions differ by the risk attached to them. Allowance based transfers include only delivery risk; while project based trades incorporate non-creation risk, project risk (meaning that the project underperforms, does not generate the expected amount of credits), country risk (political and institutional problems), and non-registration risks (meaning that the regulator may refuse to certify reductions).

Table 7. Reviews carbon emission allowances.

<table>
<thead>
<tr>
<th>Trading type</th>
<th>Unit</th>
<th>Basis</th>
<th>Value</th>
<th>Validity</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>International Emissions Trading</td>
<td>AAU - Assigned</td>
<td>Allowance</td>
<td>Right to emit 1 tonne of CO₂</td>
<td>Global</td>
<td>Assigned upon ratification of unit</td>
</tr>
<tr>
<td></td>
<td>Amount Unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Joint Implementation</td>
<td>ERU - Emissions</td>
<td>Project</td>
<td>Right to emit 1 tonne of CO₂</td>
<td>Global</td>
<td>Projects verified as eligible reductions upon certification</td>
</tr>
<tr>
<td></td>
<td>Reduction Unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clean Development Mechanism</td>
<td>CER - Certified</td>
<td>Project</td>
<td>Right to emit 1 tonne of CO₂</td>
<td>Global</td>
<td>Projects verified as eligible reductions upon certification</td>
</tr>
<tr>
<td></td>
<td>Emissions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reductions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EU Emissions Trading</td>
<td>EUA - EU Allowance</td>
<td>Allowance</td>
<td>Right to emit 1 tonne of CO₂</td>
<td>EU ETS</td>
<td>Assigned upon approval of NAP</td>
</tr>
</tbody>
</table>

Table 7. Overview of units introduced by the Kyoto Protocol

Source: author’s own table

The next chapter sheds light on implemented schemes: the EU ETS, and other emerging schemes outside the EU. Linking these may create a global carbon market.
2.3. Emissions Trading Schemes

Emissions trading systems provide carbon price signals and offer economic incentives to reduce GHG emissions to covered sectors and installations. Emission trading offers a trading platform for covered sectors; participants reducing emissions below their cap can sell the resulting excess allowances. In case of deficit at a company or at national level sources are motivated to reduce their emissions. Facilities are thus encouraged to reduce their emissions assuming it is less costly than to buy extra quotas on the market (Montgomery, 1972). All this inspires firms to reduce their emissions and to save allowances and potentially to realize extra profit.

According to Raymond Kopp (2007) all cap-and-trade systems have the followings in common:
(1) a cap on annual emissions is established,
(2) regulated entities are identified;
(3) one allowance is required for each tonne of emissions;
(4) allowances are freely transferable;
(5) allowances are initially distributed through free allocation, or sold through an auction.

The economics literature is extensive with discussions of what makes emissions trading programs effective. Successful emissions trading programs
(1) monitor emissions and enforce the requirement to surrender allowances equal to those;
(2) allocate emissions allowances in a way that is simple, transparent, and equitable
(3) ensure liquidity within and across time periods, moderate volatility and promote innovative behavior.

A number of emissions trading schemes exist, have been announced or proposed recently all over the world. Beginning in 2005 the European Union launched its cap-and-trade program for greenhouse gases. In general, the design of EU ETS builds upon the lessons of the economics literature and the experience of earlier emissions trading programs. However, the scope and complexity of the EU program is far greater than past efforts. Because of its scope and multijurisdictional political structure and because it is the first large-scale attempt to regulate greenhouse gases the EU ETS passes existing US trading programs in size and complexity and includes a variety of new features. As such, it has the opportunity to advance the role of market-based policies in environmental regulation and to form the basis for future European and international climate change policies.
**EU ETS**

Within the context of the UNFCCC, the EU committed itself to reduce its greenhouse gas emissions by 8% by 2008-2012. According to environmental economic theory, costs of achieving a given level of emissions are lowest when the marginal abatement costs between emission sources are equalized (Baumol and Oates, 1988).

The Kyoto Protocol incorporates the bubble concept into Article 4. It allows a group of Annex B countries to jointly fulfill their commitments under Article 3, provided that their total combined aggregate GHG emissions do not exceed their assigned amounts. A maximum limit, an emissions cap, the so-called “bubble” is defined for the system, which amounts to the joint maximization of the emissions in a given area on a level, which cannot be exceeded by pollutants. The bubble approach is often termed “trading without rules” because it sets few restrictions on trading between Parties. The idea behind the bubble is that companies operating in one region are encouraged to develop a cooperation strategy so that each company limit its emissions to an extent at which the reduction of emissions is the most significant where it can be achieved at the least cost. In 1998, the EU differentiated this target between their different member states in the so-called EU Burden-Sharing Agreement. The idea was that poorer Member States are given lighter burdens, compared to richer Member States. They are thus allowed to increase their relatively small emissions while other EU member states stabilize or reduce emissions. The EU’s Burden Sharing Agreement, also
called as the EU bubble, is bound to be more cost-efficient than a proportional reduction, given the large differences in reduction costs between Member States.

![Figure 6. GHG reduction (%) relative to 1990 in EU BSA](image)

Source: author’s own graph based on the Kyoto Protocol

The reduction targets of MSs are therefore different: the most severe target is that of Luxembourg, which has to reduce its emissions by 28%, while Portugal has the most loose target, it may increase emissions by 27% (see figure 6). CEE countries (EU12 on figure 5.) are not part of the BSA because when agreeing to BSA Eastern MSs were not part of the EU.

As a central element of the EU’s Burden Sharing, the EU decided to develop an internal emissions trading system. The Commission’s proposal for an EU ETS was put forward in October 2001, and political agreement on the system was reached in June 2003. This was followed by a process in the Member States of setting a national cap on emissions and allocating allowances to individual installations, through the drawing up of National Allocation Plans. The EU ETS is based on the concept on equalizing the Marginal Abatement Cost (MAC) of each participant within the scheme at a price where the market will reach equilibrium and the emission target of 8% will be fulfilled. The differentiation of MAC can be due to regional differences of installations.

The EU launched its emissions trading scheme, the EU ETS, on January 1, 2005. The first phase of trading, between 2005 and 2007, was a period for evaluating the feasibility of the system and its effects on emissions. This first phase, the so-called pilot period, was an experiment to test the functioning of the scheme rather than a tool to deliver substantial emissions reductions. The Kyoto commitment period is from 2008 to 2012. The system is the first transnational emissions trading scheme in the world, covering 27 countries. Since 2005 in the covered sectors companies with substantial emissions face the global pressure to reduce CO₂ emissions and to take part in
establishing an international market for CO₂ emission allowances. The EU ETS covers over 12,000 installations in about 4,500 companies representing around 45% of the EU’s total CO₂ emissions or about 30% of its overall greenhouse gas emissions. The framework for the EU ETS has been defined by the Directive 2003/87/EC (European Commission, 2003). The EU ETS is not an economy-wide cap-and-trade system, which regulates downstream. Only one of the six GHGs of the Kyoto Protocol is subject to the ETS. Allowances are issued by each Member State, but trading can take place between any EU participants.

The EU ETS differs from the concept of the Kyoto Protocol International Emissions Trading scheme, in the sense that the latter creates an emissions trading market between Parties that fulfill the eligibility criteria of the Protocol. On the contrary, the EU ETS creates an emissions trading market between installations. In the EU ETS, the commodity traded is the European Union Allowance, which is a right to emit one tonne of CO₂ equivalent, which is valid only for the trade under the Directive. The EU ETS is a unique system where the demand curve is centrally determined at EU level, while the supply curve is determined jointly by the decisions of the Member States. The supply of EU allowances is determined by the National Allocation Plans, while the demand depends on three issues: (1) the allocated allowances to installations, (2) the cost of carbon reduction options, and (3) the emissions levels.

**Spatial and sectoral coverage**

The EU ETS covers the 27 countries of the European Union. The 15 Member States of the BSA and the 10 new Member States joining the EU in 2004 have all introduced the EU ETS at the same time, from the beginning of January 2005; whereas Bulgaria and Romania only joined the scheme in 2007 with their accession to the EU. In order to limit the administrative costs of the ETS, the system is restricted to large installations exceeding a sector-specific threshold in the production capacity of the installation. Combustion installations exceeding 20 MW (producing heat and electricity), oil refiners, coking plants, metallurgy and steel production, cement, lime, glass and construction material production and paper industry plants may generate CO₂ emissions only subject to the permit issued by the National Authority. The Directive treats renewable energy differently, as renewable energy installations are CO₂ neutral and do not cause GHG emissions. They are by definition not part of the EU ETS - so wind farms, hydroelectric installations, landfill gas facilities, and solar panels do not obtain permits or allowances under the Scheme. The exception is biomass plants - with a thermal capacity of over 20 MW. As such, they constitute combustion installations. Biomass plants are included in the scheme but emissions from biomass are considered to be zero.
Activities & Installations covered by the EU ETS

<table>
<thead>
<tr>
<th>Activities</th>
<th>Installations covered by the EU ETS</th>
</tr>
</thead>
</table>
| Energy activities                       | • Combustion installations with a rated thermal input exceeding 20 MW (except hazardous or municipal waste installations)  
• Mineral oil refineries                  |                                                                                                    |
| Production and processing of ferrous metals | • Metal ore (including sulfide ore) roasting or sintering installations  
• Installations for the production of pig iron or steel (primary or secondary fusion) including continuous casting, with a capacity exceeding 2,5 tonnes per hour |
| Mineral industry                        | • Installations for the production of cement clinker in rotary kilns with a production capacity exceeding 500 tonnes per day or lime in rotary kilns with a production capacity exceeding 50 tonnes per day or in other furnaces with a production capacity exceeding 50 tonnes per day  
• Installations for the manufacture of glass including glass fiber with a melting capacity exceeding 20 tonnes per day  
• Installations for the manufacture of ceramic products by firing, in particular roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain, with a production capacity exceeding 75 tonnes per day, and/or with a kiln capacity exceeding 4 m³ and with a setting density per kiln exceeding 300 kg/m³ |
| Other activities                         | Industrial plants for the production of  
• pulp from timber or other fibrous materials  
• paper and board with a production capacity exceeding 20 tonnes per day |

**Table 8. Sectorial coverage of the EU ETS**  
Source: author’s own table based on the Directive 2003/87/EC

**Allocation**

Both cap setting and allocation are highly decentralized, negotiated processes, which reflect the political structure of the EU. Member States have three important tasks regarding allocation of allowances:

1. Decide the quantity of allocation; for which they must take into consideration the burden-sharing target of the country. This quantity has to be allowed by the EU Commission, that is the National Allocation Plan.
2. Draw up a list of all installations, which are subject to emissions trading. This is the National Allocation List.
3. Decide how to allocate the total quantity to individual installations. Emissions allowances can be allocated free of charge, auctioned or be a combination of the two. There are three options for free allocation:
   a. Grandfathered allowances are distributed in proportion to sources’ past emissions. Grandfathering can either be a one-off allocation to existing installations, or be regularly updated, with new emissions data.
   b. Allowances can also be distributed for free, based on the average, or expected performance for the sector as a whole; it is called benchmarking. Its’ advantages are that it favors efficient installations, does not differentiate between incumbents and new comers; and improves efficiency.
(c) Allowances can also be distributed for free, based on either past emissions or benchmarks, but corrected with the installations’ output.

The table below gives an overview on allocation methods, pros and cons.

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Preferred by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grandfathering historic emissions</td>
<td>Free allowances based on historic emissions</td>
<td>• Simple</td>
<td>• No incentive to change</td>
<td>• Some utilities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Protect stranded assets</td>
<td></td>
<td>• Some industries</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Prevent leakage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grandfathering benchmarking</td>
<td>Free allowances based on benchmarks for sectors</td>
<td>• Perceived as fair</td>
<td>• Complicated</td>
<td>• Some utilities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Limit leakage</td>
<td>• Many benchmarks</td>
<td>• Some industries</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Protect competitiveness</td>
<td></td>
<td>• Some facilitators</td>
</tr>
<tr>
<td>Grandfathering output related</td>
<td>Free allowances based on benchmarks or historic emissions, corrected for installations output</td>
<td>• Perceived as fairer</td>
<td>• Absolute cap not guaranteed</td>
<td>• Some utilities</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Many industries</td>
</tr>
<tr>
<td>Auctioning or Selling through brokers</td>
<td>Allowances are auctioned or sold through brokers</td>
<td>• Uniform,</td>
<td>• Competitiveness issues</td>
<td>• Some utilities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Unbiased,</td>
<td>• Leakage</td>
<td>• Some facilitators</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Non burocratic</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Fair</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 9. Allocation methods  
Source: Carels, 2008

Pressing deadlines and data that were not always readily available favored the simplest solution: historical emissions shares became the least controversial basis for allocation. In the first phase of the EU ETS, almost all carbon allowances have been grandfathered, not auctioned. Only three Member States chose to auction and one sold allowances through an agent.

After reviewing the EU ETS, let us look at other emerging emissions trading schemes outside Europe. This is important from this dissertation’s point of view because linking the EU ETS to other schemes gives opportunity for a global carbon market to appear.

**Emerging systems outside the European Union**

Presenting existing and emerging systems besides the EU ETS is important because of the possibility to link these systems; so one global carbon market can emerge. Following the characterization of Reinaud and Philibert (2007), this chapter introduces the main design features of further existing schemes besides the EU ETS, followed by a brief description of linking possibilities to create a global carbon market.
Apart from the EU ETS, there are other schemes in operation in countries that have ratified the Kyoto Protocol; and other schemes are under development to help countries comply with their Kyoto targets. Existing schemes besides the EU ETS, for which legislation has already been passed, are:

- Norwegian system;
- Regional Greenhouse Gas Initiative (RGGI) in the Northern States of the USA;
- New South Wales Greenhouse Gas Abatement Scheme (NSW GGAS) in Australia, which is the second largest system after the EU ETS;
- Japanese Voluntary Emissions Trading Scheme (JV ETS); and
- Albertan Climate Change and Emissions Management Act in Canada.

There are several other schemes in consideration, which can be categorized as announced or proposed systems after Reinaud and Philibert (2007). One part of these schemes have been already declared but are still under elaboration by national or regional authorities; the other part of emerging systems have been suggested by legislators but are at a less developed phase.

Announced schemes are:

- Australian federal system;
- Canadian federal system;

Figure 7. A Global Carbon Market
Source: author’s own graph
• ETS in New Zealand;
• Voluntary carbon trading in South Korea; and
• Swiss ETS.

Proposed systems are:
• Legislative proposals in the USA;
• Western States Climate Action Initiative; and
• Californian system.

**Linking**

This issue is rather new and complex but important enough to be included in the analysis of emissions trading, however only an overview is given here, this study does not cover detailed examination, which has been addressed by several scholars recently (Reinaud and Philibert, 2007; Jaffe and Stavins, 2007). Based on the definition of the IETA report (Jaffe and Stavins, 2007) *linking occurs when one system allows regulated entities to use allowances or credits from another system to meet domestic compliance obligations*. Linking creates opportunities for inter-system trading; it enlarges the carbon market by connecting isolated internal emissions trading systems, by which the aggregate costs of mitigating climate change are reduced. This relies on the same logic as allowance trading within a system, which allows lower-cost reductions to prevail, with linking trading across systems allows lower-cost reductions to replace higher-cost reductions in another system. Trading takes place until prices equalize in the linked systems.

On one hand, the main benefit of linking emissions trading programs is a reduction in the total cost of meeting the combined emissions targets due to the creation of a market with a larger number of participants with increased diversity of sources and emissions control costs. Linking increases liquidity, improves market functioning, reduces transaction costs and price volatility. Linking also reduces concerns about market power, as the broadened market is less concentrated, and more competition arises.

On the other hand, distributional impacts of liking; and reduced control over domestic trading come up as concerns against linking. The main disadvantages of linking emissions trading programs are that some participants will be adversely affected while others benefit; pre-2008 linking of trading schemes could lead to a domestic emissions trajectory that makes the achievement of the Kyoto target more difficult in one of the countries. Linked systems jointly will not achieve as much reductions as they would without linking. This can result either from emissions leakage, that is emissions occur outside the regulated systems, where there is no price on carbon, so that is cheaper.
to emit; or from the link’s impact on emissions. Linking programs in ways that secure the economic benefits while protecting environmental integrity can be complex and time consuming.

Based on Hill et al (2008) market development is currently held back due to the lack of links between markets. Liquidity is expected to improve as markets become properly linked as governments achieve greater inter-registry connectivity. Linking’s implications depend on the type of link and the design of linked systems. Jaffe and Stavins argue that some harmonization of the systems’ design will be needed in the long run. Flows of allowances across differently designed systems could lead to detrimental impacts, hence restrictions on the use of linked allowances or credits is necessary, which on the other hand could reduce expected benefits.

With linking schemes however, governments may have concerns about the environmental ambitiousness of schemes, eg. ambition of targets, cost-control measures, offsets provisions, compliance provisions, etc. States may fear that linking to a less ambitious system will undermine the functioning and effectiveness of their system. According to Pizer (2006) there are two reasons why linking programs with different levels of stringency may induce concerns. (1) Member States that have more aggressive targets would question the fairness of the scheme; (2) capital flows associated with large net sales of allowances across borders will itself be an adverse consequence.

In the European Union, in 2000, the Green Paper on Greenhouse Gas Emissions, known as the “Green Paper” was the first to address the linking of a potential EU emissions trading scheme with other policies and instruments to address climate change. The following step was the European Climate Change Programme that formed the grounds upon which the later Sixth Community Environment Action Programme was built. Article 25 of the ETS Directive foresees the linking of the ETS with other national or regional emissions trading schemes via an international agreement. The links between the EU ETS and the flexibility mechanisms established under the Kyoto Protocol were settled in a specific Linking Directive formally adopted in October 2004 (2004/101/EK, 2004b). The Linking Directive allows participants in emissions trading to count credits from emission reduction projects around the world towards their obligations under the EU ETS; the project-based mechanisms of the Kyoto protocol are available for European business starting from 2008.

“A coalition of European countries, US states, Canadian provinces, New Zealand and Norway announced on October 29, 2007 the formation of the International Carbon Action Partnership, a forum to share experience among governments and public authorities on the design of ETS.” (Reinaud and Philibert, 2007, p.35.) In October 2007 the EU commission has agreed with countries in the European Economic Area, Norway, Iceland and Liechtenstein, on linking their respective
emissions trading schemes, making it the first international link between emissions trading schemes. The Swiss registry was successfully linked to the ITL in December 2007.

* * *

Theoretical background to emissions trading and carbon market achievements of the 21st century have been introduced. We must state that the EU’s carbon market is the biggest success to date to fight global climate change. In case linking explained above will be implemented, such a global market will appear, which may have a real effect on reducing GHGs.
3. Pilot phase of the EU Emission Trading Scheme

This chapter provides an overview on previous empirical work that assesses the economic efficiency and environmental effectiveness of the EU ETS. There is an extensive literature focusing on the EU ETS in the old EU Member States, presenting their findings is important because this dissertation builds on their themes when analyzing the Hungarian emission allowance market. At the same time discussing empirical work on the new EU Member States in the context of emissions trading is indispensable to present all results that exceed the limits of this thesis.

According to the EEA report (2008) the total greenhouse gas emissions in 2005, excluding emission and removals from land-use, land use change and forestry (LULUCF) were:

- 5 177 Mt CO$_2$e in the EU27;
- 4 192 Mt CO$_2$e in the old EU Member States (EU15);
- 985 Mt CO$_2$e in the new EU Member States (EU12).

In 2005, the EU15 accounted for 81% of total EU27 greenhouse gas emissions. The largest emitters of greenhouse gas emissions in the EU27 were Germany (19%), the United Kingdom (13%), Italy (11%), France (11%) and Spain (9%). Europe’s power sector was in general short of allowances, initially they engaged in trading, while the excess was concentrated in the hands of energy-intensive industry (MacKenzie, 2007).

The ETS was adopted in a very short span of time, posing great challenges to governments and the covered sectors to prepare for it. There were a number of significant delays, among them most importantly Member States registries and National Allocation Plans, which in some cases were late by more than a year. The initial phase saw also volatility and other anomalies in the trading market (Egenhofer, 2007). The EU ETS is generally functioning well with good liquidity and tight bid/offer spreads available in various trading locations. The carbon market is growing rapidly; market participants believe it has the potential to expand considerably, with some indicating it could grow to be the biggest of all commodities markets (Hill et al, 2008).

From the launch of the EU ETS a market in EUAs developed, initially trading was on small scale but increased over time. Several delays occurred, which put an upward pressure on EUA prices. Until the first publication of compliance positions in April 2006, prices were moving upward as utilities were covering their needs. The publication of actual emissions data for 2005 resulted in a sharp price fall, when industry was selling its surpluses. After the collapse, market activity picked up because companies traded EUAs in order to meet the April 30 deadline for installations to surrender. April 2006 became and still is the most liquid month in the history of EU ETS. This price collapse had not recovered at all; there was a considerable downward pressure on prices toward the
end of the pilot phase. Since August 2006, the EUA price has been on a steady decline. This may be attributable to two factors. First, there was an over-supply on the EUA market, second, banking was not allowed, first phase allowances could not be used during the Kyoto phase. Prices moved towards zero by the end of 2007 but this moves us to the next feature, the price implications of the EU ETS.

Figure 8. Volatility of the European carbon price
Source: Convery et al, 2008

The balance between supply and demand governs the EUA price, as it is true for all commodities. The interim report of the APREC research (Convery et al, 2008) identifies three key points, as shown on figure 8. of the carbon signal. (1) The high volatility of the EUA price, (2) due to the surplus of allowances and the lack of banking drove Phase I prices to zero, and (3) phase II prices are higher due to expected scarcity.

As seen on the figure below new Member States’ emissions have decreased considerably due to their industrial restructuring after the 1990s, whereas emissions from the old Member States have been steady.
All Western MS – with four exceptions – have emitted more in 2005 than their base year emissions. EU15 2005 emissions are almost the same as in 1990 (2% decrease). On the contrary, new MS emit less – without exception – in 2005, hence overall, EU27 emissions are 11% less than in the base year. This clear difference explains why EU15 and EU12 are discussed separately in the following.

### 3.1. Emissions Trading in the old EU Member States

Previous studies have assessed the efficiency and competitiveness aspects of the EU ETS on the western, industrialized countries of the EU15 (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom).

A growing area of research is concerned with the current performance of the EU ETS in achieving its main aim of cost-efficient greenhouse gas abatement. The current design of the EU ETS has been heavily criticized by the scientific community for its lack of environmental effectiveness and economic efficiency (Oberndorfer and Rennings, 2007). Consequently, only a few countries are actually on a path to achieve their Kyoto targets (see figure 10). Only five countries – Sweden, UK, Germany, France and Netherlands – are below their BSA target, the other ten exceed their limit.
Figure 10. Distance to burden-sharing targets for EU15 Member States in 2004
Source: EEA, 2006

Böhringer et al. (2005) show that a hybrid instrument has to be introduced due to the exclusive coverage of energy-intensive sectors of the scheme. They argue that other emitting but non-trading sectors have to be regulated by complementary abatement policies. Klepper and Peterson (2004) found that the division of costs of reaching the Kyoto targets between the sectors covered by the ETS and those not participating is unequal. They argue that “if the ETS were to be introduced throughout the EU and if it would cover all sectors it would lead to considerable welfare gains compared to a situation where the Kyoto-targets need to be reached unilaterally”.

Hereinafter, a few empirical studies are presented, whose research methods were highly important for conducting this study. Although this dissertation is more focused and narrow, the following headlines are all part of the questionnaire used to reveal carbon market implications for Hungary (Appendix I). The interviews covered implications of the EU ETS on issues of allocation, competitiveness, innovation, investment decisions and costs. Albeit methods used differ, results and conclusions are similar to the findings below.
Allocation implications of the EU ETS

The main subject of numerous studies is the different rules governing the allocation of emissions allowances. Whereas earlier work tends to be of a more general manner (Vesterdal and Svendsen, 2004), more recent studies focus on incentives and distortions introduced by the different detailed allocation rules such as closure rules, updating, and allocations to new entrants (Ahman et al., 2007; Ahman and Holmgren, 2007; Betz et al., 2006; Neuhoff et al., 2006). Numerous studies have demonstrated how the recycling of auction revenue can provide a net welfare benefit, scholars agree on the efficiency benefits of auctioning compared to free allocation. The advantage of the EU ETS with grandfathering is the comparatively lower costs imposed by the system. At the same time, of course, this also means that it offers fewer incentives to innovate. Most studies argue that auctioning provides greater incentives for innovation than free allocation (Downing and White, 1986; Millman and Prince, 1989; Jung et al., 1996). All scholars agree that allowance auctioning impose costs for all emissions, thus favors the polluter-pays principle. There is little question that some firms may suffer from the introduction of allowance trading, particularly if permits are auctioned.

According to Johnstone (2002), “despite the theoretical benefits of auctioning, free allocation is the norm and is likely to remain so for the foreseeable future”. He argues that political opposition to rent transfers undermines the feasibility of auctioning. This has been truly the case for the pilot phase, as only four Member States chose auctioning, and finally three of these performed auctions, while Denmark chose to sell reserved allowances through brokers (more detail on this issue is provided in the chapter analyzing Hungary).

According to a recent study by Ellermann (2006), which explored the implication of the NER and closure provisions for agent behavior, on decisions concerning the capital stock, the only direct effects are on capacity. He argues that the effects on emissions markets are more ambiguous, in electricity markets the effect could result in either lower or higher EUA prices; while in industrial markets, these provisions will increase the demand for allowances, and allowance prices as well. The European Commission, McKinsey, and Ecofys survey (2005) finds that the majority of respondents favor a harmonized approach to new entrants and free allocation. The majority of companies and associations would like to keep allowances at closure, while government bodies would rather not allow this. Companies would prefer to be able to transfer allowances to new assets across borders at closure. However, a combination of a free new entrant reserve with the possibility of keeping allowances upon plant closure – the desired combination for companies – might be questionable from a system design perspective.
Early attitude of companies towards emission trading

A remarkable set of studies examines the early attitude of companies towards emission trading. For example, Brewer (2005) compares different surveys on the knowledge within firms about the EU ETS prior to its inception and finds low level of firm involvement. He says that firms’ were mainly gathering information prior to the operation of the system due to the uncertainty about the scheme and its design features. Paulsson and von Malmborg (2004) conduct an institutional analysis of company behavior in Sweden, and find that they are mainly in favor of emission trading, but in practice they have not made efforts referring to ”ambiguous government policies” (Paulsson and von Malmborg, 2004, p.211).

Pinkse (2007) analyzes a worldwide sample of firms (2003 data from the Carbon Disclosure Project) and their intentions to engage in emission trading or emission reduction projects. The objective of his study was to examine what drives companies to have the intention to engage in carbon trading. He found that industry pressure and product and process innovations were the main determinants for multinational companies to explore the opportunities of flexible mechanisms. He also found that energy industries were involved in the developments around emission trading more than other sectors, obviously, because their core business is affected by the new regulation. He concludes that energy companies do not restrict themselves to emission trading, whereas firms in other sectors are trying to surmount difficulties in implementing emission trading in their organization and have not participated in the emerging carbon market. His remarkable conclusion is that European companies are not ahead of Asian or North American competitors, although only European firms are facing the pressure of the Kyoto compliance. This may be explained by the fact that voluntary actions and commitments have a tradition in North America. At least for Hungary it is true that firms only take actions needed for compliance, in order to avoid penalties.

Lacombe (2008) looked at whether oil refineries perceive the EU ETS as a profit opportunity or an administrative burden. Hungarian companies’ experiences confirm his findings that cost minimizing is in the centre of attention, instead of profit maximization.

Behavior implications of the EU ETS

Literature suggests that compliance behavior in emissions trading programs is likely to be very different from behavior under C&C measures or emissions taxes (Murphya and Stranlund, 2006). The most important difference is that firms in an emissions trading program are linked to each other via the market, whereas their operation is independent under both C&C policies and emissions taxes. Their findings are inconsistent with the well-known theory of Montgomery (1972) that emissions choices of perfectly competitive firms are independent of initial allocations. Murphya and
Stranlund conclude that the initial allocation of permits determines who will be the net sellers and net buyers of permits. According to the study of the European Commission, McKinsey, and Ecofys (2005), the EU ETS has already had an effect on corporate behavior in 2005.

According to Stuetz (2008) from EGL, an energy-trading company, although most players on the European carbon market are from the industry, most of them are not willing to trade; they rather focus on their core business and only cover their needs to emit CO₂. Hungarian findings confirm his results. According to his presentation, the most active players are fossil power station operators with strict risk management and banks. He presents the market as an opportunity to power producers and to industrial players; nonetheless he calls attention to the threat of uncertainty through the whole emissions trading process.

According to the survey conducted by the European Commission DG Environment, McKinsey and Ecofys (2005) the current uncertainty about the long-term development of fundamental rules has short-term impact as well: uncertainty is seen as one of the biggest obstacles to liquidity in the CO₂ allowance market. Liquidity in this market is largely driven by emission reduction efforts that would free up allowances to then be traded on the market. Some companies fear that emission reduction efforts could be sanctioned (by possible changes) in the next allocation plan, so they refrain from reducing emissions in the current period. This affects liquidity in the CO₂ market negatively. These concerns were voiced during the Hungarian interviews, as well.

The same survey shows that around 50 per cent of the interviewed companies already in 2005 have built system costs into their prices. Seventy per cent stated that this would continue to be the case in the future. Interestingly, this attitude was not reflected at all during the interviews with the Hungarian installations. This could be attributable to the East-West differences and the significant Eastern over-allocation. This dissertation, however, concludes that it was due to the generous allocation that Hungarian companies did not take carbon costs into account during the pilot phase.

**Competitiveness implications of the EU ETS**

The sectoral competitiveness implications of the EU ETS have been assessed for the European electricity industry (Neuhoff et al, 2006), for the iron and steel industry (Demailly and Quirion, 2007) for the power sector (Sijm et al., 2006), and for the cement sector (Demailly and Quirion, 2006), with also focus on Hungary (Szabó et al, 2006). First of all, the term “competitiveness” has to be defined. According to Johnstone (OECD, 1999) competitiveness is the ability (1) to minimize costs, (2) to capture market share, (3) to increase the technical efficiency of production, and (4) to exploit new market opportunities. As the interim report of the APREC research (Convery et al, 2008) puts it, “the microeconomic or sector-specific level, competitiveness is the ability to produce
high quality, differentiated products at the lowest cost possible to sustain market shares and profitability.”

Oberndorfer and Rennings (2007) estimate the competitiveness effects of the EU ETS with a focus on existing simulation studies and deal with three levels of competitiveness: that of (1) a firm, (2) a sector, and (3) an economy. Environmental action can generate competitive advantages on all three levels.

Klepper and Peterson (2004) find that the overall competitiveness effects of the Kyoto targets can become quite small in the ETS. In their simulations they find that the total output in Europe decreases by less than half percent compared to a BaU scenario, and output in all non-energy sectors falls by less than two percent. They argue that ETS sectors gain considerably from the cheap abatement opportunities in the accession countries – confirmed by Hungarian interviews.

The results of the survey conducted by the European Commission DG Environment, McKinsey and Ecofys (2005) show that the fears of the majority of sectors concerned about strong negative competitiveness impacts of the EU ETS are not justified. According to the APREC study, “there is no evidence from Phase I that performance of the European macro economy, measured in terms of GDP or employment, has been damaged as a result of the EU ETS.” The study only focuses on short-term implications, which may arise as diminished profitability of incumbents, less competitive plants close their operations, and net imports increase.
Innovation implications of the EU ETS

Another set of research is concerned whether the EU ETS spurs innovation (Gagelmann and Frondel, 2005; Schleich and Betz, 2005). Although this question is very important for the design of future climate policy, there is insufficient empirical evidence to answer it. Gagelmann and Frondel, and Kemp (1997) provide an overview of the body of literature comparing C&C to ETS from the point of view innovation spurring effects. Compared with C&C measures emission trading does not necessarily increase a firm’s incentive to adopt new pollution abatement technology, according to the literature. On the other hand, C&C policies provide little or even no innovation incentive at all. They conclude that the substantial body of theoretical literature provides no consensus on the issue of whether or not emission trading generally triggers more innovation than other policy instruments, such as regulation standards. Downing and White (1986, pp. 21-22.) claim that emission trading increases a firm’s incentive to adopt new technologies. Jaffe et al. (2002) provide a survey on the general relationship between environmental policy and technological change. Fischer et al. (2003) conclude that a unanimous ranking of policy instruments with respect to their innovation-stimulating effects is impossible, although market-based instruments have long been regarded as superior.

Gagelmann and Frondel (2005) expect only moderate innovation effects from the EU ETS. Schleich and Betz (2005) conclude that there are only moderate incentives for developing low carbon technologies during the pilot phase. Similarly, Oberndorfer and Rennings (2007) conclude that the scheme’s impact on innovation would be rather small. Sorrell and Skea (1999, pp.12) argue that emission trading induces incentives for R&D investment and additional improvement of current technologies. The survey conducted by the European Commission, McKinsey, and Ecofys (2005) states, that about half of the companies claim that the EU ETS has a strong or medium impact on decisions to develop innovative technology. The loose design of the current scheme and experiences with trading systems in the USA counter-indicate a quick surge in innovation.

Hungarian carbon market experiences show that carbon price in the pilot phase was not high enough to spur innovation, and also the abundance of allowances did not mean constraint to innovate. Maybe the Kyoto phase will indeed spur innovation.

Implications of the EU ETS on operating and investment decisions

A number of studies tried to clarify the effect of the EU ETS on operating decisions and investment options by analyzing the varying cost increases for different technologies. Due to regulatory uncertainties and the large volatility of the allowance price, the EU ETS constitutes significant risks for technology investment decisions. In addition, the ETS review periods are too short-term for the
investments needed in the industry. On a longer term, not including a value for CO₂ in investment projections becomes increasingly hazardous. A key criterion is the extent, to which the EU ETS allows market participants to manage carbon risk over the long run.

Egenhofer (2007) argues, “a successful market allows predictability for investment and thereby provides the certainty to make efficient investment decisions, e.g. whether to invest in new equipment to reduce emissions or to buy extra allowances”. According to the study of the European Commission, McKinsey, and Ecofys (2005) for half of the companies the EU ETS is one of the key issues in long-term decisions; for the other half, it is only one among many issues.

Reinaud (2003) analyzed the effect of emissions trading on operating decisions and investment options by comparing the effects of different carbon prices on the profitability of different power plant investments. She states that contrary to the theory; in practice investment signals may be distorted by the EU ETS. Incentives for shutting plants down, companies may decide to delay the plant’s closure, which could prevent investment in new plants and have a negative signal on the market. The obligation of new entrants to purchase allowances might represent an entry barrier on the one hand. Whereas on the other hand, allocating to new entrants for free could penalize investment in capacity expansion for incumbents. After all, she concludes, that the uncertainty surrounding the trading market causes definite hesitance to invest. This conclusion was confirmed during the interviews with Hungarian operators.

Hoffmann (2007) provides an analysis of the technology investment decisions based on case studies in the German power sector. He looks at companies’ risk management and the timing of the various investments. He concludes that “the basic principle of the regulation works: CO₂ allowance prices are integrated into several aspects of corporate decision making.” He concludes however that the implementation of the EU ETS in its first phase did not constitute an optimal regulatory environment for low carbon electricity generation.

Pricewaterhouse Coopers conducted a Utilities global survey in 2007 (PWC, 2007) in order to find out whether the EU ETS has spurred investment in renewable generation. They found that two thirds of respondents from European utility companies have increased such investment and just over a third (36%) have increased investment in gas generation.
Overall, not in the short-term, but on the longer-term ETS companies take carbon into account for their operations and investment decisions. The pilot phase was too short and uncertainties were too numerous and substantial for the system to have a real effect. Nonetheless, the scheme has reached its goal as to prepare installations for the Kyoto phase.

* * *

According to the EEA report (2008) in the EU15 total greenhouse gas emissions (excluding LULUCF) decreased by 0.8 % between 2004 and 2005, by 1.5 % between 1990 and 2005 and by 2.0 % between the Kyoto base year and 2005. This means the EU15 has achieved one fourth of the total reduction needed to achieve the 8 % reduction from base-year level required by 2008-2012 under the Kyoto Protocol. After all, as the trading scheme was created a market developed spontaneously in the EU. It was possible to create a market even where there was a degree of confusion and chaos, delays and uncertainties, etc.; the market price adjusted.

After analyzing Western experiences, the study shifts to Eastern Europe. Let us review what differences occur in the new Member States in the context of the EU ETS. The next chapter sheds light on whether the political history of the region has an impact on the EU ETS, whether new market economies provide substantially different conditions for this environmental policy tool.
3.2. Emission Trading in the new EU Member States

Countries in the Central and Eastern European region are Parties included in Annex I of the Climate Convention that are not in Annex II: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia. In this paper these countries are also referred to as new Member States of the EU, Central and Eastern Europe (CEE) or as EU12. Although 12 countries have joined the EU, ten in 2004 and two in 2007, the analysis does not cover all 12. Cyprus and Malta are not addressed because they do not have a Kyoto Protocol target. Croatia is not part of the EU, therefore neither of the analysis. Bulgaria and Romania have only joined the EU and the EU ETS in 2007, their experiences are rather limited, as it will later be discussed.

Their emission reduction targets are shown in the table below:

<table>
<thead>
<tr>
<th>Country</th>
<th>Target (1990-2008/2012)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria, Czech Republic, Estonia, Latvia, Lithuania, Romania, Slovakia, Slovenia,</td>
<td>-8%</td>
</tr>
<tr>
<td>Hungary, Poland</td>
<td>-6%</td>
</tr>
<tr>
<td>Croatia</td>
<td>-5%</td>
</tr>
</tbody>
</table>

Table 10. Reduction targets of the EU12
Source: author’s own table based on the Kyoto Protocol

For most countries 1990 is their base year but because of their special situation, EU12 was granted a degree of flexibility for choosing their target. Bulgaria (1988), Hungary (average of 1985-87), Poland (1988), and Romania (1989) have chosen a base year other than 1990.

Scholars have largely neglected the question whether the EU ETS functions in Central and Eastern Europe. Previous empirical work focuses on Eastern particularities and concerns prior to introducing the system. This chapter presents Central and Eastern Europe in the context of emissions trading. Scientific papers written even before the accession of the ten countries to the EU in 2004 present concerns over the enlargement with new countries being laggards and slowing down the environmental policy. Given that EU12 countries participate in the Kyoto Protocol Mechanisms either through hosting Joint Implementation projects or through International Emissions Trading, this chapter deals with both. In relation with IET the issue of hot air is introduced, followed by a discussion of Green Investment Schemes set up with the aim of easing the anxiety over trading with surpluses. The dissertation attempts to discuss all issues that may contribute to different circumstances to the introduction of the EU ETS in these countries compared to Western Member States.

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4 Some Central and Eastern European countries have a baseline other than 1990, e.g. Hungary’s baseline is the period of 1985-87.
The CEEs differ significantly with regard to size, state of reforms, economies and environmental challenges. However, they share several similarities due to their common post-socialist history. Ürge-Vorsatz presents in several of her papers (Ürge-Vorsatz, Miladinova and Paizs, 2006; Ürge-Vorsatz, Paizs and Pesic, 2002 and 2003) the special situation of the region. They present that new Member States have finished their economic transition with the EU accession. They present the following negative and positive legacies of the centrally planned economies.

- **Negative legacies:**
  - Efficiency was not rewarded
  - Production processes were inefficient
  - Consumption was decoupled from production
  - The market lacked a mechanism for signaling resource scarcity
  - Resource pricing was improper
  - The economy was not penalizing inefficiency
  - The scale of economies was oversized
  - The heavy industry’s share was large
  - Lack of information and detailed data about real energy consumption
  - Lack of awareness of energy wasting practices and how to improve efficiency
  - Corruption was widespread

- **Positive legacies**
  - High share of organized modes of transport,
  - High share of district heating among heating modes
  - Utilization of the “waste” heat source of industrial units or from other cogeneration sources

Ürge-Vorsatz looks at Eastern MSs not from the economic point of view but rather with a focus on energy, energy policy, and energy efficiency. She describes in several of her papers (Ürge-Vorsatz et al., 2002, 2003, 2004 and 2006) that beyond diversification, most new MSs identify the increase of energy efficiency and renewable energy sources as a national energy policy priority. She points to a very interesting problem that these countries adopted policies designed based on Western experiences and that the economic transition process relied largely on the transfer of Western experiences. She warns that this “copy and paste” policy may not work for every MS with different circumstances, etc. Ürge-Vorsatz (2004) reveals in her presentation at the Öko-Institute in Berlin that although energy efficiency may be lower in new MSs due to their lower level of environmental awareness, there is great potential to improve this as their awareness reaches old MSs’ levels. She describes the CEE countries as a region where legacies of the centrally planned economy are still present, energy intensity is high, and there are “low-hanging fruit” projects, which have
environmental benefits at a relatively low or even no cost. However she points out that the “copy and paste” policy transfer has shortcomings, such as incomplete, compromised or inefficient implementation; as well as the little local capacity and negotiating experience.

The policy aim and range is generally narrower in new EU MSs than in old MSs, as emissions from most Eastern countries have dropped sharply since 1990 (particularly in the industry sector) due to profound structural change in their economies during this period (OECD, 2003). The aggregated emissions of the new EU Member States were 23% below 1990 levels in 2004 (see figure 12.).

These countries have shifted to a market-economy from the centrally planned economic system in the past decades. EU12 have high baseline emissions due to former centralized economies heavily relying on fossil fuel intensive energy production. Following the change of regime, the transition has started (that is the rational for their being called economies in transition), some new EU MSs underwent drastic reduction of energy use and so emissions have actually decreased since the baseline periods. Therefore, emissions were already below commitments listed in Annex B to the Kyoto Protocol, and the surplus of AAUs has been referred to as hot air (Sager, 2003). This will be discussed in more detail in the followings.

It is interesting to look at what concerns accession countries had prior to becoming member of the EU. It is particularly interesting how negative their attitude was towards emissions trading while for now it is incontestable that new Member States benefitted from the regulation. Almost all EU12, except for Slovenia, have surplus allowances, and selling this surplus constitutes a large revenue-generating potential.
Concerns over the enlargement

Van Der Gaast stated in 2002, even before the accession of the EU12 to the EU that “Candidate countries will most likely transfer GHG emission reduction credits to other industrialised countries listed in Annex B of the Protocol. This can take place through JI project co-operation and/or International Emissions Trading.” Fankhauser and Lavric (2003) expect EU12 to become the main suppliers of emission reductions under JI and IET. CEE countries faced EU accession processes involving substantial changes in their national legislation to comply with EU environmental and energy standards. CEEs had to harmonize their national laws with the EU legislation in order to become eligible to join the EU. Accession introduced more stringent emission and clean air limits, technical standards, nuclear safety regulations, and liberalization of energy markets with the opening up of power grids and electricity trading (Black et al, 2000). The requirements of the EU legislation (*Acquis Communautaire*) were fully introduced into practice until 2004 – in this regard there is no difference between old and new MSs.

Skjærseth and Wettestad (2007) present the widely held assumption that as the EU expands to include the CEE countries its capacity to adopt and implement environmental policy will be negatively affected. The CEE countries have been expected to be laggards, slowing down, weakening or even reversing progress in environmental policy-making. Two years after the enlargement, the new Member States have begun to make their mark on EU decision-making and implementation. In their article *Is EU enlargement bad for environmental policy? Confronting gloomy expectations with evidence* they conclude that enlargement does not result in any breakdown of EU environmental policy, however impacts will vary for particular issue-areas. They find that the accession weakened the implementation of the EU emission trading directive and have affected EU air policy hardly at all. The importance of good institutions is emphasized both in the context of transition from central planning to a market economy, and in the creation of environmental markets.

The EBRD (1999) considers the central lesson of transition that markets not function well without supporting institutions. A strong institutional framework is needed for ensuring the efficiency and integrity of the emerging carbon market.

Barker et al (2001) argue that the required reduction from the baseline emissions will be less for the enlarged EU than for the current EU15. The authors argue that while base-year emissions for an enlarged EU are considerably higher than for the EU15, projected 2008–2012 emissions do not show a similar increase. In the 12 new Member States, total greenhouse gas emissions (excluding LULUCF) decreased by 0.3% between 2004 and 2005 and by 27.8% between 1990 and 2005. Except in Slovenia, 2005 emissions of all the new Member States that have a Kyoto target were
well below their Kyoto target (EEA, 2008). All new Member States were on track to meet their Kyoto target in 2004, figure 13. shows the distance to their target in percent points below their linear target path.

Prior to 1990, the CEEs had a type of environmental policy in the form of national quality standards and pollution permits (Skjærseth and Wettestad, 2007). After that, however, all new environmental policy principles were imported from Western neighbors. These countries are now undergoing major economic and political transformation, and are considered to be benefiting from emissions trading.

Klepper and Peterson (2004) found that new Member States would be the only countries selling allowances, even without hot air taken into account. The authors argue that EU12 reduce the costs of reaching the European Kyoto targets considerably with their low cost abatement opportunities.

According to Skjærseth and Wettestad (2007), the implementation of the EU ETS should provide the EU12 with good opportunities. Gassan-zade (2003) states that EU12 benefit from participation in the Kyoto Protocol mechanisms, either through Joint Implementation or through International Emissions Trading. All EU12 have a surplus allowances, the amount of which is estimated between 696 to 1,356 Mt CO2e. “Low energy efficiency levels, high carbon intensity of the energy supply and lack of renewable energy technologies make the countries with economies in transition attractive for cost-effective GHG reduction projects under JI.” (Gassan-zade, 2003)

Reinaud (2003) argued that the inclusion of accession countries to the EU ETS would reduce the cost of emissions trading by giving access to more cost-effective possibilities. As EU12 have

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Figure 13. Distance to Kyoto Protocol target for new Member States in 2004
Source: EEA, Copenhagen, 2007

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surplus allowances, their presence in the EU ETS could put a downward pressure on allowance prices.

After reviewing Eastern particularities, the next chapter discusses allocation implications of the EU ETS on EU12 and differences with regard to their carbon market.

Allocation

In Phase I, new Member States had a later deadline to submit their National Allocation Plans to the EU Commission than the EU15: May 1, 2004 compared to March 31 for the old Member States. Only five of the EU15 managed to meet the 31 March deadline, as already described earlier the NAP process was generally complicated by delays. By May 1, several of the larger countries, including the Czech Republic, Hungary and Poland, experienced considerable problems – these countries struggled with data quality and the definition of the installations to be covered by the system. There were conflicts between the ministries of the environment and finance. Poland experienced severe conflicts between government and industry. Hungary and the Czech Republic finally submitted its NAP in mid-October. After the Czech government agreed to a 9.5% cut in its NAP, this plan was accepted by the Commission in mid-April 2005. The first Polish NAP was finally approved by the Commission at the end of June 2006. These delays have also meant delays in getting the registries in these countries into operation. Still in early 2006 Registries were not in place.

Table 11. shows Phase I. allocations and emissions for ten new MSs. With the exception of Slovenia all have been over-allocated, receiving more allowances than needed. It was partly due to the fact that their emissions were lower even compared to the baseline periods due to their infrastructural change in their economy.

<table>
<thead>
<tr>
<th>Country</th>
<th>Allocations (mt CO2)</th>
<th>Verified Emissions (mt CO2)</th>
<th>Over-allocation (mt CO2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poland</td>
<td>227.45</td>
<td>199.76</td>
<td>27.69</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>96.92</td>
<td>83.48</td>
<td>13.44</td>
</tr>
<tr>
<td>Estonia</td>
<td>18.19</td>
<td>12.04</td>
<td>6.15</td>
</tr>
<tr>
<td>Slovakia</td>
<td>30.35</td>
<td>25.53</td>
<td>4.82</td>
</tr>
<tr>
<td>Hungary</td>
<td>30.06</td>
<td>25.58</td>
<td>4.48</td>
</tr>
<tr>
<td>Lithuania</td>
<td>10.57</td>
<td>6.46</td>
<td>4.11</td>
</tr>
<tr>
<td>Latvia</td>
<td>4.06</td>
<td>2.93</td>
<td>1.13</td>
</tr>
<tr>
<td>Slovenia</td>
<td>8.69</td>
<td>8.8</td>
<td>-0.11</td>
</tr>
<tr>
<td>Total</td>
<td>463.18</td>
<td>397.58</td>
<td>65.6</td>
</tr>
</tbody>
</table>

Table 11. Over-allocation in new MSs
Source: author’s own table based on CITL data

Phase II NAPs are tighter, although only after the Commission has imposed reductions. However, several Member States have fought NAP decision in court. Only economies in transition have filed
lawsuits against the Commission for the decisions on their allocation plans. The Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Bulgaria all felt unfairly treated, and have asked the European Court of Justice to overthrow the Commission’s rulings. Slovakia retracted its lawsuit after having been allowed to increase its allocation. The court is not expected to be able to rule on these lawsuits until 2009.

The Hungarian proposal, which attempts to prioritize Eastern interests in the allocation procedure, is worth mentioning. This proposal aimed at prioritizing new MSs when implementing the so-called „20/20/20” (COM(2008)30) directive, in a way that their reduced emissions compared to their levels before joining the EU should be taken into account. Seven new MS backed Hungary to use 1990 level emission level as base instead of 2005.

**Joint Implementation**

After reviewing Eastern MSs allocation procedures, hereinafter this section presents the Kyoto Flexibility Mechanism particular to the CEE region, JI. The pressures of joining the EU, preparing for EU ETS, developing the National Allocation Plans handling communication with the European Commission, and working on preparing the registries and inventories for their eligibility status proved to be a strain to many of the new member states. The Eastern European governments that have been traditionally lacking capacity to prepare the implementation of the Kyoto mechanisms were overwhelmed by running the parallel processes for EU ETS and JI, with many of them considering JI a lesser priority. (Korppoo - Gassan-zade, 2008, p.21.), nonetheless several projects have been registered during the pilot phase.

Although JI is a market-based mechanism, it requires government intervention and involvement at several levels: governments have to approve individual projects, transfer ERUs to the investor, register these transactions in an international registry system, develop and implement project selection criteria and approval procedures. A JI transaction is an agreement between an investor and a host in which the host provides GHG abatement services in return for financial or technological investment. The host earns emissions reduction credits through GHG abatement activities and transfers all or some of these credits to the investor. In return, the investor provides financial or technological services to the host such as funding, low-emitting energy technologies, or improved information technology (Atkeson, 1997). Investors are likely to pursue JI projects in host countries where the marginal cost of abatement is low and will act to minimize the global cost of mitigating climate change.

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The marginal abatement costs of reducing emissions in Eastern EU represent significant potential for Joint Implementation projects. Nonetheless that their present emission levels are below their Kyoto targets, any strong economic growth could undermine the ability to meet their Kyoto targets domestically.

The first Conference of the Parties to the UNFCCC in Berlin established a pilot phase of so-called Activities Implemented Jointly (AIJ). This pilot phase started in 1995 and was to end in 1999 but then was prolonged after 2000. AIJ as a precursor to the Flexibility Mechanisms has attempted to test the greenhouse gas credit-trading program; it showed that additionality could involve even higher transaction costs and uncertainty than other credit trading programs. For this region it may be most cost effective to participate in second track JI. Bulgaria, Hungary and Romania have limited experience in the AIJ pilot phase (Missfeldt and Villavicencio, 2002).

Novikova and Ürge-Vorsatz (2005) explore the effect flexible mechanisms under the Kyoto Protocol may have on energy efficiency, fuel switch and the development of renewable energy sources in Central and Eastern Europe. EU12 are chief candidates for hosting Joint Implementation projects and for participating in International Emission Trading schemes, which may assist the implementation and financing of energy efficiency, renewable energy, and fuel switching projects. They conclude that the flexibility mechanisms may play a positive but rather limited role in the sustainable energy development of the region, and that due to the barriers to JI the emphasis may shift towards emission trading.

According to Missfeldt and Villavicencio (2002), the Kyoto Mechanisms could provide additional benefits to Eastern MSs:

1. additional revenue generation,
2. project finance opportunities,
3. knowledge and technology transfer, and
4. synergies with existing policies.

Trusca (2007) summarizes the Status of Joint Implementation and Green Investment Scheme in his presentation at the annual meeting of the Host Country Committee in Cologne. The four most important types of projects are water- and wind energy, landfill gas and biomass energy utilization.

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6 Two types of JI projects may be differentiated depending on the fulfillment of criteria: Track 1 and Track 2 JI Projects. To host Track 1 (fast-track) JI project a country has to meet all criteria: (1) to be the Party to the Kyoto Protocol; (2) to have calculated Assigned Amount; (3) to have established a National Registry; (4) to have submitted the annually required inventory; (5) to have established a system for the estimation of emissions and sinks; and (6) to have submitted additional information on the Assigned Amount. In case the host country does not meet all criteria, only (1)-(3), it is eligible for Track 2 JI projects. Second track JI more closely resembles the CDM process, projects must be examined and the emissions reduced or sequestered verified by an independent entity before any transaction can occur. (www.pointcarbon.com)
The most active countries to host JI projects are Russia, Bulgaria, the Czech Republic and Romania (Trusca, 2007).

Hungary is eligible to be a host country for JI projects. The Hungarian Ministry of Environment and Water applies its own rules and guidelines when deciding over JI projects and estimating emission reductions of these projects. The Ministry of Environment and Water has developed a policy to evaluate and approve JI projects, established and operates on online interface for the application and approval of these projects. It has also developed a handbook, which states additionality criteria and publicizes projects endorsed and approved. JI projects have not been approved before 2008; therefore these are out of the focus of the present dissertation.

After reviewing JI as an Eastern European particularity to emissions reductions, let us look at how these countries manage their over-allocation, as with one exception, all EU12 received more allowances than needed to cover their emissions.

**Hot air**

The EU and green nongovernmental organizations have feared that many emissions allowances sold would not come from supplementary emissions reductions but simply constitute hot air trades. Several scholars (Oberthür and Ott, 1999; Zhang, 2000; Gassan-zade, 2003; Jepma, 2004; Woerdman, 2005) have analyzed the question of hot air, and its undermining effect on the environmental effectiveness of the EU ETS. Hot air is the result of the higher allocation of the assigned amount than business-as-usual emissions to states of the former communist bloc that underwent political change. Annex B Parties are allowed to purchase AAUs under the International Emissions Trading (UNFCCC, 1997 Art.17.), which gives a legal basis for trading with hot air. Unused AAUs can be banked or transferred without any mitigation efforts. In other words, overall emissions may be higher than without such trading.

Woerdman (2005) tried to find out whether hot air trading is an environmental problem or not. He differentiated the ethical and the formal interpretation of environmental effectiveness and finds that hot air trading constitutes a problem only from the ethical point of view. Meanwhile he distinguished an ex-ante and ex-post perspective as well. He argued that hot air trading was undesirable only ex-post, nevertheless it is unavoidable during the negotiations for setting up such a system. EU12 have negotiated less stringent targets compensating for their declining industry due to the disintegration of the centrally planned economic system during the transition to market system and economic restructuring. Black et al (2000) argued that their impact would disappear at the end

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of this decade as a result of economic re-growth and industrial consolidation achieved by some countries.

Missfeldt and Villavicencio attempted to quantify hot air trading first in 2000, then in 2002. In 2000 they compared target emissions to projected levels for 2010. They defined hot air as the difference between CO₂ emissions as required by the target in the period 2008-12 and CO₂ emissions projected for 2010. In 2002, they compared hot air to baseline emissions. Table 12 and figure 14. give an overview of their results. Negative numbers indicate that emissions overshoot the target and that, unless more stringent domestic measures are taken, the corresponding countries have to acquire emissions. To calculate the value of hot air trading in 2000 they assumed the price to be USD35 per tonne of CO₂, and then in 2002 they calculated with USD5 per tonne of CO₂. The value is presented for the average current market price (€20 in April, 2008). The table clearly shows that Russia and Ukraine, and Romania have the highest potential.

<table>
<thead>
<tr>
<th>Countries</th>
<th>Hot air * (thousand tonnes)</th>
<th>Hot air ** (thousand tonnes)</th>
<th>Spare CO₂ emissions in % of projected 2010 CO₂ emissions *</th>
<th>% of base year **</th>
<th>Hot air evaluated at current market price (€20) *</th>
<th>**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td>22,651</td>
<td>-8,581.6</td>
<td>34</td>
<td>6.07</td>
<td>453,020</td>
<td>-171,632</td>
</tr>
<tr>
<td>Croatia</td>
<td>-10,200</td>
<td>5,844.09</td>
<td>-31</td>
<td>18.29</td>
<td>-204,000</td>
<td>116,882</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>-13,749</td>
<td>-17,216.20</td>
<td>-8</td>
<td>8.96</td>
<td>-274,980</td>
<td>-344,324</td>
</tr>
<tr>
<td>Estonia</td>
<td>9,877</td>
<td>14,578.98</td>
<td>40</td>
<td>35.80</td>
<td>197,540</td>
<td>291,580</td>
</tr>
<tr>
<td>Hungary</td>
<td>11,152</td>
<td>10,221.40</td>
<td>17</td>
<td>9.82</td>
<td>223,040</td>
<td>204,428</td>
</tr>
<tr>
<td>Latvia</td>
<td>N/A</td>
<td>12,676.48</td>
<td>N/A</td>
<td>35.54</td>
<td>N/A</td>
<td>253,530</td>
</tr>
<tr>
<td>Lithuania</td>
<td>1,372</td>
<td>-3,253.84</td>
<td>4</td>
<td>6.31</td>
<td>27,440</td>
<td>-65,076.8</td>
</tr>
<tr>
<td>Poland⁸</td>
<td>83,452</td>
<td>18,250.40</td>
<td>23</td>
<td>3.19</td>
<td>1,669,040</td>
<td>365,008</td>
</tr>
<tr>
<td>Romania</td>
<td>18,273</td>
<td>58,437.68</td>
<td>11</td>
<td>20.48</td>
<td>365,460</td>
<td>1,168,754</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>72,300</td>
<td>128,532.00</td>
<td>3</td>
<td>4.23</td>
<td>1,446,000</td>
<td>2,570,640</td>
</tr>
<tr>
<td>Slovakia</td>
<td>363</td>
<td>180.40</td>
<td>1</td>
<td>0.25</td>
<td>7,260</td>
<td>3,608</td>
</tr>
<tr>
<td>Slovenia</td>
<td>-3,680</td>
<td>-1,758.29</td>
<td>-22</td>
<td>9.15</td>
<td>-73,600</td>
<td>-35,165.8</td>
</tr>
<tr>
<td>Ukraine</td>
<td>105,776</td>
<td>138,338.00</td>
<td>18</td>
<td>15.27</td>
<td>2,115,520</td>
<td>2,766,760</td>
</tr>
</tbody>
</table>

Table 12. Comparing result of two studies by Missfeldt and Villavicencio (2000 and 2002)


⁸ For Poland two different estimates have been made. Poland-1 uses the projections presented in the first Polish national communication, and Poland-2 presents the projections from the second national communication. As the example of Poland shows, these calculations remain highly uncertain. (p.386)
Selling hot air may be controversial regarding the following (Deutsche Bank, 2006):

1. AAUs are bankable, the surplus may not necessarily be sold, it may be banked for later use.
2. JI might be a more attractive way to turn hot air into money; JI projects also involve foreign direct investment and technology transfer. Nevertheless these projects do not favor host countries but installations as state-owned AAUs decrease one-to-one this way.
3. Moral pressure from old EU MSs for hot air not to be sold, albeit there is no formal limit, but most probably governments will only use AAUs last, they will rather turn to CERs, ERUs and RMUs.

Hot air may only be defined in the Kyoto regime, between 2008 and 2012 (Mozsgai, 2004), hence Hungarian specificities will only be discussed marginally. In order to alleviate some of the EU concerns about hot air, a system to trade AAUs needs to be set up. Evans (2003) presents the possibility of a system where income goes to a Carbon Fund, which then allocates money for carbon mitigation projects. The government controls the fund and demonstrates a clear commitment to further reductions. The Hungarian government set up its system during 2007, the Green Investment Scheme (GIS) and has begun negotiations with Japan and the Netherlands. The first agreements were signed in December 2007 and two sales were implemented during 2008. Hereinafter let us review the Green Investment Scheme and Hungarian specificities.

**Green Investment Schemes**

The purpose of Green Investment Schemes (GIS) is to promote the environmental efficacy of transfers of excess AAUs, by earmarking revenues from these transfers for environmentally related
purposes in the seller countries (Korppoo, 2003). GIS aims at improving the marketability of AAUs from some seller countries. The GIS is outside of the EU ETS and inside of the Kyoto agreement through AAUs. As GIS is a particularity of Eastern Member States, it needs to be addressed by this analysis; moreover because Hungary was the first to set up such a system. However AAU sales were only done after the three years of focus of this dissertation, so details are not discussed.

Greening hot air ensures that the proceeds of the sale of AAUs (Streck et al, 2004, pp. 6-7.):
(1) do not result in higher emissions during the commitment period, or in the future;
(2) are reinvested in such a way that they reduce emissions compared to the baseline;
(3) are reinvested in activities which match emission reductions one to one with the volume of AAU sold; and
(4) are reinvested in activities which reduce emissions by more than the volume of AAUs sold.

The programmes and/or projects of GIS should benefit for the environment and can be voluntary, as bilaterally agreed by buyer and seller governments. As shown on figure 15. real emissions are substantially less than Kyoto targets. The difference may be banked, reserved for JI projects or set aside for AAU trades (Vayrynen, 2007).

Ürge-Vorsatz et al. (2006 and 2007) present GIS as a unique window of opportunity to finance energy efficiency. They point out that GIS is a unique opportunity as currently no international law or treaty regulates them, the buyer and seller countries signing a bilateral agreement only regulate it.
There have been three proposals on the GIS initiative (Kokorin, 2003). First, in early 1998, immediately after the adoption of the Kyoto Protocol, international environmental groups, including World Wide Fund for Nature (WWF), Greenpeace, Friends of the Earth and others, noted that unused free or cheap Russian AAUs could undermine domestic emissions reduction measures in developed countries. Second, in 1998–1999, in response to global concerns, Russian non-governmental organizations developed a common position on this problem, in response to global concerns. Finally, in the spring of 2001, the GIS idea reappeared with the withdrawal of the US from the Kyoto Protocol, and the effective power of veto that this gave Russia over the Protocol’s entry into force the situation had changed dramatically. Without the US, Russia had no chance of selling huge amounts of AAUs therefore; the EU, Japan and Canada have been looking for new incentives, acceptable to the environmental community and the public that will ensure Russian participation in the KP.

A well-functioning GIS could ensure that revenue generated through the sale of AAUs is spent on projects that will provide long-term benefits at the local, national and international level. It can also be used as a mechanism to promote and diffuse climate change friendly technologies. The potential financial flows associated with this mechanism are significant. A well-functioning GIS also means an additional financing source for the implementation of real projects, facilitate private financing and provides additional environmental benefits. GIS could finance activities ranging from capacity building to large emission reduction projects. Figure 16. shows the major activities for each year.

Several issues need to be considered when establishing a GIS, hereinafter, let us review the possibilities.

(1) Two approaches exist in designing a GIS:

Figure 16. Activities financed by a GIS
Source: Point Carbon
(a) **program approach**, where a number of smaller projects are collected together – this approach gives priority to small and simple projects such as energy efficiency, fuel switching, renewable energy and improvement of gas and heat networks.

(b) **project approach**, where each project is treated individually - this approach favors large projects, which require longer planning horizons and thus may be more complex to implement.

(2) A GIS can be organized in two main ways:

(a) scheme with no link between the buyer of AAUs and the actual use of the income; and

(b) scheme where the buyer is involved in carrying out a project in the host country.

(3) When classifying GIS design there is a clear difference between hard and soft GIS.

(a) In the case of a **hard GIS** AAU transfers are backed by investments in concrete emission reductions in the seller country. Hard greening projects include investments in equipment and activities leading directly to quantifiable GHG emissions reductions, such as energy efficiency, renewable energy, specific waste management projects (methane capturing) and forestry, agriculture, transports, etc.

(b) In the case of a **soft GIS** AAU revenues are directed to activities that do not lead to easily quantifiable reductions, such as capacity building, climate related educational support, research and development of less competitive technologies, awareness raising, education.

(4) Two types of benefits of GIS may be considered:

(a) quantifiable for which emission reductions can be estimated, are revenues from emissions trading to be spent only on GHG emissions reduction projects. These require strict verification and additionality requirements; and

(b) non-quantifiable - results are channeled revenues for capacity-building, social, educational and general environmental purposes. It allows investors to determine the degree of greenness of a proposed measure, with the aim of obtaining quantifiable results in future.

The GIS may be implemented in several ways (Streck et al, 2004): as a governmental organization, as a not-for-profit organization, or as a special-purpose corporation, a profit making entity, which is wholly owned by the State. GIS can be implemented without requiring new law. It may be concluded that it will most likely to be a buyers’ market, where sellers may have to be price takers but sellers can limit the supply or not sell at all unless acceptable conditions met. The advantages of GIS are numerous. They solve environmental concerns; avoid dumping the price of carbon by restricting the sale of AAUs; channel resources towards targeted economic sectors; increase the
transparency of AAU transfers; reduce the possible risk of inflation due to high governmental incomes from the uncontrolled sale of hot air; potentially extend the benefits of revenues from 2008–12 AAU sales into projects that will operate beyond 2012, and help reduce environmental impacts (such as local pollutants) not covered by the Kyoto Protocol.

* * *

Hungary was among the first countries to have successfully linked its emissions registry to the UN-backed system, the International Transaction Log\(^9\), which allows the country to sell government-level emissions permits. At this time only Japan, Russia, Switzerland and New-Zeeland have been able to connect their Registries with the ITL.

Ürge-Vorsatz et al. (2007) reveal possible structures for GIS in Hungary, in their study prepared for the Ministry of Environment and Water. In accordance with their proposal, the government of Hungary (GOH) will use revenues from AAU sales for financing programs to increase energy efficiency of the built-in environment, in order to reduce its emissions by 30% by 2020 compared to the 1990 level.\(^{10}\) In Hungary the system includes both project- and program-based reductions. In the Hungarian GIS the buyer country does not take part in the implementation of the emission reduction but may monitor it. GIS is managed by a governmental organization; it is aimed at hard greening; the graph below shows its operation.


\(^{10}\) Thomson Reuters: Spain buys 6 million AAUs from Hungary, Portugal buys $15m in CERs from fund, November13, 2008. (http://communities.thomsonreuters.com/Carbon/130336)
Hungary has indicated that it wants to sell between 70-90 million AAUs over the course of the first commitment period of the Kyoto Protocol. Availability of Assigned Amount Units for the use of flexible mechanisms is determined by the total quantity of AAUs available for the country, the size of the commitment period reserve, likely emission trends till the end of Kyoto commitment period and the amount of AAUs necessary to be set aside for the generation of ERUs for Joint Implementation projects (Feiler-Rabai, 2007). For Hungary the approved assigned amount is 542,366,600, and the commitment period reserve is 394,987,486 AAUs. According to emission trends for the commitment period by the Fourth National Communication of Hungary 432-443 million AAUs are needed to be set aside to cover domestic emissions. For the already approved JI projects a reserve of 10 million AAU is likely to be sufficient. Considering these factors Hungary owns around 90 million AAUs, which can be used for sale in international emission trading or for banking for the post-Kyoto period.
Hungary’s strategy is to sell 10 million AAUs in an initial phase, to test its GIS. If successful, the country plans to sell another 30-40 million AAUs over the Kyoto commitment period. No sales were organized during the pilot phase, but it is worth mentioning that on December 18, 2007 Hungary signed its first Memorandum of Understanding with Japan to sell AAUs. There were two sales during 2008: Belgium bought 2 million AAUs from Hungary on September 29\(^{11}\) then another 6 million AAUs were sold to Spain on November 12.\(^{12}\) Besides the two Hungarian sales only one was done: Slovakia sold 10 million AAUs to a Swiss private company.\(^{13}\) In the framework of the Kyoto Protocol (during the time of writing of this dissertation) hence there were three AAU transactions (Slovakia already sold 200,000 allowances to Japan in 2002). The prices for Hungarian sales are not public, but estimated around €13 by analysts; while Slovakia sold for €6/tonne, albeit a significantly higher amount.

**GIS vs. JI**

Concluding this chapter, let us compare these two mechanisms, characteristics only to the EU12. The project approach has similarities to Joint Implementation, however GIS is more flexible because it is not subject to the rules and procedures of the UNFCCC and the Marrakech Accords. There are two factors that hold back the extensive use of JI and that explain the need for the GIS.

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\(^{12}\) Point Carbon: Spain buys credits from Hungary in biggest AAU deal yet, November 12, 2008. (http://www.pointcarbon.com/news/1.1003707)

\(^{13}\) Point Carbon: Slovakia sells Kyoto carbon credits at €6.05, November 25, 2008. (http://www.pointcarbon.com/news/1.1010430)
The first is the overall purpose of GIS, to facilitate environmental improvements using the revenues from emissions trading although allowing an increase in other countries’ emissions. The second issue concerns the difficulty of proving the additionality of projects, moreover if all risks were accounted for several projects would be rendered unprofitable. Therefore the first feature of GIS is its broader scope than JI. A second key issue is the origin of AAUs used and whether revenues should be restricted to GHG emissions reduction projects. GIS involves less complicated procedures compared to JI. For instance, the rules for baselines and monitoring are simpler. Table 13 gives an overview of the differences between GIS and JI projects.

<table>
<thead>
<tr>
<th>JI</th>
<th>GIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kyoto Protocol Rules</td>
<td>No Kyoto Protocol rules</td>
</tr>
<tr>
<td>Direct “GHG reduction/ ERU” link</td>
<td>No direct “GHG reduction/ AAU traded” link</td>
</tr>
<tr>
<td>Project by project</td>
<td>Programmatic/sector wide</td>
</tr>
<tr>
<td>ERUs issued after physical GHG reduction</td>
<td>AAUs can be traded ahead of physical GHG reduction</td>
</tr>
<tr>
<td>Government and private sector market</td>
<td>Market mainly governments</td>
</tr>
<tr>
<td>ERU full fungibility</td>
<td>AAU limited fungibility</td>
</tr>
<tr>
<td>Direct transaction between seller and buyer</td>
<td>Financial intermediary or fund structure used</td>
</tr>
<tr>
<td>No conditionality on revenue use</td>
<td>Scope and terms of revenue use negotiated bilaterally</td>
</tr>
<tr>
<td>Payment on ERU delivery</td>
<td>Flexible financing schemes</td>
</tr>
<tr>
<td>Revenue stream to 2012</td>
<td>Revenues possible post-2012</td>
</tr>
<tr>
<td>Large number of projects already implemeted</td>
<td>Less experience</td>
</tr>
</tbody>
</table>

Table 13. JI Projects vs. GIS
Source: Vayrynen, 2007

* * *

New MSs of the EU differ from old MSs in the following:

(1) possession of significant surpluses over the pilot phase (except for Slovenia),
(2) no measures needed for meeting Kyoto targets,
(3) eligibility for hosting JI projects,
(4) possibility of revenue generation for the government by selling surpluses.

Albeit neither JI projects, nor AAU sales were relevant in the pilot phase, these years were indispensable for new MSs to establish their systems for JI and GIS. Hungary was the first among MSs not only to develop a GIS and sell AAUs but also to link its Registry to ITL.

After reviewing Eastern specificities, which may cause the EU ETS to be different in the new EU Member States, let us know focus on EU ETS in Hungary.
“Think Globally, Act Locally”

David Brower, Founder, Friends of the Earth

III. EMISSIONS TRADING IN HUNGARY

1. An Overview of Hungary-Specific Features
   1.1. Hungarian Greenhouse Gas Emissions
   1.2. A Review of the Hungarian Literature

2. Introducing the EU ETS in Hungary
   2.1. The Institutional Background of the EU ETS in Hungary
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3. The Operation of the EU ETS in Hungary
   3.1. An Overview of the Hungarian EU ETS Market
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   3.3. The Market Activity of Hungarian EU ETS Participants

4. A Summary of Emissions Trading in Hungary
1. An Overview of Hungary-Specific Features

Like other new Member States of the European Union, Hungary is a “country that is undergoing the process of transition to a market economy,” according to the UNFCCC, and shares most characteristics of its neighboring states with respect to climate policy (Bart, 2007). Hungary signed the UNFCCC on June 13, 1992; Parliament then passed the appropriate resolution and Law LXXXII of 1995 eventually announced the ratification to the public. The Government of Hungary made the decision to sign the Kyoto Protocol on March 27, 2002; this was announced by Parliamentary Decree no. 49/2002, VII 19.

Szláviv et al. (2000) maintain that Hungary is always in line with European policies, and that it would not introduce environmental legislation, which diverges substantially from that in place in neighboring countries. It is especially interesting and worthwhile to look at Hungary in the context of emissions trading. As an economy in transition, Hungary has barely twenty years of experience with a market-based economy: it was thus rather challenging for the country to introduce – and introduce successfully – this kind of market-based environmental policy tool (including emission trading). Not only was, for instance, the government’s staff working with climate issues initially just a team of two people (prior to the introduction of the scheme), but the infrastructure and the institutions to back such a system were lacking as well. Nonetheless, following the pilot phase of the EU ETS, a Climate Change and Energy Unit is now operating within the framework of the Ministry of Environment and Water in Hungary, with a staff of five people. The issue of climate change, and the term cap-and-trade itself, is becoming known to an ever-wider audience. Environmental awareness in Hungary has grown considerably in recent years.

1.1. Hungarian Greenhouse Gas Emissions

In terms of climate protection, Hungary finds itself – just like other countries of the region – in a paradoxical situation. Its current emission of greenhouse gases is much lower than it was prior to the 1990s, the period that serves as the point of reference for international climate protection activities. In the case of Hungary specifically, the country is obligated to reduce its emissions levels by 6% compared to the years 1985-1987. Hungary’s emissions level during those years, however, was so high (98,536 thousand tonnnes of CO₂e) that the amount it may currently emit is actually significantly higher than the country’s emissions today. In 1997, the year of the Kyoto Conference, Hungary’s emissions totaled 72,649 thousand tonnnes, which means the country’s obligations actually allow for an increase of 27.5%.
At the same time, this relatively favorable position is due not to an environmentally conscious attitude prevalent in the country, but to the abandonment of heavy industry (responsible for the majority of emissions under the socialist system), as well as to the restructuring of the Hungarian economy (National Climate Change Strategy, 2008). Although Hungary is one of the most carbon-dependent nations in the European Union, its per capita CO₂ emissions level is very low (see figure 19 below); only Latvia and Lithuania have lower emissions levels in the EU. This low per capita emissions level is due to three factors (Kerekes, 2007):

1. the state-owned Paks nuclear power station provides 40% of the nation’s electricity demand;
2. the share of natural gas in primary energy supply is very high: 40%;
3. the number of automobiles per capita in Hungary is growing, but is still very low.

In Hungary, greenhouse gases are emitted primarily by power plants using fossil fuels; steel and iron works as well as cement producers are also significant emitters. The overwhelming majority (97%) of anthropocentric CO₂ emissions is accounted for by the burning of fossil fuels (Faragó-Kerényi, 2003).

In 2006, Hungary’s energy-intensity – the energy required to produce one unit of GDP – dropped by 3.4% (see figure 20). Thirty-seven percent of Hungary’s energy needs were met by domestic producers, while 63% was obtained through imports. A look at Hungary’s energy-portfolio for 2006 reveals that the share of carbon increased to 11.6% from 11% during the previous year; oil increased from 25.8% to 26.8%. Nuclear energy accounted for just under 13%, and the share of renewable resources increased to 4.7% in 2006, up from 4.3% during the previous year. Natural gas, by far the most significant source, came in at 42%; one-fourth of this amount originated in
Hungary, while three-fourths of the natural gas quantity was imported. (Hungarian Meteorological Service, 2008)

The EU ETS system registers the emissions originating in over two thousand facilities in Central-Eastern Europe; this accounts for approximately one half of all emissions in the EU and for about 10% of total emissions. In Hungary, the EU ETS system accounts for less than one-third of all Hungarian emissions (IDEACarbon, 2008).

The maximum allowable total emissions in the EU ETS (440 million tonnes annually) were 15% higher than the amount actually emitted and verified during the three years of the pilot phase. The total emissions of the Central-Eastern European region in 2006 were 2% higher than in the preceding year; in Hungary, Estonia and Lithuania, a drop of 1-2% was recorded. Hungary’s greenhouse gas emissions dropped, because the mean daily temperature during heating months in 2006 was 0.74°C higher than in the previous year, reducing heating energy demand by 4% and households’ gas consumption by 7% (Hungarian Meteorological Service, 2008). The industrial sector showed an emissions decline of 6%. At the same time, the fossil energy demand of energy production increased slightly. The fossil energy demand required by the chemical industry for heating also dropped, but its use of non-energy-related crude oil products increased. At the same time, emissions resulting from transportation increased by 4%, and reached a level over 60% higher than that of twenty years earlier.

As the figure below shows, over three-fourths of all emissions originated in the energy sector. Agricultural activities accounted for 11% of GHG emissions, industrial processes for an additional 8%, while the waste sector was responsible for 5%. Land use, land-use change and forestry
processes on the whole act a sink, meaning that these processes remove some 6 million tonnes of carbon dioxide from the atmosphere.

Figure 21. Hungarian GHG emissions, breakdown by sector
Source: National Inventory Report (Hungarian Meteorological Service, 2008)

The most important greenhouse gas is carbon dioxide, which accounts for 77% of all emissions. The source of most carbon-dioxide emissions is the energy sector, and its burning of fossil fuels. As the figure below shows, Hungary’s CO₂ emissions dropped by 30% since the mid-1980s. Methane, accounting for 10% of total GHG emissions and released primarily as a result of animal husbandry and waste management activities, decreased by 24% compared to the base year. Dinitrogen-oxide, accounting for 12%, is released into the atmosphere above all from agricultural fields and as a result of chemical industry activities; its share dropped by half compared to the base year. F-gases altogether account for 1%, but this is a growing segment, especially due to refrigeration and air-conditioning devices (Hungarian Meteorological Service, 2008). (See figure 22.)
A regional comparison by Deloitte (2007) reveals efficient industrial energy consumption practices in Hungary. The study shows that to produce one unit of GDP, Hungary emits a relatively low amount of carbon dioxide – in other words, Hungary’s carbon intensity is fair. *Carbon-intensity* shows the quantity of CO₂e emissions required to produce one unit of the country’s gross domestic product. According to 2005 data, Hungarian industrial installations covered by the EU ETS emitted 233 tonnes of carbon-dioxide to produce one million USD worth of GDP (National Climate Change Strategy, 2008). McKinsey (2008) defined another indicator; the inverse of carbon intensity, calling it *carbon productivity* and showing how much GDP is produced through the emission of one tonne of CO₂e.

In their country report, Szlávik et al. (1999) point out that Hungary’s GHG emissions are significant neither from an absolute nor a relative perspective; thus, it is not the quantity of emissions that is the primary driving force for participation in emissions-reduction schemes. Hungary is, then, motivated more by a desire to participate in the community effort. This country report presents the opportunities for reducing GHG emissions in Hungary, along with their costs and methods of realization. The authors point out that the primary means of reducing emissions is increasing energy efficiency, both among the general population as well as in industrial sectors. Following a brief overview of Hungary, the authors assess the state of the country’s energy sector in 1999, its national energy policies, institutional framework as well as the effects of emissions on the environment. They then proceed to define baseline and mitigation scenarios for Hungary’s GHG emissions in the period 1990-2030. The results of their findings show that GHG emissions, which do not originate
directly from CO₂ emissions are essentially negligible; at the same time, the authors found that direct and indirect CO₂ emissions are basically equal. They point out that when establishing a reduction strategy, it is not only primary energy consumption, which has to be taken into account, but secondary consumption as well. According to the authors, realizing Hungary’s mitigation policies would result in an approximately 10% drop in emissions. The authors then proceed to discuss opportunities for achieving reductions in Hungary, and examine which of the mitigation policies presented may be implemented effectively and efficiently. Through case studies, they present a detailed overview of energy and carbon taxes; the authors’ conclusion is that these do not represent optimal solutions for achieving reductions in GHG emissions in Hungary. Their other case study presents the educational implications of reductions strategies – how these can be applied on a program-like basis. Their recommendation is to disseminate the relevant information and behavior, with the aid of experts, to as wide a segment of the population as possible.

During the past three years, the region’s GDP has increased at a significantly faster rate than its emission of carbon dioxide; achieving one unit of GDP growth has thus required less energy than previously (see Figure 23).

![Figure 23. Hungary’s GDP increase and GHG emissions level, 1990-2006](image)

Source: National Inventory Report (Hungarian Meteorological Service, 2008)
National Climate Change Strategy

Since its accession to the European Union in 2004, Hungary has consolidated its environmental protection regulations, has been an active participant in international negotiations and has adopted EU laws. Climate change, however, is an area where Hungary has only recently begun to integrate its relevant policies (OECD, 2008). In February 2008, the Hungarian Parliament adopted the country’s National Climate Change Strategy, covering the period between 2008 and 2025 and helping the country fulfill its Kyoto obligations. The elements of the National Climate Change Strategy will be realized through National Climate Change Programs, laid down on a biannual basis. The realization of the Strategy will be financed through the sale of carbon allowances and from the GOH’s environmental protection and energy program funds. The National Climate Change Strategy is also in harmony with the National Sustainable Development Strategy adopted by the GOH (Government Decree no. 1054/2007, VII 9). The National Climate Change Strategy spells out actions, in accordance with EU and international requirements, and defines the following major goals for Hungary’s climate policies in the medium term:

(1) Reducing the emission of gases responsible for climate change by reducing overall energy usage; this is to be achieved by shifting the structure of production and consumption toward a lower demand for material and energy use.

(2) Protecting against the unfavorable ecological and social-economic effects of unavoidable climate change, improving adaptability to the effects of climate change, and raising social awareness and consciousness of climate change.

(3) The National Climate Change Strategy is a framework, which covers all industries and all of society; its strategic goals and tasks are to be integrated in the activities of every sector.
1.2. A Review of the Hungarian Literature

The previous literature focusing on the EU ETS in Hungary is rather limited: only four authors have published about this topic. Hungarian studies about GHG emissions were published prior to the introduction of the EU ETS already; reviewing these publications is, however, beyond the scope of this dissertation. Tamás Pálvölgyi discussed the stabilization of greenhouse gases first in 1994 and then in 1998, in his UN country report; he also covered the capture of emissions in relation to obligations contained in the UNFCC (Pálvölgyi, 1994 and 1998). Another work, also edited by Tamás Pálvölgyi, discussed, already in 1997, how national emissions trading could support the realization of the UNFCC in the future (Pálvölgyi, 1997).

In their dissertation, Lesi and Pál (2004) give an ex-ante overview of the expected impacts of GHG regulation on Hungarian electricity producers. They focus on Hungary-specific features, and make recommendations for Hungary to be able to profit the most from the implementation of the EU ETS.

Mezősi (2007) analyzes absolute and relative surpluses and shortages in the Hungarian trading sectors in the first year of operation of the EU ETS. After presenting emissions data of the electricity sector, he finds that almost all power plants had surpluses in both 2005 and 2006; he argues that receiving more allowances than needed represents aid from the state, and that the electricity sector received the most subventions.

Bart (2007) has written a chapter on Hungary in the book Allocation in the European Emissions Trading Scheme, edited by Ellerman, Buchner and Carraro. He describes the allocation process in detail, both the macro decisions concerning the aggregate total and the micro decisions concerning installation-level allocation. He underlines that a small Member State, like Hungary, cannot afford to spend too many resources on climate change issues, and that it faces a greater pressure to introduce rules tailored to large installations with greater bargaining power (as is the case of the large power sector in Hungary) and which are responsible for two-thirds of all trading sector emissions.

In 2003, Hungary and other new Member States – at that point still candidate countries – expressed concerns over the effects of the EU ETS on them. Hungary, Latvia and Malta requested further clarification on the Directive’s implementation. “The scheme was designed without keeping in mind the needs of new Member States,” (ENDS Europe DAILY, 2003) officials voiced their concerns. It is true that while the scheme was vital for the EU to be able to fulfill its Kyoto commitments, the situation was different for accession countries. Another article from 2003 (Figyelő) states that accession countries will be the losers of European climate regulation: Western
countries will buy up their hot air allowances below their value, and Eastern Member States will thus waste their allowances, setting back their economic growth and development. The author agrees with Lesi and Pál (2004), who argue that this attitude is mistaken, and for Hungary not to participate in the first phase of the EU ETS – especially for firms in sectors covered by the scheme – would have been disadvantageous. Lesi and Pál (2004) argue that the majority of Hungarian installations have a high abatement potential and that by receiving grandfathered allowances, they will even benefit from the system. The authors conclude that for Hungary, a revenue-neutral allocation would be preferable, meaning that installations should obtain free allowances in such a quantity that any windfall profit would just compensate their extra expenditures put toward emissions reductions or allowance purchases.
2. Introducing the EU ETS in Hungary

This section will present an overview of the institutional background of Hungary’s carbon market and the relevant regulatory authorities. A lack of coordination during the allocation process between the Ministries of Environment, Economy and Finance will be highlighted. Hungarian experiences in the field of monitoring, reporting and verification will also be reviewed. The temporal flexibility of the EU ETS will also be covered; and the dissertation will confirm that Hungarian parties utilized both banking as well as borrowing opportunities. In the discussion of the EU ETS allocation process, special attention will be paid to National Allocation Plans and stipulations pertaining to New Entrants and installations to be shut down (closures). The analysis would be incomplete without an examination of the auctioning process: it confirms that Hungarian regulators recognized the fact that if Hungarian companies do not look upon emissions allowances as goods with inherent opportunity costs, then the government must force them to do so. Finally, the accounting implications of the EU ETS will be reviewed, an issue, which oftentimes presented problems for companies.

Hungary has proven itself in establishing the conditions for the EU ETS: the three years of the pilot phase have proven sufficient for creating the necessary institutional framework. The auctioning of allowances has confirmed that the GOH was prepared and was professionally competent. It is important to emphasize that the three full years of the pilot phase were enough to establish the necessary infrastructure, to launch the system and for the transaction registry to go live. As the problems encountered by Romania and Bulgaria – who joined the system in 2007 – showed, one year is not sufficient for a country to prepare for the system (it is a fair question whether one year would have been enough for a Western Member State; there is of course no empirical data to confirm or refute this). The Bulgarian registry was still not operational in the first half of 2008; and no National Allocation Plan had yet been developed for the period through the end of 2007. Romania is in a somewhat better position, but the system there is also still inadequate.
2.1. The Institutional Background of the EU ETS in Hungary

It is especially important to analyze the institutional background of emissions trading, as the international literature has raised concerns about this vis-à-vis Eastern European Member States (Skjærseth and Wettestad, 2007, p. 264). It is important that the institutional environment establish clear and transparent conditions for the strategy developed for coping with climate change. Hungary established its institutional capacity for processing the purchase of emissions allowances following the introduction of the emissions trading system: relevant authorities were established, as were the transaction registry and monitoring systems. The operation of the EU ETS requires a clear institutional and regulatory infrastructure. Political and technical expertise is also essential for the introduction of the system and for its successful operation.

The EU ETS is regulated concurrently on two levels: centrally by the European Commission, and at the Member State level, where several authorities are responsible for the implementation and development of the scheme. In the Commission, a Central Administrator maintains the transaction log, automatically checking and recording the transactions of allowances. The pilot phase required the establishment of the following national institutions:

- **Competent Authority**: responsible for implementing the scheme on a national level. It annually issues permits and distributes a proportion of the total amount of allowances. It is responsible for monitoring the procedure, reporting to the European Commission every year and presenting the transaction log. It supervises monitoring procedures, inspects installations’ reporting and the surrendering or cancellation of allowances, and levies fines for substandard performance. In Hungary, two authorities are responsible for these tasks: the Climate Change and Energy Unit of the Ministry of Environment and Water determines the amounts to be allocated; and the National Inspectorate for Environment, Nature and Water issues the emissions permits and maintains the Hungarian emissions registry.

- **Verifier**: an independent committee, which verifies whether the scheme is implemented correctly. This committee inspects the reports of the companies, to determine whether they are in accordance with the requirements set by the Commission. The verification body requires that (1) the reported data be free of inconsistencies, (2) the collection of data follows scientific standards and that (3) the relevant records of the installation are complete and consistent. It is rather interesting to examine verification more closely, as a regulatory task has never been outsourced before in environmental policy.

- **Registry**: ensures “accurate accounting of the issue, holding, transfer and cancellation of allowances” (EU Directive, Article 19). The registries are, essentially, standardized electronic
databases containing common data elements. In Hungary, it is maintained by the National Inspectorate for Environment, Nature and Water. The registry uses the British DEFRA software, and can be accessed at www.hunetr.hu. The national registry maintains the GHG inventory, and tracks GHG-accounts of installations participating in the ETS. There are two different types of accounts: operator holding accounts and person holding accounts. Installations engaging in carbon-dioxide emitting activities in possession of a permit have operator holding accounts; other companies or individuals – such as traders – have person holding accounts. Figure 24 shows the operation of the transaction log and its relationship to various entities of the EU ETS.

Figure 24. The operation of the transaction log
Source: Ministry of Environment and Water, 2004

Besides national institutions, the Commission established the Community Independent Transaction Log, which checks all transactions of allowances for irregularities in the issue, transfer and cancellation of allowances. It is necessary to distinguish between the CITL and the UN carbon-dioxide transaction registry, the International Transaction Log, which links national registries and tracks transactions. The ITL makes it possible to link the EU ETS with the Kyoto market (see Linking – p. 39). The pilot phase was not successful in linking the UN registry with Member States’ logs; by the time this dissertation was compiled, in October 2008, this had finally been accomplished, however.

Introducing the EU ETS was a major challenge not only for the companies, but also for regulatory bodies; the institutional learning process (Alberola et al, 2008) necessarily involved made the pilot phase all the more complex. This was a process that Western EU Member States had
undergone as well; it was not unique to the accession countries. Although the Western market economies have a longer history to look back on and possess more experience than new EU Member States, the EU ETS was new for them as well. They too had to work to establish the institutional framework and launch the transaction registry necessary for trading to commence. No significant differences are apparent in this respect between Western and Eastern Member States.

In Hungary, tasks related to the EU ETS fall under the purview of three ministries. At the Ministry of Environment and Water, Hungary’s National Allocation Plan was defined by the Climate Change and Energy Unit. The Ministry of Economy and Transport was responsible for determining the emissions caps of individual industries during the allocation process. The Ministry of Finance was responsible for auctioning the reserved allowances. In retrospect, it may be observed that it is not necessarily prudent to distribute regulatory responsibilities in such a way. It is more efficient and effective, for several reasons, to collect all tasks related to the introduction of the EU ETS, and related to determining and organizing allocations, under one organizational structure. Each of these three ministries had different priorities, and these contradictions were present for the entire duration of the pilot phase. The Ministry of Environment and Water focused primarily on reducing emissions, while the Ministry of Economy and Transport paid the most attention to the relevant sectors’ competitiveness. In the allocation process, the role of lobbying was quite significant, and the Ministry of Economy and Transport held several rounds of bilateral discussions with stakeholders. In a small country, where there may only be one or two players in each ETS sector, it is inevitable that, in some ways, the regulations in place end up being tailored according to their specific needs (Bart, 2007). (In Hungary, this could be observed in the steel and iron sector and in oil refining.)

During interviews conducted with specialists responsible for EU ETS-related measures at the installations, the general opinion encountered everywhere by the author was that although the authorities may be helpful and will always answer questions (even if this takes a long time), their expertise and know-how is insufficient to carry out their duties faultlessly. Several individuals wished to underscore that turnover in ministries and at the National Inspectorate for Environment, Nature and Water is rather high, which is unfavorable as far as their relationship to the installations is concerned. One case in particular is an especially good indicator of the lack of expertise at regulatory authorities; the public servant responsible for the issue did not understand the difference between CHP (combined heat and power) and CCGT (combined cycle gas turbine technologies), paving the way for contradictory regulations to come into force. On more than one occasion, minor and negligible mistakes in calculations were caught during the checking of documents, while several other inexcusable mistakes were never discovered. The interviews also revealed several
instances where inconsistent decision-making by regulators put installations in especially favorable (or especially unfavorable) situations that later even the regulators themselves were surprised by. Hungarian producers did not have much confidence in regulators as a result of an abundance of delays, the regular postponement of decisions and the lack of expertise.

The analysis here would be incomplete if only installations had been asked, and the dissertation only presented the viewpoints of the companies. Thus, the authorities were approached as well: Mr. József Feiler, Head of Unit at the Ministry of Environment and Water, presented the system from the perspective of the authorities. According to Mr. Feiler, the situation in Hungary during the pilot phase was reminiscent of the expression “the blind leading the deaf.” In his opinion, no one understood the system and its requirements entirely, making the laying of regulatory foundations all the more difficult and cumbersome. He explained how difficult it was to coordinate the different interests of the three ministries or to determine the division of labor between the ministries and the National Inspectorate for Environment, Nature and Water. It turned out, for instance, that when the system was introduced, no one quite understood the basic principles, and experts debated what an “installation” is for months. They tried to shape regulations and define concepts in such a way as to avoid all misunderstandings to the maximum extent possible, and to leave as few loopholes in the system as possible. In his opinion, the biggest obstacle was that no prior pollution-market experience was available to rely on, and that Hungary had to learn and implement the system concurrently with Western Member States. Hungary could rely neither on its own past experiences nor on those of other countries. Mr. Feiler emphasized that introducing, for instance, a supervisory provision fee is a special Hungarian measure. It was not required by the EU, but Hungarian authorities hoped that the fee would cover the costs of operating the system. The fee would be determined accordingly (see Appendix IV).

The head of the Climate Change and Energy Unit explained that the causes of most of the delay were the “wrestling matches” fought inside the bureaucracy. Auctioning and the date laws would go into effect also suffered delays when the two ministries could not agree on something: the Ministry of Environment and Water insisted on putting budget revenues toward climate protection activities, while the Ministry of Economy and Transport was of a different opinion. Thus, for the ministries and for the lawmakers, the pilot phase was a learning process, and the short deadlines did not favor the establishment of the necessary infrastructure. The law which was to introduce the EU ETS in Hungary (Law XV of 2005), for instance, had to be drafted in one month, which explains the high number of mistakes regulators later discovered and which also explains why the regulation had to be amended so many times later on. At the same time, it is interesting to note that this was the only
law in Hungary that was preceded by an impact study conducted jointly by the Ministries of Economy and Transport; Environment and Water; and Justice, in 2004.

Mr. Feiler underscored that his Unit did all it could to ensure that the introduction of the system would pose as little of a burden for the Hungarian sectors involved as possible. They held sessions and conferences at the time of the first allocation for all obligated parties. He mentioned, as one of the biggest problems, that the legal framework had to be developed at the same time as the allocations were being prepared. One of the most hotly contested pieces of legislation (Law XV of 2005, Section 13 and Government Decree no. 213/2006) had to do with pooling allowances by corporations; according to Mr. Feiler, lawmakers spent a great deal of time working on this measure. Ultimately, no corporation established a pool, which means more effort was expended working on the regulation than its actual utility in the end.

* * *

In sum, then, establishing the institutional framework for the EU ETS during the pilot phase and drafting the necessary regulations encountered several difficulties; it was a long learning process aggravated further by the lack of human resources. The GOH nonetheless rose to the challenge, and in many ways proved to be a forerunner compared to other countries – such as in signing on the ITL\(^{14}\) and in conducting auctions.

**Monitoring and Reporting**

Participating installations in the EU ETS are required to monitor their emissions during the compliance period and to hand in a verified report annually to the Competent Authority by March 31 of the following year. The terms “permit” and “allowance” need to be differentiated between. On the one hand, all installations covered by the scheme need to have permits to emit CO\(_2\); these permits spell out monitoring and reporting requirements, and include an obligation to surrender a number of allowances equal to the total verified emissions. On the other hand, an allowance is the right to emit one tonne of CO\(_2\)\(_e\); and it is an electronic unit clearly identifiable by a serial number. These allowances are transferable, thereby creating the possibility of allowance trading. The characteristics of permits and allowances are summarized in Table 12 below.

<table>
<thead>
<tr>
<th>Permits</th>
<th>Allowances</th>
</tr>
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<tbody>
<tr>
<td>Site-specific</td>
<td>Issued by Member States</td>
</tr>
<tr>
<td>Set monitoring and reporting obligations</td>
<td>Entitlement to emit a tonne of CO(_2)(_e)</td>
</tr>
<tr>
<td>Set obligations to hold allowances matching</td>
<td>Held in the national registry system</td>
</tr>
</tbody>
</table>

\(^{14}\) Hungary was among the first countries to receive UN approval to trade in flexible mechanisms, and to link its Registry to the ITL on July 11, 2008.
Table 14: Permits and Allowances of the EU ETS

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<tbody>
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<td></td>
<td>Tradable</td>
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</table>

Source: Based on Gabriella Pál’s lecture at Corvinus University, 2007

The European Commission has published monitoring and reporting guidelines, which provide for some flexibility for participating Member States and installations. The EU’s reporting and verification system for emissions is decentralized to a greater extent than systems in previous programs; for instance, each Member State has its own transaction log as opposed to the central transaction registry of the United States for its SO₂ trading scheme. The transaction registries of Member States communicate with each other through standardized protocols, and the European Commission collates this information in its independent transaction log, the CITL. The EU ETS leaves the monitoring of emissions in the hands of Member States, which may be performed by national authorities or third parties.

In Hungary, the monitoring of emissions data is done either through measurements or through calculations. During the pilot phase, the lack of dependable reference values posed a significant problem. No emissions data was available for years prior to 2005 that reductions in emissions could be compared to – “business as usual” data were thus missing. The majority of installations did not record and did not calculate their GHG emissions prior to the introduction of the EU ETS. This was the most significant problem of the pilot phase, and it was a problem encountered not just by Hungary but by every country in the region. The introduction of the system was very rapid, and – in retrospect – we may conclude that databases that were considered the basis for determining allocations ultimately did not prove appropriate and dependable. The majority of installations overestimated their future emissions in the hope of obtaining greater allocations (Ellerman and Buchner (2006) hypothesized as much in their work).

Accordingly, one of the most important achievements of the pilot phase is that for the Kyoto period, installations will already have measured and verified data, and compliance thus also becomes more measurable. Companies have prepared and have obtained the necessary measurement devices or assets, or have entered into partnerships with certified laboratories where they can regularly send samples for inspection. The interviews conducted by the author revealed that for many companies, the biggest expenditure related to the introduction of the scheme was obtaining appropriately calibrated measurement devices.

One verifier noted the difficulty the system posed for all parties and that it required a great amount of learning. Measuring emissions, on the whole, did not require much extra investment: not every installation is required to conduct measurements or to record data with the same exactness, meaning that not every installation was required to purchase expensive assets or devices. Some installations
send their samples to a certified laboratory every three months, saving the expense of having to purchase large measurement devices.

It is important to note: once it became apparent that the allocations for the compliance period beginning in 2008 would be determined based on the verified emissions data of 2005, there were several instances when installations adjusted their heating value retroactively, increasing their emissions for the first phase. This did not place the installation at a disadvantage during the pilot phase, since surrendering nearly worthless emissions allowances did not mean an additional burden for the company, but they could look forward to a higher allocation in the more “rainy days” ahead.

**Verification**

During verification, an independent verifier assesses and qualifies the dependability, authenticity and precision of information pertaining to the monitoring system, the data reported and emissions. During the audit, it is examined whether data reported by the operators is reliable, exact, consistent and authentic. The verification is performed by an independent, accredited auditor. The operator must prove that there are no inconsistencies in the data provided, that the data collection was in accordance with applicable standards and that their records are complete and consistent.

*Preliminary auditing* is when the monitoring system used and the organization’s emissions permits are compared. Auditing itself involves the mathematical analysis of the records and the inspection of data used for the reports. The auditors inspect, on the spot, the information prescribed in the permits and the data reported. By signing the audit report, they certify that the information contained in the annual report is valid. As one auditor shared in response to the author’s question, he has encountered situations where the data listed in the application for the emissions permit was different from the data in the permit issued; he had also encountered a case where the actual data was different from both other figures (Bodroghelyi, 2008).

The auditors conduct a strategic, process and risk analysis, and verify reporting requirements. It is also the auditor’s job to approve the emissions data recorded in the transaction log. The auditor checks whether the monitoring process utilized by the operator is in harmony with the monitoring methodology prescribed for the installation by the relevant authority, as well as appropriate monitoring and reporting principles and guidelines. According to the assessment, the auditor determines whether there is any information missing from the emissions reports, or if any misleading or erroneous information had been entered. The verification also covers the examination of calculations listed in the transaction log, and a verification of the data used in the reports. The auditors examine the different stipulations of the permit and the content of the report. If everything
is found to be in order, they may sign the auditor’s statement, which certifies the content of the annual report.

EU guidelines do not determine universal and mandatory standards for verification. In Hungary, any legal or natural person registered by the Inspectorate General in the Auditor’s Registry is eligible for work as an auditor. Auditing experts must be appropriately versed in energy policy, analytics and in industrial procedures. They must demonstrate their skills in risk management, quality assurance and auditing, and must prove their professional experience.

A parallel may be drawn between auditing and verification activities related to emissions trading. In both cases, the state’s oversight tasks are shifted to the market. It is a unique move in environmental regulation to entrust market entities with the verification tasks of the state. By relying on external auditors, the state’s expenses decrease, but the industry’s expenses increase.

The interviews conducted showed that every operator approached was satisfied with the auditor they had been using; they were on good terms. In their opinion, verification proceeded more smoothly and efficiently this way, than had a state agency had to issue certifications. Auditors were responsible not only for inspecting operators, but also worked with them through an iterative process to carry out necessary tasks. The verification market is interesting, since the demand for the service – like the number of installations – is limited. This pre-determined demand leads to a strong competition in terms of prices, since one verifier may only grow if another one shrinks in position. Seniors at the two major international auditor companies – SGS and Deloitte – emphasized that in this competitive situation, it is likely that auditors with the least expertise and least aiming to provide quality services will be the ones which will stay afloat, as long as they are able to offer the lowest prices. Both explained that the current price level is less than profitable for them, and they expect a further shrinking and restructuring of the verification market.

**Temporal Flexibility – Banking and Borrowing**

The EU ETS provides for flexibility both spatially and temporarily. This temporal flexibility makes it possible to use allowances allocated in a given year during other years or over different emissions periods. This possibility helps smooth out cost variations, as demand is spread out over three years of the period: demand is lower when market prices are higher, and it is higher when the price is lower. This phenomenon could be observed during the three years of the pilot phase (Trotignon and Ellerman, 2008, p. 27). By banking emissions allowances not utilized during one commitment period, installations can carry these allowances over to the next period. By borrowing emissions allowances, installations may use allowances allocated in one commitment period during earlier commitment periods.
Banking decisions arise in two different contexts: (1) internal banking within commitment periods and (2) external banking between commitment periods. The EU ETS has no restrictions on internal banking; however, external banking and borrowing was not allowed between the pilot phase and the Kyoto period.

Banked allowances, essentially, represent a potential supply that is not present in the market: companies do not sell their surplus allowances, but keep them for following years, saving themselves the transaction costs involved in buying and selling. Borrowing is generally practiced more by companies facing a shortage of allowances; banking is done by companies possessing a surplus. In general, Hungarian companies had a surplus of allowances, although it is difficult to ascertain whether a particular installation that did not bring its surplus allowances to the market was in fact banking them, or was instead letting them expire worthless at the end of the commitment period.

Trotignon and Ellerman (2008) observed that operators tended to use their own allowances first – grandfathered to them –, and only later would they begin to surrender the allowances they had paid money for (p. 5). The authors show that during the pilot phase, borrowing was practiced widely in states facing a shortage; many companies covered their emissions during 2005 and 2006 from their own allowances, and then surrendered foreign allowances during 2007.

Based on the interviews conducted and on available data, it is clear that banking and borrowing were both practiced in Hungary. Companies had two years to engage in both: allocations from 2005 and 2006 could be carried forward to later years, and borrowing from earlier allocations was possible in 2006 and 2007. In fact, companies had only two months for borrowing, as installations received their allocation for the particular year in February every year, and had to cover emissions from the previous year until the end of April. Essentially, companies could only borrow from the allocations of the following year. It may thus be concluded that companies, which engaged in borrowing, and did not use allowances available on the market to cover their shortages during the first two years, ended up in a favorable position, especially in the first compliance year.

* * *

Generally speaking, there was no difference between Eastern and Western Member States of the European Union in terms of establishing the institutional framework of the EU ETS and in terms of the special features of the system discussed above. Prior to the expansion of the EU, many voiced their concerns (Skjærseth and Wettestad, 2007, p. 264) about how new Member States would influence or modify the decision-making and executive processes of the Union. It may be observed that having appropriate institutions is extremely important for making the transition from a planned
economy to a market economy, as is the role of these institutions in establishing environmental markets. The last three years have witnessed the establishment of the necessary institutional framework in Hungary, assuring the efficiency and integrity of the carbon-dioxide emissions market in the country.

2.2. The EU ETS Allocation Process in Hungary

During the introduction of the system, property rights worth over 234 billion HUF\(^\text{15}\) were distributed among Hungarian installations for the period 2005-2007, at no cost to the companies. István Bart offers a detailed description (2007) of the Hungarian allocation process. This analysis will not be repeated here, but it is important to discuss the most important issues when examining the Hungarian ETS. The EU ETS is a decentralized system: decision-makers did not establish an EU-wide cap for regulating emissions; it was left up to the individual Member States to determine this cap, and Member States were also allowed autonomy in determining the allocation between individual sectors and installations as well. Every EU Member State had to compile its National Allocation Plan, and then had to present it to the European Commission, which acted as the “enforcer of scarcity” (Convery et al, 2008, p. 10) for verification and approval. Before granting approval, the Commission in most cases reduced the quantities in the National Allocation Plans. Together with Slovenia, Hungary was an exception: during the pilot phase, only Slovenia’s and Hungary’s allocation plans were approved by the Commission without modification. Ultimately, however, Hungary did not allocate its allowances according to the original NAP, but this was not due to a strict approach on the part of the Commission, but was a result of the lobbying strength of Hungarian industry and to the ambiguous regulations in place.

Four countries – Hungary, the Czech Republic, Lithuania and Romania – used top-down macroeconomic analysis to forecast total expected emissions of the ETS trading sectors. Poland, Slovakia, Estonia and Latvia, on the other hand, used microeconomic forecasting (a bottom-up approach) and based their total national emissions caps on installations’ production forecasts. Compared to allocations in previous emissions allowance systems, it is a new feature to use forecasting to determine emissions caps and to allocate emissions allowances.

Hungary utilized a macroeconomic, top-down approach to determine its national emissions cap; allocations on the sector-level and on the level of installations were done based on the respective share of Hungarian emissions during the base period. The Ministry of Environment and Water

\(^{15}\) For the relevant formulas, see the section on market activity. (2005: 30.9Mt x 20.1 EUR/t x 250.33 EUR/HUF. 2006: 30.9Mt x 9.57 EUR/t x 262.01 EUR/HUF. 2007: 30.9Mt x 0.14 EUR/t x 253.72 EUR/HUF. Total: 234.67 billion HUF.)
prepared a national GHG forecast through 2012, as well as the allocation of CO₂ quantities that may be allocated in trading sectors. These GHG forecasts were prepared with the expectation of increasing macroeconomic trends, and were supported by sector-by-sector analyses. The macro-level study was prepared by the Regional Centre for Energy Policy Research of the Budapest University of Economics and Public Administration. The study includes a forecast, through 2012, for the economic activity of ETS trading industries and for the expected trends in production for their main product groups. The total amount to allocate within Hungary was determined based on this information, after which the micro-level allocations were determined for individual installations. Companies received allowances in proportion to their share of emissions during the entire base period in Hungary. The representatives of affected industries interviewed for this dissertation did not find this approach fair; instead, they would have preferred using benchmark-based allocation, where their allocations would have been determined based on actual emissions per unit produced, and not based on a share of previous emissions. This approach would have been beneficial for more efficient installations, and would have placed less efficient installations at a disadvantage.

Thus, there are three levels of allocations:

1. Determining the total maximum emissions levels for sectors,
2. Determining emissions caps for sectors affected by the ETS,
3. Allocations within sectors, on the level of installations.

This allocation process became rather complex as a result of the cooperation – or the lack thereof, rather – between ministries. The Ministry of Environment was responsible for setting the cap, and – due to environmental concerns – its goal was to keep the total amount of allowances low. On the other hand, the Ministry of Economy and Transport, which was responsible for distributing allowances among sectors, greatly supported industry representatives who made a case for more grandfathered allowances. The Ministry of Economy and Transport also backed the energy sector, as well as the miners’ labor union (which threatened mass lay-offs of miners if power plants had to close down due to a lack of allowances). Ultimately, the Ministry of Economy and Transport opted for the fairest solution possible, by minimizing the number of disadvantaged groups and preventing participants from receiving windfall allowances.

In most of the EU12 countries, the lack of reliable base period emissions data posed a problem. Most companies did not measure or track, in any form, their emissions prior to the introduction of

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16 Taken as a whole, the forecasts of the Regional Centre for Energy Policy Research study were sufficient for preparing the allocation plan (according to József Feiler), although there were ultimately differences on an industry level between actual allocations and the study.
the EU ETS. Many observers believe this is one reason why it was prudent to launch a pilot phase for the emissions trading system, so that the Kyoto period commencing in 2008 would already see verified and reliable emissions data available in every Member State of the European Union. In Hungary, due to the shortage of time, so-called soft data \(^{17}\) (Bart, 2007) was used to determine the reference emissions level. The pilot phase confirmed that this data was much less reliable and was thus less useful in the EU ETS compliance system than authorities expected it to be. The individuals interviewed by the author corroborated the generally held view (Ellerman and Buchner, 2006), that base period emissions data was oftentimes inflated by installations. This was possible because no reliable data on previous emissions existed. As far as the EU12 region is concerned, there is little environmental regulation to speak of prior to 1989 (as confirmed by Tomas Chemlik and Tomasz Zylicz in connection with the Czech and the Polish experiences in the EU ETS, respectively); CO\(_2\) regulation was considered a novelty in the new Member States.

Opinions differ over whether the GOH was lenient or strict – in keeping with climate change policies – in its allocation of allowances. Those who placed greater emphasis on environmental protection claim the allocation was too lenient; representatives of economic players are of a different opinion, maintaining that the GOH was trying too hard to emerge the “teacher’s pet” of the system. In the pilot phase national allocation process, Hungary proposed a total amount that was 3.8% more than its emissions in 2002. The proposal was accepted by the Commission in December 2004, without modifications. According to Bart (2007), Hungarians were disappointed, and felt the process was unfair, when the much more ambitious NAPs of neighboring countries were also approved by the Commission. Certain sectors then began to lobby aggressively for increased allocations; ultimately, the GOH withdrew the NAP already submitted, and a new version – with a higher cap – was later submitted. The increase of 1.7% percent went in its entirety to large power producers. This move was due not only to the relative weakness of the Hungarian authorities in the face of industry pressure, but also confirmed that EU regulations for allocation were not consistent, and the system showed a general lack of law harmonization. The benefits of a decentralized structure can at times lead to an abuse of the system and can create problems. In the future, it would be important to ensure that regulations are better coordinated and that differences between Member States be kept to a minimum, ensuring a level playing field in every participating country.

**National Allocation Plan**

\(^{17}\) The so-called soft data is measured and recorded not because of the EU ETS, but for other reasons.
The Hungarian **National Allocation Plan** for the pilot phase had an emissions cap of 94.98 Mt CO$_2$ for the period 2005-2007, with a 2% New Entrant Reserve, and a 2.5% auction reserve (see table 15). In the Hungarian NAP, 55.6% of the total quantity was grandfathered to the energy sector, represented by 18 installations; the market is thus rather concentrated. During the pilot phase, the total allocated emissions amount is comprised of free emissions allowances provided to existing installations, allowances made available for a cost, and allowances reserved for new entrants and made available to them for free (Government Decree no. 66/2006, Appendix 1, Section 2).

According to Article 6(2) of Act XV of 2005 on the trading of greenhouse gas emission allowances, the National Allocation Plan includes the following provisions in addition to its basic principles:

- the total quantity of emissions allowances created during the trading period:  
  31,660,907 allowances in the pilot phase per year, totaling 94,982,721 tCO$_2$e
- the total quantity of emissions allowances to be allocated to each sector (see Table 15)  
  30,869,384 allowances in the pilot phase per year, totaling 92,608,152 tCO$_2$e
- the quantity of emissions allowances to be allocated for free  
  791,523 allowances in the pilot phase per year, totaling 2,374,569 tCO$_2$e
- the preliminary list of installations falling under the Allocation Plan and the quantity of emissions allowances planned to be allocated for the operators – **National Allocation List**
- the quantity of reserved allowances to be allocated for free for installations subject to the New Entrant Reserve: a total of 1,875,960 allowances during the pilot phase, with the quantity decreasing proportionally every year:
  - 2005: 937,980 tCO$_2$e
  - 2006: 625,320 tCO$_2$e
  - 2007: 312,660 tCO$_2$e
- applicable methods of allocation: allocation for free and auctions.

<table>
<thead>
<tr>
<th>Emissions allowances to be allocated to existing installations free of charge</th>
<th>Quantity of emissions allowances (CO$_2$ tonnes/year)</th>
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</thead>
<tbody>
<tr>
<td>I/a- I/b. Electricity generation*</td>
<td>16,927,857</td>
</tr>
<tr>
<td>I/b. District heating</td>
<td>2,267,091</td>
</tr>
<tr>
<td>I/c. Combustion for internal purposes (except for sugar industry)</td>
<td>2,100,160</td>
</tr>
<tr>
<td>I/d. Sugar industry</td>
<td>431,479</td>
</tr>
<tr>
<td>II. Mineral oil processing</td>
<td>1,383,170</td>
</tr>
<tr>
<td>III. Coking</td>
<td>264,233</td>
</tr>
</tbody>
</table>
Emissions allowances to be allocated to existing installations free of charge | Quantity of emissions allowances (CO2 tonnes/year)
---|---
IV-V. Roasting and concentration of metal ores; iron and steel production* | 2,643,354
VI/a. Cement production | 2,390,321
VI/b. Lime production | 464,575
VII. Glass production | 295,420
VIII. The production of roof tiles, bricks, fire-resistant bricks, wall tiles, stone products and china | 865,447
IX-X. The production of cellulose, paper and cardboard | 203,059
1. Total for existing installations | 30,236,166
2. New Entrant Reserve | 633,218
TOTAL FREE OF CHARGE (1+2) | 30,869,384
3. Quantity to be allocated for compensation | 791,523
TOTAL FOR SECTORS (1+2+3) | 31,660,907

Table 15: Allocation of allowances in Hungary by sector
Source: Point 6 of Annex 1 to Government Decree no. 66/2006

* Including the quantity to be surrendered by the sector later, according to Section 15 of the Allocation Plan.

It is worthwhile to note that only one installation is listed in the National Allocation Plan as having “opted in” (regulated by article 24 of 2003/87/EC): Dunafin Kft. joined the system, but produced no carbon-dioxide output during any of the pilot phase years, according to registry records.

When drafting the allocation plan, neither the authorities, nor industry representatives possessed previous experiences on which they could rely; the researchers compiling the necessary studies were in the same situation as well. Drafters of the regulation spent months arguing the precise definition of what an “installation”\(^\text{18}\) is (Feiler, 2008). Preparing the allocation plan was a learning process, albeit one for which only a very limited amount of time was available.

**New Entrant Reserve**

One of the unique features of the EU ETS is that all Member States had the opportunity to set aside reserves for new entrants to the system. Concurrently to doing so, most Member States mandated that installations, which were going to be, closed down surrender their emissions allowances after shutting down. The aim of these measures was to provide a level playing field in terms of competitiveness to new developments or installations within the EU, as well as to avoid leakage, or the shutting down of installations only so that their operations may be moved outside the authority of the EU ETS for the purpose of avoiding carbon-dioxide costs (Convery et al, 2008). Hungary set aside a total reserve of 1,875,960 allowances for new entrants, with allocation conducted on a first come, first served basis. In 2006, two new entrant Hungarian installations received allowances; in

\(^{18}\) Installation does not necessarily have the same meaning as site or facility.
2007, three installations joined the system. The interviews conducted for this dissertation revealed that – in several instances at least – the requested allowances appeared on the new entrant installation’s accounts only after April 30, 2008, by which time the installation had surrendered the allowances according to its emissions, and by which time, too, its allowances had become worthless anyway.

Analysis of the Allocation Plan revealed that there were twenty installations, which were not allocated allowances initially. It was hypothesized by the author, in connection with these installations, that they were new entrants to the scheme, beginning carbon-dioxide-emitting activities only after January 2005. As this dissertation was being prepared, officials of the Ministry of Environment and Water provided the list of new entrants for the years 2006 and 2007: thirteen of these twenty installations were on the list, but only five of them received allocations for free (*italicized* in the table below), all of them representing the energy sector. As far as the year 2007 is concerned, when all pilot phase new entrants had already begun their operations, only 16.5% had received allocations for free. It is interesting to note that of the five installations, two received allocations that were more than enough to cover their emissions, while three ended up facing a shortage.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Miskolc Hold utcai Kombinált Ciklusú Erőmű</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>23,04</td>
<td>21,968</td>
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<tr>
<td>DCCE gázmotoros kiserőmű</td>
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<td>0</td>
<td>22,131</td>
<td>24,757</td>
<td>22,131</td>
<td>26,17</td>
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<tr>
<td>Hankook Tire Magyarország Kft. Gumiabroncs gyár</td>
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<td>0</td>
<td>0</td>
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<td>4,133</td>
<td>5,789</td>
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<tr>
<td>Almex96 Kft</td>
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<td>0</td>
<td>3,934</td>
<td>3,891</td>
<td>3,934</td>
<td>3,404</td>
</tr>
<tr>
<td>Inotal Kft.</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>2,512</td>
<td>7,514</td>
</tr>
<tr>
<td>NYKCE Nyíregyházi Kombinált Ciklusú Erőmű Kft.</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>85,807</td>
</tr>
<tr>
<td>Újpalotai Gázmotoros Erőmű</td>
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<td>30,235</td>
<td>0</td>
<td>59,386</td>
<td>0</td>
<td>61,578</td>
</tr>
<tr>
<td>Füredi úti Gázmotoros Blokkfűtőerőmű</td>
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<td>29,806</td>
<td>0</td>
<td>53,806</td>
<td>0</td>
<td>52,459</td>
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<tr>
<td>Bakony úti Fűtőerőmű Fejlesztő Kft</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>27,159</td>
</tr>
<tr>
<td>Wienerberger, Tiszasvári Téglagyár</td>
<td>0</td>
<td>6,128</td>
<td>0</td>
<td>15,021</td>
<td>0</td>
<td>21,833</td>
</tr>
<tr>
<td>MOL Nyr.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>10,485</td>
</tr>
<tr>
<td>Creaton Hungary Kft.</td>
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<td>3,877</td>
<td>0</td>
<td>5,636</td>
<td>0</td>
<td>5,48</td>
</tr>
<tr>
<td>Gázmotoros Fűtőerőmű</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>3,247</td>
</tr>
<tr>
<td>Dunakeszi Aszfaltkeverő üzem</td>
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<td>3,969</td>
<td>0</td>
<td>2,838</td>
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<tr>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>2,202</td>
</tr>
<tr>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
International practices vary over what steps countries take when their NER is exhausted, or if emissions allowances are left over at the end of the pilot phase. In most countries, “latecomer” entrants cover their needs from the market. This was not done in Hungary; after meeting all demands, any remaining allowances were auctioned by the GOH – ultimately, this meant that the allowances sold at auction exceeded the quantity originally set aside for that purpose; this will be discussed in greater detail below.

Closures

Regulations pertaining to closure cover installations, which had received emissions allowances, but had terminated their operations during the compliance period, without either using the allocations or surrendering them. The so-called transfer rule (governed by Law XV of 2005 and Government Decree no. 213/2006) makes it possible for the owner of an installation that will be shutting down to transfer unused allocations to a new installation; the recipient installation will then not be entitled to allocations from the New Entrant Reserve. Hungarian regulations stipulate that allowances intended for installations that are closing are added to the reserve for new entrants in the following years. According to the Ministry of Environment and Water, during the pilot phase, fifteen installations were shut down – four in 2006, and eleven in 2007. It is worth noting that in the Allocation Plan, five installations were listed with zero emissions in 2007 and three with zero emissions in 2006; it was, once again, hypothesized that all of these were facing closure, but the list revealed that only one, in fact, terminated its operations.

Grandfathering or Auctioning?

The most controversial and debated – and therefore, in many ways, the most interesting – issue in connection with the EU ETS has been the politics of allocation.

Much of the economics literature focusing on the allocation of tradable allowances maintains that auctioning is a more efficient tool than allocating allowances at no cost (Hahn, 1988; Cramton and Kerr, 1999; Burtraw, 2001; Burtraw et al., 2002; Fischer, 2002; Brandt and Svendsen, 2003; Woerdmann, 2003). Nonetheless, and in spite of the apparent benefits discussed in the literature,
there has been little experience with the use of auctions in the allocation of tradable emissions allowances, as far as both the United States\textsuperscript{19} and the EU are concerned. This is largely due to the political difficulty of convincing industry groups to support the purchasing of allocations, when they could otherwise receive them at no cost. The relevant EU Directive provides at least the possibility of cost-based allocation, by allowing Member States to auction up to 5 percent of their allocation in the pilot phase and 10 percent in the Kyoto period.

A number of studies have examined allocation options, focusing on the potential impact of auctioning allowances. (Harrison and Radov, 2002; Lesi and Pál, 2003; Jouvet et al, 2005; Martinez and Neuhoff, 2005; Ellerman et al, 2006 and 2007; Demailly and Quirion, 2006; Ahman et al, 2007). Presenting these discussions in detail is beyond the scope of this dissertation; only major issues will be discussed here. Pilot phase grandfathering – based on prior emissions data – will be compared with auctioning, with a special focus on distortional effects and on the opportunity costs of allowances.

One benefit of emissions allowance trading systems is that, in theory, their efficiency does not depend on the initial allocation of allowances. While the choice between grandfathering and auctioning is not supposed to affect the conditions of competition at the margin, it is likely to have important implications on corporate balance sheets, access to capital for investments and market behavior (Reinaud and Philibert, 2007).

In terms of financial expenditures, auctioned permits resemble emission taxes, since in both cases, the firm pays for their emissions. Grandfathered permits, on the other hand, approximate efficient direct regulation, since firms do not pay for emissions. Auctioning allowances presents one practical advantage over grandfathering, in that it does not require gathering \textit{ex-ante} information on installations’ emissions (Reinaud and Philibert, 2007).

Thus, literature dealing with the allocation of tradable emissions allowances is predominantly in favor of auctioning allowances rather than distributing them at no cost. Any kind of revenue-generating environmental regulation – whether emissions taxes or auctioning of allocations – is likely to have a less distortional effect than ones which do not produce revenues, such as free allocation or direct regulation (Bohringer et al, 2006, Reinaud and Philibert, 2007). The difference lies in the way revenue effects (OECD, 1999) are utilized. One of the most important benefits of auctioning, then, is that it provides a source of revenue that could potentially address economic burdens brought about by environmental regulation, creating resources for use by the government. This is what happened in Hungary at the two auctions held during the pilot phase: the Ministry of

\textsuperscript{19} The first RGGI auctions in the United States were taking place in 2008, as this dissertation was being compiled.
Finance is putting much of the revenues from these auctions toward projects targeted at harnessing renewable energy sources and supporting energy-efficient programs (www.pm.hu).

A further benefit of auctioning is the creation of equal opportunities for new entrants in the allowance market. It helps avoid the potential of windfall profit (Sijm et al, 2006 and Neuhoff et al, 2006) and the politically contentious process of allowance allocation. If their own costs of abatement are lower than market prices, companies obtaining grandfathered allowances make a profit for which they did not have to do anything. For them, it is a windfall profit, and they are able to emit polluting materials without having to pay the price (Lesi-Pál, 2004). For the installations, this profit shows up at as profit resulting from the regulations. During the EU ETS pilot phase, the majority of Hungarian installations benefited from such windfall profit; the position and surplus of specific sectors will be discussed in the following sub-chapter.

The free allocation significantly reduces the expenditures of polluters as compared to auctioning. It is important to examine this especially in light of the grandfathered allocations of the EU ETS. Further, it is a valid question whether the theory that there is in fact no difference in efficiency between allocations distributed for free or at a cost holds true in practice as well.

In theory, free allocation amounts to compensating companies for the introduction of a price on carbon (Grubb and Neuhoff, 2006). Allowances given for free represent a rent transfer, in the form of a financial asset that can be sold on the carbon market. Free allowances have an opportunity cost, which affected companies may include in their product prices.

Companies should theoretically be working to maximize their profits – they should be striving to reduce their emissions as long as the costs of doing so are lower than the market price of an emissions allowance (Lesi-Pál, 2004; Kerekes, 2007). If the market price is higher than the marginal cost of abatement, they will still work to abate their emissions even if they are not obligated to do so, because they have sufficient allowances at their disposal. If the Hungarian companies had been interested in maximizing their profits, they would have reduced their emissions and increased their emission allowance surplus, increasing their own presence as sellers in the international carbon dioxide market.

Supposing perfect competition, a company maximizing its profits behaves as though its marginal costs had increased by the same amount, as they would have in the case of cost-based allocation. The same does not necessarily hold true in the case of imperfect competition, but it is nonetheless important to consider the marginal costs of keeping emissions allowances. Disproving this, Hungarian companies, in practice, failed to recognize the opportunity costs of allowances made available to them for free, or only recognized it to a small extent. Clearly, the explanation for this
behavior was that most Hungarian companies were in a comfortable enough situation so that they could fulfill their emissions-abatement targets without having to take any action. They could emit the same amount as before, when there was no regulation, and they surrendered the necessary emissions amount at the end of the period to the authorities.

It is worthwhile to differentiate between the sale of the surplus free emission allowances and the recognition of the opportunity costs. It, too, is interesting to consider whether Hungarian market players even recognized that they could sell their surplus allowances, i.e. the amount which was more than what they required to cover their own emissions. By selling their surplus, they can thus make a profit in the market; this, however, is not the same as recognizing the opportunity costs of allowances distributed for free.

It may be concluded that, in connection with emissions trading, companies do not necessarily have to view the price of carbon dioxide as a tangible financial expenditure, but rather as an opportunity cost. For the companies, the fact that – with the introduction of the new system – emissions were assigned a price did not entail new expenses. Companies, in theory, should consider this expense when preparing their calculations. Instead of simply emitting another tonne of carbon dioxide, they must consider the possibility of selling that extra allowance on the market. In keeping with relevant economics theories (OECD, 1999), opportunity costs have to be considered even when discussing free allocation of these units, as the profits resulting from their possible sale do not differ from cost-based allocation. In this scenario, opportunity cost means that for every tonne of carbon dioxide emitted, there is one less allowance (received originally at no cost) available on the market20.

In the course of interviews conducted for this research, only two installations – one power plant and one oil company – were encountered where the managers responsible for compliance with the EU ETS within the company understood the opportunity costs and profit-generating opportunities of emissions allowances.21 The majority of respondents focused only on compliance with the system; at the end of the period, they surrendered to the authorities the allowances necessary for covering their emissions, and expressed displeasure at the additional administrative work the scheme entailed. The officials at the two installations recognized, however, that their companies could make a profit from the careful management of their emissions allowances. The power plant is foreign-owned, while the oil company is one of only a few Hungarian companies to have reached this

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20 The basis for this definition is the author’s personal discussion and e-mail correspondence with Denny Ellerman.

21 The power plant made the switch to biomass fuels at the launch of the system, so that it would be able to sell the allowances it will no longer use. The oil company included the price of CO₂ in its investment project evaluations.
It is safe to conclude that there is no connection between recognizing the opportunity costs of emissions allowances and the type of industry, the size of the company or the nationality of the owner. In both cases encountered, it was the manager of the installation who personally played the key role in making the relevant decisions.

The biggest danger that lies in the current system of free allocation is that companies had no interest, during the three years of the pilot phase, in reducing their emissions, since Hungary’s National Allocation Plan for the Kyoto period was prepared based on verified emissions data from 2005. Ellerman et al. (2006) and Neuhoff et al. (2006, p. 75) pointed out this updating dilemma; subsequent personal discussions of the author confirmed that this kind of negative motivator has a greater effect on companies’ short-term decisions than the positive motivational effect of selling allowances. During the pilot phase, Hungarian companies had a vested interest in lobbying for abundant allocations, despite lenient reduction targets, since the allocation of allowances for the next period depended on the originally allocated quantity.

When allocating emissions allowances, it has to be decided whether allowances should be distributed for free or for a cost. Then there are further options to decide between; these are shown in Table 9 on page 37. In Hungary, allocations were distributed during the pilot phase of the EU ETS at no cost, and were based on prior emissions. Interviews conducted for this dissertation indicated, however, that obligated companies were predominantly in support of a system of free allocation coupled with the use of industrial benchmarks. Essentially, this approach means that a GHG emission quantity is determined for one unit of production produced out by the particular company’s activities, and the allocation is then determined based on the quantity of finished products which the company has put out in the past, puts out currently or plans to produce in the future. Using this method of allocation, an installation which emits less than the emissions quantity determined for one unit of production will receive more allowances compared to its current emissions than an installation which has higher emissions. Benchmarks are determined based on the so-called BAT Reference Document (BREF), developed by the European IPPC Office. BAT documents provide fairly strict requirements for different activities; representatives of several Hungarian installations were hoping to diverge from these during the pilot phase (a move the Commission consented to), but ultimately, the GOH did not allow this. According to the findings of the European Commission, McKinsey and Ecofys (2005), over 60% of respondents believed allocation based on benchmarking could be a viable option, and only 15% maintained that this would not work. Most skeptical about benchmarking were cellulose and paper plants, as well as oil refiners. At the same time, for over half of all companies, benchmarking on an EU-level is a practical option only if national corrective factors are introduced. The majority of companies and
associations approached supported the selection of three or four reference points in their own industries. Non-governmental organizations would support appraisals based on expected production, while governments would rather see appraisals based on recent or standardized production. Representatives of the sectors approached for this dissertation would, for the most part, support the kind of benchmark-based allocation that would recognize prior emissions-reductions and would provide a further motivation for continuing to do so in the future. In the author’s opinion, it would certainly be worthwhile to consider the introduction of benchmarks, even despite technical difficulties.

The only way to prevent moves which would work to counter reductions is to shift toward a policy of distributing allowances for a price, which is also what the European Commission believes is the correct approach (European Commission, 2008). It is the author’s opinion that allocating allowances for cost would compel Hungarian companies to realize the opportunity costs of emissions allowances. This, as discussed already, did not happen when the allowances were allocated for free, even though the relevant economic theory would have dictated otherwise. The allocation of allowances for a price would lead to companies’ emissions decisions being made not according to the number of allowances made available, but according to their price, thereby forcing companies to make profit-maximizing decisions.

Those interviewed for this dissertation had reservations about auctioning; claiming it is unfair and explaining that they had trouble understanding the process. It is not surprising that the only two exceptions to this point of view were the representatives of the power plant and oil company mentioned above; they were the only ones to recognize the opportunity costs of emissions allowances and thus to factor these into their decisions. Both emphasized that only a system where all allowances are allocated through auctions can bring competitive balance to the system; as the chief economist of the oil company put it, “auctioning is the only intellectually permissible method of allocation” (Varró, 2008). The author concurs with this opinion – the revenues from auctioning have to be recycled into the system and have to be used to reduce emissions. This would be beneficial for the country’s economy on the whole, and could balance out other distortional effects or forces, which would create competitive disadvantages.

* * *

One of the conclusions of the survey conducted for this dissertation is that Hungarian companies tended to pursue a strategy of cost-minimizing (rather than profit-maximizing), as far as their participation in the EU ETS during 2005-2007 was concerned. The companies would have been able to increase their profits above all by reducing their emissions, amassing an emissions
allowance surplus, and then increasing their presence as sellers in the international EUA market. Instead, a substantial number of Hungarian companies focused on compliance and worked to reduce their own costs related to the introduction of the new system. They did not recognize that the units obtained for free also entail an opportunity cost as well as a profit-generating potential, in the same way as they would had the company had to pay for them.

Auctions, as opposed to the management of allowances received at no cost, require more time, expertise and efforts from the part of industry representatives as well. Although auctions did take place in Hungary during the pilot phase, it is probably safe to conclude that those interviewed for this dissertation were not present at this trading platform as buyers. It is possible that foreign companies were present at Hungarian auctions to collect allowances and make up for their own shortages; however, there no information is available to either confirm or refute this suggestion. The following section will review the practice of allocating emissions allowances during the pilot phase for a cost.
2.3. Auctioning During the EU ETS Pilot Phase

This section will provide an overview of the pilot phase as far as auctioning is concerned (Fazekas, 2008b) and a closer examination of the Hungarian approach during the period. Of the EU’s twenty-seven Member States, only four countries set aside emissions allowances for auctioning. Hungary, Ireland and Lithuania conducted uniform-price, sealed-bid auctions\(^2\), while Denmark sold its allowances directly on the market. Auctions were open; anyone could enter bids. Table 17 shows the reserves each Member State set aside in their allocation plan, as well as the amount actually sold during the pilot period. Ireland and Hungary auctioned off more allowances than they had set aside; the difference was covered from their New Entrant Reserves and from the allowances of installations, which were shutting down.

<table>
<thead>
<tr>
<th>Auction reserve</th>
<th>EU25</th>
<th>Denmark</th>
<th>Ireland</th>
<th>Hungary</th>
<th>Lithuania</th>
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<td>7,499,201</td>
<td>5,025,000</td>
<td>502,201</td>
<td>1,420,000</td>
<td>552,000</td>
</tr>
<tr>
<td>%</td>
<td>5%</td>
<td>0.75%</td>
<td>2.5%</td>
<td>1.5%</td>
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</tr>
<tr>
<td>Allowances auctioned</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>5,172,500</td>
<td>2,762,500</td>
<td>+ 963,000</td>
<td>1,197,000</td>
<td>0</td>
</tr>
<tr>
<td>2007</td>
<td>3,348,000</td>
<td>1,618,500</td>
<td>0</td>
<td>1,177,500</td>
<td>552,000</td>
</tr>
<tr>
<td>2008</td>
<td>445,000</td>
<td>0</td>
<td>445,000</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Pilot phase</td>
<td>8,965,500</td>
<td>4,381,000</td>
<td>1,658,000</td>
<td>2,374,500</td>
<td>552,000</td>
</tr>
<tr>
<td>%</td>
<td>4.35%</td>
<td>2.47%</td>
<td>4.18%</td>
<td>1.5%</td>
<td></td>
</tr>
</tbody>
</table>

Table 17. Auction reserves and auctioned allowances
Source: Fazekas, 2008b

It is important to examine Danish sales more closely, as – starting in 2008 – more Member States will be selling their allowances directly on the market. Selling directly on the market – through the institutionalized European carbon exchanges – is different than selling allowances at auctions.

1. Auctions tend to see the concentration of greater demand at one time than is encountered in the same timeframe at exchanges. The quantity sold at auctions exceeds the amount traded daily at the exchanges.

2. Participating in an auction is less costly for buyers than using the services of exchanges and brokerage firms.

3. Auctions are held less frequently; there is more risk in the revenues to be earned through auctions than the profit, which may be expected through direct sales in the market.

Denmark set aside a pool of over 5 million allowances for sale by auction during the pilot period, accounting for 5% of the total number of allowances. To maximize state revenues, Denmark determined that the best way to proceed is to sell its allocations directly on the market via an

\(^2\) Appendix V contains a summary of pilot phase auctions.
agent. Denmark sold 2,762 thousand tonnes through the brokered market in 2006 when the price ranged from €0.90-€2.20. Selling was continued through April 30, 2008; at the end of the pilot phase, 644,000 allowances remained unsold on Danish accounts. Denmark relied exclusively on its auction reserves; its brokers did not work with the country’s New Entrant Reserves or the allowances of closing installations, so these allowances were ultimately lost (Pedersen, 2007).

Although the direct sale did not provide the same kind of price signal as auctioning, this cannot be seen as a serious drawback of direct sales, since prices were easily available on several exchanges and other market services. Compared to auctioning, price risk was reduced considerably by selling directly; the problems otherwise encountered when prices are changed after the announcement of an auction, but before the event, could not arise in this scenario. The actual weighted average selling price of the Danish allowances was higher than the average market price at the time. It appears that Denmark’s chosen method of sales, using professional agents, was clearly a better approach than selling at a flat rate (in effect, selling at the average market price).

Ireland was the first Member State to host an auction in the framework of the EU ETS. Originally, 502,201 allowances were set aside in the Irish allocation plan, or approximately 0.75% of the country’s total allocation. Ultimately, a total of more than 1.5 million allowances were auctioned, accounting for some 2.5% of the total. The source for the surplus allowances was the NER and allowances of closing installations. The first such auction took place in January 2006, the second in December of that year and the third one just prior to the end of the pilot phase. 2008. Ireland’s environmental protection agency offered the last 445,000 remaining EUAs for sale on March 6, 2008. To reduce any risks related to the auctions, it was decided that potential bidders be subject to a pre-qualification process; this practice was unique among all EU ETS auctions (Macken, 2007).

In Lithuania, the country’s Environmental Investment Fund offered 552,000 EU allowances for sale. The online auction on September 10, 2007 was the last to be held during the first phase of the EU ETS; unfortunately the price did not work in Lithuania’s favor by then (the market price stood at six eurocents). The total amount offered was sold for a total of €33,120, barely covering the administrative costs of the auction. This strategy of waiting out does not seem to have paid off in the end.

The country that was first to sell its allowances was able to realize the most profit on the auctions. At the same time, no Member State was really able to make optimal use of the inherent revenue-
generating opportunity, since auctions were only conducted in 2006, following a steep drop in prices.

**Hungary**, in its National Allocation Plan, set aside 2.5% of its total allocation – 790,000 tonnes – for auctioning in each year of the EU ETS pilot phase (per Government Decree no. 66/2006). Ultimately, Hungary sold a total of 2.4 million emission allowances at two auctions; this equaled more than 4% of the country’s total allocations. The 1.5% difference was accounted for by additional allowances from the NER and allowances received from closing installations.

The first auction, organized by the Ministry of Finance, took place on December 11, 2006, and saw a total of 1,197,000 EUAs changing hands for a price of 7.42 EUR per tonne. The auction netted revenues of 8.882 million EUR for the central budget. The auction also led, however, to disagreements between the Ministry of Environment and Water and the Ministry of Finance. The former wanted to see the auctions take place as soon as possible, and blamed the Ministry of Finance for the delay, pointing out that prices had dropped significantly by the time the reserved allowances were finally auctioned in December 2006. The second auction was held on March 26, 2007; 1,177,500 EUAs were auctioned for a price of 0.88 EUR each. The auction generated revenues of 1.036 million EUR.

The electronic auction was held on the Hungarian euets.com CO₂ trading platform. All entities or individuals holding an account at an emissions trading registry in any EU Member State were able to participate in the auction. Originally, the Ministry of Finance was planning on holding two sessions for each auction, but the entire quantity set aside was sold during the first round both in the December auction and in the March one. The auction was a uniform-price auction where the clearing price could not be lower than the minimum price determined by the auctioneer. In accordance with a preliminary study conducted by the Regional Centre for Energy Policy Research, the GOH set a minimum price for the auction (see Appendix V). Bidders had to place their bids in the given time period and could not withdraw them after the termination of the bidding phase. The bids were not visible to other bidders, which is a scenario known as a blind or sealed-bid auction. The bidders needed to deposit their collateral for the purchase with the clearing house of euets.com, or with any member of the Climex Alliance, two business days before the date of the auction. The clearing and settlement of the transactions was completed within two business days of the auction.

Government Decree no. 109/2006 spells out the rules for the sale of allowances. The managers of state property must develop, in consultation with the Minister of Economy and Transport, a proposal for the regularity and scheduling of sales, along with the quantity to be sold. Once the Minister of Finance has approved the proposal, he initiates the sales. The Ministry of Environment
and Water prepared its proposal on the regularity and scheduling of allowance sales, as well as the quantity to be sold, at the end of August 2006. Approval from the Minister of Economy and Transport was requested on September 4, 2006; this arrived at the Ministry of Environment and Water in early October 2006. The Minister of Environment and Water requested the Minister of Finance to initiate the sales on October 10, 2006. The GOH announced its intention of auctioning allowances on November 27, 2006, in accordance with Government Decree No. 109/2006 (V.5). The first auction was held on December 11, 2006. Over three months had passed between the preparation of the sales proposal and the first auction – this delay led to significantly lower prices than was originally hoped for (see figure 25).

The preliminary study prepared by the Regional Centre for Energy Policy Research recommended that auctioning begin as soon as possible in 2006 (REKK, 2006). Doing so would have mitigated the risks associated with the sales, according to the authors, and would also have been necessary due to the fundamental effects of such an auction on the supply and demand side of CO₂ markets. It is safe to conclude that had the GOH listened to the drafters of this study, it could have realized significantly higher revenues.

The two auctions netted the GOH revenues of some 10 million EUR; according to regulations, the majority of this profit had to be put toward projects promoting renewable energy sources and energy efficiency. According to the original agreement signed by the three ministries, the Ministry of Environment and Water and the Ministry of Economy and Transport were each to receive 1 billion HUF for tasks related to the reduction of GHGs and to regulating the emissions of GHGs. Projects aimed at promoting the use of renewable energy sources and at increasing energy use also
benefited from this amount. The amount left over was returned to the central state budget. (Ministry of Environment and Water, 2003 and Government Decree no. 109/2006 (V. 5.) Section 8, Paragraph 7)

According to the law on the budget of the Republic of Hungary (Law CXXVII of 2006, Section 66, Paragraph 4), the revenues resulting from the sale of emissions allowances were to be used by the Ministry of Economy and Transport for “increasing the efficiency of energy use” and by the Ministry of Environment and Water for “tasks related to the reduction of GHG emissions.” The Ministry of Environment and Water put some of the revenues toward the completion of mandatory EU and international reporting duties; some of the revenues went toward work on the preparation of the National Climate Change Strategy; and some of it was put toward specific programs, which would decrease Hungary’s emissions of GHGs. (Feiler, 2008)

The relevant economic theory dictates that auctions will result in sales at the average market price (Klemperer, 2000 and 2004). Auction participants are supposed to be able to purchase emissions at the carbon exchange, as well; therefore, it is unlikely that they would make purchase offers at the auction at prices higher than the exchange price (REKK, 2006). It is noteworthy that in reality, the clearing price at the first auction was actually higher than the average market price that day (see figure 26).

![Figure 26. Price fluctuations on the day of the first auction](Source: Kaderják, 2007)

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24 In the fall of 2008, the Economic Committee of the Hungarian Parliament put forward a proposal on the establishment of a so-called National Carbon Fund. Thirty percent of all budget revenues originating from the auctioning of greenhouse gases would be put toward this fund, which would then serve as a budget for compliance with energy efficiency and renewable energy targets. (Committee Support for Carbon Fund, Nov. 5, 2008, http://www.greeninfo.hu/kapcsolodo/kapcsolodo_item.php?table=hirek&azonosito=20016&rovat=)
What was the reason for this anomaly? The Regional Centre for Energy Policy Research study (REKK, 2006) points out an exception to the above-mentioned rule: when many buyers need emissions allowances in a great quantity, they can only procure these at the exchange by driving prices up. In this case, they may be willing to make purchases above the market price, given the urgency of their needs. In response to the author’s question, the experts of Vertis Zrt. agreed that this exceptional scenario might have been exactly what arose in Hungary, with participants willing to pay more for allowances in order to obtain a greater quantity of them. This is also supported by the fact that bidders made offers for 3.42 million allowances in December 2006: this is almost three times the amount than was originally intended for sale. In March 2007, bids were entered for 2.4 million allowances – demand was over twice as high as the actual supply offered for sale. Essentially, buyers were willing to pay a premium price for the large quantity.25 At the same time, it may be supposed – but cannot be confirmed based on the information available – that foreign companies turned to Hungarian-auctioned allowances for covering their own shortages.

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25 Unfortunately, it proved impossible to collect information on who purchased emissions allowances and in what quantity.
2.4. Accounting of Emissions Allowances in Hungary

This section is based on the author’s March 2008 article published in the journal *Budapest Management Review (Vezetéstudomány)* and co-authored with Ágnes Andor (Andor-Fazekas, 2008). The section will first cover capitalization and recognition, and will then examine the valuation and derecognition of emissions allowances from balance sheets. The valuation of emissions allowances differs depending on how long they remain in the possession of a particular company; in every case, however, a provision has to be established. The pilot phase did not see the finalization of international or Hungarian regulations, which made it all the more difficult for companies to work smoothly with the system. Even despite regulations and guidelines, neither Hungarian nor Western operators understood these completely – according to the ARPEC conference in September 2008.

**Capitalization**

With regard to the recognition of emissions allowances into balance sheets, the assessment of capitalization criteria is the first step. According to Hungary’s Law on Accounting, assets “ensuring the operation of the entrepreneur which are at the disposal of, and are used by, the entrepreneur should be indicated as assets in the balance sheet” (Law on Accounting, Section 23, Paragraph 1). According to the theory of balance sheets (Baricz, 1999), emissions allowances meet the following conditions of being recognized into the balance sheet:

(a) they have a financial value,

(b) they can be assessed individually; that is, their value can be expressed in monetary terms,

(c) they can be traded individually; that is, can be sold one by one.

Emissions allowances are assets that will be profitable in the future and, as conditions of a company’s operation and as potential objects to be sold in the market, they have a financial value. According to the National Allocation Plan, the company shall be entitled to possess, use and dispose of the emissions allowance allocated to it as assets (which are content elements of property rights). The measurement unit of emissions allowances is fixed (1 tonne CO₂ equivalent), the value of which can be expressed in monetary terms. The date considered the date of entry of an allowance into the balance books is when the government, or the National Inspectorate for Environment, Nature and Water, acting in its stead, has entered the emissions allowance on the account of the operator. In the case of a purchase, it is the date specified in the contract. Capitalization of emissions allowances has the following major types:

1) **Transfer without compensation**: According to Law XV of 2005, Section 8, Paragraph 1, the allocation of allowances, conducted within the framework of the National Allocation Plan, is
considered a “transfer.” Apart from freely allocated allowances, the so-called allocation for *force majeure* must also be mentioned: “during the first trading period, the operator may initiate the allocation of further free emissions allowances with the environmental protection authority when the performance of its surrender obligation is necessary for an inevitable external reason, beyond its control, which arose following the allocation of emissions allowances” (Law XV of 2005, Section 9, Paragraph 3). Emissions allowances are recognized into balance books at the market price valid at the time of transfer (book value). Through the transfer, extraordinary incomes are obtained, which should be listed as deferred incomes, to be released only if the allowance is accounted as a cost or expense. Tóth (2006) suggests in his article that those operators whose revenues resulting from the accounting value of allowances would be a significant portion of their operating result, allowances received for free might also be recognized against miscellaneous revenues, to ensure that the accounting of emissions allowances does not result in an unjustified distortion between result categories in profits and losses. Delimitation must also be done in these cases.

(2) **Purchase**: Companies possessing fewer allowances than their emissions needs may purchase allowances at OTC markets, auctions or at the exchange. In these cases, the value to be entered in the balance sheet is the actual procurement cost. The Law on Accounting considers several other items related to purchases as part of the procurement cost (Section 47).

(3) **Contribution in kind**: The book value is the value of contribution in kind.

(4) **Receipt against a claim**: In cases of bankruptcy, the book value is the value according to the bankruptcy agreement; in the case of liquidation, it is the value according to the recommendation for division of assets.

(5) **In the framework of a restructuring or purchase of a company**: The book value is the book value indicated with the legal predecessor.

**Classification**

The emissions allowance is a right of financial value. According to the Law on Accounting, the rights of financial value are obtained rights, which are not related to real property. The Law mentions the most typical examples (lease right, rights of use, trusteeship, rights of utilization of intellectual properties, licenses, concessions, gaming rights and other rights not related to real

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26 “It is only permissible to deviate from the letter of the law in exceptional cases – if the consent of the bookkeeper is obtained in writing – if, under the given circumstances, the application of this law or any of its components (including … the presentations included in the appendix) would not provide for a … reliable and realistic picture of relevant circumstance. In every such instance, this information has to be provided in the appendix, explaining the reasons and covering the impacts on resources, the financial situation and profits and losses.” (Law on Accounting, Section 4, Paragraph 4)
property); however, the special characteristics of emissions rights indicate that they be assigned to the other category. This position is also supported by Law XV of 2005, according to which “an emissions allowance … is created by recognizing it into the Transaction Log as a right of financial value belonging to the treasury assets of the Hungarian State” (Section 7, Paragraph 1). According to the Law, when capitalizing rights of financial value, the company should determine whether these are in the interest of the company. Emissions allowances are basic rights, which permanently serve the operation of the company since the emissions permit and the pollution right obtained based on this are basic requirements for the continued operation of the company. However, emissions allowances are allocated every year. In light of this, companies have two opportunities with regards to the accounting of emissions allowances. When an allowance is used more than one year later, it shall be recognized as an intangible asset among invested assets. (During the first period, an allowance not used in the given year could be transferred to the following year, as discussed already; this, however, could not be done between periods.) When the installation wishes to use or sell the allowance in the given year, it should be recognized as goods.

Valuation

The sections above provided an overview of the capitalization of emissions allowances and the accounting categories, which apply to allowances. The third interesting issue to discuss here is the valuation of allowances.

\[
\text{The net value of rights of material value as intangible assets} = \text{gross value} - \text{ordinary depreciation} - \text{accelerated depreciation} + \text{reversal}
\]

The net value may be supplemented by a value adjustment in the balance sheet indicated on a separate line, against a valuation reserve for liabilities. It is difficult to apply the concept of ordinary depreciation in the case of emissions allowances: the utilization of an emissions allowance is not followed by its physical deterioration or moral obsolescence. Allowances allocated and not used in the first year of the trading period can be transferred to the following years (within the same period) and considered as a performance in the given year. That explains why emissions allowances do not lose their value during the years, apart from responses to fluctuations of the market price. The Law on Accounting (Section 52, Paragraph 6) stipulates that no ordinary depreciation may be accounted for assets, which do not lose their value as a result of their use. Therefore, the net value of emissions allowances may change according to the market value, which can be indicated in accounting records using the tools of unplanned impairment and value adjustment.

\[
\text{The net value of emissions allowances as goods} = \text{gross value} - \text{impairment} + \text{reversal of impairment}
\]
When allowances are recognized as goods, they are subject to impairment rules on stocks. Impairment should be accounted for stocks, so that their book values do not permanently and significantly exceed the market value, which was valid at the time when the balance sheet was prepared. However, no revaluation apart from the reversal of the amount accounted as impairment is possible to account for an increase in prices.

Accounting valuation uses market prices as its basis. In the case of grandfathered allowances, the most typical accounting method is to use the market value of the allowance. If impairment exceeds the planned amount, or if value adjustment or value losses also have to be included, the market value shall be used. In their work entitled *Valuing Intangible Assets*, Reilly and Schweihis (Nagy-György, 2005) set the following criteria for the assessment of intangible assets:

1. it is legally existing and protected by law – protection by EU Directives and national legislation
2. it is private property and can be legally transferred as private property – these are owned by the operators and are characterized by a right of free disposal
3. its existence is proved permanently – national and international transaction logs, sales agreements
4. it was created at an identifiable time or as a result of an identifiable event – national allocations, purchases
5. it is cancelled at an identifiable time or as a result of an identifiable event – mandatory surrender, sale, deletion

No discounted cash-flow assessment, used frequently for assessments, is possible here, since the possession of the right does not directly result in money flow. During the assessment of emissions allowances, a method, which may be applied relatively well, is **pricing based on costs**. Business experiences usually suggest that sellers on the market supplement the received pollution prevention marginal cost when pricing several transactions. The authors Coggins and Swinton (Nagy-György, 2005), in their work entitled *The Price of Pollution: A Dual Approach to Valuing SO₂ Allowances*, indicate that the approach based on stochastic time sequences used for the analysis of prices should, in many cases, be replaced by pricing based on marginal cost. In their opinion, it is the most rational method for companies to follow up the fundamental bases of prices in a nascent market like this. At the same time, they underscore that regulating authorities have no other opportunity for the interpretation of prices apart from this, until the supply and demand relationships of the market are created.

As an assessment method, the model of **option pricing** can also be considered. According to this principle, it is not directly the emissions allowance that is to be priced, but the investment in the
field of environmental protection, which is financed by the installation when allowances are too expensive. The literature suggests, however, that the more volatile allowance prices are, the later the installation makes supplementary investments that are the higher the prices of allowances shall be. (Nagy-György, 2005)

Assessment practice in Hungary roughly corresponds to that of the rest of Europe. In Hungary, the most frequent pricing type is that based on preventive marginal cost. As opposed to other rights of financial value, the value of the allowance is not determined by benefits and expected future revenue arising from the possession of the allowance. In reality, it is only the relative market supply and demand and their situation and volume that influence market prices of allowances. As a result, the price of allowances has fallen under 1 EUR by the end of the first period, down from the original unit price between 10 EUR and 15 EUR: Member States allocated too many allowances and thus there is a surplus, with only few companies in scarcity wanting to purchase them.

Provision

A central feature of the allocation and trading of emissions allowances is that the operators shall surrender allowances for the quantity emitted in the current year by April 30 of the following year. Thus the operator is obliged to make provisions under the Law on Accounting: “provisions shall be formed to the debit of pre-tax profit or loss – to the extent necessary – to cover payment liabilities toward third persons which originate from past and current transactions and contracts and which are likely or sure to be incurred by the balance sheet date, however the amounts of such liabilities are not established by the balance sheet preparation date and the company has not provided the required cover for such in any other form”. (Law on Accounting, Section 41, Paragraph 1). According to Law XV of 2005, Section 5, Paragraph 1, “the operator shall follow up the emission of greenhouse gases falling under the emissions allowance according to special legislation and submit an audited report for the environmental protection authority relating thereto by March 31 of the following year.” The fact that actual figures might be evident only after the balance sheet date is not contrary to the applicability of the provision, since “during the formation of a provision, liabilities that exist on the balance sheet date and the estimated expenses shall or may be taken into account even if they become known between the balance sheet date and the date of closing” (Law on Accounting, Section 41, Paragraph 9).

As a result, the operator should determine the quantity of allowances to be surrendered with regard to the balance sheet date, which corresponds to the emissions in the current year, and then it should deduct the quantity, which is covered by the delayed revenue indicated on the liabilities. (This is the remaining quantity of allowances allocated for free by the state at the end of the year.) The
provision is to be formed against the difference of the two quantities by multiplying it with the market price of the balance sheet date. The provision should be released against other income by surrendering the allowances corresponding to the annual emissions during the spring (by April 30) of the following year.

**Derecognition**

Allowances are removed from balance books when they are surrendered or sold. The obligation to surrender allowances applies only to quantities; the actual value is determined by the book value of the emissions allowances. Derecognition of emissions allowances during their use is done against other expenditure. When allowances are being sold, the book value of allowances listed as intangible goods shall be recorded as an expense, and the sale price shall be listed as other revenue. If allowances recorded as goods are sold, their value shall be listed on the costs of goods sold account; the price received in exchange shall be accounted as net revenues. If the deregulated allowances are deregulated from among the allowances grandfathered by the government, delayed revenues, proportionately, must also be released.

The Authority shall cancel emission allowances:

1. “any time according to a declaration of the beneficiary of the emissions allowance, submitted to the keeper of the transaction log;

2. on June 30 of the year in question following the surrender;

3. on May 1 in the year following the end of the trading period when the emission allowance has not yet been canceled under points a) or b)”.

“The keeper of the transaction log shall credit new emissions allowances in a quantity corresponding to the cancelled ones to the account of the beneficiary of the emission allowance instead of emission allowances deleted under Paragraph (2)c, following the second and the next trading period” (Government Decree No. 143/2005, 8(2-3)). For accounting purposes, cancelation under points (1) and (3) shall be considered accelerated depreciation. Emissions allowances allocated in the first trading period could be used only within this pilot phase. At the end of the trading period, after April 30, 2008, remaining and not surrendered emissions allowances from the period 2005-2007 had to be cancelled.

There are three cases for compliance with the surrender obligation; operators had to follow the same practices both in the pilot phase as well as starting in 2008:

1. The emissions by the operator in the current year correspond exactly to the quantity of allowances received for free for the given year from the government, to be surrendered later; in such cases no further action is required.
(2) The emissions of the operator in the current year are higher than the quantity of allowances received for free from the government in the given year, to be surrendered; in such cases
- the operator shall make up for the missing quantity by purchase, or
- it shall pay a fine on April 30 and shall present the missing quantity in the following year.

This quantity cannot be accounted as a short-term liability, since the value of the liability cannot be determined exactly, as only the quantity is known, and thus legislative conditions for the presentation of the item as an liability do not apply. However, by forming the provision, the resulting effect to be indicated in the current year is possible. (Tóth, 2006)

(3) The emissions of the operator in the current year are below the quantity of allowances received for free for the given year from the government, to be surrendered; in such cases
- the operator shall sell all or part of the allowances and thus it shall have other income (net sales), or
- it transfers it as a reserve to the following years since the allowances can be used freely in the years of the given trading period (banking).

The accounting of carbon-dioxide emissions allowances is a constantly developing area that did not yet take final shape during the pilot phase. As the International Accounting Standards Board (IASB), in July 2005, withdrew the IFRIC 3 Emissions Rights standard partly in response to uncertainties regarding sales, no generally accepted standards for accounting exist. According to the IFRIC interpretation, emissions allowances can be presented as follows:

1. **As intangible assets** (IAS 38), without regard as to whether they were obtained by the operator for free or by purchase. No impairment can be accounted for, but depreciation can be applied.

2. **As government support** (IAS 20), the amount which is the difference between the value of the grandfathered allowance (or that purchased from the government) and the fair value. This shall be deferred income, which shall be indicated as revenue during the accounting period for which allowances have been issued.

3. **As provision** (IAS 37), the amount corresponding to the emissions in the current year and thus subject to surrender. The provision shall be released upon complying with the liability. The value of the liability shall be obtained by multiplying the quantity to be surrendered and the actual market price of allowances. If the operator takes the payment of the penalty into consideration from the very beginning, its expected amount should be taken into account. This is considered the IAS model based on capitalization value.

The revaluation model under IAS 38 deviates from the book value model in that it allows for the evaluation of emissions allowances at fair value when these are traded on an active market. Thus
the model shall be supplemented with fair valuation reserve accounted as asset value and item modifying the capital in the difference of the recognition and the fair value on evaluation. (Tóth, 2005)

Companies may record allowances as intangible goods or as products, depending on how long they remain in the possession of the particular company. Appendix VII provides detailed information on the effects of allowances on company balance sheets. It would be vital to publish international standards adopted both by Member State authorities and acknowledged – and then committed to – by obligated companies, so that burdens on companies and uncertainty may be reduced.

* * *

After examining Hungarian allocations under the EU ETS, the author concurs with Egenhofer (2007), who was debating whether the EU’s emissions trading scheme lived up to the expectation that it would serve as a cost-efficient tool for reducing GHG emissions in the spirit of the Kyoto protocol. Egenhofer mentions two areas where, in his opinion, the EU ETS did not meet previous expectations. (1) The allocation of almost all allowances for no cost, which is less efficient than auctioning allowances. (2) The decentralized allocation process, which, in Egenhofer’s opinion, was due to a desire to win the support of industry representatives and Member States. In Hungary’s case, the first issue is defensible, since – contrary to prevalent practices in other countries – Hungary did decide to sell allowances for a cost. The GOH recognized, on the one hand, the revenue-generating potential of auctions, and on the other hand, that this was the only way companies which otherwise failed to consider the opportunity costs of allowances could be made to cover the costs of carbon-dioxide allowances. The second item Egenhofer takes issue with, the decentralized allocation process, and winning industry support, could clearly be observed in Hungary during the EU ETS pilot phase. And not just in sectors which included only one or a handful of installations, but on an ETS-wide level, since the first National Allocation Plan was withdrawn, modified and resubmitted exactly in the face of industry pressure.

The second phase did not bring about much improvement in terms of delays in the allocation process. By mid-September 2008, only thirteen Member States had had their National Allocation Plans approved; the Hungarian plan was approved by the Commission only in October. This is clearly unfavorable for the sectors involved, as well as for trading in general; and, unfortunately, there is little sign that the uncertainty inherent in the system will go away anytime soon.
3. The Operation of the EU ETS in Hungary

This chapter will present an overview of Hungarian participants and the positions of the various sectors. In Hungary, most of the sectors and most companies possessed a surplus during the pilot phase, and did not have to struggle to fulfill their obligations. This chapter will examine the concentration of the market and the allocation of allowances among sectors and company groups. Hungarian companies’ approach to the scheme will be presented through the author’s personal discussions, with the conclusion that most obligated companies perceived the system essentially as an administrative burden. Later, the effects of the scheme on Hungarian sectors will be examined, with a special focus on its impact on motivating innovation, competitiveness and corporate behavior. Transaction costs will be analyzed, as will effects on operative and investment decisions. Lacking reliable preliminary data, it is difficult to quantify whether emissions reductions actually occurred in Hungary during the pilot phase. The chapter will also offer a comparison of allocation data with verified emissions quantities, and will show the surplus that Hungarian sectors possessed. The final part of the chapter will examine the activity of the Hungarian carbon market, quantifying Hungarian and international trade activity.

3.1. An Overview of the Hungarian EU ETS Market

The EU ETS market is a regulated one; its participants are obligated to enter into emissions trading activities by the authorities, and do not necessarily join the market simply of their own volition. In Hungary, only some one-third of all GHG emissions (32.73%, IDEACarbon, 2008) are covered by the EU ETS market. Essentially, there is no separate Hungarian ETS market or Hungarian carbon-dioxide market, since the trading of emissions allowances is not limited to within the borders of the country: the EU ETS establishes a common market without borders, and the Hungarian segment is an integral part of this marketplace.

This subchapter will review the Hungarian participants of the EU ETS, and will group them according to size and sector. The EU ETS market in Hungary is rather concentrated, both in terms of sectors and markets as well as installations. In general, Hungarian sectors tended to receive more units than would have been necessary to cover their emission amounts during the pilot phase. Fifty-two installations were facing a shortage, while 191 installations were long. The positions of the various sectors will be discussed, and relative allocations will be compared. Overall, Hungarian participants were able to rely on a surplus of 14%, which amounts to 12 Mt of CO₂ emissions allowances.
Participants of the Hungarian EU ETS Market

The operation of the EU ETS resulted in the establishment of a new market and the birth of new market players. The major participants of the market are the following:

- **European Union**: defines the framework and operating conditions of the market.
- **The Government of Hungary**: determines the number of total allowances companies should receive, and determines the breakdown of allocations between participants.
- **Obligated parties**: companies covered by the scheme; they purchase emissions allowances primarily to fulfill their obligations, or they either sell their surpluses or sell allowances, which are freed up as a result of abating emissions.
- **Other legal and natural entities**: individuals and organizations concerned for the environment are able to purchase emissions on the market, in order to invalidate them and thereby reduce overall emissions.
- **Financial investors, banks, insurance companies**: these participants are behind the majority of market transactions. (The author has no information on how much of Hungary’s emissions trading was accounted for by financial institutions.)
- **Exchanges**: trading with emissions allowances is done at major Western European exchanges as well as the Hungarian euets.com exchange (for an overview of the exchanges, see Appendix IV).
- **Legal advisors, consulting firms**: advisors to obligated companies, they have a role in shaping companies’ investment strategies which impact their emissions in the long term. (In Hungary, the most significant such consulting company is Vertis Zrt., operators of the euets.com exchange; Vertis was also the organizer of the GOH’s allowance auctions.)

The obligated parties of the Hungarian carbon-dioxide market may be grouped according to sector or according to size. As of January 1, 2005, Hungarian heating plants (producing heat or electric energy) over 20 megawatts, oil refiners, coking plants, steel and iron producers, cement, lime, glass and construction material producers and paper plants may only engage in carbon-dioxide-emitting activities in possession of an emissions permit issued by the National Inspectorate for Environment, Nature and Water.

The size of an installation is determined by its emissions data. There are five categories: zero, “de minimis,” small, medium and large emitters. The second column in the table below provides the emissions levels for each category above. Certain installations may be placed in different categories in every year of the pilot phase, since their placement thus depends on their activities. The number
of installations in each category changes as a result of new installations beginning operations and installations facing closure.

<table>
<thead>
<tr>
<th>Installation</th>
<th>Verified CO₂ emissions</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero emitters</td>
<td>0 kt</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>“De minimis” emitters</td>
<td>under 10 kt</td>
<td>75</td>
<td>71</td>
<td>43</td>
</tr>
<tr>
<td>Small emitters</td>
<td>between 10 and 50 kt</td>
<td>98</td>
<td>97</td>
<td>84</td>
</tr>
<tr>
<td>Medium emitters</td>
<td>between 50 and 500 kt</td>
<td>42</td>
<td>42</td>
<td>33</td>
</tr>
<tr>
<td>Large emitters</td>
<td>over 500 kt</td>
<td>12</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>Provided all necessary information</td>
<td>229</td>
<td>100.00%</td>
<td>224</td>
<td>100.00%</td>
</tr>
<tr>
<td>Provided only incomplete information</td>
<td>19</td>
<td>7.60%</td>
<td>24</td>
<td>9.60%</td>
</tr>
<tr>
<td>All installations</td>
<td></td>
<td>250</td>
<td>250</td>
<td>254</td>
</tr>
</tbody>
</table>

Table 18. Emitters categorized according to size
Source: author’s calculation based on the EEA “CITL Viewer”

The number of EU ETS installations classified as zero emitters was negligible during the pilot phase: in the first two years, only two installations did not emit any carbon-dioxide, one in the energy sector and the other in the construction sector (ceramics manufacturers). It is likely that one of these installations was to be shut down by the end of the pilot phase.

In the first two years, two-thirds of the installations were considered “de minimis” emitters, producing less than 10 kilotonnes of carbon dioxide. By the time the pilot phase was over, this figure had dropped to one-fourth of all installations. This was possible because the number of medium emitters increased from 43% during the first two years to nearly one-half of all installations later. The number of large emitters did not change significantly, nor did the total number of companies covered by the ETS during the three years of the pilot phase.

The CITL data-management program of the European Environmental Agency – EEA CITL Viewer – made it possible to determine how many installations had provided sufficient information about their emissions to the authorities in a particular year. Table 18 only includes installations, listed according to size, which had provided all necessary data.

It is interesting to note that in the year 2007, nearly one-third of all installations (30.71%) failed to provide adequate or comprehensive information about their emissions, which is significantly higher than the trend encountered during the first two years of the scheme (7.6% and 9.6%). In the author’s opinion, there were cases every year of certain installations failing to observe the April 30 deadline for submitting their information. This appears to explain the significant difference quoted above; in other words, when the EEA was preparing – and then publishing – its CITL data-management
program, full sets of emissions data were not yet available for the final year of the pilot phase. It may be hypothesized that this information was submitted after the April 30 deadline, but was then not included in the database.

Companies which failed to meet their reporting requirements completely belonged above all to the energy sector (15, 16 and 52 companies, respectively) and the construction industry (3, 6 and 14 companies, respectively); in 2007, three steel and iron industry companies, four cement industry companies and three glass industry producers failed to fulfill their obligations. On the whole, the emissions output of these installations is negligible when compared to the size of the entire Hungarian ETS market.

Table 19. shows a breakdown, by sector and size, of installations providing all necessary information in 2005. (The author believed it more prudent to use data from 2005 rather than to rely on averages, since 2007 was especially high in terms of non-compliance with reporting requirements.) The energy sector is the only one, which includes installations representing all size categories; oil refining (MOL) and coking (Dunaferr) can only boast one large and one medium emitter. As far as metal ore production is concerned, two medium installations emit all regulated carbon dioxide. In cement production, the number of medium emitters is approximately equal to the number of large emitters; in ceramics manufacturing, “de minimis” and small emitters share the same amount of emissions.
<table>
<thead>
<tr>
<th>Sector</th>
<th>Zero emitters</th>
<th>„De minimis“ emitters</th>
<th>Small emitters</th>
<th>Medium emitters</th>
<th>Large emitters</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy production</td>
<td>1</td>
<td>1%</td>
<td>44 30%</td>
<td>66 45%</td>
<td>30 20%</td>
<td>7 5%</td>
</tr>
<tr>
<td>Oil processing</td>
<td>0</td>
<td>0 2%</td>
<td>0 2%</td>
<td>0 2%</td>
<td>1 100%</td>
<td>1</td>
</tr>
<tr>
<td>Coking</td>
<td>0</td>
<td>0 2%</td>
<td>0 2%</td>
<td>1 100%</td>
<td>0 2%</td>
<td>1</td>
</tr>
<tr>
<td>Metal production</td>
<td>0</td>
<td>0 2%</td>
<td>0 2%</td>
<td>2 100%</td>
<td>0 2%</td>
<td>2</td>
</tr>
<tr>
<td>Steel and iron production</td>
<td>0</td>
<td>2 38%</td>
<td>3 38%</td>
<td>4 13%</td>
<td>1 13%</td>
<td>8</td>
</tr>
<tr>
<td>Cement production</td>
<td>0</td>
<td>0 2%</td>
<td>0 2%</td>
<td>4 57%</td>
<td>3 43%</td>
<td>7</td>
</tr>
<tr>
<td>Glass production</td>
<td>0</td>
<td>2 33%</td>
<td>4 44%</td>
<td>2 22%</td>
<td>0 2%</td>
<td>9</td>
</tr>
<tr>
<td>Ceramics manufacturing</td>
<td>1</td>
<td>2%</td>
<td>24 51%</td>
<td>22 47%</td>
<td>0 2%</td>
<td>47</td>
</tr>
<tr>
<td>Paper production</td>
<td>0</td>
<td>2 17%</td>
<td>3 50%</td>
<td>2 33%</td>
<td>0 2%</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td>1%</td>
<td>75 33%</td>
<td>98 43%</td>
<td>42 18%</td>
<td>12 5%</td>
</tr>
</tbody>
</table>

Table 19. Emitters categorized according to sector size

Source: author’s calculation based on the EEA “CITL Viewer”

In Hungary some 250 installations participated in the pilot phase of the EU emissions trading system; two-thirds were involved in energy production, one-fifth represented the ceramics manufacturing industry, and less than ten installations belonging to other sectors were party to the scheme.

**The Concentration of the Hungarian EU ETS Market**

The following section will examine the concentration of the Hungarian carbon dioxide emissions market based on information obtained from the CITL and the Hungarian National Allocation Plan. Figure 27. provides a cumulative overview of Hungarian installations’ allocations. The pie chart makes it quite clear just how concentrated the Hungarian EU ETS market is. One single installation received nearly one-fourth (22.5% – Mátra Erőmű) of all Hungarian allowances. A further four installations (five total) obtained almost one-half of all allowances allocated in Hungary (48%). Twenty allocations shared exactly three-fourths of all grandfathered allowances. And 60% of all Hungarian installations received 95% of the allowances in Hungary. This heavy concentration is not a feature that is unique to Hungary. An examination of the entire ETS market reveals similar results (Trotignon and Delbosc, 2008, p. 26). On an EU level, one company received 6% of all allowances, ten companies obtained 33%, 50 companies received 62%, 500 were given 93% of the total, and the remaining 6% were shared by over 4000 companies.
In Hungary, the energy sector received nearly three-fourths of all allowances – the ETS market is also rather concentrated if broken down by sector (see figure 28). Cement, iron and steel production, and oil refining accounted for 9%, 7% and 5%, respectively, of Hungary’s total allocations during the three years of the pilot phase. The other five sectors received 3% and 1% each of the grandfathered allowances. The same appears to hold true on an EU level as well (Trotignon and Delbosc, 2008, p. 19); the energy sector received 70% of the allocations, cement production obtained 9%; iron and steel production and oil refining each received 8%.
In Hungary 55% of the allowances grandfathered during the pilot phase were received by seven installations; interviews with representatives of all seven were conducted to analyze the system. The Mátra Erőmű obtained nearly one-fourth of all allowances allocated in Hungary. The Dunamenti Erőmű received 9%, two other power plants obtained 6% and 5%, Dunafer received 6% and MOL received 4% of the grandfathered allowances. These seven installations received over 60% of the allowances dedicated to the energy sector, 88% of the allowances that went to iron and steel producers, and 100% of the allowances which ended up in the hands of oil refiners. The pie chart on the right, below, shows that these seven installations were the recipients of a significant portion of the allowances that went to the three largest sectors.

Figure 29. The breakdown of allocations in the Hungarian EU ETS market
Source: author’s calculation based on CITL data

It is important to examine the allocation process also with respect to companies and corporate groups. By linking the individual installations with companies and corporate groups, it becomes clear, once again, that the Hungarian market is concentrated also from this perspective. The Mátra Erőmű is the biggest market player, both in terms of the Hungarian market and in terms of the biggest sector (energy production), with 22%. By linking allocation data with corporations, multinational companies also enter the scene: the French Electrabel (9%), EDF (3%), E-ON (2%), the American AES (8%), and the Swiss ATEL (3%) are all present.

The share of two cement-industry multinational companies is also significant in the Hungarian ETS market: Heidelberg (5%) and Holcim (3%) have a strong presence. Dunafer (8%) is the most significant Hungarian steel and iron producing company, while the MOL group (7%) is the only ETS participant of the Hungarian oil refinery industry.
Thus, the carbon dioxide emissions allowance market is a rather concentrated one, as far as sectors, companies and installations are concerned. In Hungary, over 70% of allocated allowances are accounted for by barely 4% (Hungarian Meteorological Service, 2008) of the installations, which are predominantly power plants.

**The Positions of Hungarian EU ETS Sectors**

The positions of the various sectors are examined by researchers in the literature by comparing verified emissions and allocated allowances; Ellerman and Buchner (2008) subtract the quantity of verified emissions from allocations. Anger and Oberndorfer (2007) consider the ratio of the two quantities to be the best indicator, and refer to this figure as an allocation factor. In the literature, installations facing a shortage are said to be in a short position, whereas installations with a surplus are said to be long.  

\[
\text{Position} = \text{allocation} - \text{verified emissions}
\]

The difference obtained when allocations and verified emissions are subtracted from each other serves to show whether the particular installation was facing a surplus or a shortage during the

---

27 The data examined pertain to the initial allocation, and do not contain new entrants or the allowances grandfathered to them. Thus, it may actually happen that certain installations only appear to be short because they were not considered in the first place. The quantity of allowances allocated in Hungary to new entrants during the pilot phase, however, is not significant (0.18%), and does not distort the other findings of this dissertation.
given time period. The two figures below show the positions of Hungarian sectors during the pilot period (figure 31 provides figures in million tonnes; figure 32 lists percentages). As the three-year pilot phase is relatively short, and allocated quantities were identical every year, installations’ aggregate figures are shown here for the entire period. Positive values denote that the particular installation received more allowances than the quantity of verified emissions (“long”). If the opposite holds true and the installation was facing a shortage, negative figures are shown (“short”). The “position” indicated in the figures indicates the overall surplus or shortage of all installations belonging to that sector. In Hungary, every sector – taken as a whole – had a surplus, although individual installations may have been faced with shortages. This is most easily seen in the energy sector; a shortage of some four million allowances was offset by a surplus of over ten million allowances – thus, taken as a whole, the sector had a surplus of 6.5 million allowances.

![Figure 31. The positions of Hungarian ETS sectors (million tonnes)](image)

Source: author’s calculation based on CITL data

The surplus, shortage and position of the various sectors is more clearly illustrated in figure 32, where values are shown as percentages. With the exception of ceramics manufacturing, as well as iron and steel production, all sectors had both installations facing a shortage and installations with a surplus. Taken together, their positions show up as a slight positive.
Figures 31 and 32 clearly show that Hungarian installations obtained more allowances than would have been required to cover their verified emissions during the pilot phase. Iron and steel production had the biggest surplus (50%), while the oil-refining industry obtained the smallest surplus (2.5%).

So-called relative positions may also be defined within each sector, indicating allocations within the sector (Ellerman and Buchner, 2008). The relative position thus shows the ratio of net positions and gross positions.

\[
\text{Relative position} = \frac{\text{Net (long) position}}{\text{Brut (long) position}}
\]

The ratio is negative if the particular country, sector or installation is facing a shortage; a positive ratio indicates a surplus. A negative ratio is a sure indicator that in the particular country or sector, allowances were not over-allocated. It is possible that certain installations were in a long position; but this is offset by the shortage of other installations. Only net long positions could be observed in Hungary during the pilot phase; no sector was found to experience a shortage in this period. This is the reason why the formula above shows that only long positions were compared in the case of Hungary. As figure 33 shows, Hungary’s relative position on the whole is 0.74. The high positive value is merely an indicator that Hungary possessed a surplus (number greater than zero) and that only a handful of Hungarian installations faced a shortage during the pilot phase (high number).
Ellerman and Buchner categorize individual countries based on their ratios; after examining Hungary’s position, their conclusion was that allowances were over-allocated in Hungary. In Hungary, the paper industry was the only sector during the pilot phase, which saw a surplus in every single installation (relative position = 1). In the cement industry and in steel and iron production, the number of installations facing a shortage was essentially negligible (0.981 and 0.997, respectively). Among coking plants, Dunaferr’s three installations had the greatest shortage among all Hungarian installations; this was indicated by the low number (0.3), meaning that this sector was the least over-allocated.

Anger and Oberndorfer (2007, p. 3) define their so-called allocation factor for every sector and every installation. In their ratio, the numerator is the quantity of allocations during the pilot phase, while the denominator indicates the quantity of verified emissions. A factor greater than one indicates a long position, whereas a factor less than one shows a short one. In Hungary, there was no installation with a ratio equaling one – which means not a single installation emitted the exact amount, which was permitted for it by the National Allocation Plan. (On a European level, this happened in thirteen instances, which in itself is also a rather low figure compared to some twelve thousand participating installations.)

\[
\text{Allocation factor} = \frac{\text{allocation}}{\text{verified emissions}}
\]
Figure 40 below shows the allocation factors of the various Hungarian sectors. This figure clearly shows, once again, that every sector, without exceptions, possessed a surplus; i.e. they were grandfathered more allowances from the GOH than the amount that would have been required for covering their actual emissions. If all sectors are examined, the overall allocation factor is 1.15. Hungarian ETS participants were thus in possession of a surplus, overall.

Naturally, the two formulas produce the same result. In Hungary, 52 installations were short; 191 installations were long. (There is no point in performing these calculations for installations, which were not grandfathered allowances in the first place.) In eighteen cases, the allowances received were significantly higher than the verified emissions; in one Wienerberger brick factory, they were actually over five thousand times higher. Bakonyi Bioenergia Kft. received twenty times the amount than it would have required. The author’s interview with the plant manager revealed that this surplus was a result of the authorities’ mistaken categorization of their production plants.

In the author’s opinion, the Ellerman-Buchner indicator is more relevant – and more useful for this analysis – because it indicates not just the positions, but also the relative positions, of the sectors. As a comparison of the figures above shows, all Hungarian ETS sectors, when taken together, were long; the Ellerman-Buchner relative position shows, however, that there were some short installations in Hungary, even if the particular sector on the whole was long. With the exception of the paper industry, however, every sector had at least one installation, which received more emissions allowances than it eventually ended up using; there was also at least one installation, which received less emissions allowances than it would have required (see figure 31). Overall,
Hungarian participants were able to rely on a surplus of 14%, which amounts to 12 Mt of CO\textsubscript{2} emissions allowances.

It is important to emphasize that this approach, too, has its disadvantages, in that in every case when allocations are greater than actual verified emissions, one supposes an over-allocation. This is not necessarily true in every case, however; a so-called long position in and of itself does not necessarily point to over-allocation. Installations that abated their emissions so that they may bring their surplus allowances to the market, or so that they may ration these for later use ("borrowing"), were also long, and thus ended up being listed as over-allocated installations. Actually, the comparison of these two quantities on the level of installations does not indicate whether over-allocation took place, or it is simply a case of emissions-abatement. Ellerman and Buchner cover this in their article (2008), define the concept of over-allocation, and point out that it is impossible to tell without a reliable reference level whether an installation in a long position has been over-allocated. To determine a reference level, they attempt to lay down, in their article, a so-called "business-as-usual" (BaU) scenario, supposing a counterfactual type scenario. Discussing this is beyond the scope of this dissertation, especially in light of the brevity of the pilot phase and its non-representative nature.
3.2. The Impact of the EU ETS on Hungarian Participants

Representatives of the Hungarian ETS sectors do not see the EU’s carbon dioxide trading scheme as a solution to the global problem of climate change. The uncertainty resulting from regulations is the biggest risk of the scheme: the system is not a clearly defined one, neither on the level of the Commission, nor on the level of states. Regulations were laid out as the pilot phase was already in effect; deadlines were not observed, and the system thus generally became unpredictable for participants. At the same time, the brevity of the pilot phase – much shorter than what would be advantageous in terms of economic decision-making – and further uncertainty resulting from the volatility of EUA prices (e.g. the steep drop in April 2006) made it difficult for carbon dioxide pricing to become ingrained in business decision-making. Nonetheless, the first three years of the EU ETS did have an effect on Hungarian sectors, and carbon dioxide emerged as an important factor in business life.

This section of the dissertation will discuss the impact of the EU emissions trading scheme on Hungarian sectors. Based on criteria used in previous studies and the author’s personal discussions, this section will also examine the assessment of the EU ETS pilot phase from the point of view of the participants. The initial willingness of Hungarian companies to participate in the scheme was rather low; in most cases, it was exactly the uncertainties of the system, which raised the interest of companies. Throughout the Eastern region, most installations were hoping to fulfill their Kyoto obligations without having to take additional steps toward the reduction of GHG emissions. Hungarian companies looked upon the trial period of the EU ETS emissions scheme as an administrative burden. The questionnaire used for the survey showed that obligated companies, in general, did not wish to begin trading with emissions allowances, but focused rather on ensuring a sufficient number of units to cover their own CO₂ emissions.

The author examined the effect of the EU ETS, in Hungary, on driving and motivating innovation; the pilot phase, however, did not bring about the kind of technological or operative change which would not have taken place had the system not been introduced. In examining the effects of the scheme on the competitiveness of Hungarian sectors, the author wishes to call attention to the so-called leakage effect. Hungary lies at the periphery of the ETS market – it is thus a realistic possibility that carbon dioxide emitting operations could be shifted outside of the country’s borders. The overall impact of the EU ETS on Hungarian companies during the pilot phase was not especially significant. Its effect on company operations was mostly limited to fuel switching. Only

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28 This approach was confirmed by Tomas Chemlik in connection with Czech experiences with the EU ETS and Tomas Zylicz in connection with Poland – “goal already achieved, no further effort needed” (Chemlik, 2008).
one of the companies approached for the survey introduced the costs of carbon dioxide emissions into its operative and investment decision making processes. The interviews conducted for this dissertation revealed a practice, which is otherwise contrary to economics theories: Hungarian companies did not effect significant reductions in emissions as a result of the EU ETS.

An Administrative Burden – Or Opportunity for Profit?

Hungarian companies did not have to take special measures in order to comply with the scheme. (This did not hold true for Western European installations facing a shortage, which either had to abate their emissions or increase their emissions allowances to ensure compliance.) It is difficult to ascertain the attitude and reactions of installations and companies possessing a surplus. It is unclear whether the decision to focus simply on compliance is part of a conscious strategy (i.e. allowances are banked for future years, or saved for later in the hope of selling at a higher price then), or allowances simply did not matter to these participants. Unsold allowances also have an opportunity cost if the market price during the following year is lower (Trotignon and Ellerman, 2008, p. 22). Did Hungarian businesses possessing a surplus recognize this?

The author used her personal discussions with Hungarian ETS participants to learn just how participants viewed the scheme. Did they only see the administrative burdens inherent in the new regulation – or did they look upon the carbon market established as a result of the EU ETS as a marketplace where further profit can be realized? Hungarian companies were able to make a profit by selling their surplus allowances, or by further reducing their emissions. It has become clear, after the interviews conducted for this research, that market participants who realized emissions reductions with the goal of freeing up allowances were few and far between. Only one power plant, which switched to the use of biomass during the first year of the pilot phase, had this goal in mind. It was motivated purely by financial interests – the goal being to enter the market as a seller, offering surplus allowances. Another power plant also made a significant switch to biomass during the first year of the system, but – according to their own statements – they resorted to this more out of a fear of ending up short, and not out of a realization that a profit could have been made.29

The majority of companies focused on compliance with regulations, rather than on maximizing their profit from selling their allowances. When asked about the impacts of the scheme on their profits, Hungarian installations only mentioned their expenses related to the regulation, but failed to mention possible profits resulting from selling allowances. It was the author’s impression during the

29 This power plant, in 2005 – which year served as the basis for the Kyoto period allocation – emitted a considerably lower amount than before, due to the use of biomass in great quantities. When it was realized that 2005 data would serve as the point of reference, it requested a correction of its heating value data, thereby increasing its 2005 emissions retroactively.
interviews, that companies looked upon the quantity they were grandfathered more as a maximum emissions level, and did not even consider that it may be lucrative to realize additional reductions in emissions. Almost all of the company executives approached announced that pilot phase allocations do not pose a risk to their companies, but added that they are afraid of the next periods, beginning in 2008. Hungarian installations looked above all at their original allocations as standards for the pilot phase, and did not recognize that by reducing their emissions, a profit was to be made. They failed to understand that as long as it is less costly for them to abate one tonne of CO₂ than its market price, that should be the way to go. It is also important to add, however, that by the end of the pilot phase – and the beginning of the Kyoto period – this attitude, too, appears to be changing. In the author’s opinion, this only serves to confirm that grandfathering allowances is not necessarily the most effective solution; even if, according to the relevant theory, companies should not treat these allowances any differently from allowances purchased for a price. Thus, for companies participating in the scheme to realize the opportunity costs of allowances, it would be necessary to increase the share of allowances allocated for a cost.

It may be concluded that, in connection with emissions trading, companies do not necessarily have to view the price of carbon dioxide as a tangible financial expenditure, but rather as an opportunity cost. For companies, the fact that emissions were assigned a price as a result of the system did not mean additional expenditures; this cost, however, is a factor which a company out to maximize its profits should consider in its calculations. In the future, the company would have to weigh the benefits of either increasing its emissions quota by one allowance or selling the allowance instead. In Hungary, then, during the first trading period, a sufficient number of allowances was available; power plants and installations emitting carbon dioxide did not see their expenditures change as a result of the introduction of the scheme. Table 20 shows that Hungarian companies could have realized revenues of almost 125 million EUR during these three years had they sold all their surplus allowances on the market in the year when they were freed up. The EU ETS offered Hungarian companies the potential of realizing a serious profit.

<table>
<thead>
<tr>
<th>Potential profit</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net surplus (tonne)</td>
<td>4,074,524</td>
<td>4,390,258</td>
<td>3,400,668</td>
</tr>
<tr>
<td>Average price (EUR)*</td>
<td>20.18</td>
<td>9.57</td>
<td>0.14</td>
</tr>
<tr>
<td>Possible revenues (thousand EUR)</td>
<td>82,223.9</td>
<td>42,014.8</td>
<td>476.1</td>
</tr>
</tbody>
</table>

Table 20. The potential profit for Hungarian sectors
Source: author’s calculation based on CITL data average EUA prices

The system promised significant revenues not just for companies, but also for the government. The central budget realized a profit from different revenue categories:
• from the sale of emissions allowances (total budget revenues resulting from the two auctions: 10 million EUR);
• from the account management fees the owner of the Registry is entitled to (see Appendix VIII for figures);
• from the supervisory fee the central authorities are entitled to (some 850 EUR);
• from fines (40 EUR per tonne in case of non-compliance; in the next period, the installation would receive a proportionally lower amount).

* * *

The answer to the question posed in the title of the section is, thus, that Hungarian companies looked upon the EU ETS in its pilot phase more as an administrative burden. They pursued cost-minimizing strategies, and strove to reduce their costs, while focusing on compliance. This does not contradict the fact that the companies sold their surpluses, at the same time. It is more important to emphasize that the majority of Hungarian companies failed to recognize that by achieving further reductions in their emissions, allowances that may be sold are freed up, enabling them to increase the company’s profits.

Thus, emissions trading, in addition to other implications, is also a serious business opportunity for participating companies. In order to make full use of these opportunities, obligated companies must develop at the earliest possible point their optimal emissions allowance management scheme. By using emissions allowances carefully and in accordance with the company’s investment policies, obligated installations are even able to realize a profit from reducing their emissions.

The EU ETS as a Driver of Innovation

When the trading of emissions allowances was introduced, it was supposed that the scarcity of allowances will act a driving force of innovation, and companies will develop and realize new technologies to ensure their compliance and to make their own productions more efficient and less polluting (Lacombe, 2008). Hungarian sectors, however, did not face a shortage of emissions allowances – there was thus no scarcity that would force companies to change their technologies or production.

Most studies that examine the EU15 (Gagelmann and Frondel, 2005; Schleich and Betz, 2005; Oberndorfer and Rennings, 2007) expected the EU ETS to have but a modest impact on innovation, and believed the pilot phase was lacking the motivational factors, which would have driven companies to develop low-emissions technologies. This expectation was confirmed by the leniency of the system during the pilot phase and the ample supply of emissions allowances. In Hungary,
neither emissions-reduction targets nor the scarcity of emissions allowances acted as a driving force of innovation.

A study conducted by the European Commission, McKinsey and Ecofys (2002) showed that approximately half of all companies believed the EU ETS has a strong or moderate effect on decisions targeting the development of innovative technologies. An examination of Hungarian market experiences reveals, however, that the price of carbon dioxide was not high enough during the pilot phase to spur Hungarian businesses’ innovation. Also, the quantity of available allowances proved to be more than sufficient, and this also provided little impetus for businesses to develop innovative solutions. There were, certainly, a handful of companies that adopted new technologies or introduced some minor, innovative, solutions; but it would be difficult to find a direct correlation between these steps and the EU ETS. These processes appear to have been, rather, business-as-usual measures. The interviews conducted by the author also revealed that the innovations realized during the pilot phase would have been introduced even had the system not been put in place; the author encountered no solution that was driven purely by the introduction of the EU ETS. It is possible that the scarcity, which companies may experience during the next phase, will lead to the development of innovative solutions; but this is a topic to perhaps address in a different study.

The method of carbon capture and storage (CCS) is a hotly contested solution and is still being examined. This approach, essentially, means that emitted CO₂ is captured and then injected – stored – underground or beneath an ocean (or even inside Iceland’s ice surfaces). This is not a topic to address in this dissertation in greater detail. The international literature, however, is showing increasing interest in the issue, which is continuously being challenged by environmental groups, on the other hand. This is certainly an innovative solution as far as reducing the quantity of carbon dioxide that is amassed in the planet’s atmosphere; in Hungary, it would only become an economically viable option if the price of carbon dioxide reached 120 EUR, according to Péter Kubus, the expert in charge of MOL’s CCS research. This is one of the highest prices throughout the EU. The Geological Institute of ELTE University has conducted a coordinated study of exhausted Hungarian oil and natural gas fields and found that of the country’s 180 such fields, only 20-25 could be used for the storage of CO₂. The total capacity of these installations would be 200-300 million tonnes, meaning it could only offer storage capacity for Hungary for 5-6 years. The innovations of this method cannot necessarily be tied directly to the EU ETS pilot phase, and much research will still be required for this technology to become economically viable and safe.

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The Impact of the EU ETS on the Competitiveness of Participants

In the author’s opinion, the leakage effect is the most important issue to discuss when examining the effects of the EU ETS on Hungarian sectors. Leakage refers to the phenomenon of moving production from an area regulated by the EU ETS to an area where these regulations have no affect. Hungary lies at the periphery of the EU ETS zone; its exposure, thus, to the phenomenon of leakage is especially significant, as confirmed by the experts interviewed by the author. As it were to turn out, both the oil refining industry and the cement sector\(^{31}\) include suggestions in their long-term strategies for moving their carbon dioxide emitting productions to areas outside the geographic reach of the EU ETS, where no additional costs are associated with the emission of such pollutants. The moving of carbon dioxide emitting operations is significant not only because doing so may reduce Hungarian and European GDP, but also because it threatens the environmental integrity of the EU ETS. Although the system may meet its targets for reducing emissions, the emission of harmful substances will only increase on a global level, due to the lower efficiency of Eastern installations.

The manager in charge of strategy and technology at Dunaferr mentioned that carbon dioxide emission is an integral component of oil processing, and is thus considered “technological” emission. There is only one way to reduce this, and that is by reducing production as well, or eventually shutting down installations (Lukács, 2008). Péter Lukács explained that the possibility of closing down the company’s Dunaújváros plant was considered during the pilot phase; its operations could be moved to the Ukraine, where there are no carbon dioxide costs to consider as the country is not party to the EU ETS. If Dunaferr does double its production capacity by limiting its production in Hungary to a half of the previous amount – and the other half is covered through imports from the Ukraine – the emission of carbon dioxide on a global scale will surely increase, even if the EU ETS does show a drop at the same time. Although production in the Ukraine is less efficient and is much more CO\(_2\)-intensive (i.e. more CO\(_2\) is emitted to produce the same amount of steel), it will still be lucrative – thanks to allowance prices – to shift production across the border. On a global level, this would actually lead to greater pollution of the environment through increased carbon dioxide emissions. The world would see more carbon-intensive and less efficient emissions, and efficient production would drop.

This fear – and consideration – was shared by the chairs of the cement industry and the steel and iron industry interest groups. Although the pilot phases ended neutrally as far as their production

\(^{31}\) In the cement sector, for instance, the area where it is still viable for the company to deliver its product is a circle with a radius of 200 km; cement produced in the Ukraine thus poses a threat to cement production in eastern Hungary, while cement produced in Serbia does likewise to cement plants in the southern part of the country.
was considered, since they all obtained a sufficient quantity of allowances to cover their emissions, they are already considering moving their operations beyond the borders of the country. It is important to note that during the pilot phase, Hungarian installations obviously had no interest in reducing their production, as emissions allowances for the next period will be determined by these figures. If they had decreased their emissions already during the pilot phase, or if they had already shifted their operations outside the EU ETS zone, that would only have led to yet more scarce allocations for themselves during the second period. Several suggestions were presented for the avoidance of leakage and on how to resolve this issue (e.g. introducing order adjustment measures or import limitations – see Katayama and Ursprung, 2004; Cendra, 2006; Ismer and Neuhoff, 2007; Neuhoff and Droege, 2007). From the perspective of Hungarian industrial production and economic expansion, and from the perspective of the environmental objectives of the EU ETS, it is vital that political decision-makers consider these risks.

Representatives of production sectors told the author during the interviews that – with the exception of the energy sector, which passes on allowance prices to consumers – the system places a burden on every sector; they expressed their concern that the region will end up at a disadvantage compared to cheaper production conditions to the east. In Hungary, however, as a result of long-term power purchase agreements signed well before the introduction of the EU ETS, passing on CO2 costs to consumers is not necessarily evident, as the author found in her discussion with Vilmos Civin, head of the Environmental Department of the Hungarian Power Companies Ltd. (MVM). In Hungary, approximately two-thirds of the power produced is sold to MVM through long-term power purchase agreements. This solution limits competitiveness, according to EU legal practices, and these agreements must therefore be denounced by the end of 2008.

In Hungary’s neighbors to the West, CO2 costs can easily be passed along to consumers, given that the energy markets there are liberalized. The opposite holds true in the Eastern region, where the energy market was not yet entirely free during the pilot phase. The EU ETS does not raise energy market prices directly, since selling is conducted based on prices contained in pre-determined and long-term contracts. Free allocation, then, actually appears to be a fairer solution, in light of this; as the market becomes liberalized, however, the justification for grandfathering allowances becomes questionable. (This is one important difference between old and new members of the EU.)

In a Point Carbon article32, György László – chair of the Professional Alliance of District Heating Providers – confirms the same. Viktor Rudolf, senior engineer of the Budapest Power Plant, also emphasized the burdens the EU ETS places on district heating plants. District heating produces both

heat and electric energy at the same time; cogeneration in this way is very efficient, and also emits some 30-35% less CO₂ (Rudolf, 2008). Hungary emits 1.782 million tonnes less CO₂ per year because district heating is used, writes Point Carbon. As a result of increasing costs, however, more and more households are looking for ways to sever their ties to the district heating system; smaller and less efficient furnaces will thus be installed in residential buildings, and – due to their size – these units will not belong to the EU ETS. Once again, it will appear on paper as though the emissions of the Hungarian EU ETS sector are dropping; at the same time, however, emissions will actually be increasing as a result of inefficient energy use in sectors not regulated by the scheme. The above-mentioned article points out two potential risks to competitiveness: on the one hand, the market share of district heating plants is declining, as consumers are switching to cheaper heating solutions. On the other hand, as the article points out, the other risk is the increasing reliance on Russian natural gas, which may put the Hungarian energy sector at a disadvantage. According to György László, this cheap, Russian energy source did not succeed in taking the lead during the pilot phase, as a result of the abundance of allowances; experts expect this to change, however, during the Kyoto period. Every Eastern country is afraid that Russian natural gas is gaining ground; this is a concern not only as far as competitiveness is concerned, but also in terms of the energy security of the region. EU regulations are becoming stricter and emissions-reduction targets in Eastern Member States call for increasing the import of natural gas, since burning natural gas still results in significantly lower CO₂ emissions than reliance on Hungary’s abundant coal resources. September 26, 2008 saw the governments of eastern Member States – Bulgaria, Poland, Hungary, Romania and Slovakia – join forces to establish the Eastern Partnership to better represent their interests within the European Union.

Companies’ competitiveness is affected by the implications of the scheme on the companies’ profitability. The pilot phase did not entail any expenses, and it thus did not affect profitability. Even though Hungarian participants received a sufficient number of allowances and emissions trading did not really increase their expenses, the price of CO₂ could have become figured into their prices had the companies considered that to be an element of maximizing their profits. This, however, did not occur during the pilot phase; Hungarian companies, taken as a whole, looked upon CO₂ allowances more as negligible goods. The introduction of these allowances entailed neither late revenues nor late expenditures. Certainly, emissions trading also affects those sectors which are not participating in the trading directly. Large consumers of electric energy could be affected by a

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34 Declaration of the ministers and Secretaries of State responsible for European affairs of Bulgaria, Hungary, Poland, Romania and Slovakia, Warsaw, September 26, 2008.
spillover effect; this, however, could not be observed in Hungary during the pilot phase, due to ample allowances and to long-term electric power purchase agreements.

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As the pilot phase did not see any significant carbon dioxide emissions caps put in place, it is more worthwhile to examine companies’ competitiveness mainly in the medium and long term. The three years of the pilot phase were not enough to draw any far-reaching conclusions from. On the whole, the effect of the EU ETS on the competitiveness of Hungarian sectors was basically neutral, thanks to a plentiful allocation of allowances. Nonetheless, every sector expressed concern about the stricter allocation plans for the period beginning in 2008 and for the additional pressures they will have to face. Number one among these, according to those interviewed by the author, is shifting production to beyond the borders of the country and placing Hungarian producers at a disadvantage as a result.

The Impact of the EU ETS on the Behavior of Hungarian Participants

According to the author’s survey of Hungarian participants, Stuetz (2008) was correct in declaring that the obligated parties of the European carbon dioxide market are not really interested in trading, but focus instead on their core activities and, in the process, only cover their own CO₂ emissions needs. In his presentation, Stuetz presented the EU market as an ideal opportunity for both energy producers and industry participants. This matches the author’s findings – the emissions trading scheme is, above all, an opportunity for Hungarian installations, as it enables them to convert their surpluses into money. At the same time, the uncertainties of the pilot phase also carry risks, and these were mentioned by almost every respondent.

Hungarian participants see this uncertainty as one of the biggest hurdles to liquidity. Liquidity is driven by efforts at reducing emissions; many companies are afraid that their emissions-reduction efforts will be “punished” through modifications to the system introduced during the next allocation plan. That was one reason why many companies were reluctant to reduce their emissions during the 2005-2007 period. This has a negative effect on the liquidity of the CO₂ market.

The survey conducted by the European Commission, McKinsey and Ecofys (2005) shows that approximately 50% of the companies approached included the costs of carbon dioxide in their prices already at the introduction of the system; 70% believe this trend will continue in the future. It is interesting to compare this data with the results of the survey conducted among ETS participants by the author, and to consider whether the reason for the difference is simply a difference in mentality between Eastern and Western nations, or it is actually a result of the significant surplus in
Eastern countries. Of the large emitters surveyed by the author, only one company, an oil refiner – which also had an internal investment-assessment scheme in place –, included the costs of CO₂ in its decisions, and referred to this new cost factor during the pilot phase. Certainly, when discussing the anticipated\textsuperscript{35} scarcity of the Kyoto period, no respondent failed to mention that they were intending to include this new cost factor in their planning; on the whole, then, it may be surmised that the failure to include the costs of CO₂ in planning during the pilot phase was more a result of the abundance of allowances, and less a product of differences in mentality between Eastern and Western Member States.

The interviews conducted suggest that the switch to biomass from coal heating was the most frequent solution by Hungarian installations to the challenges posed by the introduction of the system. When asked whether any installations were shut down directly as a result of the introduction of the system, every respondent answered in the negative. This is not surprising; only a few installations were faced with a truly meager allocation.

It is interesting to examine the effects of the management of emissions allowances within the company on the organization’s response to the scheme, and how effective the regulation of emissions through tradable allowances proved to be. According to the author’s interviews, companies that distributed their allowances among company branches tended to manage them much less efficiently. On the other hand, companies where allowances were managed centrally and were traded on the corporate level, and the company was focusing on compliance, tended to be much more efficient. The oil company where allowances were managed on a central level was much more efficient. Company sections or branches had to obtain the number of allowances, at an internal accounting price, which would cover their emissions. Thus, the opportunity cost of allowances became a part of the company’s decision-making processes.

The impact of the scheme on the operation of companies and on corporate behavior appeared to reflect the extent to which a company’s management came to understand, and figure into their decisions, carbon dioxide emissions as a new factor of production, and as something with a price which can affect the company’s day-to-day activities. Companies surveyed – with one notable exception – failed to consider this new factor during the pilot phase, although, as they pointed out, they were prepared to consider the possibility of purchasing allowances on the market during the Kyoto period, which promises yet greater scarcity. In the author’s opinion, the majority of Hungarian companies asked failed to recognize that purchasing allowances is not the only way toward compliance. Few understood that abatement and switching to a new technology might also be lucrative steps.

\textsuperscript{35} At the time the survey was conducted (May 2008), allocation data for 2008-2012 were not yet available.
During the pilot period, Hungarian companies were not striving to maximize their profits. They were in no hurry to balance out their abatement marginal costs with the market price. Examining the pilot phase, it may be concluded that companies’ reactions to the introduction of the scheme were rather weak, which raises questions about the efficiency of the system. Clearly, the number of Hungarian companies interviewed by the author is negligible when compared to the number of all participating companies, making results not representative. Nonetheless, this suggestion may be worth considering.

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Based on the interviews conducted, it is the author’s conclusion that the introduction of the EU ETS had no significant impact on the operation or behavior of Hungarian companies during the pilot phase. The companies viewed the scheme as an additional regulatory burden, and paid more attention to the administrative duties it required than to the positive effects it could have had on participants (through the possibility of realizing profits from the sale of surplus allowances). The fact that CO₂ costs failed to become integrated into company price calculations is most likely due to the abundance of allowances available during the pilot phase.

The Impact of the EU ETS on Expenditures

No examination of the effects of the EU ETS would be complete without a discussion of the cost implications of the scheme. Based on the author’s interviews with representatives of the installations, it may be concluded that the carbon dioxide trading system posed no significant financial burdens for operators during the pilot phase. There are three kinds of transaction costs of the EU ETS (Convery et al, 2008). In Hungary, (1) expenditures prior to 2005 were negligible. (2) Administrative costs and (3) trading costs did not entail significant expenses for the companies. This section will offer an examination of two major kinds of administrative costs: fees and fines, and trading costs.

Operators are obligated by the relevant regulations to pay fees for the operation of the emissions trading system. Most Member States work to recover at least a part of their administrative costs related to the trading scheme by levying different kinds of dues on operators and person holding accounts. These fees imposed on operators, however, are generally insignificant compared to the value of the emissions allowances.

(1) Each operator pays a supervisory fee to the authorities. The revenues from these fees are put by the environmental authorities toward covering expenses related to the operation of the system, supervisory activities related to the regulations in place, maintaining required records.
and logs and expenses related to cooperation with other state authorities. During the pilot phase, this supervisory fee amounted to 3 HUF per emissions allowance. (Law XV of 2005, Section 19)

Participants of joint implementations projects are also required to pay supervisory fees. The amount of these fees depends on the total amount of planned emissions reductions during the pilot phase; 10 HUF per tonne of CO$_2$e allowance, but no less than 1.5 million HUF. (Law XV of 2005, Section 15, Paragraph 4)

(2) A *service provision fee* is to be paid for the permit procedure of GHG emissions, as well as for registration in the Registry of Auditors, the Auditor Expert Registry and the European Community Registry of Auditors, or for the termination or suspension of the auditor’s permit. (Ministry of Environment and Water Decree no. 32/2005, Section 1)

(3) An *account management fee* is to be paid for the official maintenance and monitoring of emissions allowances (Government Decree no. 143/2005, Section 15/A-C). “The basis of this fee is to be determined according the quantity of emissions allowances, per installation, provided for the particular year in the National Allocation List.” (Government Decree no. 143/2005, Appendix 2, item 2)

Hungary’s Law on Accounting includes the stipulation (Section 78, Paragraph 4) that official fees and other public administration fees are to be recorded for accounting purposes as *costs for other services*.

The other major types of administrative expenses are the penalties levied as a result of non-compliance. Operators are required to pay fines, of varying types and amounts, if they fail to comply with requirements outlined in the relevant legal regulations. These costs are to be listed, for accounting purposes, as other expenses; Appendix IV. provides a detailed list of possible penalties. Penalties must be consistent and predictable in order to act as efficient motivators of compliance. According to Article 16 of the directive, Member States are required to determine the actual penalties themselves. The EU directive provides the following guidelines for fines to be levied in case emissions are greater than allowed by surrendered allowances:

(1) The surplus-emissions penalty levied for each tonne of emissions emitted by the installation but not covered by surrendered allowances was 40 EUR during the pilot phase, but was raised to 100 EUR beginning in 2008. The payment of the surplus emissions penalty shall not exempt the operator from its obligation to surrender emissions allowances in a quantity corresponding to the surplus emissions, when allowances relating to the following year are surrendered. (Article 16 of Directive 2003/87/EC) The EU directive further stipulates that operators who fail
to comply shall have their names published – a provision referred to as “naming and shaming” in EC Directive 2003/87. This list shall be made available to the public, in an electronic format, until the obligation to surrender emissions allowances is met.

(2) Should the operator fail to track its GHG emissions and fail to meet its reporting requirements, or if it operates without possessing a valid emissions permit, the Inspectorate General may levy a fine up to 500 thousand HUF. (Government Decree no. 272/2004, Section 5, Paragraph 2)

(3) Should the operator fail to meet its reporting requirements or fail to report any changes in its operation, the Inspectorate General may levy a fine between 10 thousand and 50 thousand HUF. (Government Decree no. 272/2004, Section 5, Paragraph 3).

(4) Should the operator provide incomplete information or provide information past the relevant deadlines, the environmental authority may impose a fine between 10 thousand and 50 thousand HUF per day. (Government Decree no. 143/2005, Section 6, Paragraphs 3-4).

(5) Should the operator fail to pay the fees for the management of its holding account (see Appendix IV) on time, the operator shall be obliged to pay interest for as long as the fee is not received; the interest shall be two times 1/365 of the prime interest rate, as determined by the Hungarian National Bank, per day. Once interest on arrears has been paid, no further interest on arrears can be claimed. (Government Decree no. 143/2005, Section 15/D)

The most substantial financial burden related to the introduction of the scheme was actually the procurement or installation of certified mechanical devices for measuring emissions. Based on the discussion above, the introduction of the scheme was not preceded by a preparatory phase of training or instruction, which would also have posed a significant burden in terms of costs. The costs of verification were not seen as superfluous expenditures by the companies, since these assured their compliance and that the data they would be reporting will be correct. Some companies mentioned the fees of outside consultant experts, but these were not especially significant.

A further cost related to the system, in addition to the administrative expenses mentioned, is the cost of trading on the exchange. This, too, is relatively low, and is no higher than fees encountered at exchanges trading other goods. Trading 1 million tonnes, for instance, at Nordpool carries transaction costs of 0.015 EUR per allowance, for members; if the amount traded is higher than 2.5 million tonnes, this figure is 0.01 EUR. The fee used on the ECX is 0.002 EUR per allowance, but this is supplemented by an annual fee of 2,500 EUR.

The expenses listed above all apply to companies covered by the system; but they are not the only ones who had to face costs related to the scheme: the GOH also had to pay. The first category of
costs to be borne by the state (1-3 below) are one-time expenses; another type are annual operating costs (item 4 below); and the third category is the cost, to the state, of auctioning allowances (item 5). The figures included in parentheses below (items 1-4) are based on a 2003 study by the Ministry of Environment and Water.

1. Establishing the transaction registry – procurement of hardware and software, localization and installation of the system, user training. (73 million HUF)
2. Establishing the permit, monitoring and supervisory system – granting permits (70 million HUF)
3. Compiling the allocation plan and allocating allowances (58 million HUF)
4. Annual operating costs of the transaction log and the permitting, monitoring and supervisory system (117 million HUF)
5. Costs to the state of auctioning allowances (2-3 million HUF)

The grand total of these costs is 320 million HUF – a relatively small amount compared to revenues of 2.5 billion HUF from the auctions held. The conclusion, then, is that the GOH made a good deal with the introduction of the EU ETS.

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In sum, it can be stated that neither installations nor the state were faced by substantial transaction costs related to the system. It can also be concluded that the amounts of the costs involved posed no hindrance to the trading of allowances. It is also important to note, however, that every kind of fee poses a much greater burden for smaller companies; it may be worth simplifying, during future periods, the monitoring, reporting and verification costs of small emitters.

The Impact of the EU ETS on Operative and Investment Decisions

Several studies have attempted, by examining the cost implications of different technologies, to assess the impact of the EU ETS on the operative and investment decisions of companies involved in emissions trading (see section II/3.1). The three-year pilot phase of the system in Hungary had no tangible impact on companies.

Operative Decisions

It is worth examining just what effect, if any, the pilot phase of the system had on the operation of companies. Surprisingly, none of the companies surveyed by the author in 2008 hired new staff to deal with matters related to the introduction of the system. Every installation managed to solve these tasks in-house. In most cases, it was not one dedicated staff member who dealt with the EU ETS, but it was the concerted effort of a team which was required. This does not make it easy to
react efficiently to regulations. The division and sharing of labor in this way is necessitated by the complexity of the data and the information involved: emissions data are recorded in one location, whereas the accounting of allowances is done elsewhere by a different unit, and a third department may be responsible for the trading of allowances. Most important, naturally, is the flow of information, and this is not something one single individual can be responsible for; but the coordination of different organizational units is critical to the success of the scheme.

Most companies, the author found, chose the member of the staff for these tasks who had already collected experience with the system previously – through the JI project, for instance. In many cases, it was difficult for the author to find just who the individual tasked with these duties is. In many cases, the individual listed in the Allocation Plan did not even know that they had been provided as the point of contact. The positions held by the individuals responsible for the system also varied greatly: the author met Fuel Managers, Consultants, Senior Engineers, Group Trading Directors, Managing Directors, Energy Traders, Deputy CEOs in charge of strategic and technical issues, Environmental Managers, Deputy Department Heads, Chief Economists, Energy Directors and Trade Officers – all of whom were responsible at their particular company for EU ETS issues. There were companies where oversight of the system belongs under the purview of an environmental protection office, while a separate CO₂ accounting office also exists; in some cases, an Environmental, Health and Safety office is responsible for the scheme. And in some cases, the trading office is responsible for the EU ETS. Finally, there was also a company where an internal consultant was tasked with all administrative matters related to the scheme.

Generally, Hungarian companies included EU ETS issues in their regular decision-making processes; in most cases, however, investments aimed at the abatement of emissions, as well as decisions related to the purchase or sale of allowances, required approval from the senior leadership of the company. In the author’s opinion, it is not necessarily prudent to separate decision-making responsibilities in this way, as doing so may, in some cases, lead to results which are ultimately at odds with the company’s interests. For instance, if a lengthy approval process is required to sell or purchase allowances, that makes it difficult to do so, and to do so quickly, and react to changing market prices. Or, also, if monitoring emissions and allowance trading is not done by the same unit or the same individual, the company may not necessarily receive an appropriate number of allowances.

Nonetheless, the EU ETS pilot phase introduced, without a doubt, real changes to the way companies do business. Above all, they had to establish a monitoring system, set up a registry for monitoring CO₂ emissions, and had to procure the software and measurement devices necessary. Hungarian companies, for the most part, did not wish to take risks; in most cases, they prepared an
estimate of the number of allowances they will require to meet their production demands, and then put in a request for a somewhat greater amount at the beginning of the period. The general approach was that surpluses were to be saved, and were only to be sold when it became absolutely clear that these allowances were indeed a surplus. At the same time, when Hungarian companies detected a shortage, they proceeded to purchase allowances, to be sure to meet regulations. The author’s interviews revealed that compliance was the driving force for Hungarian participants. *The majority of the companies viewed emissions allowances as administrative units, and not as financial assets.* In most cases, the opportunity to sell surplus allowances did not especially act as a motivator for participants; it has to be acknowledged, however, that the market price was too low during the second half of the three year long pilot phase.

The author’s interviews indicated the prevalence of a “typical Hungarian” attitude: most installations expressed no happiness at receiving a surplus of allowances, and that they would thus not have to face a shortage, but complained that other companies or installations had received more. This approach was clear both on the level of installations and on the level of the country: when a more abundant allocation for Hungary’s neighboring states was approved by the Commissions, Hungarian decision makers expressed concern about Hungary not having received more allowances.

During the pilot phase, neither installations nor the authorities understood the working of the system in its entirety. It was not clear how the surrendering of allowances after the period works. In some cases, instead of surrendering them, allowances were simply deleted and were thus lost. Hungary was not the only country to have done so. In the Czech Republic, an installation, which deleted its allowances instead of surrendering them, received new allowances from the New Entrant Reserve, so that it did not risk non-compliance (Chemlik, 2008).

To examine the effects of the scheme on operative decisions, two examples will be presented below, both discussing fuel switching. One power plant switched to the use of biomass at the beginning of the period so that it would save emissions allowances, which it could then take to the market, and make a profit off of. When, in April 2006, CO₂ prices plummeted, it became doubtful whether the use of biomass would be lucrative in the long term, as it did not prove more cost-efficient than the use of coal. One reason for this is that the price of the product was determined not by the market, but by the state, through its long-term power purchase agreements. The power plant, then, to avoid uncertainty and increase the predictability of its operations, switched back from biomass to the use of coal. This rare case is a good example of an installation in Hungary, which recognized the profit-generating potential of the system, and began to abate its emissions solely for the purpose of eventually selling allowances. But, when the installation did not see this tactic as
ensuring great enough profit, it switched back to the cheaper fuel. In all likelihood, had the market price been higher during the pilot phase, abatement would have been practiced more widely in Hungary also.

The other case is a more controversial one. Another power plant also switched to biomass at the beginning of the pilot phase, but not out of financial considerations, but as a result of their uncertainty. In 2005, the plant did not yet know what to expect, and wanted to prepare for a potential scarcity of allowances. Then, when it became clear that the 2008 trading period will be based on 2005 emissions figures, and that allocation was rather abundant during the pilot phase, the installation corrected its heating value retroactively, citing measurement issues. Thus, they were able to increase their 2005 emissions, surrendered 2005 allowances retroactively, and paid a penalty. The question is, of course, just what this scenario was about. Was it simply fraud? Or is this kind of retroactive “self-correction” permissible during this period of learning, when both the authorities as well as obligated parties were still familiarizing themselves with the scheme? Establishing the appropriate regulatory framework, and then enforcing the regulations, is essential for the system to be effective and efficient.

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Even though Hungarian companies were mostly driven by a desire at compliance during the pilot phase, every organization approached by the author had prepared for the Kyoto period. The three years of the pilot phase witnessed the establishment of the necessary system and framework, as far as both the country and installations were concerned; and the basic operations of emissions trading were recognized by participants, who came to understand the market, as well. Producing companies are able to adequately measure and record their emissions, are prepared as far as abatement opportunities are concerned, and have recognized the potential which lies in the trading of allowances.

Investment Decisions

Before moving on to discuss the impact of the EU ETS on investment decisions, it is important to underscore that the compliance periods of the scheme are too short, when they are compared with the usual timelines required for industry investment decisions. This, as well as all of the delays the system suffered, increase uncertainty, even though long-term predictability would be essential for the system to succeed. The National Allocation Plan for both the pilot phase as well as for the first real trading period was only prepared when obligated parties had already had to make their decisions for the period in question; they were, thus, unable to plan for the short term and unable to
create strategies for the long term. The system has to be transparent and predictable for all participants; without that, it cannot be as effective and efficient.

The impact of the EU ETS on Hungarian investment decisions was mostly marginal, with one notable exception. MOL is a unique player, among Hungarian companies, in this regard. The Hungarian oil company is the largest purely privately owned company in any new Member State of the European Union; it was transformed into a market participant after the system change, shedding its past as a socialist behemoth. In many respects, it actually functions better than the other corporations of the region, the author learned from László Varró, MOL’s chief economist. MOL pays the most attention, compared to other corporations in the region, to climate change issues. The management of the company is international, which may explain why MOL finds itself at the cutting edge of a paradigm shift. Its stocks are traded on the Budapest Stock Exchange, which also sets it apart from other organizations surveyed.

László Varró described how MOL is working to curb its emissions of carbon dioxide. A multi-variable model\(^{36}\), which takes into consideration different political scenarios, was created, and used to determine an internal price for CO\(_2\). This CO\(_2\) price is consistent with the prognoses of oil and gas prices. For some years, carbon dioxide emissions of any project are regularly included in the assessment of the project, and this is also included in MOL’s decision-making processes. Every tonne of emissions is calculated at 25 EUR, which is substantially higher than the market price during the pilot phase. MOL’s economists worked to introduce the kind of price mechanism within the company that could still be maintained even in a so-called carbon-constrained world, and that could be applied without putting the company at a competitive disadvantage. This approach to project assessment meant that only those projects were realized which could cover all CO\(_2\) emissions resulting from the project, and would thus have a net positive result. MOL is thus transforming its internal processes as it considers carbon dioxide emissions caps, and it does so independently of market prices.

For the period beginning in 2012, a price of 40 EUR was calculated, in light of expected market processes until that date. As Varró pointed out, this will enable MOL to realize certain projects, particularly after 2012, which are structured around renewable energy and which can see a return on investment even without state support, if the 40 EUR per tonne price holds. In the author’s opinion, this kind of pioneering commitment, which shows a willingness to move faster than regulations,

\(^{36}\) The model is not public information – what may be known is that the scenarios included would take changing circumstances into consideration – e.g. the United States becomes party to a global scheme after 2012, or the EU ETS is linked with another cap-and-trade system.
combined with an internal price that is higher than market prices, are all strategically important factors, which may translate into a competitive edge in the future.

Concurrently, the company has also revamped its management assessment system. The operations of various units were reviewed, and the company decided to move away from the traditional indicator EBITDA\(^\text{37}\) for use as its assessment criteria, to focus instead on EBITDA corrected with CO\(_2\) emissions indicators. The system is less likely to be successful without the motivation of business unit managers. Introducing CO\(_2\) emissions in assessment practices is a solution that BP and Shell have both used in the past, when establishing their own CO\(_2\) trading platforms. The internal system introduced by the two corporations is different, however, from MOL’s use of internal pricing. These multinational companies, present on the global market, attempted to develop their own trading system before the global trading scheme was put in place. Taking a different approach, MOL does not actually engage in trading, but introduces this new factor of production in its business processes.

Emissions allowances are managed centrally, and are not distributed; transactions, including all sales and purchases as well as surrendering, are all done on the corporate level. The surplus of grandfathered allowances during the pilot phase promised the potential of additional revenues; this, however, was not a factor within the company, as allowances were not distributed among the organizational units. The managers of the various functions were given the impression that they had to pay for allowances, and the cost was the internal price determined by the company model.

One benefit to MOL’s internal project assessment system is the emission of carbon dioxide as an externality becomes internalized, as its prices become a part of the company’s decision-making process. The goal of this system is thus not to reduce emissions, but to fully internalize the price of carbon dioxide – in other words, to balance out the marginal abatement costs and marginal net private benefit (MAC=MNPB; see figure 1, optimal levels of pollution). MOL’s innovative approach confirms that there are several studies currently underway, looking for ways to reduce carbon dioxide during manufacturing. As Varró pointed out, methods of CO\(_2\) separation and storage are in the focus of R&D activities internationally, and this is an area MOL may decide to base an entire new branch on.

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Applying the EU emissions trading regime necessitates a learning process within affected companies. The author’s interviews with industry representatives revealed that first, obligated

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37 EBITDA (Earnings before Interest Tax Depreciation and Amortization) figures show the results of a company’s activities regardless of its capital structure or investment willingness.
parties (1) view the system as “regulation,” as additional administrative burdens and as something to comply with (and it is likely that several Hungarian companies never moved past this first stage during the pilot phase); then, (2) they see the system as a framework, which requires a whole new way of thinking. It will therefore take time for them to recognize that the emission of pollutants like carbon dioxide cannot simply be left out of production processes, and that CO₂ is not a substance that a filter can be used to easily capture (like SO₂, NOₓ). In the learning process related to the EU ETS, (3) managers must come to an understanding of the system, must appoint an individual responsible for it within the company (and this individual must be able to follow all necessary processes, and must introduce tradable allowances into the company’s operative and strategic processes). It is the conclusion of this study that some Hungarian companies did reach this stage during the pilot phase, but of the companies surveyed, MOL was the single one where the system has really become an integral part of the organization and its processes, and where emissions-reduction targets are being met. At MOL, (4) CO₂ emitting externalities are being internalized.

![Figure 35. The corporate learning process of the EU ETS](source: author's own illustration)

The author concludes that the three years of the pilot phase were intended as a timeframe for this learning process to play out; in many cases, these three years were sufficient, but further major shifts in attitudes will still be required before the system is fully internalized in Hungary.
Were Emissions Actually Reduced?

Companies, according to economics theories (Lesi-Pál, 2004; Kerekes, 2007), should be looking to maximize their profits and should, therefore, work to reduce their emissions as long as the costs of this reduction are lower than the market price of an emissions allowance. Companies should also act this way if they possess a sufficient number of allowances. Nevertheless, no significant reduction in emissions could be confirmed in the case of Hungarian companies as a result of the EU ETS. Certainly, there may be underlying strategic reasons for this behavior, such as a realization that it was better for companies to delay reducing their emissions until the period 2008-2012. Doing so would mean that reductions accomplished during the earlier period, which serves as the basis for the Kyoto agreement, would not lead to a shortage later. Also, any surplus amassed through reduction could be sold over five years (REKK, 2006).

It is also important to differentiate between a drop in emissions and the reduction of emissions\(^{38}\). The drop in emissions is independent of the introduction of the EU ETS; it may be caused by lower energy needs during a mild winter. Reduction, on the other hand, is a conscious behavior related to the scheme. It is likely that the ETS did have an effect on emissions: the total emissions of CO\(_2\) in Hungary during the pilot phase differed, looking at a breakdown by year, from the emissions of sectors involved in trading carbon dioxide. Had total emissions changed at roughly the same rate as the emissions of ETS covered sectors, or had the latter increased substantially, it could be hypothesized that the system did not result in real emissions reductions. If the emissions of sectors involved in the scheme decreased at a greater rate than Hungary’s total emissions, a correlation may be supposed. An examination of the relevant data reveals that the emissions of ETS sectors dropped by 1.2% from 2005 to 2006, and then increased by 3.8% from 2006 to 2007 (Table 21). A similar trend is visible on a national level. It is, therefore, likely that the three years of the EU ETS pilot phase did not result in a quantifiable reduction of emissions.

<table>
<thead>
<tr>
<th>CO(_2) emissions</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Hungarian emissions (M t CO(_2)(_e))</td>
<td>80.2</td>
<td>78.6</td>
<td>n.a.</td>
</tr>
<tr>
<td>Emissions of ETS sectors (M t CO(_2)(_e))</td>
<td>26.16</td>
<td>25.85</td>
<td>26.84</td>
</tr>
</tbody>
</table>

Table 21. Hungarian CO\(_2\) emissions
Source: CITL data and EEA

Three possible ways of reducing emissions are: (1) fuel switching (2) increasing efficiency, (3) introducing new technologies and (4) reducing production output or changing product structures. According to preliminary information (REKK, 2006), the electric energy sector appears to hold

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\(^{38}\) In Hungarian these are almost identical words, hence it’s important to point out the difference.
most potential for reducing emissions through both increasing efficiency and fuel switching. Most other sectors could reduce their emissions by improving their efficiency. Quantifying CO₂ abatement during the pilot phase is difficult; data from a period longer than three years would be required to draw relevant conclusions. The three years of the pilot phase in Hungary surely brought about (1) fuel switching and (2) increasing efficiency; this is supported by the author’s interviews, which also revealed that (3) new technologies were not really introduced, nor (4) was companies’ product structure changed.

It is fairly difficult to determine whether the introduction of the EU ETS led to emissions reductions in Hungary. To distinguish between emissions reductions or emissions abatement, it is necessary to separate the effects of the EU ETS; to do so would require determining the quantity, which would have been emitted, had the EU ETS not been introduced. Clearly, this amount cannot be measured; it may only be estimated. Producing such an estimate is difficult for several reasons; for one, there is great uncertainty in the system, and verified emissions data was rarely available (especially in new Member States) which could be used to determine emissions quantities in a “business-as-usual” scenario.

\[
\text{Emissions abatement} = \text{Verified emissions} - \text{Business as Usual emissions}
\]

Although carbon dioxide emissions data is available on a national level, for years before 2005, this data cannot be used as a basis, since the EU ETS only covers a part of the economy. Another basis could be the emissions quantity of the base period used for preparing the National Allocation Plan; the utility of this data could be questioned, however. One the one hand, companies are generally interested in over-estimating their emissions in the hopes of obtaining greater allocations, and on the other hand, the collection of such soft data was not necessarily free of mistakes (Bart, 2007 and Ellerman-Buchner, 2007). Additionally, the three years of the pilot phase were not long enough to draw conclusions about long-term trends. Too much data is missing, and the chance of mistakes is too high, to try to establish “business-as-usual” scenarios.

According to figures by the National Meteorological Service (2008), Hungary’s emission of greenhouse gases between 1985 and 1987 was, on average, 115.4 million tonnes; the country’s emission of carbon dioxide at the same time was 85.8 million tonnes. The carbon dioxide emission quantity that served as the basis for the compilation of the National Allocation Plan was roughly one-fourth of this amount, 23.4 million tonnes per year, and did not include data for every ETS sector. The left-hand side of the chart in figure 36 compares the emissions of the base period (left column) – the average of the years 1985-1987 –, the annual allocations of the pilot phase (middle
column) and the verified emissions for 2005-2007 (right column). As no emissions data was available for the base period for every sector, the left-hand side chart is somewhat distorted, because it uses the entire Hungarian ETS sector to compare reference, allocated and verified quantities. An examination of these data, however, still shows clearly that the level of verified emissions was substantially (10.5%) higher than the reference level.

So that the data may be compared more realistically, the author has separated sectors (oil processing and coke production) for which no data was available during the base period, and has pooled metal ore, steel and iron production, as the base period only showed data combined for these two sectors (see the right-hand side graph in figure 36). It is clear that in sectors where data was available for the base period, allocations were approximately 20% higher than compared to the years before the system change, and verified emissions were approximately 3.7% higher.

Figure 36. Hungary’s reference emissions, allocations and verified emissions
Source: author’s calculation based on NAP and CITL data (Mt)

The graph below compares data in a sector-by-sector breakdown (obviously only for sectors where base period data was available). It is apparent that allocations were greater, in every case, than emissions during the base period and the quantity emitted during the pilot phase.
Figure 37. Hungary’s reference emissions, allocations and verified emissions, shown by sector
Source: author’s calculation based on NAP and CITL data (Mt)

So that correlations between emissions during the base period, allocations, and verified emissions quantities may be shown more clearly, the chart below is included for the six ETS sectors which had base period data to rely on. The darker diamond shapes show allocations, lighter squares compare verified emissions data to the base period for these six sectors, and the final set of data shows the average ratio. It is quite apparent that the average of the emissions data verified for 2005-2007 surpasses base period data in the case of two sectors (energy production and cement manufacturing), meaning that the six Hungarian EU ETS sectors surpassed the pre-system change levels by 3.7%, while other sectors emitted less than during the base period. The allocation was greater, in the case of every sector, than the average emissions during 1985-1987. The metal ore, steel and iron production sector received the greatest surplus of allowances in this context (47.5% more), while the glass producing industry got the least number of extra allowances (1.3% more) as compared to their emissions during the base period. Taken together, these six sectors obtained over 20% more allowances than the reference level.
As the figures show, the emissions data verified during the pilot phase was not always greater than the base period data; this matches other previous conclusions, when the authors compared allocations to verified emissions and found that not every sector and every installation was long in the Hungarian market.

On the whole, carbon dioxide emissions of EU ETS sectors during the pilot phase increased by 2.5% from 2005 to 2007. The drop of 1.2% seen during the first year was offset by an increase of almost 4% during the second year. The greatest drop was seen in the paper production industry (-10.13%); the greatest increase occurred in the coking sector, but this was still negligible on a national level due to the low quantity of production and the small number of installations involved. Figure 22 shows that emissions dropped during the second year in the paper, ceramics, iron and steel and metal ore industries, as well as in energy production and overall; the third year then showed an increase, with the exception of metal ore production, which saw a decrease each year. On the other hand, glass and cement manufacturing and oil refining increased their emissions each year, but not always substantially.
Table 22. Changes in emissions at Hungarian sectors during the pilot phase
Source: author’s calculation based on NAP and CITL data (Mt)

<table>
<thead>
<tr>
<th></th>
<th>Verified emissions</th>
<th>Change compared to previous year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2005</td>
<td>2006</td>
</tr>
<tr>
<td>Paper</td>
<td>171,715</td>
<td>159,501</td>
</tr>
<tr>
<td>Tile and brick</td>
<td>624,324</td>
<td>617,005</td>
</tr>
<tr>
<td>Glass</td>
<td>275,273</td>
<td>283,544</td>
</tr>
<tr>
<td>Cement</td>
<td>2,436,328</td>
<td>2,484,559</td>
</tr>
<tr>
<td>Steel and iron</td>
<td>1,256,901</td>
<td>1,196,376</td>
</tr>
<tr>
<td>Metal ore</td>
<td>320,775</td>
<td>306,649</td>
</tr>
<tr>
<td>Coking</td>
<td>184,815</td>
<td>299,823</td>
</tr>
<tr>
<td>Oil refining</td>
<td>1,317,231</td>
<td>1,345,427</td>
</tr>
<tr>
<td>Energy production</td>
<td>19,574,280</td>
<td>19,153,024</td>
</tr>
<tr>
<td>All sectors</td>
<td>26,161,642</td>
<td>25,845,908</td>
</tr>
</tbody>
</table>

Of the 240 registered Hungarian installations, 96 saw an increase in 2006 and 134 saw a decrease; in 2007, 74 reported an increase and 155 a decrease in emissions – according to Róbert Reiniger of Deloitte (2008); the remaining installations terminated their operations in 2007. A press release by Deloitte indicates that the pilot phase did not bring about significant emissions-reduction measures. Experts claim that the changes of at least 20% are a result of changes to production, the shutting down and restarting of machines; changes smaller than this amount – primarily in the energy industry – may be ascribed to meteorological changes (a mild or a harsh winter, for instance). This finding was confirmed by those interviewed for this dissertation that claimed, the EU scheme did not provide the necessary motivation for change. The insignificant extent of emissions reduction witnessed in Hungary is probably due to two factors. One of these was the lax allocation practices of the pilot phase; the other factor is that the price of emissions allowances during the second half of the trading period plummeted, soon after the Hungarian Registry went online and trading could commence. The author’s interviews revealed that emissions reduction measures, which were realized, were in fact not due to the EU ETS; all of these measures would have been realized without the introduction of the scheme, and were not driven by the possibility of trading allowances.

Most installations achieved their reductions during the EU ETS pilot phase through the use of biomass. Deloitte (2008) reports that switching to the use of sawdust was dominant in the ceramics industry, and certain solid-fuel-burning power plants switched to the use of biomass – including plant granulates, tallow, meat flour and wood – to reduce their carbon dioxide emissions. The same trend was apparent in the cement industry, which began using wastewater silt, paper silt and energy grass.
The effects of the EU ETS on Hungarian participants may be divided into two categories. It is necessary to distinguish between the effects of the scheme on the Hungarian state and on affected companies. The state had to consider a set of strategic issues related to the introduction and operation of the scheme, on the one hand. On the other hand, it also had to establish the institutional framework of the system, and ensure the utilization of auction revenues and the enforcement of sanctions. At the same time, the system posed administrative burdens for affected companies. For Hungarian companies, the most important goal was compliance and meeting the requirements of the scheme. In the author’s opinion, the system was not successful during the pilot phase in reducing Hungary’s emissions, since it did not manage to motivate the obligated parties. If, however, the scheme is viewed more as a learning process, it may be said to have been successful.
3.3. The Market Activity of Hungarian EU ETS Participants

The CO₂ emissions allowance of the EU is, as a product, a market-friendly good, as it is defined in the exact same way in all 27 Member States. It is an easily definable mass product, which is a basic factor of production for some twelve thousand European producers. The common and liquid allowance trading market was thus easy enough to establish at the beginning of the pilot phase. The carbon dioxide market of the EU is a common market without borders, which is still undergoing change and being developed; the Hungarian ETS market is an integral component of the European umbrella. The pilot phase of the EU ETS saw traditional financial products enter the market as well – options, swaps, hedges and derivative deals appeared. In addition to spot trading, futures trading also started, and in fact preceded the former due to the delays associated with the Registries. Essentially, trading began during the pilot phase both in the physical and in the financial sense. The so-called cross commodity effect is also present in the CO₂ market (Horváth 2008): changes in the price of other products, such as oil, gas, coal and electricity have a significant effect on CO₂ prices.

This chapter will provide an overview of the currently functioning EUA market and exchange trading, and will examine Hungarian trading data based on the Hungarian Registry and CITL data. Differences in methodology between the two systems will be pointed out, and the quantity of emissions allowances exported by Hungarian companies will also be examined. Finally, special attention will be paid to foreign purchases and sales by Hungarian installations possessing a surplus; and the origin and ratio of allowances surrendered at the end of the year will also be looked at.

Market Trading in the EU ETS

The trading of carbon dioxide emissions allowances does not generally take place directly between two installations, but is done at trading exchanges, usually with the involvement of a broker. Currently, CO₂ emissions allowances may be traded in Europe at several exchanges. The large trading houses active outside the exchange make either spot or futures deals. In terms of futures products, the most widespread deals on the exchange are yearly products, but quarterly and monthly products can also be traded.

The process of trading is comprised of several steps, as shown in figure 39 below. Installations covered by the scheme initially apply to the Competent Authority for an account. The Registry keeps specific accounts for each installation:

(1) Holding account of allowances,

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39 Appendix VI provides more detailed information on emissions platforms.
(2) Transfer account of allowances,
(3) Cancellation account of allowances.

Operators apply to the Competent Authority for EUAs (step 1 in the figure below). When an operator lowers its emissions and wants to sell its excess allowances to another company, it must notify the Registry of this transaction (step 2). The Registry informs the Independent Transaction Log of the desired transfer of allowances (step 3). The Independent Transaction Log then performs an automated check for any discrepancies and reports back to the Registry and the Competent Authority (step 4). The allowances are then transferred from the transfer account of the seller to the holding account of the buyer (step 5). This market is the primary market. In addition, firms can trade permits between themselves on the secondary market. In theory, the permit price will be equal between the two markets; otherwise, arbitrage would occur, and would equalize prices.

![Figure 39. The trading process](source: author’s own graph)

When discussing the emissions allowance market of the EU, it is important to differentiate between compliance trading and financial trading (Trotignon and Ellerman, 2008, p. 3). Compliance trading involves a fundamental demand, when installations purchase emissions allowances to cover their own shortage. They do this in order to be able to surrender the required number of allowances to the authorities in the given year; or they sell their excess allowances on the market, if they have a surplus they will not need for their own compliance. Compliance trading always involves the trading of emissions allowances on the registries, as allowances are shifted from the account of one installation to the account of another. Financial trading – speculative trading – on the other hand is aimed not at compliance, and not at covering a shortage or selling a surplus, but making use of revenue-generating opportunities. It does not necessarily involve allowances changing hands.
Financial trading was a significant component of the market activity observed during the pilot phase. The goal of speculative demand is to achieve a favorable market position based on information relevant to the market; the goal is not the direct utilization of emissions allowances. Speculative demand is, especially in a new market, “natural and desirable, as its tremendous demand for information helps smooth out the operation of the fundamental market and any inherent shocks” (REKK, 2006).

Derivate deals – futures deals, futures deals on the exchanges and options – also played an important role in the EU ETS, and accounted for approximately 95% of the total volume of the European carbon dioxide market, as compared with spot deals’ share of just 5% (Hendrickson and Mamay, 2007). The limited amount of spot trading that took place may be explained by the fact that national registries were only established relatively late, and the allocation of allowances also suffered a delay. Hungarian installations, due to the late launch of the Hungarian transaction registry, were unable to begin trading at the beginning of the pilot phase, when the market price of carbon dioxide was still around 30 EUR per tonne. The Hungarian transaction registry was launched on April 11, 2006, just a few days before the 2005 emissions data were made public and prices began to fall (even so, Hungary was still better off than Polish companies, who could only begin trading yet later still – Zylicz, 2008). Hungarian companies could engage in spot trading as of April 20 that year on the euets.com electronic platform. The market price at that point was 29.9 EUR; by the April 20 deadline, the price had fallen to 13.3 EUR, in light of the emissions data published. Thus, Hungarian companies, which sold their surplus amounts during this period, could realize significant profits.

In 2005, they traded some 262 million allowances on the EU market; by 2006, this figure had quadrupled, and reached 809 million tonnes. The market continued to increase – in 2007, nearly 1,500 million tonnes changed hands (Convery et al., 2008, p. 13). According to Point Carbon’s data, the trade volume of the European carbon dioxide market reached 28 billion EUR in 2007. This was accounted for by the trading of 1.6 billion tonnes of EUAs, an amount 62% higher and worth 55% more than in 2006. According to the World Bank, the EU ETS is the dominant player of the global carbon dioxide market, with transactions worth nearly 25 billion USD, or approximately 16 billion EUR in 2007 (www.pointcarbon.com). Hungarian emissions trading accounted for 17.1 million EUAs during the three years of the pilot phase, worth 234 million EUR (according to data from the Hungarian trade registry).

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40 The December 2006 EUA price then was 29.43. (www.vertisfinance.com and www.euets.com)
In an EU-context, Hungary held its own in this rapidly developed carbon dioxide market. Ellerman and Trotignon (2008), in their presentation, defined five groups within the EU emissions allowance market as far as international transactions were concerned (see figure 40). They examined the number of Member States a country enters into transactions with, and then used the numbers obtained to place each country in the 25 by 25 matrix reproduced below\(^4\). Theoretically, the maximum number should be 24, but Malta did not engage in trading with any Member States. Countries that did not engage in trading are positioned close to zero. Malta neither sold nor purchased emissions allowances. Cyprus and Luxemburg, although they sold emissions allowances to eight and nine countries, respectively, had no companies purchasing allowances from other states. Greece is also in a group of its own: Ellerman and Trotignon called it “undecided,” although the term “neutral” may also fit, since they purchased allowances from roughly half of all Member States and sold allowances to approximately the same number. Two smaller groups are positioned in the corners of the matrix, these are the small exporters and the small importers. Slovenia and Ireland purchased allowances from many other countries, but sold to few. Lithuania and Estonia sold to many, but purchased from few. The fifth, and biggest, group includes Hungary and may be called the group of “active traders,” who entered into transactions with many other Member States. This cluster, which includes seventeen countries, traded with at least ten or fifteen countries, involving both selling and purchasing. Most of the countries in this group belong to the EU15, but five eastern Member States – Poland, the Czech Republic, Latvia, Slovakia and Hungary – are also found here.

\(^4\) Romania and Bulgaria are not listed in the matrix, as their transaction registries did not go online prior to the end of the pilot phase.
In the author’s opinion, this confirms that Hungary was an active party to the pilot phase trading of carbon dioxide emissions allowances, even though it had no prior experience to rely on in the field of pollution, and even though the reduction of carbon dioxide emissions was a new objective for Hungarian environmental policy. The following section will provide a detailed overview of Hungarian transactions.

**Hungarian Market Transactions**

It is quite a complex task to analyze the market activity of participants and Hungarian EUA transactions during the pilot phase. It is challenging because it is difficult to obtain the relevant data. The central transaction registry classifies the data of the transactions for five years, making analysis all but impossible. It would be important to provide for greater transparency of the information, including making the database more accessible and easier to work with. Unlike the EU’s carbon dioxide trading system, all information on the U.S. SO₂ market was made available one day after trading – which proves that publishing this kind of information does not impinge upon participants’ interests. Unfortunately, euets.com, the exchange which handles the majority of Hungarian transactions, did not provide the author with any information; the representatives of the
installations the author spoke to were also reluctant to reveal how often and at what value they traded on the market.

Two databases, however, were available for the author’s study of market activity during the pilot phase: the EU’s Community Independent Transaction Log and the Hungarian National Transaction Registry. The Transaction Registry includes the collated data of transactions conducted during the pilot phase; these were obtained directly from the registry operator. The other source for the author’s research was thanks to her participation in the APREC research group. Currently, all the central log will provide is the destination of a specific emissions allowance, i.e. what installation in which Member State received it, as well as information on what installation in which Member State surrendered it. Data was collated by the research group. Certainly, this analysis could not have been comprehensive, as only the country of the emissions’ origin and the country where they were surrendered could be identified. It is possible that allowances wandered through several other countries as well, having changed hands several times. This, unfortunately, could not be examined without additional data. The flow of emissions allowances between individual nations may thus be reconstructed, as long as it is assumed that the units were not redistributed through other installations and other Member States. This dissertation will be confined to an examination, based on the information detailed above, of the activity of Hungarian participants in the carbon dioxide market.

It is important to underscore that the data contained in the two sources do not completely match. The direction and the quantity of the transaction are close enough, for the most part, for the three years of the pilot phase. But there are differences when the data is broken down by year. The reason for this is that CITL looks at transactions based on the origins of surrendered allowances, whereas the registry provided the author with actual transaction data.

Only very few researchers used CITL data in the past; two studies appeared, which were based on CITL information (Kerr, 2007 and Trotignon-Ellerman, 2008). This dissertation examines the aggregate transfer data of the Hungarian transaction registry as well, and is thus among the first to interpret the differences between the two databases and to point out that surrendered amounts indicated in the CITL do not reflect real emissions allowance transactions. We may conclude that it is prudent to use the central transaction log and the national registry data together in parallel, as the two databases contain information to complement each other. Although CITL data do not precisely depict international transactions, they may be useful for inferring which Member States’ companies entered into transactions with the installations in a given Member State. The data of the national registries may be used to determine the precise quantity, scheduling and value of national transfers.
The databases contain information on transactions (figures provided in tonnes). To quantify the transactions, the chart below (figure 41) shows the average prices of each year. The 2005 transaction period started January 1, 2005 and lasted until April 30, 2006; an average price of 20.18 EUR was used for this period. The same way, compliance period 2006 started May 1, 2006 and ended April 30, 2007 with an average price of 9.57 EUR. For the 2007 period, beginning May 1, 2007 and ending April 30, 2008, the average price was 0.14 EUR. The HUF values for the same period were obtained based on the official exchange rate published on the website of the Hungarian National Bank (www.mnb.hu). For 2005, this was 250.33 HUF/EUR, in 2006 it stood at 262.1 HUF/EUR, and the 2007 exchange rate was 253.72. The average rate for the three years was 255.35 HUF/EUR.

The majority of Hungarian companies joined the carbon dioxide market with the help of brokers; only a few entered the trading platform on their own, and many never even participated in trading during the pilot phase. Multinational corporations tended to manage their allowances centrally; Hungarian subsidiaries were components of the central trading desk, and in most cases received the allowances they required for compliance regardless of the market prices, according to a predetermined schedule. Accordingly, much of the trading going on during the pilot phase was done within corporations. For instance, the majority of the Hungarian cement industry’s transactions were executed by HOLCIM Heidelberg. Certainly, as those interviewed by the author explained, the regrouping of allowances within multinational companies was done in accordance with the EU’s transfer pricing regulations (Horváth, 2008).
Companies, which were certain of their surpluses, were more likely to enter the market with their surplus emissions at the beginning of the trading period. Others tended to wait, and there were even cases of companies trying to sell their surplus allowances in April 2008 (Csikesz, 2008). As one subject interviewed mentioned, their heating installations were classified incorrectly by the authorities, and the plant ended up receiving a substantial surplus without even having to lobby for it. By selling these allowances, the company made a profit of more than 2 billion HUF. The company had not had to work for this amount – it was truly a windfall profit for them. There was also at least one company that engaged in trading only to test the way the system works. When they used a small number of allowances to test the waters of the transaction market, they made quite a substantial profit. Later, when they were really interested in selling their surplus, the lower market price meant that they could barely cover their expenses.

Those surveyed for this dissertation pointed to compliance as their number one priority in entering the carbon dioxide market. Their strategy, as far as EUA trading was concerned, revolved around covering their CO₂ emissions amounts. At the same time, it became clear that market participants are signing longer-term contracts in preparation for the Kyoto period; at the end of the pilot phase, EUA-CER swaps become most widespread (Csikesz, 2008).

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42 A total of sixteen transactions were conducted, at an average price of 15 EUR.
**Hungarian Transaction Registry Data**

Based on the data of the Hungarian transaction registry, it can be seen just how many allowances grandfathered in Hungary ended up abroad between April 11, 2006 and April 30, 2008, and how many foreign allowances entered Hungarian transaction accounts (see table 23).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Market transactions (EUA)</td>
<td>9,082,356</td>
<td>5,291,869</td>
<td>2,726,573</td>
<td>17,100,798</td>
</tr>
<tr>
<td>No. of transactions</td>
<td>263</td>
<td>116</td>
<td>104</td>
<td>483</td>
</tr>
<tr>
<td>Transaction value (million HUF)</td>
<td>45,465</td>
<td>13,385</td>
<td>99</td>
<td>58,949</td>
</tr>
</tbody>
</table>

Table 23. Hungarian transactions during the pilot phase

Source: author’s calculation based on Hungarian Registry

Figure 42, below, shows the total transactions of the pilot phase in Hungary, in million allowances (left-hand side axis), the number of transactions (right-hand side axis) for each year. The most Hungarian allowances ended up abroad during the first year (dark grey column), both in terms of quantity (6.5 million) and in terms of number of transactions (198). Then, the quantity and number of allowances transferred abroad dropped each year (2.8 million, then 1.4 million, and 63 and 27, respectively). The transfer of foreign allowances to Hungary (light grey column) was more balanced throughout the three years, both in terms of quantity (630, 550 and 344 thousand allowances) and in terms of transaction numbers (21, 22 and 14). The third – black column – shows the transfers between Hungarian transaction accounts. This was nearly steady during the first two years (1.98 million and 1.94 million), then dropped during the third year (1 million EUAs). There is no clear-cut trend as far as the number of transactions is concerned. The most transfers took place in the first (44) and third (63) year, and the least during 2006 (31).
Hungarian companies could begin trading on the spot market following the launch of the transaction registry on April 20, 2006. The opening market price of 29.9 EUR was more than halved by the April 30 compliance deadline, dropping to 13.3 EUR (vertisfinance.com). Hungarian companies conducting sales during this period were able to realize a substantial profit. It is
interesting to examine what percent of Hungarian participants entered the market prior to the April 2006 deadline. Was the last month of the first year of the pilot phase sufficient for obligated companies to sell their surpluses on the market?

During the first compliance year, more than 9 million Hungarian emissions allowances changed hands\(^43\) through 263 transactions. The value of these transactions was some 45.5 billion HUF\(^44\) (approximately 0.1% of the GDP\(^45\)). This equaled more than 54% of all pilot phase transactions. During the second and third year, 5.3 million and 2.7 million emissions allowances were traded in the market, through 116 and 104 transactions, respectively. Over the course of these two years, the value of the Hungarian transactions traded reached 13 billion HUF and 1 billion HUF. See table 23 and figures 43 and 44. The columns on the left in figure 44 show the number of allowances traded on the left-hand side Y-axis, with the right-hand side indicating the number of transactions; the chart on the right-hand side provides the value of the transactions in HUF.

Figure 44. Hungarian EUA transactions during the pilot phase
Source: author’s graph based on Hungarian registry

In terms of the value of the transactions conducted in the market: the first year accounted for three-fourths of the entire pilot phase, the second year for one-fourth and the third year was essentially negligible as far as value is concerned. Half of the market transactions were conducted within sixteen months (between January 2005 and April 2006), as opposed to the twelve months of the other two trading periods; at the same time, trading was only possible for approximately ten days during the first sixteen months. Half of all transactions conducted were conducted during these ten days. This accounted for over three-fourths (77%) of the value traded during the entire pilot period. During the second year, one-fourth of the allowances were traded in the market, and the value of these transactions was also roughly proportionate to that. In the third year, only less than one-fourth of the allowances were traded, accounting for merely 0.17% of the total transactions of the pilot

\(^43\) Market transactions = international transactions + domestic transactions
\(^44\) 9 million tons x 20.18 EUR/tonne x 248.05 HUF/EUR
\(^45\) Based on the Major Macroeconomic Indicators statistics, November 20, 2008. (http://www2.pm.gov.hu)
phase.

**CITL Data**

The transaction data above was presented based on information in the Hungarian registry. An examination of CITL data provided the opportunity for a different approach, based entirely on the number of allowances surrendered. For the research for this dissertation, the author compared, focusing on Hungarian specifics, CITL data with the information contained in the Hungarian registry. Significant differences came to light – it is thus a questionable practice to rely only on CITL data in analyzing trends (although, in many cases, that information was all researchers had to rely on). Those responsible for examining the system on an EU level within the APREC group explained that they often encountered language barriers when wanting to look at Eastern Member States’ data.

Figure 45 shows Hungarian transactions based on the location of surrendered allowances as indicated in the CITL. These figures do not include transactions within countries; only net flows are shown, together with their values. Net flows are allowances allocated in Hungary but surrendered in other countries, corrected with the number of allowances allocated abroad and surrendered in Hungary. Figure 51 shows that in 2005, 74 thousand allowances were surrendered abroad; in 2006, this number was net 2.8 million, and in 2007 it stood at net 6.87 million EUAs. Naturally, the data indicating transaction values is also different compared to data provided in the Hungarian registry. The figure below on the left shows that during the first year, hardly any Hungarian allowances were surrendered abroad (0.76%). This grew to just over one-fourth of all allowances during the second year (28.95%), and Hungarian allowances were surrendered in the greatest numbers during the third year, amounting to over two-thirds of the total (70.29%). The figure below on the right shows how, according to CITL data, the value of sales was the highest in 2006. According to CITL data, then, Hungarian allowances were surrendered by other participants of the EU carbon dioxide market for a worth of 375 million HUF during the first year, for over 7 billion HUF during the second year, but for just 252 million HUF in the final year.
What is most striking, if figures 44 and 45 are compared, are temporal characteristics. While Hungarian data show that the most Hungarian allowances were transferred abroad during the first year, they were surrendered abroad mostly during the second year. The data of the transaction registry appear to reflect the actual flow of allowances, and will thus be considered as the bases for further evaluation here.

* * *

The following section will attempt to quantify differences between the two databases and discuss what may cause these differences. It is important to review market transactions in greater detail. The section will also track the route of Hungarian allowances, which ended up abroad, and will examine allowances, which entered Hungary from abroad; finally, internal trading within Hungary will also be analyzed.
International Transfers

The author has used data from both the CITL and the Registry to examine international transfers. Differences between the two databases can thus be pointed out. It is also important to include CITL data in the analysis because those can be used to determine which countries’ companies Hungarian firms entered into transactions with. During the pilot phase, a net total of 9.5 million allowances flowed abroad from Hungary. This is a sure indicator that Hungarian companies truly became parties to the EU emissions trade.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Registry data</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foreign allowances</td>
<td>630,010</td>
<td>549,032</td>
<td>344,005</td>
<td>1,523,047</td>
</tr>
<tr>
<td>entering Hungary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hungarian allowances</td>
<td>6,474,507</td>
<td>2,805,788</td>
<td>1,378,700</td>
<td>10,658,995</td>
</tr>
<tr>
<td>leaving the country</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>7,104,517</td>
<td>3,354,820</td>
<td>1,722,705</td>
<td>12,182,042</td>
</tr>
<tr>
<td><strong>CITL data</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foreign allowances</td>
<td>0</td>
<td>27,681</td>
<td>645,985</td>
<td>673,666</td>
</tr>
<tr>
<td>entering Hungary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hungarian allowances</td>
<td>74,185</td>
<td>2,829,743</td>
<td>7,516,811</td>
<td>10,420,739</td>
</tr>
<tr>
<td>leaving the country</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>74,185</td>
<td>2,857,424</td>
<td>8,162,796</td>
<td>11,094,405</td>
</tr>
</tbody>
</table>

Table 24. Transactions based on information provided in the two databases

Source: author’s calculation based on Hungarian Registry and CITL data

If the three years are examined together, both databases show approximately 10.5 million allowances leaving Hungary. There are, however, significant differences as far as foreign allowances entering Hungary are concerned. When the years of the pilot phase are examined separately, there are considerable differences between CITL and registry data.

Transaction registry data show higher numbers in both influx and outflow; thus it may be concluded that not every allowance that crossed national borders was surrendered at the end of the period. The data also show two special features: (1) banking and (2) the number of allowances surrendered.

(1) Allowances sold or purchased in a particular year were not used in the same year. Companies were able to bank the emissions allowances obtained during the first year, to surrender them later. Companies used the possibility of banking allowances during the period. Allowances entering Hungary through transactions recorded in the first compliance year (630,010 EUAs) were not surrendered until after April 30, 2006. Transaction and surrender data for the second year do not show what year the allowances surrendered originated in. Data for the last year serve to reinforce the conclusion reached, based on the first year, namely that the number of Hungarian allowances ending up abroad (1.4 million EUAs) was much less than the number of Hungarian allowances that were surrendered abroad (7.5 million EUAs). At the same time, only 344 thousand foreign-
originated EUAs ended up in Hungary, but Hungarian installations surrendered nearly 650 thousand allowances. As allowances could not be carried over to the period beginning in 2008, the cumulative data for the two databases match when looking at the entire period. Within the three years of the pilot phase, operators were free to manage their allowances as they wished, but they had to be prepared to surrender them at the end of the period. Allowances expired worthless on April 30, 2008.

(2) Table 25 shows the number of Hungarian allowances, which remained unused abroad, as well as the number of foreign allowances, which remained unused on Hungarian accounts. CITL data can be used to track allowances, which were surrendered in any Member States prior to the end of the pilot phase. Transaction data of the Hungarian Registry show how many allowances left the country (were sold or were transferred within an international corporation). The number of allowances, which expired worthless, is obtained by subtracting the number of surrendered Hungarian allowances from the number of allowances allocated in Hungary. If it is supposed that every allowance transferred abroad from a Hungarian account originated in Hungary, and none were ever returned to the country, it may be concluded that a significant number of Hungarian allowances remained unused (238 thousand EUAs), i.e. were not surrendered in the registry of any Member State. At the same time, transaction registry data indicates that 1.5 million EUAs entered Hungary. CITL data only show 673 surrendered allowances, however, meaning that 850 thousand foreign allowances expired worthless on Hungarian accounts.

<table>
<thead>
<tr>
<th>(thousand tonnes)</th>
<th>Transactions</th>
<th>Surrendered EUAs</th>
<th>Unused EUAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hungarian allowances leaving the country</td>
<td>10,659</td>
<td>10,420*</td>
<td>239</td>
</tr>
<tr>
<td>Foreign allowances entering Hungary</td>
<td>1,523</td>
<td>673**</td>
<td>850</td>
</tr>
</tbody>
</table>

Table 25. Unused EUA quantities during the pilot phase
Source: author’s calculation based on Hungarian Registry and CITL data
* Hungarian-originated allowances surrendered in other Member States
** Foreign-originated allowances surrendered in Hungary

Although the difference is negligible if only the results for the entire pilot phase are examined, there is considerable temporal difference between transactions. While Registry data indicate that over half of all international transactions took place during the first year (53.8%), CITL data put this at a negligible amount (0.67%). An examination of data for 2006 reveals roughly similar ratios; more than one-fourth and less than one-third of all transactions were conducted during the second year (27.5% and 25.76%). The third year, once again, shows significant differences between the two databases. While the Registry only shows 14% of all transactions as having taken place during the third year, CITL data indicate that the majority of transactions took place in this year (73.58%).
Based on these numbers, it may be concluded that – although in lieu of other relevant market data, researchers could only rely on the data of the central registry (Kerr, 2007; Trotignon and Ellerman, 2008) – this is not a reliable method for determining the true number of transactions and allowance flows.

According to the Registry, Hungary saw the inflow of the most foreign emissions allowances (41.37%) during the first year of the pilot phase; CITL did not record the surrendering of any foreign allowances in Hungary during the first year. According to the Registry, approximately one-third of foreign allowances (36%) entered Hungary during 2006; about one-fourth entered the country during the last year (22.6%). Based on CITL figures, the second year was essentially negligible (4.11%), while the third year saw the influx of the majority of foreign allowances (95.89%).

In the author’s opinion, the differences in the transactions and uses of allowances may be explained by the tendency for operators to use their grandfathered allowances first, before going on to surrender foreign allowances. Trotignon and Ellerman (2008) also point out that installations tend to use their own allowances first, before utilizing other allowances (p. 5). The two authors cite the borrowing practices of individual installations as proof. They identified 69 installations (p. 21), which only surrendered their own allowances during the first two years, but surrendered only foreign allowances during the final year. The author has examined, for this dissertation, Hungarian companies, which had surrendered foreign allowances, and found that the conclusions drawn by Trotignon and Ellerman are in fact correct. Three-fourths of Hungarian companies used Hungarian-
originated allowances during the first two years to cover their emissions, and only turned to foreign allowances during the last year (see Appendix VII).

**Allowance Flow between Member States**

During the pilot phase, Hungary entered into transactions with twenty-one other Member States. Hungarian allowances were surrendered in a total of twenty Member States, and allowances originating in twelve countries were utilized by Hungarian companies in addition to the amount allocated to them. Naturally, most of the allowances surrendered in Hungary originated in the country (78.6 million EUAs), representing 88.3% of all Hungarian allowances surrendered in the EU. In other words, nearly 13% of all Hungarian-originated allowances were surrendered abroad. Of all emissions allowances surrendered in Hungary, 99.15% were allocated in Hungary, meaning that less than 1% of all allowances surrendered in Hungary originated abroad.

Table 26 below shows Hungarian transactions with other Member States, based on CITL data. The United Kingdom was the biggest user of Hungarian allowances (27%), followed by German (24.26%), Belgian (14.26%), Spanish (10.86%) and Italian (10.37%) companies. Concurrently, Hungarian companies utilized allowances above all from Poland (35.18%), the Czech Republic (21.63%) and France (20.13%) to cover their emissions. As the above shows, the international carbon dioxide market was quite concentrated as far as transactions were concerned. Two countries purchased over half of all Hungarian allowances, and Hungary utilized allowances from two countries to cover half of its compliance needs in addition to domestic allowances.

<table>
<thead>
<tr>
<th>Member State</th>
<th>Hungarian allowances surrendered abroad</th>
<th>Foreign allowances surrendered in Hungary</th>
<th>Net flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>United Kingdom</td>
<td>2,812,306</td>
<td>14,389</td>
<td>2,797,917</td>
</tr>
<tr>
<td>Germany</td>
<td>2,528,348</td>
<td>28,700</td>
<td>2,499,648</td>
</tr>
<tr>
<td>Belgium</td>
<td>1,485,513</td>
<td>7,443</td>
<td>1,478,070</td>
</tr>
<tr>
<td>Spain</td>
<td>1,131,910</td>
<td>24,000</td>
<td>1,107,910</td>
</tr>
<tr>
<td>Italy</td>
<td>1,080,673</td>
<td>0</td>
<td>1,080,673</td>
</tr>
<tr>
<td>Poland</td>
<td>78,618</td>
<td>236,987</td>
<td>-158,369</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>478,242</td>
<td>145,737</td>
<td>332,505</td>
</tr>
<tr>
<td>France</td>
<td>21,456</td>
<td>135,616</td>
<td>-114,160</td>
</tr>
<tr>
<td>Estonia</td>
<td>0</td>
<td>38,692</td>
<td>-38,692</td>
</tr>
<tr>
<td>Slovakia</td>
<td>10,000</td>
<td>21,494</td>
<td>-11,494</td>
</tr>
<tr>
<td>Other</td>
<td>793,673</td>
<td>20,608</td>
<td>773,065</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>10,420,739</strong></td>
<td><strong>673,666</strong></td>
<td><strong>9,747,073</strong></td>
</tr>
</tbody>
</table>

Table 26. Emissions allowance transactions based on CITL data
Source: author’s calculation based on CITL data
The two right-hand side columns in Table 26 show so-called net flows, which is the difference between the first and the second columns. The author has separated the flow of allowances back and forth between Member States (see figure 47). Positive numbers show the flow of Hungarian allowances toward foreign countries, while negative numbers indicate the flow of foreign allowances into Hungary. A total of 9.75 million Hungarian allowances were surrendered abroad (according to the Registry, a net amount of 9.1 million tonnes ended up abroad) – this represents 10.74% of all Hungarian allocations. Although, on the whole, Hungarian companies were net exporters, Hungary was actually a net importer when only its relationship to certain countries is examined (Poland, France, Estonia and Slovakia). This may seem surprising, but may be explained by the internal transfers of international corporations.

![Figure 47. Emissions allowance transaction with other Member States](source: author’s graph based on CITL data)

**Hungarian Allowances Leaving the Country**

Figure 48 shows the Hungarian allowances, which left Hungarian trading accounts during the pilot phase. The values of the vertical axis on the left show the number of allowances transferred from Hungarian trading accounts to foreign countries. The triangle shapes show the number of transactions for the given year (vertical axis on the right side). The quantity traded, as well as the number of transactions, dropped each year.
Based on the findings of Trotignon and Ellerman (2007, p. 7), this dissertation supposes that companies with a surplus would surrender the units necessary for meeting their own emissions requirements to the authorities at the end of each year, and would sell their surplus on the market. The surplus is thus the potential supply.\(^{46}\) It is interesting to examine just how much of the potential supply offered by Hungarian companies became an actual supply. The author compared the quantity of allowances ending up abroad to the available surplus. Hungary’s allocation for the entire pilot phase was 90,708,498 EUAs; verified emissions amounted to 78,843,048 – thus the Hungarian carbon market was long by twelve million EUAs. According to the figures of the transaction registry, 10,420,739 allowances from Hungarian trading accounts ended up abroad. The author believes, however, that this figure must be corrected with allowances flowing into the country. A net total of 9,135,948 emissions allowances ended up abroad. Comparing the surplus of 12 million EUAs with this outflow of 9 million allowances, it is safe to conclude that not every Hungarian surplus allowance ended up abroad. Two million allowances expired without having been surrendered from Hungarian transaction accounts. Four-fifths of the surplus ended up abroad – this (see figure 49) seemed like a fair percentage (82.15\%) during the pilot phase as compared to other Member States. It is impossible to know, however, just what percentage of this were true allowances freed up as a result of emissions abatement could also be a potential supply. Based on the interviews conducted – and the lenient allocation of allowances, as well as low market prices – it can be supposed that obligated companies in Hungary only took their surplus allowances to the market, and did not reduce their emissions as a result of financial motivations.

\(^{46}\) Allowances freed up as a result of emissions abatement could also be a potential supply. Based on the interviews conducted – and the lenient allocation of allowances, as well as low market prices – it can be supposed that obligated companies in Hungary only took their surplus allowances to the market, and did not reduce their emissions as a result of financial motivations.
sales, and how much was accounted for by internal transfers conducted by multinational corporations who transferred allowances to company headquarters.

Figure 49. Sales of surplus allowances in different Member States
Source: Ellerman, 2008

Foreign Allowances Entering Hungary

Figure 50 presents several aspects of the import activity of Hungarian companies during the pilot phase. The columns show the number of emissions allowances transferred from foreign transaction accounts to Hungarian accounts (see values on left-hand side vertical axis). The triangle shapes show the number of transactions for the given year (vertical axis on the right side). It is obvious that the quantity traded, as well as the number of transactions, dropped each year. Looking at the number of transactions, the graph shows that these decreased in both 2006 (by 25%) and yet further in 2007 (12%).

The twenty-one transactions which were conducted during the first year, and which resulted in 630 thousand EUAs entering Hungary, cannot be considered negligible. This, in the author’s opinion, may be ascribed to the situation companies found themselves in, being unable to predict whether the allowances allocated to them will be sufficient to meet their requirements or whether they will face a shortage during the pilot phase. Additionally, in the author’s opinion, internal allowance transfers by multinational companies also contributed to this quantity.
As the charts and figures above show, a significant number of foreign allowances entered Hungary during the EU ETS pilot phase, even despite the fact that most installations and sectors actually came to possess a surplus. The author believes that the reason for these significant quantities is that multinational companies tended to manage their allowances centrally; accordingly, Hungarian installations received foreign allowances from their headquarters, and not because they had purchased them on the market. In other words, the transactions conducted do not reveal actual import activities, but that at the beginning of the compliance period, certain multinational corporations pooled their subsidiaries’ allowances, regardless of the geographic location of the company’s activities, and then proceeded to surrender, at the end of the pilot period, the number of allowances they required for compliance. This hypothesis was confirmed through personal discussions (Horváth, Kuhl, Hohol, Briglovics, 2008). The author encountered cases where the system did function exactly in this fashion: companies usually used a transfer price (those interviewed for the dissertation declined to provide further details on this price), and trading was often done on a central level. There, were, however, some cases where installations had greater autonomy.

Figures 26 and 47 show that Hungary was a net importer when compared to certain other countries; this did not seem logical, and was certainly worth following up on. The author’s hypothesis was that this figure was in fact caused by the trans-border emissions trade activities of multinational companies; CITL surrender figures were used to confirm this, along with the permit identifier numbers of allowances allocated abroad but surrendered in Hungary. It was not a simple task, since
the CITL only contains data on where a particular allowance was allocated, and what company it was surrendered by. The author examined permit identifier numbers and verified whether the particular Hungarian installations were the Hungarian subsidiaries of any multinational companies operating in both countries. A further distorting factor is that it is impossible to use the information available to track the route of emissions allowances through markets. The simplification employed by the author was that transactions were conducted between the country where the allowance was allocated and the country where it was surrendered. (Appendix VII provides information on allowances surrendered, including data on year, quantity and country of origin.)

The author examined twenty-seven cases where Hungarian installations utilized foreign allowances to cover their compliance needs; this is roughly one-tenth of all Hungarian installations. A total of 670 thousand foreign allowances were involved over the three years; in 2005, no foreign allowances were used by Hungarian companies. In 2006, less than 23 thousand allowances were surrendered, and the majority of all allowances (646 thousand EUAs, or 96.5%) were recorded in the Hungarian Registry during the last year. Interestingly, this amount is still less than half (44%) of the 1.5 million registered foreign-originated units, which were transferred to Hungary during the pilot phase. We may conclude that over half of all foreign emissions allowances showing up on Hungarian accounts expired worthless at the end of the pilot phase, without having been used and/or surrendered by the Hungarian company.

Only three of the twenty-seven installations using foreign allowances looked to the international market as a new entrant to meet their requirements. The Dunakeszi Aszfaltkeverő Üzem obtained 610 Polish allowances, the Paksi Téglagyár received 2710 British allowances, and Inotai Kft. purchased allowances from Poland (1513 EUAs) and Spain (1000 EUAs). These account for less than one percent (0.87%) of all foreign allowances.

The largest percentage (87.66%) of foreign allowances – in accordance with the author’s expectations – was accounted for by allowances surrendered by international companies. Surrenders by four multinational companies account for over four-fifths of the total quantity (86.86%). Electrabel (32.89%) purchased allowances from Belgium, France, Germany, Poland, Spain and the United Kingdom; Dalkia (25.86%) purchased from the Czech Republic, France, Poland and Slovakia; the Wopfinger group (14.47%) used Belgian, Estonian, Dutch and Polish allowances; ATEL (13.64%) relied on allowances originating in the Czech Republic and Estonia; Villeroy & Boch used German allowances; the Uralita group used Spanish allowances; the Rath Group German allowances; Owens Illinois relied on French and Italian allowances; Agrana used French ones; and Nestlé transferred British and French allowances to the country.
The author identified eleven installations owned by the Hungarians, which used foreign-originated allowances to cover their own emissions during the pilot phase. Three of these installations clearly resorted to buying foreign allowances on the market to offset their own lack. These were the following: EURO-METAL Öntődei Kft., Szombathelyi Távhőszolgáltató Kft. and ST GLASS Öblösüveggyártó és Forgalmazó Zrt. In all of these cases, it appears likely that they also borrowed allowances from upcoming years, as all three companies first surrendered Hungarian allowances and only then engaged in obtaining foreign allowances. Of the eleven installations, one – the Hódtói Kazánház operated by Mező és Mező Kft. – shut down during the pilot phase. They used the Slovak allowances obtained in 2007 to cover their non-compliance during 2006 (they surrendered fewer units than their verified emissions). Surprisingly, seven of the eleven installations surrendered foreign allowances despite having had a surplus. This behavior on their part warrants further examination. If there had been any companies, which sold their surpluses at the beginning of the pilot phase and then purchased additional ones at the end of the period, these would have made a great profit thanks to the fall of market prices. These companies sold their allowances at a high price, but then purchased new ones at a much lower cost later, at the end of the period. This, unfortunately, would be difficult to quantify without additional data.

* * *

It may thus be concluded that even though Hungary possessed a surplus on the whole, certain Hungarian installations turned to foreign allowances to cover their own needs. The reason for this is that it was not countries, but companies which engaged in trading in the EU’s carbon dioxide emissions trading system. A common European carbon dioxide market was established; no isolated, compliance-centric national platforms were developed. Regardless of nationality, companies used the European market to try and sell surplus allowances or to cover their emissions shortages. The fact that the allowances allocated in different countries were identical and universal helped the process.

**Domestic Transfers**

This section will examine domestic transfers, i.e. transactions conducted between Hungarian accounts. Table 27 shows total domestic transfers broken down by year, as well as their volume. Nearly five million emissions allowances changed hands in Hungary between April 11, 2006 and April 30, 2008. The total value of these transactions was some 15 billion HUF, amounting to 0.06% of the country’s GDP.

During the first two years of the pilot phase, the number of transactions among Hungarian operators was roughly the same (1.978 EUAs and 1.937 EUAs, respectively); this accounted for
approximately two-fifths of the volume traded each year. During the last year of the period, the number of allowances dropped slightly (1 million EUAs), accounting for one-fifth of the total volume. As a result of a drop in market prices, the first year was the most significant in terms of transactions – two-thirds of the volume traded changed hands during that year. Approximately one-third of transactions were conducted during the second year and less than one-fourth during the third year. In terms of the number of transactions, the numbers are more balanced: 2005 saw one-third of all transactions (31.88%); in 2006, approximately one-fourth of the total number was traded (22.46%), and in 2007, this figure was roughly one-half (45.65%).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Transactions (tonnes)</td>
<td>1,977,839</td>
<td>1,937,049</td>
<td>1,003,868</td>
<td>4,918,756</td>
</tr>
<tr>
<td>No. of transactions</td>
<td>44</td>
<td>31</td>
<td>63</td>
<td>138</td>
</tr>
<tr>
<td>Transaction value (million HUF)</td>
<td>9,991.5</td>
<td>4,857</td>
<td>35.66</td>
<td>14,884.24</td>
</tr>
</tbody>
</table>

Table 27. Domestic transfers of EUAs in Hungary

Source: author’s calculation based on Hungarian transaction registry data

Figure 51 shows domestic transfers in Hungary during the pilot phase according to several criteria. The values of the vertical axis on the left show the number of allowances transferred between Hungarian trading accounts. The triangle shapes show the number of transactions for the given year (vertical axis on the right side).
No further information regarding domestic transfers could be gleaned from the data made available. A comparison of the data clearly reveals that the volume of transactions conducted with other Member States was much greater, in terms of numbers, quantities and values. This is hardly surprising, as Hungarian companies and sectors on the whole possessed a surplus of allowances. They brought their supply before the international carbon dioxide market. Hungary’s cumulative short position amounted to a total of four million allowances; this shortage could easily be covered by Hungarian operators on the one hand from domestic transfers and on the other hand by relying on foreign allowances.

* * *

Hungarian companies became partners in the carbon dioxide trade of the pilot phase. Although the author’s conclusion, based on the interviews conducted, was that Hungarian companies viewed compliance as their priority trading strategy for the pilot phase of the EU ETS, according to transactions recorded in the transaction registry and CITL data, Hungarian allowances became integral components of the international carbon dioxide market.

The following conclusions may be drawn based on transaction data:

(1) The majority of emissions allowances allocated and surrendered in Hungary did not enter international trading.

(2) The trading conducted by Hungarian companies was generally “one way” in relation to the majority of Member States. Companies sold allowances to companies in sixteen other Member States. There were four countries that Hungarian companies only purchased allowances from, and both selling and purchasing was conducted with only one country, Portugal.

(3) Although Hungary was a net exporter during the pilot phase, it was nonetheless a net importer vis-à-vis five countries.47

Several installations possessing a surplus actually surrendered more allowances than the number, which would have covered their emissions during the given year. A closer examination of these cases makes the following categorization possible:

(1) Installations compensating for substandard performance during the preceding year;
(2) Installations where emissions were significantly lower during the pilot phase than the amount allocated; these companies surrendered all of their available allowances in April, since holding on to them was not worth it, as allowances would be worthless by the end of the pilot phase;

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47 The study by Trotignon and Ellerman (2008, p. 6) shows, in the case of 25 Member States, that trading was conducted in both directions, and that the same countries were net importers and net exporters depending on which other country they are compared to.
(3) Installations that had shut down during the pilot phase, and had surrendered all of their allowances;

(4) Installations that refused to work with the system and with emissions allowances; these companies only took minimal efforts at compliance, banked their emissions allowances in February and surrendered them the following April.
4. A Summary of Emissions Trading in Hungary

Chapter III has provided an overview of the institutional background of the Hungarian carbon dioxide emissions market, regulatory authorities and the process of institutional learning. The author has described how, from a scenario comparable to the “blind leading the deaf” (Feiler, 2008), the pilot phase has led to a greater understanding of necessary tasks and the appointment of responsible officials. A lack of coordination during the allocation process between the Ministries of Environment, Economy and Finance has been highlighted. The execution of auctions during the pilot phase has called attention to the necessity of cooperation between ministries. The system could work more efficiently and more quickly – and in an environmentally sounder way – if oversight were practiced by one professional team within one department.

Decentralized allocations, the decision-making purview of national authorities and a drive to obtain the support of industry groups characterized the EU ETS pilot phase in Hungary. From the perspective of monitoring and verification, the pilot phase was lacking reliable reference values. The majority of installations did not record and did not calculate their carbon dioxide emissions prior to the introduction of the EU ETS. This was the most significant problem of the pilot phase, and it was a problem encountered not just in Hungary but also in every country of the region. The databases, which served as the basis for determining allocations, did not prove adequate and reliable, as the majority of installations overestimated their future emissions.

The dissertation has examined the auctioning practices of the pilot phase, and has provided a detailed overview of Hungarian processes. The author’s analysis confirmed that Hungarian regulators recognized how companies not viewing emissions allowances as goods with inherent opportunity costs must be made to understand as much by the authorities. The two auctions netted the Government of Hungary revenues of over 2.5 billion HUF, which could have been greater still, had the auctions taken place earlier.

The accounting of emissions allowances posed a significant problem for companies, even despite their having had access to Hungarian and EU guidelines. Companies did not understand these guidelines and the impact of allowances on company balance books. It would be vital to publish international standards adopted both by Member State authorities and acknowledged – and then committed to – by obligated companies, so that burdens on companies and uncertainty may be reduced.

The dissertation has introduced and grouped the obligated parties of the Hungarian carbon dioxide market according to sector and according to size. In Hungary some 250 installations participated in the trial period of the emissions trading system; two-thirds were active in the field of energy...
production, one-fifth represented the ceramics manufacturing industry, and less than ten installations belonging to other sectors were party to the scheme. The Hungarian market is fairly concentrated in terms of companies and corporate groups.

Hungarian companies’ approach to the system was presented based on the author’s personal interviews. For the most part, companies viewed the system as a set of administrative burdens. The initial allocations received were seen by companies as being normative in terms of future emissions. An analysis of whether the system posed merely administrative burdens for companies or was also viewed as an opportunity for realizing profits has led to the following three conclusions:

1. Obligated companies in Hungary tended to focus primarily on their expenditures related to the scheme, and not on market profits. This appears to endanger the effectiveness of the scheme, as not all abatement opportunities will be realized when the marginal costs of doing so are lower than market prices.

2. Hungarian market players, on the whole, did not recognize the opportunity costs of emissions allowances, and only strove to minimize whatever expenses they were faced with.

3. During the pilot phase, Hungarian companies viewed the originally allocated amounts as their standard amounts, and worked to maximize their profits through the allocation process. In other words, they were interested in obtaining as many units as possible at no cost, instead of focusing on preventable emissions.

The author has examined the effect of the EU ETS on driving and motivating innovation, and has concluded that the pilot phase did not bring about the kind of technological or operative changes, which would not have taken place, had the system not been introduced. In analyzing the effects of the scheme on the competitiveness of Hungarian sectors, the author focused especially on carbon leakage (i.e. the transfer of carbon dioxide emitting activities to beyond the borders of the country). This poses a real risk mostly in the Kyoto period, however.

The effects of the EU ETS on Hungarian companies was, on the whole, not significant during the pilot phase. One company, however, chose to introduce the costs of carbon dioxide into its operative and investment decision-making processes. In the author’s opinion, doing so presented the company with strategic opportunities and potentially also profits.

The dissertation has covered the issue of why it is difficult to determine whether emissions-reductions occurred as a result of the introduction of the EU ETS; several approaches were used to quantify differences between allocation and emissions figures. The author believes that no significant reductions were achieved in Hungary during the pilot phase of the EU ETS.
The final part of the chapter has reviewed the EUA market, exchange trading and the activity of the Hungarian carbon dioxide market. Hungarian companies became partners to carbon dioxide emissions trading during the pilot phase, even despite little experience in the field. The reduction of carbon dioxide emissions was a new target for Hungary’s environmental policies.

Differences between the data of the Hungarian Registry and the central transaction log clearly showed that not every allowance emitted was surrendered at the end of the period. It is interesting to observe that internal transfers conducted within multinational companies accounted for over four-fifths of all allowances ending up on Hungarian accounts.
IV. EXPERIENCES OF THE EU ETS PILOT PHASE

This dissertation presented the pilot phase of the EU ETS between 2005 and 2007 in Hungary. The results contradict prevalent international opinion that emissions trading as a market-based environmental tool cannot be successfully implemented in a country that has lacked the necessary institutions, experience with markets and practices (Skjærseth - Wettestad, 2007, p. 264.).

This dissertation is among the first attempts to study CITL data. Only two studies (Kerr, 2007; Trotignon and Ellerman, 2008) have recently been published based on CITL analyses. This dissertation examines not only the CITL data, but also the aggregate transfer data of the Hungarian trading registry, provided directly by the registry for this project. This dissertation is among the first to interpret the differences between the two databases and to point out that surrendered amounts indicated in the CITL do not reflect real emission allowance transactions. It may be concluded that it is prudent to use the CITL records and the national registry data together in parallel, as the two databases contain information to complement each other. Although CITL data do not precisely depict international transactions and their schedules, they may be useful for inferring which Member States’ companies entered into transactions with the installations in a given Member State. The data of the national registries may be used to determine the precise quantity, scheduling and value of national transfers.

The EU’s CO₂ emissions trading scheme represents an entirely new approach, both from the perspective of parties regulated and from the perspective of regulators. The system called for a new approach on the part of all stakeholders. The dissertation examined whether expectations of the pilot phase were fulfilled. During the three years of the pilot phase, a new resource was created – the carbon emissions allowance. Hungarian entities established the necessary institutional framework and oversight mechanisms. The Government of Hungary and installations obligated to participate in the scheme came to understand the workings of emissions trading. Producers are able to appropriately measure and track their emissions – this is a key result of the pilot phase: EU Member States now have reliable and verified emissions data available going back to 2005.

This new factor of production, however, failed to take root in individuals’ mindset during the three years of the pilot phase. It did not become ingrained in corporate decision-making and company executives did not prepare for expenses related to the emission of carbon dioxide. The fact that CO₂ costs failed to become integrated into company price calculations is most likely due to the abundance of allowances available during the pilot phase, rather than to differences between Eastern and Western MSs.
The EU ETS was an obligation for Hungary when joining the EU. The GOH considered it as a tool for economic development rather than a system necessary to reach environmental objectives. A lack of coordination during the allocation process between the Ministries of Environment, Economy and Finance has been highlighted.

The effects of the EU ETS on Hungarian participants may be divided into two categories. It is necessary to distinguish between the effects of the scheme on the Hungarian state and on affected companies. The state had to consider a set of strategic issues related to the introduction and operation of the scheme, on the one hand. On the other hand, it also had to establish the institutional framework of the system, and ensure the utilization of auction revenues and the enforcement of sanctions. At the same time, the system posed administrative burdens for affected companies. For Hungarian companies, the most important goal was compliance and meeting the requirements of the scheme. The impact of the three-year pilot phase on companies in Hungary was mostly marginal, nevertheless in the long run the cost of carbon emission needs to be taken into account for investment decisions.

Hungarian companies considered the pilot phase of the European Unions Emissions Trading Scheme to be an administrative burden. The majority of the companies viewed emissions allowances as administrative units, and not as financial assets. For companies participating in the scheme to realize the opportunity costs of allowances, it would be necessary to increase the share of allowances allocated for a cost. The survey pointed out that companies where allowances were managed centrally and were traded on the corporate level, tended to be more efficient. Dealing with EU ETS issues is a rather complex process, which requires harmonized efforts of several responsibles - the coordination of different organizational units is critical to the success of the scheme.

Uncertainty surrounding new legal regulations made it difficult to adopt the system in Hungary. The EU ETS appeared to be unpredictable: regulations were still being put in place during the pilot phase itself, and decision-making on the EU level was not coordinated. Member States did not observe deadlines. At the same time, a pilot phase, which was far shorter, to begin with, than the timeframe necessary for implementing new economic decisions, did not aid the pricing of carbon emissions in business decision-making. The ability to plan ahead for the long term is vital for the scheme to succeed. It is important for companies to know that the effects of current investments aimed at reducing emissions will bear fruit in the long term.

Hungarian companies – due to more plentiful allocations than may have been necessary – were able to realize significant profits in the short term. The long term, however, is a different situation;
starting in 2012, the European Union plans to significantly reduce the amount of grandfathered allowances. It is important to note that if the percentage of CO₂ emitting industry increases in the medium term as a result of lower production costs, it is to be expected in the long term that the competitiveness of this industry will drop (as a result of necessary environmental protection investments). Alternatively, the industry may be shifted east, outside the coverage of the EU ETS. This strategy would simply mean delaying necessary expenditures, and would mean doing so through a less than practical economic approach as far as the future is concerned.

The operation of the EU’s carbon-dioxide emissions trading scheme is a valuable experience on the road to the establishment of a global CO₂ market. On the whole, the EU Emissions Trading Scheme brought about the realization of a common European carbon market. Countries did not establish their own, isolated and compliance-focused, national trading systems. It was not countries but companies, which participated in the trading, and – regardless of nationality – they worked to either sell their surplus or obtain additional allowances through the common European market. The decentralized and liquid carbon market established an effective trading scheme, with minimal transaction costs. Hungarian companies were party to this in the same way as Western-European – and already highly experienced – corporations.

Tight schedules and substantive delays diminished participants’ confidence in the scheme, both in the Eastern as well as in the Western part of the EU. There was a correlation between energy markets and the EU ETS carbon allowance market in both the old Member States as well as in new EU nations, where energy deregulation was still underway during the period in question. A free-riding approach and the lack of coordination between ministries were, however, unique to Eastern Member States. It may thus be concluded that on the whole, similarities between Eastern and Western Member States outnumber the differences. Undoubtedly, a change in environmental awareness is to be seen in the Eastern region; companies’ management structures are showing signs of "westernization" today. Corporate decision-making is also clearly undergoing a change in attitude as well as a generation change, a process, which is expected to lead to a further narrowing of differences between the two parts of the EU. The system was not successful during the pilot phase in reducing Hungary’s emissions, since it did not manage to motivate the obligated parties. If, however, the scheme is viewed more as a learning process, it may be said to have been successful.

Findings of the Thesis

The findings of the dissertation are structured around the following three main themes.
The majority of Hungarian companies have not realized the opportunity cost of emission allowances.

During the 2005-2007 pilot phase Hungarian companies covered by the EU ETS received 97.5% of the allocation at no cost to them. In keeping with relevant economics theories, opportunity costs have to be considered even when discussing free allocation of allowances, as the profits resulting from their possible sale do not differ from cost-based allocation OECD (1999). In this scenario, the opportunity cost refers to the fact that for every tonne of carbon-dioxide emitted, the number of emission allowances – received in this case for free – available on the market decreases by one, so that companies’ potential revenues will also decrease by the same amount. Interviews showed that contrary to the theory – companies did not recognize the opportunity costs of these allowances during the pilot phase.

Hungarian companies tended instead to pursue a cost-minimizing strategy regarding the EU ETS, and were not striving to maximize their profits. If they had been interested in maximizing their profits, they would have reduced their emissions and increased their allowance surplus, increasing their own presence as sellers in the international carbon market. Instead, a substantial number of Hungarian companies focused on compliance and worked to reduce their own costs related to the introduction of the new system. They did not recognize that the grandfathered allowances also entail an opportunity cost as well as a profit-generating potential in the same way as they would had the company had to pay for them. Based on personal interviews, it may be concluded that the majority of Hungarian companies did not recognize that grandfathered allowances have an opportunity cost; in other words, that by reducing their emissions, further units would become available, the sale of which would generate additional profits.

An examination of Hungarian accounting practices confirms that the management executives did not clearly understand the impacts of emission allowances on the company’s finances and balance sheets. They failed to understand that this new regulation would not only mean a burden for their company, but would also potentially entail profits. They did not recognize, then, that they could generate revenues by reducing their emissions as long as doing so is less costly to them than the market price of the allowances.

It is worthwhile to differentiate between the sale of the surplus free emission allowances and the recognition of the opportunity costs. This thesis supposes that, as can also be concluded based on the interviews, Hungarian companies did not substantially reduce their emissions. This study quantifies the surplus, which was at the companies’ disposal as a result of the generous allocation, as the difference between the verified emission amounts for the given year and the allowances...
originally allocated. Based on these calculations, Hungarian entities amassed a surplus of some 12 million tonnes. Trade data show a net amount of nine million tonnes that was transferred abroad from Hungarian trading accounts. It was not possible, however, to quantify, based on the data available, what percentage of this amount was related to internal transfers executed by international companies and what amount was actually sold.

(2) The large number of foreign allowances surrendered by Hungarian companies is not a result of purchases, but is due to internal transfers by multinational companies.

The data of the Hungarian transaction Registry show that a significant number of emission allowances, originally allocated abroad, were transferred to Hungarian installations. This is surprising, as virtually all Hungarian sectors and installations amassed surpluses during the pilot phase. During these three years more than one and a half million emission allowances were transferred to the accounts of Hungarian installations from foreign accounts. This import activity seems questionable – why would Hungarian companies, in possession of a surplus, purchase emission allowances from abroad to ensure their compliance? Import data seemed misleading; it therefore appeared useful to also identify the allowances surrendered in Hungary but originally allocated abroad, and to examine the industries involved. This part of the research was made possible by an examination of the CITL.

It was determined that Hungarian installations used foreign allowances to ensure their own compliance in twenty-seven instances, amounting to one-tenth of all Hungarian installations. This comes to some 670 thousand foreign allowances over a period of three years. It is interesting to note that this amount is still less than half of the 1.5 million registered foreign-originated allowances, which were transferred to Hungary during the pilot phase. It may be concluded that over half of the foreign emission allowances showing up on Hungarian accounts expired worthless at the end of the pilot phase without having been used and/or surrendered by the Hungarian company. This interesting finding is not unique to Hungary, however (Trotignon - Ellerman, 2008). At the same time, a significant number (240 thousand) of emission allowances originating in Hungary were not surrendered in any EU Member State Registry.

According to the data examined, the majority (87.66%) of the foreign allowances surrendered in Hungary were surrendered by international corporations. Four multinational companies are responsible for over four-fifths of the total amount: Electrabel (32.89%), Dalkia (25.86%), the Wopfingergroup (14.47%) and ATEL (13.64%).
Of the twenty-seven installations, which utilized foreign allowances, three were new entrants and attempted to meet their emission needs through the international market; this accounted for less than one percent of all foreign allowances. A further eleven Hungarian-owned installations utilized foreign-originated allowances to meet their emission needs during the pilot phase. Three of these installations clearly resorted to this move to offset their own short position. One installation was closed down during the pilot phase; this installation made up for substandard performance in 2006 by purchasing foreign allowances in 2007. Seven of these eleven installations imported allowances even though they were in long position. This behavior on their part warrants further examination. There may have been installations in this category, which had sold off their own surpluses earlier and were thus left with an insufficient amount in the final year to meet their own requirements, leaving them to turn to the market to obtain the necessary allowances. Companies following this course of action were able to profit greatly from a drop in market prices, having sold their own allowances at a high price but buying them back later at a lower cost.

The quantitative findings of the dissertation were confirmed by the personal interviews conducted. It was found that the headquarters of foreign-owned companies tended to pool their subsidiaries’ units at the beginning of the compliance period, and would re-allocate at the end of the period the number of allowances each installation required to meet its obligations.

The difference between aggregate Hungarian transaction data and real trade data serves to justify the research methodology used, which combined information from the two databases. Results thus showed that the significant import activity apparently conducted by Hungarian installations was not necessarily an accurate assessment. Four-fifths of the foreign emission allowances entering Hungary were accounted for by internal transfers between the headquarters and the Hungarian subsidiaries of multinational corporations.

(3) The Government of Hungary made use of the revenue-generating potential of emissions trading.

According to a general perception, Eastern European EU Member States lack the necessary experience to recognize and make use of the opportunities within the emissions trading system. (Skjærseth, - Wettestad, 2007. p. 266.) For Hungary, participation in the EU Emissions Trading Scheme was an obligatory component of the country’s adherence to the European Union. The lenient goals aimed at the reduction of emissions led to environmental concerns being pushed to the background, and the Government of Hungary began to look upon the EU ETS more as a tool for

48 The authors cite some ten articles.
economic development rather than as a system necessary for meeting environmental protection goals. This dissertation, however, confirms that the GOH met the inherent challenges. During the pilot phase, the establishment of the institutional framework for the implementation of the EU ETS, and compliance with relevant legal regulations, encountered some obstacles, which was exacerbated by the lack of experienced officials and the continuous fluctuation of any such individuals. The long process of institutional learning evolved from a sort of “blind leading the deaf”\(^49\) scenario.

At the same time, Hungary was in many ways a pioneer among the Member States: the country was first to join the UN’s International Transaction Log, which is a major step toward the establishment of a global carbon market. Hungary was also the first in the region to establish a Green Investment Scheme to ensure that surplus allowances do not harm the environmental effectiveness of targets aiming to reduce emissions. Hungary was also the first nation to sell Assigned Amount Units to another country at a high cost.\(^50\) Hungary was one of only a handful of states to have used provisions in the ETS Directive allowing governments to auction allowances, contributing 10 million EUR to the central budget of the country. The Hungarian experience serves as evidence that a new market economy has the institutional capacity and technical expertise to carry out auctioning. This dissertation wishes to call attention to the stressful situation due to the conflict of interests and lack of coordination between Ministries when conducting the auctions. Accordingly, the timing of Hungarian auctions did not help maximize profits, as market prices fell in the meantime.

\(^{49}\) In the words of József Feiler, former head of Climate Change and Energy Unit at the Ministry for Environment and Water

\(^{50}\) The actual price is not public, estimates are between €13-15.
Outlook for the post-2012 Phase of the EU ETS

The main difference between pilot phase of the EU ETS and Kyoto compliance phase, and also further phases is the inclusion of more sectors and installations (see table 28). the more sectors and gases are covered by the scheme, the more probably liquidity and efficiency is (Baron és Bygrave, 2002). It is now certain that EU ETS will continue after 2012. On 23 January 2008, the EU Commission adopted a proposal51 designed to amend the current EU ETS; and then the European Parliament adopted the Revised EU ETS Directive on 17 December 2008.

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<tr>
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</thead>
<tbody>
<tr>
<td>Energy activities</td>
<td>Production and processing of ferrous metals</td>
<td>Further sectors: Aviation from 2011</td>
<td>Further sectors: • Non-ferrous metals • Wool and gypsum • Chemicals • CCS related emissions</td>
</tr>
<tr>
<td>Mineral industry</td>
<td>Other activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gases covered</td>
<td>CO₂</td>
<td>Other GHGs</td>
<td>Other GHGs</td>
</tr>
<tr>
<td>Installations covered</td>
<td>Approx. 12 000</td>
<td>More installations</td>
<td>Leave out installations with emissions less than 10Mt CO₂/year</td>
</tr>
<tr>
<td>Emissions covered</td>
<td>45% of EU emissions</td>
<td>More</td>
<td>More (approx 150 Mt CO₂)</td>
</tr>
<tr>
<td>Grandfathering</td>
<td>At least 95%</td>
<td>At least 90%</td>
<td>Approx 1/3</td>
</tr>
<tr>
<td>Auctions</td>
<td>Maximum 5%</td>
<td>Maximum 10%</td>
<td>Approx 2/3 at EU level Differentiated at MS level, 10% of revenues redistributed. Gradual: Energy production: 30% in 2013 to 100% in 2020 Other sectors: 20% in 2013 to 70% in 2020</td>
</tr>
<tr>
<td>Penalty</td>
<td>40€/t</td>
<td>100€/t</td>
<td></td>
</tr>
<tr>
<td>Banking</td>
<td>No</td>
<td>In accordance with KP</td>
<td>In accordance with KP</td>
</tr>
</tbody>
</table>

Table 28. Comparing Phases of the EU ETS

Source: author’s table based on Directive 2003/87/EC and Proposal for amending

A year after Kyoto phase launched, it might be stated that not too much has changed compared to the pilot phase. Various delays occur; authorities are faced with complex tasks; the Hungarian expert team is rather small; influenced by politics, and the fluctuation is even greater than before. In November 2008 the NAP for 2008-2012 was not finalized. Therefore it is not surprising that installations’ confidence has not grown for the scheme in 2008 either. Nonetheless AAU sales were done, transferability of EUAs and AAUs have been resolved.

Hungary has still to learn to operate emission trading effectively, both at the national and at the corporate level. However, the pilot phase was successful in testing the scheme. Emission trading is working, allowances are means of active trading, and market players have come to an end in their learning curves.

Further research based on the dissertation

There is some interesting space for further studies on the topic of this dissertation. On one hand, the focus of the study may be broadened by analyzing other MSs as well. After gathering Registry data and overcoming language barriers, interviews should be made. Neighboring countries’ experiences could be compared to that of Hungarian companies.

On the other hand, broadening the time horizon of the study may be of interest. After having data of the Kyoto period publicly available, it will be interesting to look at whether operators realize opportunity costs of grandfathered emission allowances in the case of scarcity. Once CITL data will be publicly available, it will be worthwhile analyzing trading and compliance. Looking at international companies’ intrafirm transfers will be of particular interest.

Also analyzing the spending of auction and AAU sales revenues, their efficiency might be of interest to scholars and to policy makers. It will be interesting to quantify the efficiency of earmarking these revenues; and to analyze whether it was pure state intervention or emission reduction goals were really prioritized.

Linking is particular to the Kyoto phase, its analysis and implications for the EU ETS will be important to look at. Implementation, experiences and success of Kyoto Flexibility Mechanisms; Hungarian JI projects and AAU sales are also of particular interest in the future.
V. APPENDIXES

Appendix I. Questionnaire
Appendix II. Timing and deadlines
Appendix III. Accounting Aspects of Emissions Allowances
Appendix IV. National fees for the EU ETS
Appendix V. Overview of the auctions implemented in the pilot phase
Appendix VI. Trading platforms
Appendix VII. Foreign emission allowances transferred to Hungarian accounts
Appendix I. – Questionnaire

Please note: The questionnaire was sent out in Hungarian to the companies – this version is a simplistic translation only

1. Allocation effects for the company
   Positive □
   Negative □
   Neutral, no effects □

   Why?

2.a. More or less EUAs than needed for BaU operation
   Less □
   Equal □
   More □

2.b. Received as many EUAs as claimed for?
   Yes □ go to 3.a
   No □ go to 2.c

2.c. If not, how many less EUAs received? _____ (EUAs)

2.d. Change in number of EUAs when final allocation?
   More □
   Less □
   Not changed □

2.e. How was EUA shortage covered? (Multiple answers)
   Reduce production/Closure □
   Buy EUAs □
   Emissions reduction project □
   Transfer of EUAs between installations □
   Other □

3.a. New installations during 2005-2007?
   Yes □ go to 3.b
   No □ go to 3.c

3.b. Received as many EUAs as claimed?
   Yes □ _____ EUA
   No □ _____ EUA

   Yes □ go to 3.d
   No □ go to 4.a
### 3.d. What happened to EUAs?

<table>
<thead>
<tr>
<th>4. Hungarian institutions?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appropriate institutional framework/authorities?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Appropriate information?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Appropriate communication?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Receive appropriate help from authorities?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Receive appropriate answer from authorities?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5.a. Relationship with verifier?</th>
<th>☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous</td>
<td>☐</td>
</tr>
<tr>
<td>Monthly</td>
<td>☐</td>
</tr>
<tr>
<td>1-2 yearly</td>
<td>☐</td>
</tr>
</tbody>
</table>

| 5.b. Relationship with verifier (quality, content)? | ☐ |

<table>
<thead>
<tr>
<th>5.c. Problems during measuring/calculating or verifying emissions?</th>
<th>☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>☐</td>
</tr>
<tr>
<td>No</td>
<td>☐</td>
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</table>

| 5.d. Problem in detail? | ☐ |

<table>
<thead>
<tr>
<th>6.a. Competitiveness effects?</th>
<th>☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved, better than others</td>
<td>☐</td>
</tr>
<tr>
<td>Neutral</td>
<td>☐</td>
</tr>
<tr>
<td>Worse off than other companies not covered by EU ETS</td>
<td>☐</td>
</tr>
</tbody>
</table>

| 6.b. Competitive advantage/disadvantage? | ☐ |

### 7. Decision-making process within company?

<table>
<thead>
<tr>
<th>8.a. Emissions reduction?</th>
<th>☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>☐</td>
</tr>
<tr>
<td>No</td>
<td>☐</td>
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</table>

<table>
<thead>
<tr>
<th>8.b. Emissions reduction due to EU ETS and carbon allowance costs?</th>
<th>☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, emissions reduction and innovation due to introduction of EU ETS</td>
<td>☐</td>
</tr>
<tr>
<td>No, emissions reduction due to decrease in production</td>
<td>☐</td>
</tr>
<tr>
<td>No, emissions reduction due to change in temperature</td>
<td>☐</td>
</tr>
<tr>
<td>No, other: ______</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>8.c. Emissions reduction?</th>
<th>☐</th>
</tr>
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<tbody>
<tr>
<td>&lt;5 %</td>
<td>☐</td>
</tr>
<tr>
<td>21-30 %</td>
<td>☐</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>9.a. EUA sales/purchases?</th>
<th>☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>☐, ______ EUA</td>
</tr>
<tr>
<td>Purchase</td>
<td>☐, ______ EUA</td>
</tr>
<tr>
<td>Neither</td>
<td>☐</td>
</tr>
</tbody>
</table>
Had surplus but did not sell EUAs  □. Why? _____ go to 10.a.
Had a shortage but did not purchase EUAs  □. Why? _____ go to 10.a.
Other:

9.b. Transactions?
Broker/Clearing house  □, through _____ company
Bank  □, through _____
Bilateral transaction  □
Central trading desk  □, _____ multinational company.
Other:

Yes  □, go to 10.b.
No  □, go to 11.

10.b. New investments in detail?

11.a. Costs incurred due to EU ETS?
Administrative cost  □
Transaction cost  □
New employee  □
EUA purchase  □
Penalty due to non-compliance  □
R&D costs  □
New instruments  □
Other:

11.b. Costs (total) incurred due to EU ETS: _____ HUF

12. Responsible for EU ETS within company?
Environmental department  □
Financial department  □
CEO  □
Expert (outsourcing)  □
Other:

13. New employee to cover EU ETS tasks?
Yes  □, number: _____ position: _____
No  □

14. Production since EU ETS?

15. GHG emissions since EU ETS?

Thank you for your cooperation!
Appendix II. - Timing and deadlines

<table>
<thead>
<tr>
<th>Event</th>
<th>Deadline</th>
</tr>
</thead>
<tbody>
<tr>
<td>The beginning of the performance period</td>
<td>January 1 of the current year</td>
</tr>
<tr>
<td>Installations receive emission allowances:</td>
<td>February 28 of the current year</td>
</tr>
<tr>
<td>Submission deadline of the application for the permit for existing installations:</td>
<td>November 15 of the current year</td>
</tr>
<tr>
<td>Submission of applications for the permit for non-existing installations: (IPPC permit, environmental protection permit, building or establishment permit determining the conditions of the usage of the environment)</td>
<td>Continuously, following the granting of effect for the supporting permit</td>
</tr>
<tr>
<td>End of the performance period</td>
<td>December 31 of the current year</td>
</tr>
<tr>
<td>Submission of the emission report on emissions in the current year</td>
<td>January 15 of the following year</td>
</tr>
<tr>
<td>Preliminary auditing of the emission report on the emissions in the current year</td>
<td>February 15 of the following year</td>
</tr>
<tr>
<td>Submission of the audited emission report on the emissions in the current year</td>
<td>March 31 of the following year</td>
</tr>
<tr>
<td>Registry is notified with the emission data</td>
<td>April 1 of the following year</td>
</tr>
<tr>
<td>Surrendering of emission allowances corresponding to actual emission in the current year</td>
<td>April 30 of the following year</td>
</tr>
<tr>
<td>Compliance published</td>
<td>May 15 of the following year</td>
</tr>
<tr>
<td>Compliance with the obligation for reporting changes</td>
<td>Planned changes should be reported beforehand, and others within 15 days following the change</td>
</tr>
</tbody>
</table>

![Diagram of Compliance year]

- **Beginning of the performance period** January 1
- **Submission of the emission report** January 15
- **Preliminary auditing of the emission report** February 15
- **Installations receive emission allowances** February 28
- **Submission of the audited emission report** March 31
- **The Registry is notified with the emission data** April 1
- **Surrendering of emission allowances** April 30
- **Compliance published** May 15
- **End of the performance period** December 31

WORKING PAPER SERIES N. 20 - MAY 2011
### Appendix III. – Accounting Aspects of Emissions Allowances

<table>
<thead>
<tr>
<th></th>
<th>Entered as intangible assets</th>
<th>Entered as goods</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reducing profits</td>
<td>Increasing profits</td>
</tr>
<tr>
<td></td>
<td>Reducing profits</td>
<td>Increasing profits</td>
</tr>
<tr>
<td><strong>Recognition</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Free allocation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accrual of extraordinary revenues (as a delayed revenue)</td>
<td>As extraordinary revenue</td>
<td>Accrual of extraordinary revenues (as a delayed revenue)</td>
</tr>
<tr>
<td></td>
<td>The proportionate resolution of the accrual upon the accounting of the allowance as a cost or expense</td>
<td>The proportionate resolution of the accrual upon the accounting of the allowance as a cost or expense</td>
</tr>
<tr>
<td><strong>Other typical recognition</strong></td>
<td>No effect on profits nor losses</td>
<td></td>
</tr>
<tr>
<td><strong>Assessment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Market price below the book value</strong></td>
<td>Unplanned depreciation as other expense</td>
<td>Depreciation as other expense</td>
</tr>
<tr>
<td><strong>Market price above the book value</strong></td>
<td>The reversal of unplanned depreciation as other revenue</td>
<td>The reversal of depreciation as other revenue</td>
</tr>
<tr>
<td></td>
<td>(Value correction against the assessment reserve – effect on the capital)</td>
<td></td>
</tr>
<tr>
<td><strong>Provision</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>The creation of a provision on the balance sheet day</strong></td>
<td>As other expense</td>
<td>As other expense</td>
</tr>
<tr>
<td><strong>The resolution of the provision by April, 30</strong></td>
<td>As other revenue</td>
<td>As other revenue</td>
</tr>
<tr>
<td><strong>Derecognition</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Usage</strong></td>
<td>As other expense</td>
<td>As other expense</td>
</tr>
<tr>
<td><strong>Sale</strong></td>
<td>Book value as other expense</td>
<td>Sale price as other revenue</td>
</tr>
<tr>
<td></td>
<td>Sales price as other revenue</td>
<td>Book value as purchase value of sold goods</td>
</tr>
<tr>
<td></td>
<td>Sales price as net price revenue</td>
<td></td>
</tr>
<tr>
<td><strong>Fees, penalties</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Supervisory fee</strong></td>
<td>As expense for other service</td>
<td>As expense for other service</td>
</tr>
<tr>
<td><strong>Administrative fee</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Account holding fee</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Penalties</strong></td>
<td>As other expense</td>
<td>As other expense</td>
</tr>
<tr>
<td><strong>Interest on arrears</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Andor-Fazekas, 2008
Appendix IV. – National fees for the EU ETS

Certain activities relating to the emission of greenhouse gases and the amount of the administrative service provision fee

<table>
<thead>
<tr>
<th>Serial No.</th>
<th>Name of activities subject to administrative service provision fees relating to greenhouse gas emissions</th>
<th>The amount of administrative service provision fees (HUF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(section)</td>
<td>sub-section</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Emission permit for activities resulting in the emission of greenhouse gases [Article 3 of Government Decree 272/2004. (IX. 29.)]</td>
<td></td>
</tr>
<tr>
<td>1.1.</td>
<td>annual emissions ≤50 kt of CO₂</td>
<td>50,000</td>
</tr>
<tr>
<td>1.2.</td>
<td>50 kt &lt; total annual emissions ≤500 kt</td>
<td>75,000</td>
</tr>
<tr>
<td>1.3.</td>
<td>total annual emissions &gt;500 kt</td>
<td>100,000</td>
</tr>
<tr>
<td>1.4.</td>
<td>when authorizations in points 1.1., 1.2. and 1.3. are amended</td>
<td>30% of the amount in points 1.1., 1.2. and 1.3.</td>
</tr>
<tr>
<td>2.</td>
<td>Entry into the register of auditors, auditor experts, and the European Community Register of Auditors and the termination of the suspension [Government Decree 183/2005. (IX. 13.)]</td>
<td>100,000</td>
</tr>
</tbody>
</table>

Source: Section I of the Annex to Decree 32/2005 KvVM of the Minister of Environmental Issues and Water of the Minister of Environmental Protection and Water Issues

The amount of the account management fee related to the transaction log of emission allowances

<table>
<thead>
<tr>
<th>Serial No. (section)</th>
<th>Accounts relating to the emission allowance transaction log (emission allowance quantity/year)</th>
<th>Amount of the account fee (HUF/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Operator’s account</td>
<td>20,000</td>
</tr>
<tr>
<td>1.1.</td>
<td>-10,000</td>
<td></td>
</tr>
<tr>
<td>1.2.</td>
<td>10,001-100,000</td>
<td>61,000</td>
</tr>
<tr>
<td>1.3.</td>
<td>100,001-1,000,000</td>
<td>142,000</td>
</tr>
<tr>
<td>1.4.</td>
<td>1,000,001-3,000,000</td>
<td>285,000</td>
</tr>
<tr>
<td>1.5.</td>
<td>from 3,000,001 emissions</td>
<td>610,000</td>
</tr>
<tr>
<td>2.</td>
<td>Personal account</td>
<td>35,000</td>
</tr>
</tbody>
</table>

## Appendix V. – Overview and main features of the auctions implemented in the pilot phase

<table>
<thead>
<tr>
<th></th>
<th>Ireland</th>
<th>Hungary</th>
<th>Lithuania</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of auctions</strong></td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td><strong>Date of auctions</strong></td>
<td>January 27, 2006</td>
<td>December 11, 2006 and March 27, 2007</td>
<td>September 10, 2007</td>
</tr>
<tr>
<td><strong>Reserved for auctioning (EUA)</strong></td>
<td>502,201</td>
<td>791,523</td>
<td>552,000</td>
</tr>
<tr>
<td><strong>Reserved for auctioning (%)</strong></td>
<td>0.75%</td>
<td>2.5%</td>
<td>1.5%</td>
</tr>
<tr>
<td><strong>Total auctioned (EUA)</strong></td>
<td>January 2006: 250,000</td>
<td>December 2006: 1,197,000</td>
<td>March 2007: 1,177,500</td>
</tr>
<tr>
<td><strong>Total auctioned (%)</strong></td>
<td>2.47%</td>
<td>7.5%</td>
<td>1.5%</td>
</tr>
<tr>
<td><strong>Lot size</strong></td>
<td>500 in January 2006</td>
<td>500</td>
<td>1,000</td>
</tr>
<tr>
<td><strong>Deposit</strong></td>
<td>1000 in December 2006</td>
<td>100% collateral</td>
<td>100% collateral</td>
</tr>
<tr>
<td><strong>Auction design</strong></td>
<td>Sealed bid</td>
<td>Sealed bid</td>
<td>Sealed bid</td>
</tr>
<tr>
<td><strong>Minimum bid (EUA)</strong></td>
<td>500 in January 2006</td>
<td>1,000</td>
<td>1,000</td>
</tr>
<tr>
<td><strong>Minimum bid increment</strong></td>
<td>n.a.</td>
<td>1 eurocent</td>
<td>1 eurocent</td>
</tr>
<tr>
<td><strong>Minimum price</strong></td>
<td>n.a.</td>
<td>1 eurocent set at the Point Carbon 2007 EUA closing price index of the day before the auction minus 90 cents</td>
<td>85% of the market price</td>
</tr>
<tr>
<td><strong>Participants</strong></td>
<td>Registry account owners listed on CTL</td>
<td>Registry account owners listed on CTL</td>
<td>Registry account owners listed on CTL</td>
</tr>
<tr>
<td><strong>Auction type</strong></td>
<td>Uniform-price auction</td>
<td>Uniform-price auction</td>
<td>Uniform-price auction</td>
</tr>
<tr>
<td><strong>Reserve price</strong></td>
<td>Undisclosed</td>
<td>Undisclosed</td>
<td>Undisclosed</td>
</tr>
<tr>
<td><strong>Settlement time</strong></td>
<td>5 days in Jan, 2 days in Dec</td>
<td>1 day</td>
<td>1 day</td>
</tr>
<tr>
<td><strong>Pre-qualification</strong></td>
<td>on-line, website</td>
<td>not needed</td>
<td>not needed</td>
</tr>
<tr>
<td><strong>Clearing price (€ per tonne)</strong></td>
<td>26.32 in January 2006</td>
<td>7.42 in December 2006, 6.87 in December 2006</td>
<td>0.88 in March 2007, 0.06</td>
</tr>
</tbody>
</table>

Source: Fazekas, 2008
## Appendix VI. – Trading platforms in the European carbon market

<table>
<thead>
<tr>
<th>Trading platform</th>
<th>Center</th>
<th>EU ETS products</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Climate Exchange (ECX)</td>
<td>London</td>
<td>Spot and forward trading in EUA</td>
</tr>
<tr>
<td>European Energy Exchange (EEX)</td>
<td>Leipzig</td>
<td>Spot and forward trading in EUA Auctions daily</td>
</tr>
<tr>
<td>Energy Exchange Austria (EXAA)</td>
<td>Wien</td>
<td>Spot and forward trading in EUA Auctions weekly</td>
</tr>
<tr>
<td>NordPool</td>
<td>Oslo</td>
<td>On 11 February, 2005 Nord Pool became the first exchange in the world to start trading in EUAs Spot and forward EUA</td>
</tr>
<tr>
<td>BlueNext</td>
<td>Paris</td>
<td>Europe's leading spot exchange for EUAs BlueNext Spot EUA BlueNext Spot CER and Futures EUA and CER will be launched at the beginning of the second quarter of 2008</td>
</tr>
<tr>
<td>CSX</td>
<td>London</td>
<td>Provides the platform for the spot trading of environmental products designed to combat climate change</td>
</tr>
<tr>
<td>Carbon Pool Europe</td>
<td>Moedling</td>
<td>International spot trading platform for EUAs</td>
</tr>
<tr>
<td>Poee</td>
<td>Rogowiec</td>
<td>Spot and forward trading in EUA</td>
</tr>
<tr>
<td>New Values</td>
<td>Amsterdam</td>
<td>Spot and forward trading in EUA</td>
</tr>
<tr>
<td>Vertis</td>
<td>Budapest</td>
<td>In February 2008 the euets.com, the European Energy Auction and New Values merged their activities into Climex Spot CO₂ exchange</td>
</tr>
<tr>
<td>STX Services</td>
<td>Amsterdam</td>
<td>• CO₂ allowances&lt;br&gt;• Green Certificates&lt;br&gt;• Dutch NOx Emissions&lt;br&gt;• Power &amp; Gas&lt;br&gt;• Biofuel Tickets</td>
</tr>
<tr>
<td>APX Power Limited</td>
<td>London</td>
<td>Central clearing counterparty Spot and forward trading in EUA</td>
</tr>
</tbody>
</table>
Appendix VII. - Foreign emission allowances transferred to Hungarian accounts

<table>
<thead>
<tr>
<th>Installation</th>
<th>Compliance year</th>
<th>Originating Registry</th>
<th>Amount</th>
<th>Sector</th>
<th>Company</th>
<th>Allocation</th>
<th>Verified emissions</th>
<th>Surrendered amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>EURO-METAL Öntödéi Kft.</td>
<td>2005</td>
<td>HU</td>
<td>6508</td>
<td>Iron and steel</td>
<td></td>
<td>3910</td>
<td>6508</td>
<td>6508</td>
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<tr>
<td></td>
<td>2006</td>
<td>HU</td>
<td>5222</td>
<td></td>
<td></td>
<td>3910</td>
<td>7012</td>
<td>5222</td>
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<tr>
<td></td>
<td>2007</td>
<td>PL</td>
<td>2682 6000</td>
<td></td>
<td></td>
<td>3910</td>
<td>6892</td>
<td>8682</td>
</tr>
<tr>
<td>Villeroy &amp; Boch Magyarország Rt.</td>
<td>2005</td>
<td>HU</td>
<td>26266</td>
<td></td>
<td></td>
<td>24358</td>
<td>26266</td>
<td>26266</td>
</tr>
<tr>
<td></td>
<td>2006</td>
<td>HU</td>
<td>26761</td>
<td></td>
<td></td>
<td>24358</td>
<td>26761</td>
<td>26761</td>
</tr>
<tr>
<td></td>
<td>2007</td>
<td>HU</td>
<td>20793</td>
<td>Ceramics</td>
<td>Villeroy &amp; Boch</td>
<td>24358</td>
<td>24793</td>
<td>24793</td>
</tr>
<tr>
<td>Pannon Hőerőmű Rt. Pécsi Erőmű</td>
<td>2005</td>
<td>HU</td>
<td>255831</td>
<td></td>
<td></td>
<td>375649</td>
<td>255831</td>
<td>255831</td>
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<tr>
<td></td>
<td>2006</td>
<td>HU</td>
<td>198566</td>
<td></td>
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<td>375649</td>
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<td></td>
<td>2007</td>
<td>CZ</td>
<td>44236</td>
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<td>106199</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>PL</td>
<td>504384</td>
<td>Energy production</td>
<td>DALKIA</td>
<td>375649</td>
<td>182204</td>
<td>677384</td>
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<tr>
<td>Csepel II. KCYT Erőmű</td>
<td>2005</td>
<td>HU</td>
<td>777952</td>
<td></td>
<td></td>
<td>810866</td>
<td>777952</td>
<td>777952</td>
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<tr>
<td></td>
<td>2006</td>
<td>HU</td>
<td>761485</td>
<td></td>
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<td>810866</td>
<td>761485</td>
<td>761485</td>
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<tr>
<td></td>
<td>2007</td>
<td>EE</td>
<td>837368</td>
<td>Energy production</td>
<td>ATEL</td>
<td>810866</td>
<td>964968</td>
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<td>Paksi Téglagyár</td>
<td>2006</td>
<td>UK</td>
<td>2710</td>
<td>Ceramics</td>
<td>New entrant</td>
<td>0</td>
<td>1354</td>
<td>2710</td>
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<tr>
<td>INOTAL KFT</td>
<td>2007</td>
<td>HU</td>
<td>5001 1513 1000</td>
<td>Energy production</td>
<td>New entrant</td>
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<td>URSA Salgótarjáni Üveggyapot Rt.</td>
<td>2006</td>
<td>HU</td>
<td>20160</td>
<td></td>
<td></td>
<td>9659</td>
<td>10001</td>
<td>20160</td>
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<td></td>
<td>2007</td>
<td>ES</td>
<td>8126 2000</td>
<td>Glass</td>
<td>Uralita Group</td>
<td>9659</td>
<td>10126</td>
<td>10126</td>
</tr>
<tr>
<td>Vértesi Eőmű Rt. Oroszlányi Erőmű</td>
<td>2005</td>
<td>HU</td>
<td>1702685</td>
<td></td>
<td></td>
<td>1728503</td>
<td>1702685</td>
<td>1702685</td>
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<tr>
<td></td>
<td>2006</td>
<td>HU</td>
<td>1558331</td>
<td>Energy production</td>
<td>MVM</td>
<td>1728503</td>
<td>1558331</td>
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<tr>
<td></td>
<td>2007</td>
<td>PL</td>
<td>1590456 40000</td>
<td></td>
<td></td>
<td>1728503</td>
<td>1630456</td>
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<tr>
<td>Berényi téglagyár</td>
<td>2005</td>
<td>HU</td>
<td>5763</td>
<td></td>
<td></td>
<td>10244</td>
<td>6069</td>
<td>5763</td>
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<tr>
<td></td>
<td>2006</td>
<td>HU</td>
<td>6087</td>
<td></td>
<td></td>
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<td>5780</td>
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<tr>
<td></td>
<td>2007</td>
<td>SI</td>
<td>6587</td>
<td></td>
<td></td>
<td>10244</td>
<td>7488</td>
<td>7487</td>
</tr>
<tr>
<td>Szombathelyi Távhőzolgáttató Kft.</td>
<td>2005</td>
<td>HU</td>
<td>37874</td>
<td></td>
<td></td>
<td>36302</td>
<td>37874</td>
<td>37874</td>
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<tr>
<td></td>
<td>2006</td>
<td>PL</td>
<td>4000</td>
<td>Energy production</td>
<td></td>
<td>36302</td>
<td>37017</td>
<td>37017</td>
</tr>
<tr>
<td></td>
<td>2007</td>
<td>HU</td>
<td>27456</td>
<td></td>
<td></td>
<td>36302</td>
<td>27456</td>
<td>27456</td>
</tr>
<tr>
<td>Rath Hungária Tüzéllő Rt. Téglagyár</td>
<td>2006</td>
<td>HU</td>
<td>13828</td>
<td></td>
<td></td>
<td>7671</td>
<td>7642</td>
<td>16028</td>
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<tr>
<td></td>
<td>2007</td>
<td>HU</td>
<td>7138</td>
<td>Ceramics</td>
<td>Rath Group</td>
<td>7671</td>
<td>7138</td>
<td>7138</td>
</tr>
<tr>
<td>ST GLASS Öblöösvégg</td>
<td>2005</td>
<td>HU</td>
<td>20723</td>
<td>Glass</td>
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### VI. GLOSSARY

- Abbreviation list -

<table>
<thead>
<tr>
<th>Expression</th>
<th>Abbr.</th>
<th>Explication</th>
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<tr>
<td>Additionality</td>
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<td>Under the Kyoto Protocol, certificates from JI and the CDM are awarded only to project-based activities where emissions reductions are &quot;additional to those that otherwise would occur&quot;.</td>
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<tr>
<td>Allocation</td>
<td></td>
<td>Emissions allowances distributed among greenhouse gas emitters to establish an emission trading market. The division of allowances can be done through grandfathering method and auctioning.</td>
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<tr>
<td>AIJ</td>
<td></td>
<td>39 emissions-capped countries listed in Annex B of the Kyoto Protocol.</td>
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<tr>
<td>Annex I of the UNFCCC</td>
<td></td>
<td>The schedule of countries which agreed to limit their own GHG emissions and return to levels of emissions of an earlier period. There are currently 41 Annex I signatories.</td>
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<tr>
<td>Annex II of the UNFCCC</td>
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<td>All original OECD member countries plus the European Union.</td>
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<tr>
<td>Assigned Amount Units</td>
<td>AAU</td>
<td>UN Kyoto Protocol based allowance, a tradable unit of 1 tonne of CO2e. The assigned amount is the total amount of greenhouse gas that each Annex B country is allowed to emit during the first commitment period of the Kyoto Protocol.</td>
</tr>
<tr>
<td>Auctioning</td>
<td></td>
<td>Allocation of greenhouse gas emissions among emitters within domestic emissions trading scheme concerned with willingness to pay for permits.</td>
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<tr>
<td>Banking</td>
<td></td>
<td>Parties to the Kyoto Protocol may bank some emissions allowances or credits (maximum limit of 2.5% of country's target) to use them in subsequent commitment periods.</td>
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<tr>
<td>Baseline and Baseline Scenario</td>
<td></td>
<td>The baseline represents forecasted emissions under a business-as-usual (BAU) scenario, often referred to as the 'baseline scenario', i.e. expected emissions if the emission reduction activities were not implemented.</td>
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<tr>
<td>Bubble</td>
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<td>A bubble is a regulatory concept whereby two or more emission sources are treated as if they were a single emission source.</td>
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<tr>
<td>Burden Sharing Agreement</td>
<td>BSA</td>
<td>Differentiates abatement commitments among Member States according to their level of development.</td>
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<tr>
<td>Business As Usual Scenario</td>
<td>BaU</td>
<td>Business as usual scenario is a policy neutral reference case of future emissions, i.e. projections of future emission levels in the absence of changes in current policies, economics and technology.</td>
</tr>
<tr>
<td>Cap-and-trade</td>
<td></td>
<td>Cap-and-trade system is an emissions trading system, where total emissions are limited or capped. The Kyoto Protocol is a cap and trade system in the sense that emissions from Annex B countries are capped and that excess permits might be traded.</td>
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<tr>
<td>Carbon Capture and Storage</td>
<td>CCS</td>
<td>Process consisting of the separation of CO2 from industrial and energy-related sources, transport to a storage location and long-term isolation from the atmosphere.</td>
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<tr>
<td>Carbon Dioxide</td>
<td>CO₂</td>
<td>Measurement unit used to indicate the global warming potential (GWP) of greenhouse gases. Carbon dioxide is the reference gas against which other greenhouse gases are measured.</td>
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<tr>
<td>Carbon Dioxide Equivalent</td>
<td>CO₂e</td>
<td>New EU Member States (EU12)</td>
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<td>Certification</td>
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<td>The certification process is the phase of a CDM or JI project when permits are issued on the basis of calculated emissions reductions and verification, possibly by a third party.</td>
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<tr>
<td>Certified Emission</td>
<td>CER</td>
<td>Tradable units generated by CDM Projects</td>
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<td><strong>Reductions</strong></td>
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<tr>
<td>Clean Development Mechanism</td>
<td>CDM</td>
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<tr>
<td>Mechanism for project-based emission reduction activities in developing countries. Certificates will be generated through the CDM from projects that lead to certifiable emissions reductions that would otherwise not occur.</td>
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<tr>
<td>combined cycle gas turbine technologies</td>
<td>CCGT</td>
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<tr>
<td>combined heat and power</td>
<td>CHP</td>
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<tr>
<td>Commitment Period</td>
<td>The five-year Kyoto Protocol Commitment Period is scheduled to run from calendar year 2008 to calendar year-end 2012</td>
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<tr>
<td>Commitment Period Reserve</td>
<td>To avoid over-sell and thus non-compliance with targets, Annex I Parties to hold a minimum level of AAUs, CERs, ERUs and/or RMUs in a commitment period reserve that cannot be traded</td>
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<tr>
<td>Community Independent Transaction Log</td>
<td>CITL</td>
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<tr>
<td>Central Administrator programme started at January 1, 2005 according to EU Directive 2003/87/EC, which underline the necessity to maintain an independent transaction log recording the issue, transfer and cancellation of allowances within European Union</td>
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<tr>
<td>Compliance</td>
<td>Achievement by a Party its quantified emission limitation and reduction commitments under the Kyoto Protocol</td>
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<td>Conference of the Parties</td>
<td>COP</td>
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<tr>
<td>COP is the supreme body of the United Nations Framework Convention on Climate Change (UNFCCC). The Sixth Conference of the Parties under the UN Framework Convention on Climate Change (COP-6) took place in The Hague 13-24 November 2000. COP6 was formally not ended before agreement was reached at the second part of the conference (COP-6bis) in Bonn, Germany, in July 2001. COP-7 was held 29 Oct -9 Nov, 2001, in Marrakech, Morocco. COP-8 was held in New Delhi, India, in October/November 2002, COP-9 took place in December 2003 in Milan, Italy. COP-10 was held in December 2004 in Buenos Aires, Argentina COP-11 in Montreal, Canada in November/December 2005, this also was the first Meeting of the Parties to the Kyoto Protocol (MOP-1). COP -12 was held in Nairobi in November 2006. COP -13 was in Bali in December 2007. The last conference COP – 14 was in Poznan in December 2008.</td>
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<td>Double Counting</td>
<td>Projects within installations covered by the EU ETS can not be put forward as Joint Implementation projects because allocation of EUAs and generation of ERUs in the same installation would lead to double counting</td>
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<tr>
<td>Designated Operational Entity</td>
<td>DOE</td>
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<td>United States Environmental Protection Agency</td>
<td>EPA</td>
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<tr>
<td>Early Crediting</td>
<td>Early credits can be given for projects implemented between 2000 and 2008 to achieve compliance in the first commitment period</td>
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<tr>
<td>Emission Reduction Purchase Agreement</td>
<td>ERPA</td>
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<tr>
<td>Binding purchase agreement signed between buyer (of CERs or ERUs) and seller</td>
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<tr>
<td>Emission Reduction Unit</td>
<td>ERU</td>
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<tr>
<td>Permits achieved through a Joint Implementation project</td>
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<td>EU Emissions Trading Scheme</td>
<td>EU ETS</td>
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<td>Trading Scheme within the European Union. The first compliance phase is from 2005 to 2007, while the second compliance phase continues from 2008 to 2012.</td>
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<td>European CO2 Allowance / European Union Allowance</td>
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<tr>
<td>EU Allowances, the tradable unit under the EU ETS. Equals 1 tonne of CO2e.</td>
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<td>Global Warming Potential GWP</td>
<td>the impact a greenhouse gas has to global warming. By definition, CO2 is used as reference case, hence it always has the GWP of 1. GWP changes with time, and the IPCC has suggested using 100-year GWP for comparison purposes.</td>
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<td>Grandfathering</td>
<td>Method for allocation of emissions, where permits are allocated, usually free of charge, to emitters and firms on the basis of historical emissions.</td>
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<td>Green Investment Scheme GIS</td>
<td>a fund to promote the environmental effectiveness of AAU transfers by earmarking revenues from these transfers for environmentally-related purposes in the seller countries.</td>
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<tr>
<td>Greenhouse Gases GHG</td>
<td>Gases that control energy flows in the Earth's atmosphere by absorbing infrared radiation. There are six GHGs covered under the Kyoto Protocol - carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF6). CO2 is the most important GHG released by human activities.</td>
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<tr>
<td>Host Country</td>
<td>where a JI or CDM project is physically located. A project has to be approved by host country to receive CERs or ERUs.</td>
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<tr>
<td>Hot Air</td>
<td>Excess permits that have occurred due to economic collapse or declined production for reasons not directly related to intentional efforts to curb emissions</td>
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<td>Hungarian Government GOH</td>
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<td>Hydrofluorocarbons HFC GWP: 150 - 11 700</td>
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<td>Intergovernmental Panel on Climate Change IPCC</td>
<td>IPCC was established by World Meteorological Organisation (WMO) and the United Nations Environmental Programme (UNEP) in 1988 to assess scientific, technical and socio-economic information relevant for the understanding of climate change, its potential impacts and options for adaptation and mitigation. It is open to all Members of the UN and of WMO (<a href="http://www.ipcc.ch">www.ipcc.ch</a>)</td>
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<tr>
<td>International Emission Trading IET</td>
<td>Allows for transfer of AAUs across international borders or emission allowances between companies covered. It is a general term often used for the three Kyoto mechanisms: JI, CDM and IET.</td>
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<tr>
<td>International Transaction Log ITL</td>
<td>A planned centralized database of all tradable credits under the Kyoto Protocol and the application that verifies all international transactions and their compliance with Kyoto rules and policies.</td>
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<tr>
<td>Japanese Voluntary Emissions Trading Scheme JV ETS</td>
<td>Cap-and-trade system in Japan</td>
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<tr>
<td>Joint Implementation JI</td>
<td>a mechanism for projects financed by developed countries in other developed countries (including Central and Eastern European countries) and is tradable in Phase II. JI generates ERUs on the basis of emission reduction projects leading to quantifiable emissions reductions.</td>
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<td>Joint Implementation Supervisory Committee JISC</td>
<td>Supervises the verification of ERUs generated by JI projects following the verification procedure under the JISC.</td>
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<td>Kyoto Protocol KP</td>
<td>The Kyoto Protocol originated at COP-3 to the UNFCCC in Kyoto, Japan, December 1997. It specifies emission obligations for the Annex B countries and defines the three so-called Kyoto mechanisms: JI, CDM and IET. It entered into force on 16 February 2005</td>
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<tr>
<td>Land Use, Land Use Change and Forestry LULUCF</td>
<td>The LULUCF sector was included under the Kyoto Protocol to take into consideration certain human-induced activities that remove greenhouse gases from the atmosphere, also known as carbon sinks. (afforestation, reforestation, deforestation, revegetation, forest management, cropland management and grazing land management.</td>
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<td>Leakage</td>
<td>Decrease or increase of greenhouse gas-related benefits outside the boundaries set for defining a project's net greenhouse gas impacts that result from the project.</td>
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<td>Linking Directive</td>
<td>The EU Emissions Trading Directive 2003/87/EC and its amendment arrange the use of project credits in Phase I (2005-2007) of the EU ETS, as well as provisions relating to project approval processes and authorisation to participate in the flexible mechanisms. They also contain additional provisions relating to the establishment of the national emissions inventory.</td>
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<tr>
<td>Marginal abatement cost MAC</td>
<td>The marginal abatement cost in the context of the carbon market is the cost of reducing emissions with one additional unit. Aggregated marginal costs over a number of projects or activities define the marginal abatement cost curve.</td>
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<tr>
<td>Marginal net private benefit MNPB</td>
<td>Represents the marginal profits to the firm with each additional unit of output.</td>
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<tr>
<td>Marrakesh Accords</td>
<td>Accords include the detailed modalities and procedures of the international climate change policy regime developed at COP-7 (seventh Conference of the Parties). Marrakesh Accords cover significant principles for technology transfer, accounting, flexible mechanisms implementation etc.</td>
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<tr>
<td>Meeting of Parties MOP</td>
<td>MOP is the Supreme Body of the Kyoto Protocol. The first Meeting of Parties to the Kyoto Protocol firstly was held in Montreal in December 2005 during the 11th Conference of Parties.</td>
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<td>Member State MS</td>
<td>Countries of the European Union.</td>
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<td>Memorandum of understanding MoU</td>
<td>Agreement between two parties that aims to formally recognize a joint desire to ultimately conclude an agreement or to achieve goals jointly. MoUs between host and investor country are often used as a basis for CDM/JI projects.</td>
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<tr>
<td>Methane CH₄ GWP: 21</td>
<td>Collection and archiving of all relevant data necessary for determining the baseline, measuring anthropogenic emissions by sources of greenhouse gases within the project boundary of a project activity and leakage, as applicable.</td>
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<tr>
<td>Monitoring</td>
<td>Allocation and establishing the rules to issue emission allowances at the national level to individual sites under the EU ETS. Public authorities and industrial companies calculate the expected emissions levels, defined on the basis of past emissions adjusted for achievable progress and the growth forecast for the coming period. The total quantity of allowances made available by the Member State must correspond to the target assigned to it under the Kyoto protocol.</td>
</tr>
<tr>
<td>National Allocation Plan NAP</td>
<td>NCA monitor individual firms’ accounts in order to monitor compliance with the overall national emissions reductions targets. (D)NA is the official body representing the Government, which takes part in the arrangement of CDM/JI projects. For JI host countries, the national authority approves the projects and issues the emission reduction units. For CDM host countries, the designated national authority issues a non-objection letter necessary for the project approval, if it agrees that a project is in line with its sustainable development objectives.</td>
</tr>
<tr>
<td>National Competent Authority NCA</td>
<td>Under the EU ETS each Member State establishes a national registry that links to the Community Independent Transaction Log (CITL) which in turn ensures a secure, compatible and smooth integration of all systems under one European umbrella. The sum of all registries together with the CITL is known as the ‘Registries System’</td>
</tr>
<tr>
<td>National Authorities and Designated National Authorities (D)NA</td>
<td></td>
</tr>
<tr>
<td>National Registries Nitrous-oxides NOₓ GWP: 310</td>
<td>Signatories to UNFCCC that made no specific commitments other than to cooperate with the process, particularly by assisting in the monitoring and measuring of GHG emissions. There are currently 148 non-Annex I countries.</td>
</tr>
<tr>
<td><strong>New South Wales Greenhouse Gas Abatement Scheme</strong> (NSW GGAS)</td>
<td><strong>Cap-and-trade system in Australia, which is the second largest system after the EU ETS</strong></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>Perfluorocarbon (PFC)</strong></td>
<td><strong>GWP: 6500 - 9200</strong></td>
</tr>
<tr>
<td><strong>Phase I</strong></td>
<td>The first EU ETS compliance period (2005 – 2007).</td>
</tr>
<tr>
<td><strong>Phase II</strong></td>
<td>The second EU ETS compliance period (2008 – 2012).</td>
</tr>
<tr>
<td><strong>Phase III</strong></td>
<td>The third EU ETS compliance period (2013 – 2020).</td>
</tr>
<tr>
<td><strong>Regional Greenhouse Gas Initiative (RGGI)</strong></td>
<td><strong>Cap-and-trade system in the Northern States of the USA</strong></td>
</tr>
</tbody>
</table>

**Registration**
- The formal acceptance by the Executive Board of a validated project activity as a project activity. Registration is the prerequisite for the verification, certification and issuance of credits related to that project activity.

**Removal Units (RMU)**
- A unit relating to land use, land use change and forestry activities is equal to one metric tonne of CO2 equivalent. RMUs cannot be banked for use in any subsequent commitment period, but can be converted into Assigned Amount Units (AAUs) within National Registry.

**Set-aside (JI Reserve)**
- A set-aside should be established in the National Allocation Plan for the period 2008 to 2012 of each Member State hosting or intending to host activities under the project based mechanisms of the Kyoto Protocol, which could cause double-counting, listing planned project activities and its anticipated reductions or limitations of emissions that take place in installations under EU ETS and for which ERUs or CERs should be issued by the Member State.

**Sinks**
- Removal of greenhouse gases from the atmosphere through land management and forestry activities that may be subtracted from a country's allowable level of emissions.

**Sulfur hexafluoride (SF₆)**
- **GWP: 23 900**

**Supplementarity**
- A provision in the Kyoto Protocol stating that emissions trading should be a supplement to domestic action. It reflects the request of the European Union to limit the use of the Kyoto Protocol Flexibility Mechanisms.

**United Nations Framework Convention on Climate Change (UNFCCC)**
- The UNFCCC was established 1992 at the Rio Earth Summit. It is the overall framework guiding the international climate negotiations. Its main objective is "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic (man-made) interference with the climate system".

**Validation**
- The process of independent evaluation of a CDM project by an accredited Independent Entity according to requirements to CDM projects.

**Verification**
- In order for CDM projects to have a formalized validation of an emission reduction stream, a recognized independent third party must confirm that claimed emissions reduction activity has occurred.

**Verified/Voluntary Emission Reductions (VER)**
- Generated by small scale projects, which are assessed and verified by third party organizations rather than through the UNFCCC.

**Voluntary Carbon Market (VCM)**
- Cover those buyers and sellers of Verified Emission Reductions (VERs), which seek to manage their emission exposure for non-regulatory purposes.
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