

DOMESTIC EMISSIONS TRADING SYSTEM IN THE CZECH REPUBLIC: OPTIONS FOR AN IMPLEMENTATION FRAMEWORK

Prague, December 2001

This report analyses the potential for implementation of domestic emissions trading system as a part of a climate change policy in the Czech Republic. It aims to present and discuss various design and implementation issues, and intends to analyse how to integrate such a system into the existing institutional, legal, and administrative frameworks.

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EXECUTIVE SUMMARY

The CR is considering developing a domestic trading system as part of its climate change policy. There is, however, no experience of emissions trading in the CR. This case study represents therefore a first step by the Czech Government to analyse the potential -and options- for implementing a domestic trading system. This study aims to provide a preliminary discussion of design and implementation issues, as well as suggestions for a pilot trading system for the CR. This should help launch a debate and enhance the understanding of this instrument among various national stakeholders.

The Czech Republic is expected to be in compliance with its Kyoto target with its current set of policies. It is likely to be a seller on the international emissions trading market, although the precise amount is still very uncertain. However, the CR still has an interest in further reducing GHG emissions, for a variety of reasons: supply of GHG permits to the international market as well as secondary benefits, such as reduced air pollution, increased energy efficiency, lower energy dependency.

The existing policy reflects a broad spectrum of measures related to energy saving and increased penetration of renewable energies. There is, however, no strategic approach to GHG emissions reductions, with measures often introduced separately and aiming at different primary targets, with GHG reductions as a side effect. It is expected that a new strategy should include a clear goal for emissions reduction, instruments directly emphasising GHG emissions reductions, as well as better co-ordination and linkages between instruments.

The proposed emissions trading system would therefore be introduced in the context of a new climate change strategy, with trading as a pillar and combined with other instruments. This new climate change strategy should also define a national target for GHG reduction during the first commitment period, probably stronger than Kyoto target (the current national target is 20% reduction of 1990 emissions by 2005, but no further goals are set).

The design of a cap-and-trade system should reflect the specific circumstances of a transition country like the CR. Since the CR will most probably be in compliance with its Kyoto emissions target under business-as-usual conditions, the goal of such a system, in particular during the pre-commitment period, would be to gain experience in operating this kind of system. The study suggests therefore that a pilot, voluntary system will be developed for the pre-commitment period 2005 – 2007 (with the possibility to set up a mandatory system for the first commitment period). Since participation is voluntary, incentives would be needed for firms to take on an emissions cap. The incentives that are considered are: recycling of air pollution charges back to sources (with participation in trading as necessary condition) as well as better access to other subsidy programmes (related to e.g. energy efficiency or renewables). A strong incentive that could be considered is the possibility to bank pre-commitment period permits for use during the first commitment period, so that they can be sold on the international market. Further studies are needed to assess the likely effects of these different incentives.

The study suggests using the 20% reduction target (by 2005 compared to 1990) that is defined in the State Environmental Policy as a basis for setting the emissions cap. Such a target would be maintained between 2005 and 2007 for the trading system.

For the economy as a whole, a 20% target would mean that emissions should not increase above 150 Mt CO₂-eq/year during the period 2005-2007 (as compared to 187,5 Mt in 1990). This means that total GHG emissions in 2005-2007 would be allowed to increase by about 3.5% between 1998 and 2005-2007. In 1998, CO₂ emissions from the 141 firms that would be

covered by the system amounted to 68.1 Mt CO₂, or about 47% of total GHG emissions. One possible way to set the cap for these 141 firms (“the capped sector”) would be to set a 3.5% growth target for the CO₂ emissions of these firms, as compared to 1998, which is equivalent to about 71 Mt CO₂.

Considering the specific situation of a transition country like the CR, a “growth cap” of +3.5% might be justified, since economic development is considered as the primary goal and emissions reductions from current levels are not a policy priority in the time frame considered. This would not ensure that the 20% national target is met, since only 47% of GHG emissions are (theoretically) covered by the system. Other policies and measures would be needed for the “uncapped” sector.

The study suggests grandfathering as the rule for the initial allocation. This would imply a gratis allocation of permits and distribution of permits to individual sources on the base of historical data. If 1998 emissions would be used as a basis, this means that emissions from each of the 141 firms would be allowed to grow by 3.5% between 1998 and 2005-2007.

In the CR, an emissions register already exists, which is based on a self-reporting system by industrial pollution sources (the REZZO database). For large pollution sources, the monitoring is based on the registration of amounts of individual fuels (with their characteristics) consumed in individual plants. CO₂ emissions can be derived easily from such information.

In order to use the REZZO database for the trading system, several elements will need to be improved or added: quality assurance/quality control functions, including cross-checking energy data, attention to the quality of fuel characteristics, improvement of emissions factors. There is a significant need for research and development activities on the GHG inventories for the time period 1990 – 2000. In addition, a registry system, which tracks emissions allowances, will also need to be developed.

Institutions already exist for the monitoring and verification system. The Czech Hydrometeorological Institute and the Czech Inspection Office operate the REZZO1 system, which could be an appropriate emissions database for the emissions trading system in the Czech Republic. These institutions, preferably the Czech Hydrometeorological Institute, may also operate the allowance tracking system (national registry). Both these institutions are managed by the Ministry of Environment. They will require additional human resources to operate these monitoring and tracking systems.

The study suggests that the rules and features of the trading system could be specified in an incident decree to the new Clean Air Act, to be adopted by Parliament in January 2002. This Act specifies potential binding obligations for large and extra-large stationary sources and could be a legal basis for emissions trading. Some other legal issues will also need to be dealt with, including: the legal status of the permits, tax treatment of permits etc.

It is expected that international broker institutions or financial markets will play a key role in developing and maintaining the GHG market. Financial markets in the Czech Republic are themselves relatively well developed and should also be able to participate.

It is supposed that the results of the study will be disseminated and submitted for broad discussion and evaluation, and subsequently to begin with the systematic creation of conditions for further developing knowledge in the field of GHG emissions trading.

1 INTRODUCTION

1.1 What is a domestic emissions trading system

Emissions trading is a market based (economic) instrument. In general, economic instruments have some advantages over the traditional command and control approach: they assure environmental results, allow environmental goals to be achieved at lower costs, address environmental issues where an approach based on regulating individual sources is not feasible (e.g. due to a high number of small sources), and provide incentives for polluters to innovate.

There are four main reasons for the growing interest shown in transferable permits:

- the desire to improve environmental performance;
- the flexibility with which the policy can be implemented;
- explicit and separate treatment of distributive aspects;
- economic efficiency.

The instrument consists in a combination of two elements:

- the setting of quantified constraints in the form of obligations, permits, or rights allocated to target groups (pollution sources, land-owners etc.);
- the authorisation of such target groups, under certain conditions specified by an administrative authority, to transfer these permits from one agent (activity, time period) to another one (OECD, 1999; OECD, 2000).

Emissions trading is one of the areas that fall within the scope of transferable permits (tradable permits)¹. Many applications of this instrument can be found. They are mainly related to the emissions of air pollutants, but both water-based and land-based applications have also been involved. In practice, their implementation ranges from measures to ease conventional administrative regimes to the organisation of markets with a special commodity.

Until now, some experience with emissions trading exists only at the national level. However, this scheme, as a part of the proposed flexible instruments within the Kyoto Protocol, should be introduced for CO₂ trading at the international level.

Emissions trading is based on the cap and trade mechanism. At the national level, different units can be defined (permit, entitlement, allowance, quota, credit).

Introducing such measures into environmental policy includes the following steps:

- Setting an emissions cap;
- Allocating permits (targets for individual sources);
- Reviewing the emissions sources;
- Sanctions for any over-emitting.

For the sources, after having been allocated some permits, they can choose between reducing emissions or buying permits on the market.

¹ Two types of tradable permit system are under operation: those based on emissions reduction credits (baseline and credit, ERCs), and those based on ex-ante-allocation (cap-and-trade, allowances).

1.2 International policy context and its relationship with international emissions trading

For over two decades parts of the international community have realised the need for actions that would limit the global emissions of greenhouse gases (GHG). A number of intergovernmental conferences, focused on climate change, have been held in recent years. Increasing scientific evidence, growing public awareness and political actions helped to raise international concerns about the issue. The Intergovernmental Panel on Climate Change (IPCC) released its First Assessment Report in 1990. It provided the basis for negotiations at the Climate Change Convention.

In December 1990, the UN General Assembly approved the start of treaty negotiations. The proposal for the UN Framework Convention on Climate Change (UNFCCC) was finalised in June 1992. 154 states (plus the EC) signed the UNFCCC at the “Earth Summit” in Rio. Later on the Convention was ratified by 187 states.

At the Third Conference of the Parties to the Convention (COP-3) the delegates agreed upon the Kyoto Protocol, which sets differential binding emissions limitations for developed countries (Annex B-countries) for the commitment period 2008-12. The combined result of individual country targets is estimated to result in an overall reduction in Annex B-countries’ GHG emissions by 5.2 % from the 1990 levels within the commitment period (averaged across the period). The emissions target covers all six groups of GHG not included in the Montreal Protocol.

The Kyoto Protocol states that “Parties included in Annex B may participate in emissions trading for the purposes of fulfilling their commitments under Article 3 of the Protocol. Any such trading shall be supplemental to domestic actions for the purpose of meeting quantified emissions limitation and reduction commitments under that Article.” (Article 17). The rules and guidelines for international emissions trading are still under discussion.

Tradable permits have emerged as the most appropriate instrument for achieving climate policy goals. The location and timing of GHG emissions abatement does not matter (uniformly mixed pollutants), cheap sources of abatement lie outside of the industrialised nations accepting the earliest and most demanding limits on GHG emissions. Accessing these abatement possibilities through emissions trading will both reduce the cost to the developed countries for meeting those limits and provide developing nations (and probably the EIT countries) with a new source of export revenue. According to several empirical studies, the cost saving potential of the international trading is high (e.g., see Holtsmark and Hagem, 1998).

The Kyoto Protocol sets quantified emissions limitations for all Annex B countries. This corresponds to the allocation of quotas to the Annex B countries, where the amount of quotas is equal to the amount of emissions following from the emissions limitations set out in the Protocol (the quantitative limits can be transferred in tradable permits)².

A party adopting such a system could then bequest its assigned annual amount (AAU) to domestic legal entities that might then trade those AAUs across national borders (for details, see Ellerman, OECD 1999). The trade can take place in various ways under mechanisms as follows:

- international emissions trading: under Article 17 of the Protocol Annex I Parties (or firms settled in these countries) can trade parts of the amount assigned;

² The Kyoto Protocol speaks about “quantified emissions limitations” and about “assigned annual amounts (AAUs)” that may be “acquired” or “transferred”.

- joint implementation: Article 6 establishes that trading can take place between the Annex I Parties (and firms settled in these countries) in selling emissions reductions compared to the baseline for respective projects;
- CDM: Article 12 establishes that the Annex I Parties and firms in the Annex I countries can buy emissions reductions from projects in developing countries.

At the national level, there are more policy instruments to reach the quantified emissions limit (the Protocol does not set restrictions on the national choice of policy instruments). Cost-effective solutions can be reached through carbon taxes or other instruments. However, emissions trading at the national level (the domestic system) seems to be an instrument with strong expectations. There are more reasons for this: the attempts to introduce a carbon tax have failed in most countries, the involvement in the national (domestic) trading system would provide a “learning effect” and facilitate the direct access of emitters (legal entities) to the international market, in contrast to the carbon tax the cap and trade scheme guarantees that the total emissions limit (cap) is reached at the national level.

Emissions trading is allowed according to Article 17 of the Kyoto Protocol. According to Article 3 a state shall guarantee the limits, nevertheless the emissions trading system may be entered by legal entities. If such an entity wishes to participate in the international trading system they must have a commodity for sale (allocated limits) and certain experience in its trading.

The EC is considering a European emissions trading system. Emissions trading is seen as an instrument that needs to be tried (Vis, 2001a,b). In March 2000, the Green Paper on Emissions Trading was published (European Commission, 2000). The Commission has requested a number of studies on crucial aspects of the emissions trading regime (CCAP, 1999; FIELD, 2000). The next step is the development of a trading regime in the form of a concrete legislative proposal (Lefevere, 2001). On October 23, 2001, a proposal for a directive establishing a framework for greenhouse gases emissions trading within the EU was published (COMMISSION, 2001).

1.3 Experience of other countries

Within the last two decades, transferable permits have progressed from the stage of a theoretical proposal to that of an instrument used on a large scale by many countries and potentially to that of a major international policy instrument for climate change policy³.

Tradable permits in air pollution control have been successfully used in the US at the national (Acid Rain Program), or regional level (RECLAIM) to reduce sulphur dioxide (SO₂) and nitrogen oxides (NO_x) emissions.

The example of Slovakia provides inspiration. The country, as one of the first of the EIT countries, implemented quotas on SO₂ emissions into the current command and control system. Binding caps will be in force there from 2002, but some transactions have already occurred. The US experience suggests that cap and trade systems are easier to negotiate with stakeholders and, from the point of view of administration, simpler than credit-based systems. The initial allocation seems to be a critical issue. The initial concerns about newcomers and the risk of strategic manipulation by market participants did not pose a serious problem in practice. A credible system of monitoring and enforcement is a prerequisite for tradable permits to be successfully implemented (Shellabarger et Fischerova, 2001). Any new trading programme

³ A comprehensive analysis of experience of tradable permits is provided in the OECD (1999).

must take into account the existing regulatory framework, which may incur the issue of incompatibility with the extensive body of existing administrative regulations and the rigidity of the system (including the reluctance of civil servants to leave their positions).

Currently, GHG emissions trading systems are being developed nationally, commercially, and internationally as follows:

- National systems have been established in Denmark (Sorensen, 2001) and the United Kingdom (DETR, 2001; Dervent, 2001);
- Many countries are planning (or analysing) domestic emissions trading initiatives to ensure that they reach the binding targets, which have been set out in Kyoto (Australia⁴, Austria⁵, Canada⁶, France, Germany⁷, Ireland⁸, New Zealand⁹, Norway¹⁰);
- Some of the EIT countries are considering several options for a GHG emissions trading programme. In Poland, a pilot emissions trading system in the energy industry and the combined heat and power energy generation is thought to be a realistic option in the near future (Hauff, 2000, 2001. In Slovakia, a study concerning the development of a CO₂ cap and trade programme is being finalised (MOE/CCAP, 2000 and 2001);
- Some of the EIT countries indicate that they expect both government and legal entity trading (OECD, 2000a);
- Organisation-wide trading systems are being implemented (Shell, BP-Amoco¹¹);
- System components facilitating the trading of emissions reductions are under development, mostly by the private sector (Joshua et Lowen, 2001; Walsh et Baron, 2001).

So it may be said that there are very many theoretical analyses, recommendations and several cases of concrete steps for the implementation of the domestic GHG emissions trading. Nobody, however, has yet proved and evaluated the pluses and minuses based on practical experience.

Thus this study employs only theoretical a model findings. Therefore it is of utmost necessity to perform the initialisation step in order to be able to apply the principle of learning through experience.

⁴ AGO, 1999.

⁵ Kletzan, Köppl and Buchner, 2000

⁶ TPWB, 2000

⁷ Schafhausen, 2001

⁸ CONSULTATION GROUP, 1999

⁹ MOE, 1999.

¹⁰ Alfsen, 1999; Stiansen, 1999

¹¹ Lewis, 2001

1.4 Scope and objectives of the case study

The Czech case study is a part of the OECD/IEA initiative to respond to the new challenges the EIT countries are currently facing regarding the implementation of the Kyoto Protocol. The overall objective of the OECD/IEA EIT support programme on climate change is to provide a targeted analysis of existing initiatives, experience and practices in the EIT countries to implement the climate change commitments and to support the exchange of information among the Annex I countries.

Domestic emissions trading is a policy option that is currently considered by the Czech Government as a part of its climate policy. There is limited experience in emissions trading in the Czech Republic. The case study could therefore significantly enhance the understanding of various national stakeholders in the topic and could support decision-makers in taking informed decisions with respect to future policies.

The case study

- aims to present and discuss various design and implementation issues related to the possible set-up of a domestic emissions trading system in the Czech Republic, given the country's specific national circumstances;
- intends to analyse how to integrate such a system into the existing institutional, legal, and administrative frameworks, which are very similar to circumstances in every EIT country.

The study content follows the specifications (Annex 2) in the contract between the OECD and the ECON company, which was the contractor for conducting the study.

The work is based on researching and assessing the relevant literature data on emissions trading, especially on CO₂ trading at the national level. It has been supported by the Czech authorities and was conducted in close co-operation with ministries and state agencies. Many experts from these institutions provided valuable inputs to it. The study relies especially on the co-operation with the Ministry of the Environment of the Czech Republic and the Czech Hydrometeorological Institute, the Institute for Economic and Environmental Policy at the University of Economics, Prague, and SRC International CS whose experts are mentioned as consultants.

The proposed domestic trading system is meant to be used as a suggestion for a pilot project for implementing this scheme, given the existing context and specific conditions in the Czech Republic as an EIT country.

The study was carried out in close collaboration with the OECD experts Martin Cames, Cristine Cros, and Marjan Vezjak. The OECD/IEA Project Secretariat experts were Anca-Diana Barbu and Stephane Willems. The authors gratefully acknowledge their comments and co-operation.

2 POLICY CONTEXT IN THE CZECH REPUBLIC

This chapter provides a brief description of the energy, environment and climate change policies in the Czech Republic that are relevant to the possible development of an emissions trading system. This analysis should provide the background for the following chapters.

2.1 Environment and energy policy developments

For the Czech Republic there are very close links between environmental and energy policy problems (which is the case of most EIT countries). The main reason is the continued high energy intensity combined with the high percentage of brown coal in total primary energy supply. Despite a significant improvement in energy consumption and air emissions indicators in the last decade (which was partly connected with the decrease in GDP), energy consumption and emissions per capita are still significantly higher than in other OECD countries (OECD, 1999; MOE CR, 2001).

2.1.1 Policy developments resulting from the EU accession process

The Czech Republic respects that the European Community considers the protection of the Earth's climate system a priority issue (EUROPEAN COMMISSION, 2000). The approaches of the Czech Republic in this area have been harmonised with the EC approach in the last 2-3 years through intensive consultation and it can be expected that climate change protection will be one of the policies, which will be examined in detail in the case of EU entry. It is thus necessary to declare climate change policy as one of the top priority areas even during the accession process, which should result in climate change protection being reflected in Environmental Policy and consequently included in other strategic documents approved at the governmental level. The strategic approaches are prepared in co-operation between the ministries of Environment, Foreign Affairs, Industry and Trade, Transport and Communications, Agriculture and Finance.

The current position regarding Community legislation is described in the document Approximation Strategy for Environment, chapter J: Climate change (MOE CR, 1999). The existing mechanisms in the Czech Republic are functional and correspond to the requirements of Decision 93/389/EEC, for a monitoring mechanism of Community CO₂ and other greenhouse gas emissions. The monitoring of HFCs, PFCs and SF₆ was identified as a problem area. A special plan to implement the Decision in the Czech Republic has been approved (MoE CR, 2001).

Thus in the area of climate change the Czech Republic will be capable of meeting all its commitments stemming from the pertinent environmental *acquis communautaire*, including institutional and financial requirements, by the reference date for accession to the EU and will not request any transitional period.

The Czech Republic recognises that accession is expected to accelerate economic growth in candidate countries where emissions are likely to slowly increase in the coming years. In particular, the EU enlargement strategy for internal markets, transport and agriculture sometimes raises concerns for sustainability. The adequate integration of climate concerns into policy development in areas such as energy, transport, industry and agriculture is essential and

should be properly reflected in the EU Accession Strategy as well as in Accession Partnerships Agreement and the related national climate change strategy in the Czech Republic.

This has become far more essential since the integration principle is now ranked as a general principle and climate change has been promoted to a key priority under the 6th Environmental Action Programme as adopted by the Commission on 24 January 2001. This integrated approach will help both the EU and, generally, all the candidate countries to fulfil their individual commitments according to the Kyoto Protocol.

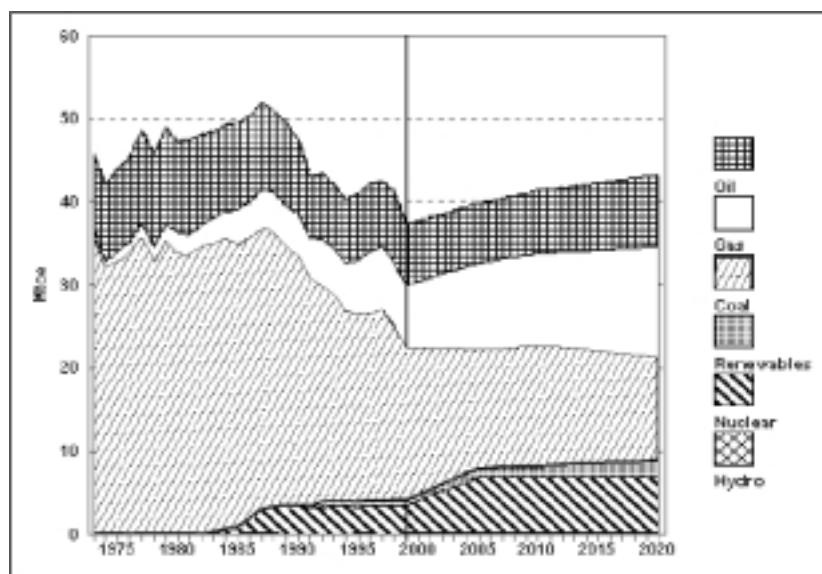
It is obvious, that such an integrated approach will prioritise climate change issues through the pre-accession strategies for the environment. The Accession Partnerships Agreement with the EU represents a single framework for implementing the Czech national programme in preparation for EU membership.

As already mentioned in Section 1, the EU has published a proposal for a directive on GHG emissions trading within the EU. In case such a legislative document would be approved, the Czech Republic has to initiate appropriate measures.

2.1.2 Energy intensity and GHG emissions in the Czech Republic

The current energy intensity of the Czech Republic is still significantly high. Gross consumption of primary energy sources equals approximately 167 GJ per capita, which, in relation to the structure of energy sources, also results in a high level of total GHG emissions per capita - 13.4 t CO₂ equivalent (2000)¹². This therefore leads to an increased responsibility of the Czech Republic in attempts to decrease overall emissions.

Figure 2-1 Primary energy supply



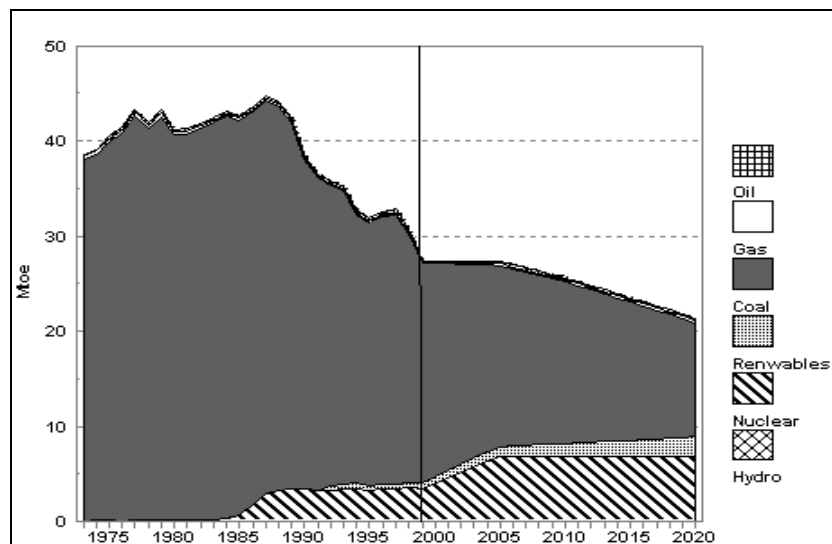
Source: IEA/SLT/CERT (2001)

¹² Source: data from SRCI CZ for the 3rd National Communication

A decade of transition has obviously modified the energy supply levels and the fuel mix. The energy supply (Figure 2-1) remains characterised by limited domestic energy resources concentrated on solid fuels (more than half of Total Primary Energy Supply (TPES)) and a strong dependence on hydrocarbon imports (40 per cent of TPES).

Between 1990 and 1999, the energy mix of TPES has become less dependent on solid fuels at 49-52 per cent of the 1999 - 2000¹³ total due to the switch from brown coal to other fuels and the closure of coal power plants. In 1999, domestic production covered 51 per cent of TPES. Figure 2-2 illustrates the large dominance of coal in domestic energy production (85 per cent in 1999) despite its sharp decrease by one-third between 1990 and 1999. Nuclear output has remained stable during the same period reaching 12 per cent of total production in 1999. In 1999, imports covered the remainder, 45 per cent in the form of oil and 50 per cent natural gas.

Figure 2-2 Energy production by fuel

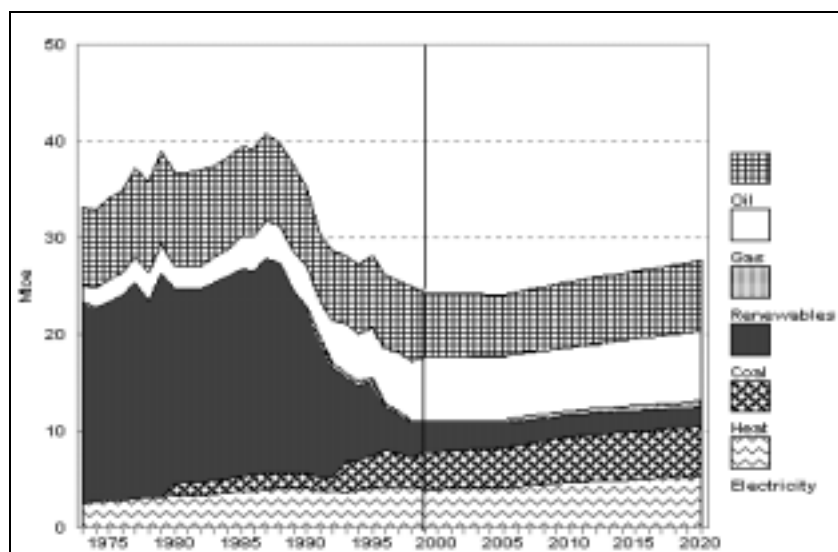


Source: IEA/SLT/CERT (2001)

Electricity generation remains dominated by coal (71 per cent in 1999) and nuclear (21 per cent). The share of natural gas increased but remains limited to 3,3 per cent of total generation, just above hydropower (2,7 per cent). In 1999 electricity exports accounted for 5,7 TWh (0,5 Mtoe).

¹³ The data for 2000 were provided by SRCI CS.

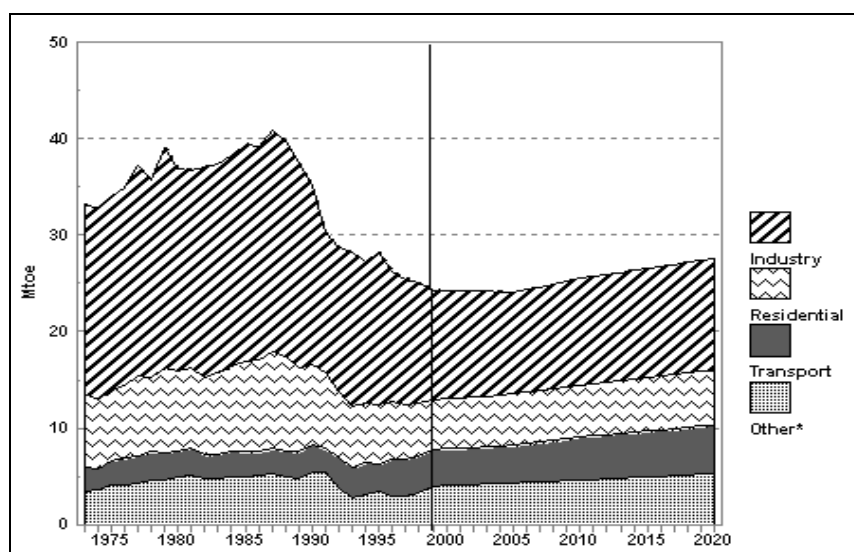
Figure 2-3 Total final consumption by fuel



Source: IEA/SLT/CERT (2001)

Total final energy consumption (TFC) in 1999 was 24,3 Mtoe, a sharp decrease of 11 Mtoe (or 31,1 per cent) from 1990 (Figure 2-3). Between 1990 and 1998, the gross domestic product decreased only 3.4 per cent, showing that the energy intensity decreased significantly during the same period. Solid fuels, which accounted for 49,4 per cent of final consumption in 1990, fell to 12,3 per cent in 1999. Gas in final consumption increased from 11,9 per cent in 1990 to 26.7 per cent in 1999 and oil increased from 22,9 per cent to 27.2 per cent in the same period. In 1999, industry accounted for 46,5 per cent of final energy consumption as compared with 52,8 per cent in 1990. The share is higher than the average for the OECD Europe (30 per cent).

Figure 2-4 Total final consumption by sector



Source: IEA/SLT/CERT (2001)

Since 1990, transport demand for energy has increased by 32,9 per cent and its share in energy consumption increased from 8,1 per cent in 1990 to 15,6 per cent in 1999. The share of final energy consumption of the residential/commercial sector remained at 34 per cent. This is due to poor energy efficiency in the housing sector, primarily due to poor insulation of buildings, space heating systems and hot water distribution systems (Figure 2-4).

The following trends are the most important in energy production and consumption for the last years:

- a decrease in total primary energy supply (about 23 per cent),
- a reduction of coal consumption by more than 60 per cent,
- an increase in natural gas consumption by 45 per cent
- an increase in motor fuel consumption because of expansion in road transport
- reduced demand for central heating,
- rapidly increasing electricity production, followed by moderate demand growth, which resulted in an export increase in the last two years (2000 and 2001)

In Table 2-1 a summary of GHG emissions inventories for the Czech Republic in 1990–1999, as prepared by the Czech Hydrometeorological Institute (CHMI) is given as reported to the UNFCCC Secretariat (for 1998 and 1999 in Common Reporting Format). Figure 2-5 shows the percentage different gases had in the total aggregated balance in 1999.

Table 2-1 Greenhouse gas emissions inventory in 1990-1999

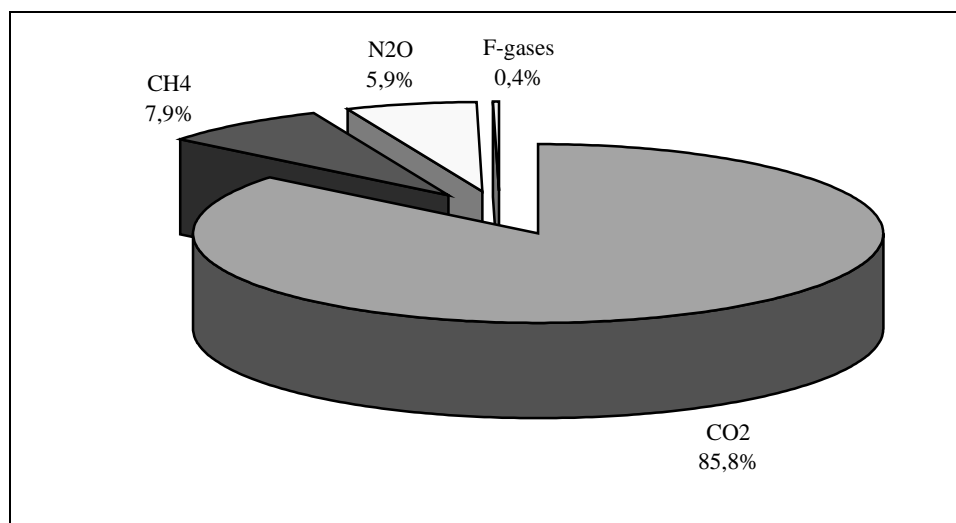
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
CO ₂ [Mt]	163,2	148,1	134,2	129,2	123,8	123,4	128,2	130,4	124,7	118,2
CH ₄ [Mt CO ₂]	16,3	14,9	14,0	13,3	12,9	12,6	12,0	11,8	11,1	10,9
N ₂ O [Mt CO ₂]	8,0	7,3	7,0	6,6	6,7	6,7	9,0	8,9	8,4	8,1
F-gases [Kt CO ₂] ¹⁴	inventory has not been provided					63,1	407,5	415,8	523,4	525,4
total emissions (incl. sinks) [Mt CO₂]	187,5	170,3	155,2	149,1	143,4	142,7	149,6	151,5	144,8	137,7 x)
per cent of 1990	100,0	90,8	82,7	79,5	76,4	76,1	79,8	80,8	77,2	73,4
inter-annual differences [in per cent]	-	-9,2	-8,8	-4,0	-3,8	-0,5	+4,8	+1,3	-4,4	-4,9

Source: CHMI

x) GHG emissions in 2000: 141,8 Mt (preliminary results)

¹⁴ F-gases are HFCs, PFCs and SF₆

Figure 2-5 Percentages of greenhouse gases (1999)



Source: CHMI

It is evident, that GHG emissions have been reduced in the last 10 years by 26,6 per cent of the emissions balance in 1990 (base year for the Kyoto Protocol); in the first 3-4 years mainly due to the transformation of the Czech economy. Since 1993-1994 GHG emissions are more or less stabilised, even reduced. In the last inventory year 1999, total aggregated emissions reached their “historical minimum”, which was 137,7 Mt of CO₂ and the inter-annual change in the last two years is 4,4 and 4,9 per cent points, respectively. These changes react to at least three major aspects: changes in the national (possibly also world) economy; actual winter weather conditions and the implementation of policies and measures to reduce GHG emissions, which have been implemented in the last five years.

GHG emissions inventories and projections

Total emissions in 1990 – 187.5 Mt CO₂, in 1999 – 137.7 Mt CO₂

Reduction by 26.6 per cent in period of 1990 - 1999

Possible reduction by 14 to 34 per cent in 2010 relative to 1990 level

Estimated emissions potential for Kyoto mechanism in 2008-2012 about 60 – 240 Mt CO₂

Table 2-2 shows the percentages sources and fuel types have on CO₂ emissions, compared for the years 1990 and 1999. This information relates to Figures 2-3 and 2-4.

Table 2-2 Percentages fuel combustion have on CO₂ emissions (%)

	1990	1999
sources	100	100
<i>stationary sources</i>	94	88
<i>mobile sources</i>	6	12
fuels	100	100
<i>solid fuels</i>	79	64
<i>liquid fuels</i>	13	19
<i>natural gas</i>	8	16

Source: Moe et CHMI, 2001

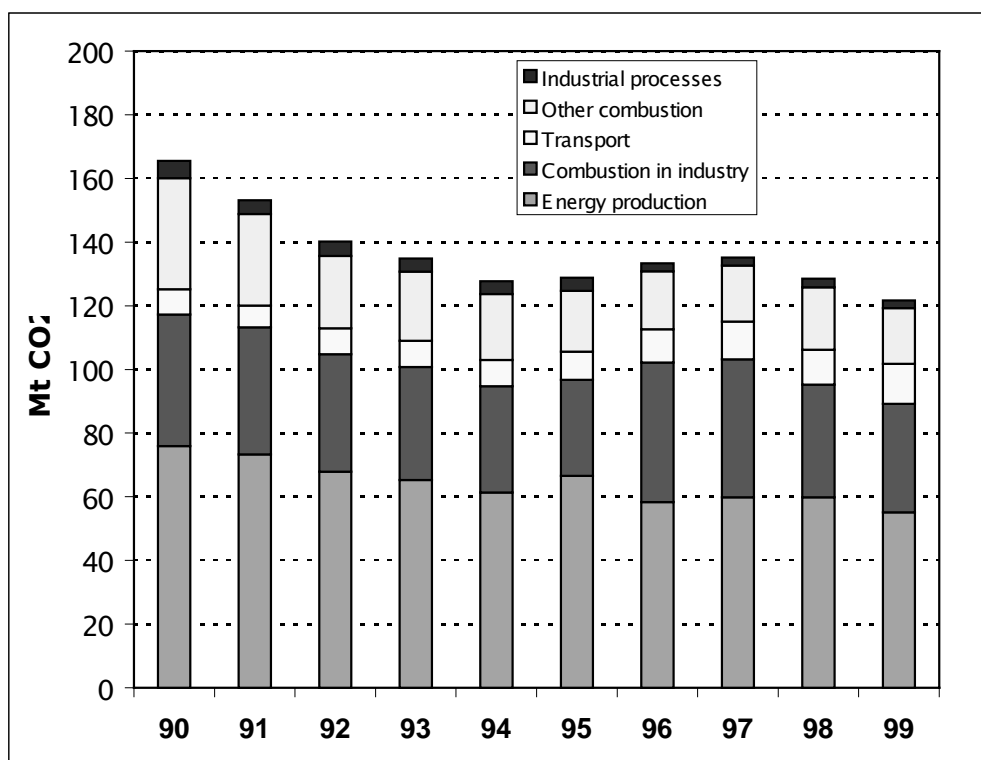
The following Table 2-3 and Figure 2-6 indicate the development of CO₂ emissions from the relevant sectors. The emissions from energy production make up the main part of total emissions, with the most rapid reduction between 1990 and 1999.

Table 2-3 Emissions and sinks of CO₂ from relevant sectors, 1990 – 1999 (Mt CO₂)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Combustion	160.1	148.8	135.6	130.7	123.6	124.6	130.3	132.1	125.1	118.6
<i>energy production</i>					61.4	66.6	57.9	59.4	59.1	54.4
<i>combustion in industry</i>					33.4	30.1	43.9	43.3	35.4	34.2
<i>transport</i>	8.0	6.9	8.1	8.3	8.3	8.9	10.4	11.8	11.0	12.6
<i>from which road transp.</i>			7.3	7.4	7.4	8.0	9.3	10.9	10.3	11.3
<i>other fuel combustion</i>	34.9	28.7	22.7	21.6	20.6	19.0	18.2	17.6	19.6	17.5
<i>from which mobil s.</i>			1.5	1.1	1.3	1.0	0.6	1.1	1.1	1.3
Industrial processes	5.4	4.3	4.6	4.2	4.1	4.2	2.5	2.5	2.7	2.4
Other sources							0.5	0.5	0.7	0.7
Total emissions	165.5	153.1	140.2	134.9	127.7	128.8	133.3	135.1	128.5	121.6
Sinks in forestry	-2.3	-5.0	-6.0	-5.6	-3.9	-5.5	-4.5	-4.6	-3.8	-3.4
Emissions and sinks total	163.2	148.1	134.2	129.2	123.8	123.4	128.8	130.4	124.7	118.2

Source: Moe et CHMI, 2001

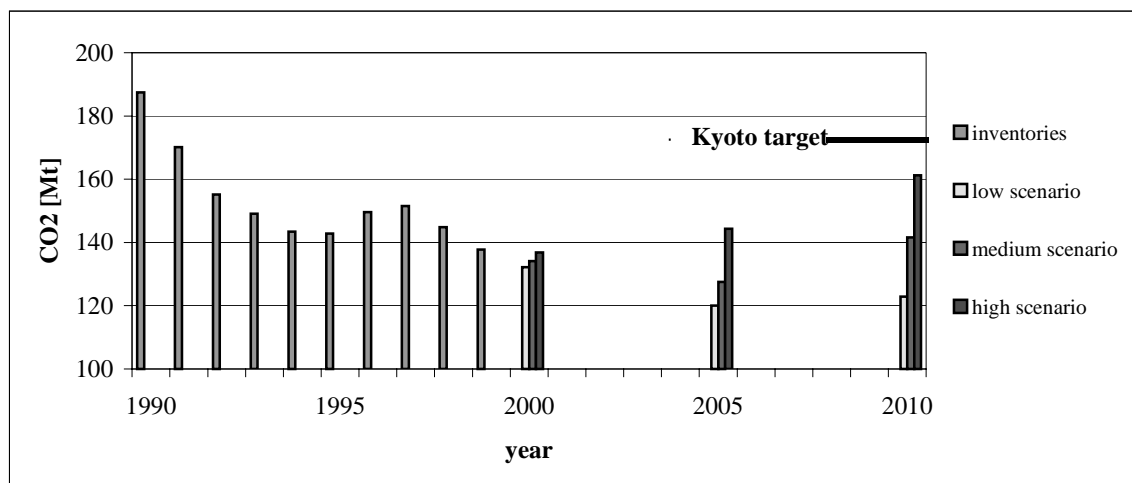
Figure 2-6 CO₂ Emissions from relevant sectors 1990 – 1999 (Mt CO₂)



Source: Moe et CHMI, 2001 Source: Czech Hydrometeorological Institute

For the purpose of emissions projections and analysis of mitigation options, two different basic sets of emissions scenarios have been elaborated in 2000 (CARLBRO/DHV/SRCI, 2000). One set of scenarios describes “business as usual” (BAU), while the other one should reflect the impact of mitigation policies and measures. It is not an easy task to elaborate BAU projection scenarios given the high uncertainty level not only for the Czech Republic but, in general, also for other EIT countries. That was the reason three different BAU scenarios have been prepared to project country emissions for a time span reaching only to the end of the first commitment period. These scenarios depend mainly on the intensity of economic growth (low, medium and high).

Figure 2-7 Inventories and updated BAU projection scenarios for 2000 - 2010



Source: CHMI and SRCI, Phare Project, 2000

In Figure 2-7, there is a basic comparison of the real inventory trend with three levels of BAU scenarios by 2010. It can be seen that there is a very realistic possibility to reduce GHG emissions in the Czech Republic by at least 14 to 34 per cent relative to the 1990 level. This leads as a minimum, to about 60 to 240 Mt of CO₂, as an estimated potential for possible international emissions trading in the five-year period 2008-2012. It is obvious, that introducing domestic emissions trading into the national climate change strategy could even raise this rough estimation.

Projections of primary energy supply, energy production by fuel, total final consumption by fuel and final consumption by sectors for the time horizon of 2020 (ref. Figures 2-1 to 2-4) relate also to GHG emissions projections for the time horizon 2010 (see Figure 2-7) and the medium BAU scenario. The same energy related projection has also been used for preparing the latest updated GHG emissions projections for use in the 3rd National Communication of the Czech Republic, which is currently under preparation¹⁵. As the Government did not officially approve these new projections for the time horizon of 2020, they are not included in this report. New data should be available by the end of 2001.

Comparing, in particular, Figure 2-1 with Figure 2-7 we can see that energy supply is increasing much faster than GHG emissions. The main reason is that fuel substitution for energy sources producing less emissions is progressing quite favourably. It could also serve as evidence for how important increasing energy efficiency and the share of renewables is for the Czech Republic. As a “by-product” of related policies and/or the application of “no regret measures” a significant reduction of air pollution emissions and concentrations is perceptible (e.g. SO₂ and solid particulate matter emissions have been reduced by about 90 per cent in the last decade). The air quality problem, which currently has nation-wide relevance, is the problem of rising NO_x emissions and other pollutants, for instance benzene from the transport sector, primarily in large cities. The next pollutant upon which considerable experts’ attention is focused is ground-level ozone due to its potential negative impact on all types of receptors.

¹⁵ According to the UNFCCC guidelines for preparation of the 3rd national communications, emissions projections have been prepared for the time horizon 2020, the level of uncertainty for most EIT countries is extremely high.

2.1.3 Energy policy and its context

The basic document for the energy policy concept is the Energy policy prepared by the Ministry of Industry and Trade (MoIT), which defines the main objectives and targets for the energy sector in the long-term time horizon of 15-20 years. The Government approved the last version by Resolution No. 50/2000. In the document it is declared that approved policies must be harmonised with the economic, legal and environmental interests of the society. The State Energy Policy is evaluated every two years.

The Energy Policy of the Czech Republic is directly linked to the energy policy of the EU. However it does not provide any specific statement regarding the position of the Czech Republic relating to the Climate Change problem nor specific targets or measures of the energy policy in the Czech Republic.

As the liberalisation of the energy market represents one of the main challenges for the energy policy a more detailed description is given in the box below.

Liberalisation and privatisation of the energy sector in the Czech Republic

The legal and regulatory framework for liberalising the Czech electricity market and reform of the Czech electricity sector is set by a new Czech Energy Act, signed in December 2000 and in force as of January 2001. The main objectives of the Act directly relevant to electricity are:

- to create a transparent business environment for the energy sector;
- to develop competition in certain segments (e.g. generation and retail supply),
- to define the positions, rights and obligations of the independent regulator,
- to complete liberalisation of electricity consumers by 2006 and support the development of renewable electricity generation and CHP.

In late 2000, the Czech Government decided to sell 64 per cent of its 67 per cent stake in CEZ (Czech Electricity Power Company - the major energy producer in the Czech Republic) and all shareholdings in six regional electricity distributors (in which it had a majority as well) as a single package to one strategic buyer by 2002. The Government believes that selling the assets of CEZ and the distributors as a single package would enable it to achieve substantial proceeds and ensure the stability of the sector. It also believes that the package sale is consistent with the pattern of other vertically integrated utilities in Europe increasing in size through mergers and acquisitions, rather than being broken up.

The energy policy also includes the objective to increase the share of renewable energy to 5-6 per cent of TPES by 2010 and 8-10 per cent by 2020. This objective is coherent with the EU energy policy contained in the Green Paper on Renewable Energy issued in 2000.

The Czech Government believes that renewable energy can make a valuable contribution to the diversification of the energy supply and meeting the GHG emissions reduction target, as well as supporting local and regional economic development. In 1999, renewable energy production was estimated at 0,71 Mtoe of which 70 per cent was biomass and 17 per cent hydropower, representing altogether 1,7 per cent of TPES. According to estimates, including non-accounted biomass energy, total production may represent around 2 per cent of TPES.

One of the important organisations dealing with energy issues is the Czech Energy Agency (CEA), founded by the Ministry of Industry and Trade as a publicly funded government

organisation carrying out the work of the former Federal Energy Agency which was in existence in Czechoslovakia and later the Czech Republic. The CEA's main mission is to encourage and carry out activities aimed at energy savings in all end-use sectors and mitigate the negative environmental impacts due to the consumption and conversion of all kinds of energy.

The state programme for supporting energy savings and the use of renewable energy sources

This programme was introduced in the Czech Republic in 1998. The Government firstly approved its Framework, which indicates long-term objectives, while short-term objectives are defined every year by adoption of a concrete version of the Programme. This approach allows adjustment of the programme reflecting the latest developments or changes in policy objectives and priorities. The programme is divided into four parts, with a different ministry responsible for each part (Ministry of Environment, Ministry of Industry and Trade, Ministry of Agriculture and Ministry of Regional Development).

The Czech Energy Agency manages the part of the Programme under the competence of the Ministry of Industry and Trade and the part under the competence of the Ministry of Environment is managed by the State Environmental Fund.

The support from the programme is focused on funding measures related to energy savings and usage of renewable energy sources in the form of grants and soft loans.

Another important legislative act is the Energy Management Act. It was adopted by Parliament in 2000 and has been implemented since January 2001. This framework law deals, inter alia, with the various types of subsidies from the State budget for relevant programmes and with the ways to promote energy efficiency (e.g. minimum energy efficiency requirements, conditions for house occupiers, energy efficiency labelling, energy auditing and CHP).

2.1.4 Environmental policy and its context

The environmental protection policies, adopted and implemented in the 90's have contributed to tangible results, such as large reductions in pollutant emissions and improvements in environmental quality (mainly air and water). These policies were mainly based on the effective use of regulatory instruments, associated economic instruments and environmental investment. For details see OECD (1999).

State Environmental Policy as a separate document was firstly adopted in 1995 and the latest version was approved in January 2001. It is a basic, strategic, cross-sectional document for preparing detailed programmes for the individual components of the environment and for dealing with particular environmental issues (MoE, 2001).

The latest version of the State Environmental Policy includes a more detailed concept of Climate Change Policy. High emissions of greenhouse gasses are set as the first problem in the list of priority environmental problems. This document even specifies environmental requirements for the Energy Policy (energy intensity, currently at the level of 0,27 toe/1000 USD GDP is aimed to be reduced to 0,24 toe/1000 USD GDP). The only specific objective regarding Climate Change is to ensure that emissions of GHG are 20 % lower in 2005 than the 1990 level (a stronger requirement than given in the Kyoto protocol).

A specific regulation on air pollutant emissions was developed at an early stage of the new environmental policy's introduction. In 1991, the Clean Air Act established emissions standards for combustion installations with a unit-installed capacity higher than 0,2 MW and financial penalties for non-compliance to the standards. The Act was revised in 1997 to make the new standards comply further with the EU standards. The energy sector (power generation, district heating and oil refineries) and industry have carried out significant efforts to comply with the emissions standards before the deadline of 31 December 1998, focusing on sulphur emissions and particulates. The measures mainly included the installation of scrubbers and replacing brown coal and heavy fuel oil with natural gas. The extension of the natural gas network has allowed final users in the household and service sectors to replace the heavily polluting brown coal.

New Clean Air Act under preparation in the Czech Republic

The Czech Government is presently reviewing amendments to the Clean Air Act drafted by the Ministry of Environment. These amendments will introduce climate protection into the Czech legislation and will allow the Government to establish emissions limits for trading with selected pollutants and opens the possibility of implementing emissions trading.

The new version should transpose, e.g., Directive 96/62/EC and other related Directives into the national legislation by November 2001, Council Decision 1999/296/EC amending decision 93/389/EEC for the monitoring mechanism of Community CO₂ and other greenhouse gas emissions. It has not only the nature of legal obligations, but also forms a legal basis for issuing implementing Decrees. A substantive part of the new act's intention is to cover not just protection of the air but also the ozone layer and the Earth's climate system. The concept was approved by the Government in 2000 and a legal version was adopted by Government in April 2001. If the announced EU Directive on emissions trading will be available by the time of Parliamentary approval, it could be also implemented in the act, if necessary.

The legal possibilities to initiate domestic emissions trading are contained in paragraphs 34 and 35 of the current version of the proposal. These paragraphs address potential binding obligations for large and extra-large stationary sources. These sources can be the only possible participants in domestic emissions trading in its first stage. Their obligations could be specified in detail by an incident Decree, prepared later on and based on paragraph 55 of the current version, after the rules of an operational model for emissions trading have been set up. According to normal legal practices it is impossible to include fully elaborated paragraphs in the new act (e.g., dealing with emissions trading), if rules and technical guidelines are not available in the Czech Republic, nor, e.g., in the EU.

For reasons, such as consistency of climate policy, transparency, technological development, time lags associated with investments, and other similar factors, it is necessary that the development of operational models and regulations concerning emissions trading will be started in good time before the actual decision-making. Globally, climate policy on emissions trading is undergoing a very active period, so the Czech Republic must have the vigilance to take part in the discussion, which also requires that introductory work be continued.

2.2 Climate change strategy and policy options

The Kyoto Protocol requires that the Czech Republic will reduce total emissions of greenhouse gases by 8%, i.e. by the same amount as prescribed for the EU countries. The Czech Republic signed the Protocol on November 23, 1998 and ratified it on October 22, 2001.

2.2.1 Climate change strategy in the Czech Republic

In 1990 the directors of the Czech and Slovak Hydrometeorological Institutes proposed the establishment of the National Climate Programme to the Federal Committee of the Environment, which finally consented to the establishment of the programme and to the declaration of Czechoslovakia's participation in the World Climate Programme. Currently the National Climate Programme is composed of 16 legal entities located in the Czech Republic. It helps to create the professional and organisational conditions enabling the co-operation of specialists working in member organisations involved in studying the climate system. The Czech Hydrometeorological Institute (CHMI) works as a Secretariat of the associations, taking care of contacts with the World Meteorological Organisation (WMO). The national climate change strategy, prepared and approved in the Czech Republic as one of the first accession countries, places the highest priority for emissions reductions on policies and measures implemented at the national level.

Through its Decision No. 669 of October 12, 1998, the Government of the Czech Republic agreed to sign the Protocol. It also required that the Minister of the Environment and Ministers of Foreign Affairs, Industry and Trade, Agriculture, Transportation and Communications, and Finance provide for implementation of the Protocol and submit to the Government a strategy for protection of the climate in the Czech Republic.

Strategy of the Earth's Climate Protection in the Czech Republic

The document Strategy of the Earth's Climate Protection in the Czech Republic (hereafter Strategy) was approved in 1999 and determines the current position of the Czech Republic to climate change issues. This document, which has been approved by the Czech Government (Resolution No. 480/1999), formally accepted the national greenhouse gas emissions reduction target according to Annex B of the Kyoto Protocol.

It defines key elements in the Strategy to reduce GHG emissions and sets measures in the sector of energy production and consumption, in the transport sector, in the waste management sector, measures in the sectors of agriculture and forest management.

It declares an emphasis on practical measures following from the national reduction potential.

2.2.2 Existing policies and measures

As the preparation of the Strategy started immediately after the Buenos Aires Action Plan of Actions in 1998, many parts of the document need to be updated in the light of latest developments. For this reason, the document needs to be considered as an open one, oriented towards on-going activities. The Ministry of Environment intends to update national climate

change strategy at the beginning of 2002 and also reflect the main outcomes from COP-6 (Part II) and COP-7.

Measures aiming to support the reduction of greenhouse gasses emissions can be divided into the following groups:

- measures in the air pollution sector,
- measures in the transport sector,
- measures in agriculture and forestry
- other measures.

The air pollution measures represent the most important group of measures related to reducing GHG emissions. Despite the massive reduction of air pollution recently (mainly SO₂, particulates), the sector of fuels and energy production remains the most air polluting sector. This problem is worsened by the high energy intensity of the Czech economy. The energy sector was also highly subsidised before, where the major part of the subsidies flowed into non-renewable sources (fossil and nuclear). The energy sector is currently influenced by the following economic instruments of environmental policy (for details see Hajek and Chmelik, 2000): Following the influence of economic instruments the clean air and energy policy (for details see Hajek and Chmelik, 2000):

Tax adjustments

Taxation of fuels and energy was and partially still is imbalanced. Coal, heat, natural gas and electricity were subject to a reduced VAT rate (5%) until 1997 (at present only heat).

Petrol, diesel and fuel oils are subject to an excise (consumer) tax, which represents a relatively stable portion of revenues to the State budget. Other tax allowances have negligible significance (environmentally friendly products at a reduced VAT rate, reduction in income taxes for producers of energy from renewable sources, other exemptions for renewable energy etc.).

Charges affecting the energy sector

There are four main charges that are relevant regarding air pollution. Air emissions charges are imposed on selected categories of sources (large, medium and small-scale business), there are no CO₂ charges within this instrument. Charges were introduced in 1992 and reached the full rate in 1997 (in several steps). The main reason for their use is revenue raising – the revenue goes to the State Environmental Fund or to the municipalities. Remaining charges are mining charges consisting of two components – a charge for mining space and a charge for extracted minerals. There are also waste deposition charges and a levy on the nuclear account (paid from every kWh produced in a nuclear power plant). Air emissions charges are the most important ones, followed by mining charges, the other remaining charges have relatively little significance in relation to air emissions, particularly of GHG.

Specific measures in the energy sector related to GHG reduction

There are a number of measures that are related (at least providing side effects) to reducing GHG emissions. The examples of measures can be listed as follows:

On the level of *energy demand and final energy consumption*, the following measures are in place:

- steps to remove deformed price and tariff structures for energy commodities and services,
- measures aiming to increase public awareness, focused on the possibility of utilising more effective and energy saving equipment,
- changes in crediting systems for small and medium entrepreneurs, related to the introduction of energetically more efficient production technologies,
- compulsory energy audits, especially for every legal and natural person applying for state subsidies, particularly for savings in fuel and energy,
- introduction of compulsory labelling of energy consuming appliances, primarily intended for households, stores and services,

In the area of *energy production*, the measures include:

- support for combined production of heat and electricity in the construction of new and the reconstruction of old sources,
- subsidies for renewables
- subsidies for conversion to gas in towns and cities,
- drawing up of energy audits by energy producers and important consumers,
- voluntary agreements with energy producers on increasing the energy-production efficiency of sources.

Measures in other sectors

Different measures are aimed at reducing emissions in the transport sector and in agriculture and forestry (e.g., subsidies for bio-gas from waste dumps and waste water treatment plants, research and development, information and education, information exchange and international or bilateral co-operation).

The measures are implemented through different programmes, the main ones are:

- State Programme on Energy Efficiency (implemented by Czech Energy Agency)
- State Programme for Support of Renewable Sources of Energy (implemented by State Environmental Fund)
- State Programme on Energy Savings (implemented by State Environmental Fund)

From the above-mentioned description of measures and instruments it can be clearly seen that there is no strategic or systematic concept for reducing GHG emissions. There are a number of separate measures and programmes implemented, but often introduced separately and aimed at different primary targets providing GHG emissions reduction as a side effect.

The climate change policy should restructure a system of instruments and measures to get a comprehensive and effective system.

AIJ projects

Recently there were also some AIJ projects realised in the Czech Republic (see box below), but their overall significance on total emissions balance is negligible.

AIJ Projects in the Czech Republic

During the period 1996 – 1999 the Ministry of Environment approved five AIJ projects in the Czech Republic.

Decin (1996, USA)

The project “*City of Decin: Fuel Switching for District Heating*” involves fuel-switching, co-generation and efficiency improvements at the Bynov district heating plant, located in North Bohemia. The project has converted the plant from a coal (lignite) burning facility to a natural gas-fired plant, which provides both heat and hot water to local apartment blocks. The foreign investors are private companies from the United States. The total cost of the project was about 8 mil. USD, the AIJ component is a 7,5 per cent investment in the form of a soft loan from US private companies (600.000 USD).

FACE (1997, The Netherlands)

The project “*Forest Rehabilitation in Krkonose and Sumava National Parks*” includes the afforestation of 14000 hectares in two national parks – Krkonose in northeast Bohemia (9.000 ha) and Sumava in southwest Bohemia (5.000 ha). The foreign investor of the project is the FACE foundation from The Netherlands. The total costs are about 60,5 mil. USD, the AIJ component covered by FACE is about 80 per cent (48 mil. USD).

Cizkovice (1997, France)

The project „*Modernisation of the Cizkovice Cement Factory*“ is realised by the private company Lafarge Czech Republic, in which the Lafarge Group is making all the investment into its own daughter company. The aim of the project is to improve energy efficiency. The emissions reduction is estimated at about 33600 tonnes of CO₂ per year. Total investment is 31,9 mil. USD.

Skoda (1999, Germany)

The project “*Co-generation Unit SKODA plant Mlada Boleslav*” includes the modernisation and renovation of a combined heat and power generator in the private company Skoda Volkswagen. The annual amount of CO₂ emissions reduction is about 272 ktons. The unit costs are estimated at about 20 USD per ton of CO₂.

Hostetin (2000, The Netherlands)

The “*Hostetin Biomass Heating Project*” is a demonstration project for using wood chips and solar panels for domestic heating in the village Hostetin. The total emissions reduction is estimated at 3350 t CO₂ eq. per year. The emissions reduction costs are about 17 USD per ton of CO₂ eq., in the case that only the AIJ component is used, than it is about 9 USD per ton of CO₂ eq.

Nevertheless, recent practices also show many weak points. They are related, in particular, to the approval process. For all of the above-mentioned projects it was based only on very general rules, similar to the first come - first served principle. There are many issues, which led to practical difficulties:

- although all of the projects are approved as AIJ projects, some investors plan to negotiate credit sharing,
- due to lack of capacity within Ministry of Environment, projects are not assessed by the host country,
- there are no baseline methodologies,
- the types of projects vary from municipal to the purely private sector, from renewable energy use to improvement of energy efficiency in the industrial sector.

Due to the unsolved issues, mainly no approval process, new rules for AIJ projects have been developed in the Czech Republic.

Prototype Carbon Fund

The Czech Republic is considering to participate in Prototype Carbon Fund activities. The share of the participation in terms of amount of emissions credits offered for such activities will have to be agreed at the political level.

Prototype Carbon Fund

Recognising that global warming will have the greatest impact on its borrowing client countries, on July 20th, 1999 the Executive Directors of the World Bank approved the establishment of the Prototype Carbon Fund (PCF). The objectives of PCF are mainly:

The PCF funds projects that produce high quality greenhouse gas emissions reductions, which could be registered with the UNFCCC for the purposes of the Kyoto Protocol. To increase the likelihood that the reductions will be recognised by the Parties to the UNFCCC, independent experts provide baseline validation and verification/certification procedures for emissions reductions that respond to UNFCCC rules as they develop.

Companies and Governments have contributed to the PCF, which uses Fund resources to support projects designed to produce emissions reductions fully consistent with the Kyoto Protocol and the emerging framework for Joint Implementation (JI) and the Clean Development Mechanism (CDM). Contributors, or "Participants," in the PCF receive a pro rata share of the emissions reductions, verified and certified in accordance with carbon purchase agreements reached with the respective countries "hosting" the projects.

2.2.3 Possible new policy options

The analysis conducted above has shown that in the Czech Republic there is no co-ordinated strategic concept of climate change policy. There are many measures in place providing the reduction of GHG gases as an additional effect, but they are not concretely focused on GHG reduction as a primary target. A clear goal is missing of the sets of measures and linkages between instruments.

The key political documents the State Energy Policy and the State Environmental Policy don't include any concept or new measures for climate change policy in the Czech Republic. Political discussion on these issues is now ongoing.

There are some new instruments in preparation, which include GHG regulations:

- IPPC Directive
- Waste Management Law
- Air Protection Law Amendment.

The analysis has shown the necessity to develop a system, which would combine the existing framework of measures with new instruments, which reflect the development and challenges in their national and international context.

We propose this system consisting of the following main instruments:

- emissions trading as the pillar of the system

accompanied by and linked with:

- air pollution charges
- subsidies (e.g. support of renewables and energy savings)
- project based measures (Joint Implementation, Prototype Carbon Fund –under preparation)
- IPPC Directive (the Czech law under preparation)
- Air Protection Law (new version under preparation) – new CO₂ provisions
- Waste Management Law (new version under preparation) - CO₂, CH₄, N₂O regulation.

In the medium- term perspective, the goals of the programme are:

- GHG emissions reduction by 20% from 1990 level (high emissions per capita and GDP),
- possible link with the EU trading scheme,
- proof of concept and demonstrations of the feasibility and merit of the domestic system as a low cost way to reduce GHG emissions,
- getting practical experience in emissions trading so that Czech entities can access the international trading systems (learning by doing)
- build effective institutions and standardise procedures;

In the long-term perspective the goals of the programme are:

- sustainable emissions reductions beyond the first commitment period
- identify least cost opportunities for emissions reductions,
- revealing real marginal abatement costs for Czech entities, which can then get better information in advance about their opportunities on the international market.

The limited effect of existing policies and measures and the advantages and benefits of potential emissions trading as described below predestine the emissions trading scheme to set new and effective incentives to improve the impact of other instruments and to further reduce GHG emissions in the Czech Republic.

2.2.4 Possible advantages, benefits, disadvantages and risks of domestic emissions trading in the context of the Czech Republic

The following discussion concerns the proposed system (voluntary system, with private entities as key players).

Advantages and benefits for state/public:

- CO₂ is not yet recognised by the current legislation as a pollutant. The voluntary scheme with specific incentives could create an enforcement system to reduce emissions;
- it allows clearly defined GHG emissions reduction,
- it provides SO₂ emissions reduction as an additional benefit (e.g. through the reduction of lignite consumption),

- it can serve as a source of public subsidies (through selling a certain number of permits on the international market, which can be used for environmental protection or supporting energy consumption reduction programmes,
- the system brings quantification of the costs for abating GHG emissions (it makes mapping a cost-effective strategy for future mitigation possible, with a targeted design of subsidy programmes for energy intensity reductions and renewables)
- it demonstrate the feasibility and merit of trading as a low-cost way to reduce GHG emissions

Advantages and benefits for private entities:

- participation in the design of the programme in public-private partnership connected with the chance to influence the design of GHG regulations,
- getting a clear price signal on marginal abatement costs,
- identify least-cost opportunities for emissions reduction,
- reducing long-term GHG mitigation costs,
- gain practical experience in emissions trading,
- establishing GHG management and trading skills,
- reducing emissions and improving energy intensity,
- getting financial sources from the trading and additional subsidy programmes of the government,
- developing practical expertise in GHG trading,
- getting prepared for a carbon-constrained future, which could include a mandatory compliance regime imposed on industry,
- enhancing environmental reputation among stockholders, customers, and employees.

There are certain risks and disadvantages of the emissions trading system under discussion. These problems have been extensively researched in the theoretical literature, but in none of the actual applications has it ever emerged as a serious practical problem.

The following problems have been identified: potential inflation development (see Cihak, 1994), risk of strategic manipulation by market participants who are seeking to exert monopolistic power, permit hoarding, trading rule delays and confusion, vanishing permits (Duckett, 1998).

The main weak point of the proposed voluntary system is low attractiveness of the proposed system for companies with small number of players, which would result in a market with low liquidity. This has to be managed by the design of effective incentives to access the scheme.

3 CORE DESIGN ISSUES

This chapter focuses on a more detailed description of key elements for designing a domestic tradable permit system. The aim is to summarise the theoretical background with conclusions related to national or in some cases more general circumstances. It is necessary to understand that the situation in the Czech Republic is, to some extent, relatively specific; on the other hand some findings can be generalised. As all the countries interested in designing a domestic emissions trading system are learning from the experience of others, the conclusions and recommendations will be structured to help readers to understand the line between more general suggestions and country specific ones.

The chapter starts with a discussion of the type and goal of emissions trading, continues with a description of coverage in the Czech Republic and finally focuses on initial allocation as one of the key design issues of an emissions trading scheme.

3.1 Type and goal of emissions trading

General emissions trading approaches

In general, the domestic emissions trading system can be modelled as either “upstream”, “downstream” or “hybrid” systems (Zhang, 1998). An upstream system would target fossil-fuel producers and importers as regulated entities, and so would limit allowance holders to oil refineries and importers, gas pipelines, coal mines and processing plants. Implemented effectively, an upstream system would capture virtually all fuel use and carbon emissions in a national economy. Firms would raise fuel prices to offset the additional cost. In an upstream system, the number of firms that has to be monitored for compliance is relatively small, and thus it is easier to administer. The question might be raised, whether a small number of potential participants in the trading system can negatively affect the liquidity and thus working of the permit market. This question becomes even more important in small countries (such as the Czech Republic), where the number of firms in this sector is relatively small.

In contrast, a downstream trading system would be applied at the point of emissions. As such, a large number of diverse energy users would be included. This would offer greater competition and stimulate more robust trading, thus leading to increased innovation. The larger number of sources represents a bigger difference in marginal abatement costs, which provides the background for sources’ intention to trade. However, such a system would be more difficult to administer, especially in the case of emissions from the transportation sector and other small sources. To keep a downstream trading system at a manageable level, regulated sources could be limited to utilities and large industrial sources. Government could then address uncapped sources through some other regulatory means not to provide indirect support to those who are not under the trading system.

A national trading system could also be modelled as a hybrid system (Zhang and Nentjes, 1999), which would be similar to a downstream trading system in the sense that regulated sources at the level of energy users are also limited to utilities and large industrial sources. A hybrid system, however, would require fuel distributors to hold allowances for small users and to pass on their permit costs in a mark-up on the fuel price. Small fuel users would therefore be removed from the requirement of holding allowances.

Conclusions and recommendations:

The selection of an emissions trading approach represents the starting point for considering the preparation of a cap and trade scheme. It is necessary to find a balance between coverage of emissions (which is better in an upstream approach), operation of the market itself (as the number of participants would probably be bigger in a downstream system, the liquidity of the market would be better as well), manageability (better with a smaller number of participating sources) and its transparency, which is usually connected with a clear environmental objective (regulation at the point of emissions is often more “clear” and thus “acceptable”, both by political representatives and the wider public).

For the Czech Republic, bearing in mind international development, a downstream approach is appropriate, which would include only a relatively limited amount of industrial sources into the system. Such an approach would be more manageable and better linked to national circumstances (availability of the necessary data, monitoring, verification etc.). However, the scope of the system can be modified in future to include a larger number of sources if the evaluation of the working of the system in the initial stage suggests so. It is necessary to design a relatively flexible system so the possibility for adjustments, based on experience with its operation, exists.

The proposed form is a **voluntary system** for the pre-commitment period 2005 – 2007 (three years period) providing incentives for early action and providing experience with the operation of such a system (for details see section 5). It is intended, in the commitment period, to develop this system further into a mandatory system.

Since the participation is voluntary, strong incentives would be needed for firms to take on an emissions cap. The option considered is the possibility to bank pre-commitment period permits for use during the first commitment period so that they can be sold on the international market.

Emissions goal and cap setting

Discussion of the amount of emissions that will be used for trading is usually derived from comparing actual emissions and the goal, in this case given by international commitments. If the actual emissions are above the commitment, the goal for reduction is relatively clear and both the amount of emissions to be reduced and the time period for reduction are thus clearly given.

This situation becomes different in those countries that have their actual emissions below the commitment, which is the case for a number of countries in transition, including the Czech Republic. In this case it is much more difficult to define volumes of emissions and the time period for trading, because there is actually no need to take any action. The arguments why such a country is interested in introducing such an instrument is thus more difficult as there is no real target to be achieved, which is also connected with the fact that the economic situation in transitional countries suffers from various problems including recession. Imposing stronger targets on the national economy than is really necessary might have negative effects on competitiveness and performance of the economy as a whole and is not suggested. Also, to find the political and public support for such measures would be difficult.

The system proposed represents a strategic solution or approach and has to be seen in the wider context including the time period. The situation in a particular country can be influenced by international circumstances in the medium and long term perspective, which is, for example, the case of the Czech Republic regarding EU entry. From this point of view it is necessary to take into account that in the European Union there are substantial steps towards introducing such a trading scheme already in process and thus this will influence all accession countries.

The current state of emissions can change in the medium term quite significantly depending upon the development of the economy. As in most of the accession countries there are efforts made to stimulate economic growth, the question of necessity to control emissions in the relatively near future becomes important. It seems reasonable to have an efficient instrument for such emissions control ready in order to be able to react to emissions growth.

Also the situation in the EU plays an important role. If an emissions trading system is introduced in the EU, the question of inclusion of the Czech Republic as a result of EU entry becomes real. In this case, any experience with such an approach, even at the domestic level and in an experimental phase will be an advantage and will help the country orient itself in the new market. It is also necessary to mention the length of the preparation process, especially in the case of a completely new instrument, that has never been used in the Czech Republic before, such as emissions trading. It will be necessary to resolve a number of problems of differing natures and these discussions, together with legislative proposals, might take a relatively long time. Again, the development in other countries clearly indicates, that any early experience, even if achieved by the “learning by doing” process, can pay in the future by a higher level of experience with such an instrument.

Conclusions and recommendations:

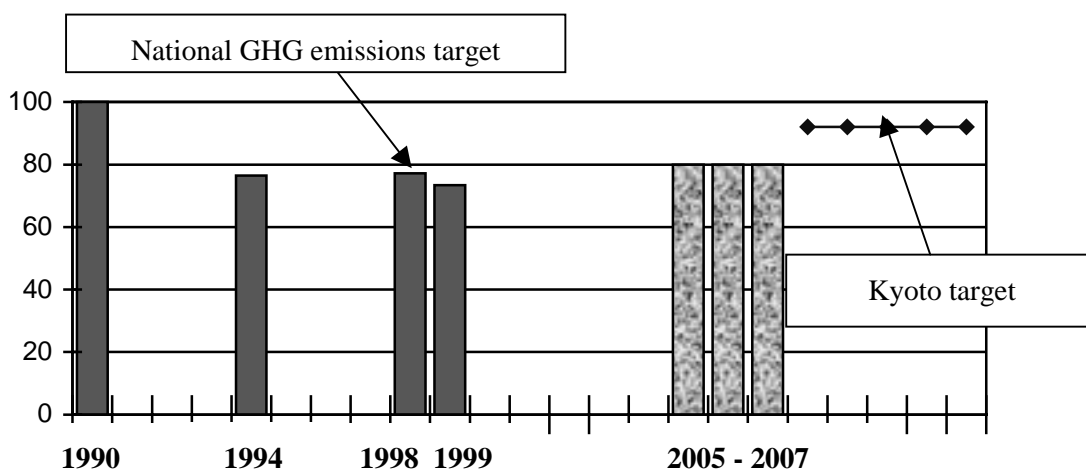
As a starting point, we suggest using the 20% reduction target (by 2005 compared to 1990) that is defined in the State Environmental Policy as a basis for setting the emissions cap. Such a target would be maintained between 2005 and 2007 for the trading system.

Setting the target (emissions goal) in the context of initial allocation will be the key point of political discussion.

For the economy as a whole, a 20% target would mean that emissions should not increase above 150 Mt CO₂-eq/year during the period 2005-2007 (as compared to 187,5 Mt in 1990). This means that total GHG emissions in 2005-2007 would be allowed to increase by about 3.5% between 1998 and 2005-2007. In 1998, CO₂ emissions from the 141 firms that would be covered by the system amounted to 68.1 Mt CO₂, or about 47% of total GHG emissions. One possible way to set the cap for these 141 firms (“the capped sector”) would be to set a 3.5% growth target for CO₂ emissions of these firms, as compared to 1998, which is equivalent to about 71 Mt CO₂ (see section 3.2)

Considering the specific situation of a transition country like the CR, a “growth cap” of +3.5% might be justified, since economic development is considered as the primary goal and emissions reductions from current levels are not a policy priority in the time frame considered. This would not ensure that the 20% national target is met, since only 47% of GHG emissions are (theoretically) covered by the system. Other policies and measures are needed for the “uncapped” sector.

Figure 3-1 Defining the target for GHG emissions trading in the Czech Republic - cap setting (%)



Nature of the tradable unit

The physical basis of the permit has to be homogenous in order to facilitate transfers between different entities. In the case of greenhouse gases the permit will consist of the right to emit the uniform unit of greenhouse gasses, usually expressed in the form of CO₂ equivalent. This option probably represents the easiest and most transparent means to cover different emissions. On the other hand, as the monitoring and inventory systems are not able to cover all six greenhouse gasses, CO₂ itself will remain the main gas to be traded.

A permit will represent an authorisation for a one-time emissions of one unit of CO₂ equivalent. The question that should be discussed is whether to allow banking (transfer of permits from one year to another), even in a limited form (banking for a few years only) or borrowing.

Conclusions and recommendations:

The proposed tradable unit is 1 ton of CO₂. Banking would be allowed. The possibility of banking and borrowing between the pre-commitment and first commitment period is under consideration.

3.2 Coverage in the Czech Republic

The system's coverage limits the system's dimension to a specific number of eligible sources.

The following options are considered as possible for CO₂ trading in the long term perspective in the Czech Republic:

1. sources with installed thermal output (installed thermal capacity) over 50 MW (i.e. up to 200 sources)
2. sources with installed thermal output over 5 MW (i.e. 2200 large sources)

3. combustion installations with a rated thermal input exceeding 20 MW (excepting hazardous or municipal waste), mineral oil refineries, coke ovens and selected industrial sources.
4. open system for any large and medium air pollution source (over 0,2 MW thermal output).

Even though participation would be voluntary, it is suggested to limit the system's coverage to a specific number of eligible sources.

Looking first at the percentage of total GHG emissions balance in the Czech Republic, using data for the last 10 years (percentages are more or less constant). Roughly 86 per cent of all total emissions are covered by CO₂, 8 per cent by CH₄, 6 per cent by N₂O and less then 0,4 per cent by F-gases - HFCs, PFCs and SF₆ (Table 3-1).

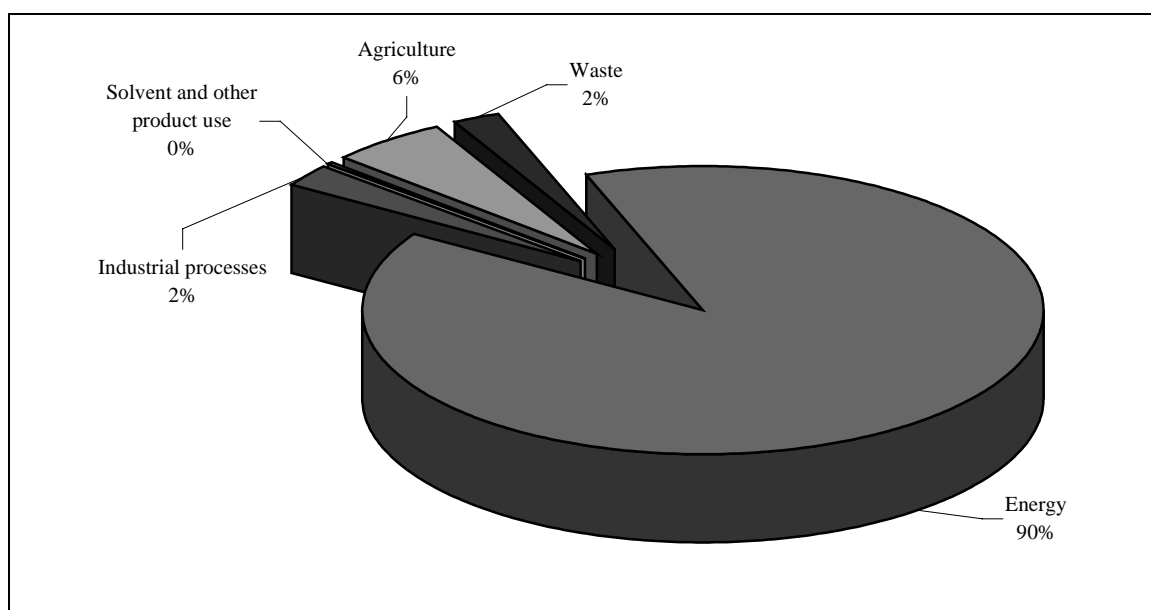
Table 3-1 Coverage of GHG in 1990- 1999

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
CO ₂ [per cent]	86,0	85,9	85,3	85,5	85,1	86,4	85,7	86,0	86,1	85,8
CH ₄ [per cent]	9,8	9,9	10,3	10,2	10,3	8,8	8,0	7,8	7,7	7,9
N ₂ O [per cent]	4,2	4,2	4,4	4,3	4,6	4,7	6,0	5,9	5,8	5,9
F-gases [per cent]	-	-	-	-	-	0,1	0,3	0,3	0,4	0,4

Source: CHMI

About 90 per cent of all total GHG emissions are covered by the energy sector (IPCC category 1), 6 per cent by the agricultural sector (IPCC category 4), 2 per cent by industrial processes (IPCC category 2) and waste (IPCC category 6) and less than 1 per cent by solvent and other product use (category 3). Land-use change and the forestry sector (IPCC category 5) in the Czech Republic serves as a sink of slightly more than 2 per cent (Figure 3-2).

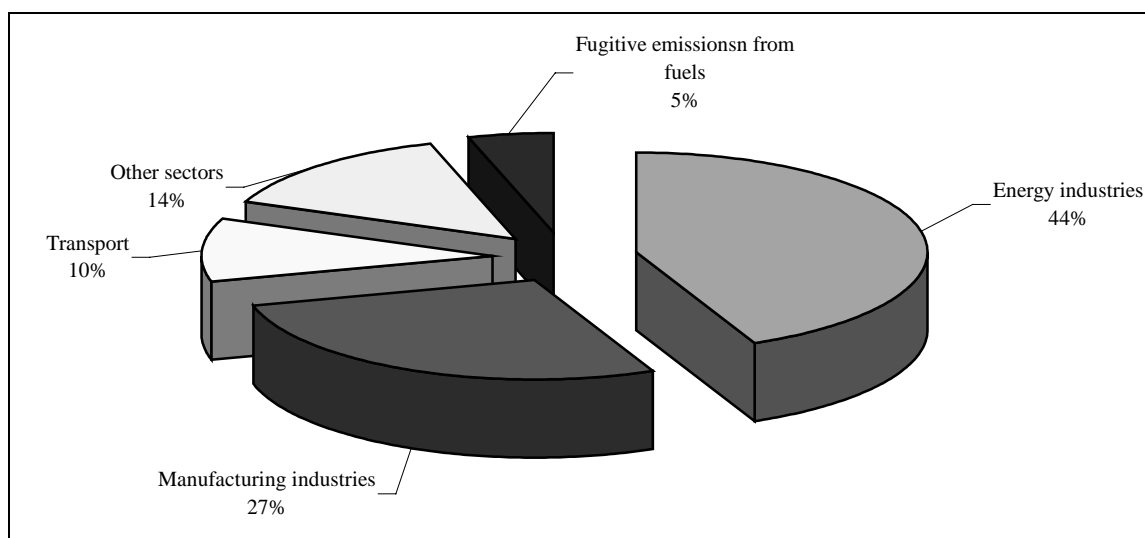
Figure 3-2 Sectoral coverage – inventory 1999



Source: CHMI

Taking into account only the energy sector, 44 per cent of total GHG emissions are produced by the energy industries (IPCC category 1A1), 27 per cent by the manufacturing industries (category 1A2), 10 per cent by transport (category 1A3) and 5 per cent by fugitive emissions from fuels (categories 1B1 and 1B2) and other activities (category 1A4), which are commercial/institutional, residential and combustion in agricultural activities, remains at about 14 per cent (see Figure 3-3).

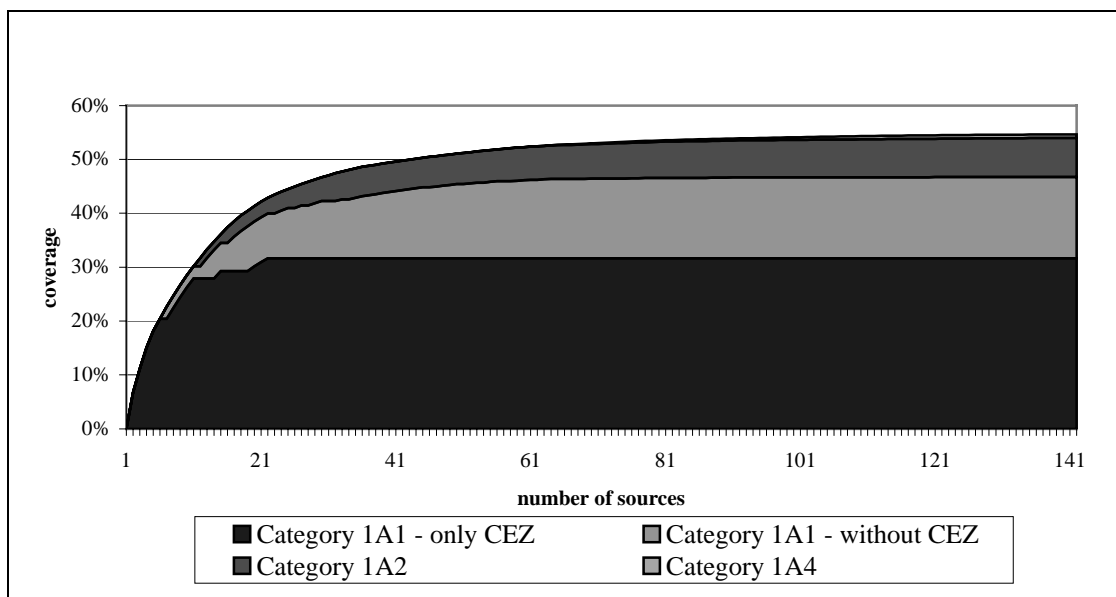
Figure 3-3 Activities coverage (energy sector) – inventory 1999



Source: CHMI

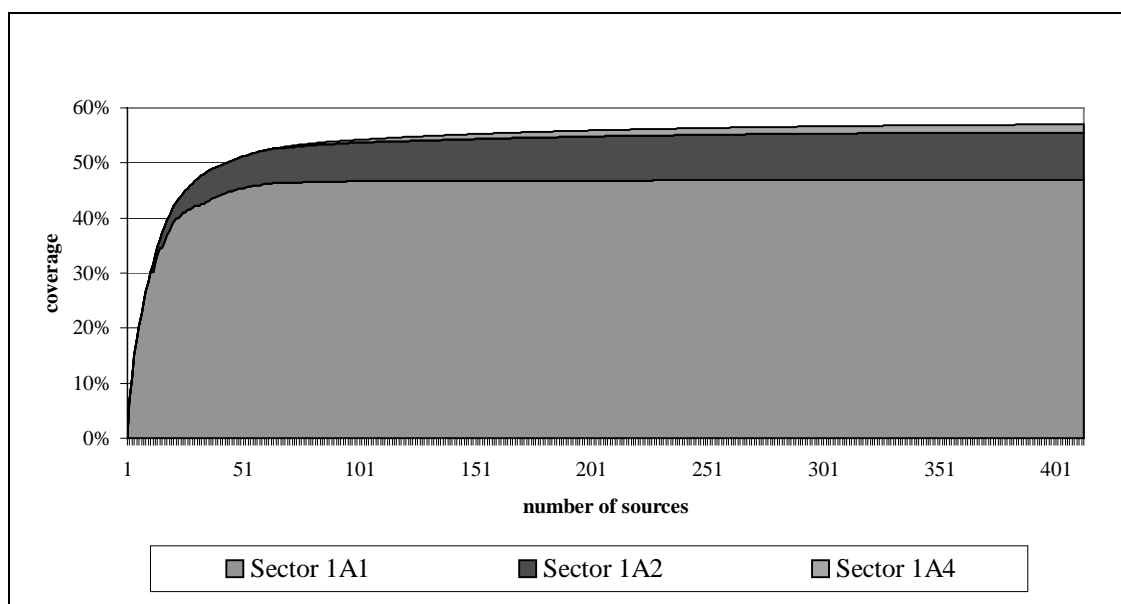
The Figures presented above clearly document that energy and the manufacturing industries cover 64 per cent of all GHG emissions in the Czech Republic and about 76 per cent of total CO₂. In the Czech database REZZO (see section 4.2. for reference), 141 sources with an installed energy output over 50 MW are registered. They cover 68,133 Gg of CO₂, or 71,073 Gg of CO₂, respectively. Cumulated coverage can be seen from Figure 3-4.

Figure 3-4 Cumulated coverage of CO₂ emissions by sectors (for 141 sources)



Source: CHMI

Figure 3-5 Cumulated coverage of CO₂ emissions by sectors (for 412 sources)



Source: CHMI

We get a very similar picture, if we take the 412 sources with installed energy output over 20 MW. For comparison we can use Figure 3-5.

The Czech Electricity Power Company (CEZ), which covers about 32 per cent of all CO₂, produces the majority of energy in the Czech Republic and other energy sources cover 15 per cent. In total sector 1A1 covers 47 per cent of all CO₂ emissions. Individual sources from

manufacturing industries, with an installed energy output over 50 MW, produced 7 per cent and individual sources from sector 1A4 only less than 1 per cent of CO₂ emissions.

Both Figure 3-4 and 3-5 give a good basis for some limitation of the number of sources (or entities) to a reasonable and technically manageable number – at least for the first stage of a domestic emissions trading system.

To decide on the correct coverage upstream the most critical step in the design of an emissions trading system is to take into consideration real national circumstances in the Czech Republic. There are several possible justifications for selecting a certain number of sources:

- proportion of selected sources in the total emissions balance;
- monitoring capability, which is related to monitoring costs and capacity for verification;
- competitiveness issues; and
- market size.

The proportion of selected sources has been already discussed, in detail, above. In general, substantially increasing the amount of sources does not significantly increase GHG emissions coverage in the Czech Republic. Increasing the amount of sources included in the trading system also increases the needs for related monitoring costs and personal capacities. Although the existing REZZO system covers a large number of sources, there is still need for manual verification of calculated values of CO₂ emissions (the REZZO system was not originally established for CO₂ monitoring purposes!). The role of competitiveness should also be an important issue. We do not have the economic information, which is, probably, very important here, to discuss it more properly. On the other hand, if we make some choice of a limited amount of sources, most of them belong to homogeneous sectors (sector categories 1A1 and/or 1A2 - see Figures 3-4 and 3-5). To develop a successful trading system, we need a sufficient number of sources participating in the market. They need to have different cost curves, which could create their potential for trading. Only a limited amount of sources covered by the trading system may lead to skewed market power.

More analysis will be needed in the future as well as more lessons learned from practical experience in other countries. To elaborate an efficient and operative trading system, it is necessary to consider not only experiences from countries with a well-developed general market system (e.g., EU), but also from countries, where such a market system is not so well developed (economies in transition).

For the pilot phase in the pre-commitment period, option 1 is proposed, thereby restricting the system coverage to a small number of sources. Limiting the eligibility to participate to a small number of firms does not significantly affect the system's coverage, defined in terms of GHG emissions covered by the system (as a percentage of total GHG emissions).

However, further studies will need to evaluate whether this does not lead to a loss of market efficiency or to distortions of competition within economic sectors.

A distinction needs to be made between the participants that take on an emissions cap and other possible participants. Permits could be distributed –or sold- to entities other than firms with an emissions cap. For instance, renewable energy sources, or other entities promoting environmental measures, could be awarded or purchase emissions permits. This option can be part of a wider policy context, such as support for energy saving or renewables.

For new entrants, a specific allocation or auction rule needs to be defined for these new entrants.

Participants of the trading system

The choice of permit receivers represents a key decision in permit market design and has already been discussed.

The following options are possible:

- initial distribution of permits only to polluters (using the permits for their own operation of technical facilities),
- initial distribution of permits to other subjects, not solely depending upon the fact, whether they are polluters or not. The Government can choose this option when, for example, renewable sources, firms realising voluntary environmental measures or even citizens as physical persons become recipients of permits. All these subjects, as they do not need these permits for their operations, can directly express their preferences through their behaviour in holding the permits (keeping them outside of the market) or reselling them getting a direct financial gain from such an allocation. This option can be part of a wider policy context such as support for energy savings or the use of renewable sources of energy.

New entrants (newcomers) represent a new source of emissions, they cannot be given permits on the base of historical emissions. From the economic point of view, receiving permits on the basis of historical emissions represents a subsidy, giving the advantage to old firms over new ones. There are a number of possible options. The first one is that the new entrant has to buy permits from current holders (the total amount of permits remains unchanged) - this is the case when all permits have been issued. The Government can also set aside a certain amount of permits for such cases, the question is how to distribute these permits to new entrants neither to distort market conditions nor to provide indirect support to some firms. This issue will probably have to be further investigated from the foreign investment point of view as well, because credit limitation could also be understood as a restriction to foreign investment. This issue will probably have to be consulted with WTO rules.

It is also necessary to consider the situation when the firm exits the business. Regulators are often tempted to withdraw the future permit allocations from firms that go out of business. If these permits have little value they are unlikely to affect the exit decision of a firm. If however they were very valuable, continuing to receive permits may become a key reason for the firm to continue. Such a firm could continue to produce, even if its marginal and average production costs are high, because they can subsidise their output.

The experience from the USA (see CCAP, 1999, 2000) showed that a very important role in the whole system of tradable permits is the role of brokers or, generally, financial markets. As trading between individual subjects can significantly increase transaction costs and not provide correct market price signals (the market would be broken into a number of small transactions not taking into account the total supply and demand), the brokers can be a very important factor enhancing market operation. As the tradable unit is uniform, there are clear conditions for such market assistance. The experience from other countries show that a number of international broker institutions are interested in participating in this market and are able to offer their experience with the operation of these markets and even enhance the market by using financial instruments such as options or futures.

Conclusions and recommendations:

It is suggested not to restrict the market by reducing the subjects who can buy or sell permits. Even if non-emitters will not be given the permits initially, they should be allowed to enter the market and participate in trading. Even if their influence on the market will probably not be significant, they can represent an individual approach to reducing environmental pollution by buying the permits and not using them.

3.3 Initial allocation

The starting point for translating policy decisions regarding permit allocation into operating rules would be to determine the total quantity of permits to be allocated. In contrast to all Annex II and also to the majority of Annex I Parties, the Czech Republic's assigned amount (92 per cent of total emissions in 1990) cannot be simply used as the initial point of reference in determining this total quantity.

There are two general approaches to permit distribution possible:

- a gratis allocation of permits (grandfathering)
- auction.

For the proposed system, the grandfathering method is proposed for two reasons: the gratis allocation would increase the acceptability of the system for business; there is almost no experience with initial allocation through auction.

A mixed system based on gratis allocation can be considered (auction for newcomers, distribution of a limited amount of permits at a fixed price etc.). Both auctioning and sale at a fixed price generate extra revenue for the central authorities, on the other hand it represents an extra burden for the affected sectors or entities (this impact can be eliminated or reduced by removing distortions in taxes at the same time). All these types of initial allocation of permits represent an approach in which the polluter does not have a „right to continue polluting“ and are thus closer to a „polluter pays principle“.

As to the auction, it is absolutely necessary to mention the effect of the revenue from the auction too. It could be used in a number of ways but, from the economic point of view, it would be best to use the revenue in such a way that it produces a so called double dividend. The double dividend effect can, but does not have to, have a relation to the environment – the revenue can be recycled back into the economy in a number of ways, including support for environmental measures. The use of such revenue represents a separate issue that is discussed at the political level. The further distribution of potential revenue is also a very complicated issue that will have to be solved at the political level. There are a number of options for the use of revenue, ranging from use by central Government as needed (though not necessarily addressed to environmental protection), through a variety of possible transfers to local governments or extra-budgetary funds (including funds for environmental protection) and, finally, to the use of the revenue for supporting environmental protection measures at specific emitters. Again, all options have their advantages and disadvantages and are the subject of relatively involved political negotiations.

Even if auction represents, from the theoretical economics point of view, the most transparent solution, the extra burden represents a very politically sensitive issue, especially in economies in transition where the overall tax burden is still relatively high.

A distribution of permits to individual sources is proposed on the historical principle.

Two options are under consideration:

- allocation based on 1998 data about CO₂ emissions. The data from individual sources for 1998 have been prepared. It is the year in which the large and medium sized air pollution sources were required to meet the performance standards (emissions limits) set in 1991.
- allocation based on historical data from the time period 1995 – 1999.

Data for a longer time period (i.e. from 1990) are available only on a limited basis (the main reasons are changes in the inventory's methodology and separation of the former Czechoslovakia in 1993).

4 KEY ASPECTS OF SYSTEM IMPLEMENTATION

This section is focused on the discussion of key aspects of the system's implementation, in particular on institutional a legal aspects and monitoring, verification and compliance.

4.1 Institutional and legal aspects

Legal authority, organisation of permit transfers

To ensure the permit market's smooth operation, the market has to be organised to minimise transaction costs. Emissions trading serves as an instrument for reducing the compliance costs of polluters, but to be interesting for them, they must not to be too complicated nor operate with high transaction costs (MoE, 1998).

Permits themselves could, in principle, take a variety of forms ranging from certificates to entries in a registry maintained on a computer. We presume that most permits would be maintained on an electronic system which allows, at the current level of computer technology, tracking the transaction in real time, reducing the need of capacities to a relatively minimal level. All entities having potential permit liabilities have to have their special accounts in the registry. Laws governing contracts and financial instruments could provide most of the required legal framework. There may be some adjustments necessary but, in general, Czech legislation relating to the operation of such a market would not be a restrictive factor.

Transfers can take a variety of forms. They can be internal and take place between different sources of the same company or can be realised (as already mentioned above) between different firms directly or on the financial market. From the point of view of time, transfer contacts may be established so as to take immediate effect or deferred until a certain date, as in the case of futures. Transfers may be made freely on the initiative of permit holders or they may require prior authorisation.

The financial markets in the Czech Republic are relatively well developed, considering the size of the market in the Czech Republic. However, there is relatively little experience with commodity trading. Nevertheless, there is no evidence that the above mentioned facts would be a limiting factor for good market operation, broker firms are flexible enough to operate with a new commodity very quickly.

The data about trades made will be available to the wider public. The availability of information to the public positively influences the credibility of the system, on the other hand, a number of data have a private origin and could be abused by competitors. A balance must be found to provide enough information about the system's operation and performance whilst keeping secret or private information classified.

Entity responsibility, liability issues

In an emissions trading system it is important to come to a decision on rules to settle liability; in the event that a traded amount proves to be invalid. This stipulation can substantially affect the simplicity of trading. The liability can be imposed on the seller, buyer, divided between seller and buyer or be distributed to other subjects such as insurance companies etc. The lack of seller liability may result in a considerable increase in effective transaction costs and thus diminish the liquidity of a permits market. It would be interesting to further investigate the amount of interest insurance companies have in actively participating in the permit market. The key prerequisite for every liability arrangement is a functional monitoring and tracking system.

Conclusions and recommendations:

From the point of view of the central authority, it will have to be considered at which level the permits will be issued, who will be responsible for tracking, verification of trade, issues related to monitoring and compliance including enforcement possibilities. All these issues have a political background and will have to be considered on the basis of political decisions.

Legal status and validity of permits and transactions

There are two basic options to define the legal status of permits:

- right (permits are an asset or commodity),
- administrative allowance, which is transferable under certain conditions.

This issue represents one of the most complicated aspects within the design process and must be solved in close collaboration with lawyers and experts on financial markets. In both cases it is necessary to ensure that a permit can be transferred without excessive costs or complications to ensure smooth operation of the market. Also this issue will be influenced by financial markets' legislation and rules. In the proposed system, an allowance is the administrative authorisation to emit a certain amount of emissions.

Competition law and tax treatment

The main legislative document tackling this issue is the EU competition law. As to the proposed system, there are two main problems:

- the proposed EU trading system is based on sectors, not sources,
- grandfathering with a growth provision could be viewed as a subsidy to industry.

The system has to respect the EU competition law. Regarding this issue, further analysis is necessary.

4.2 Administrative issues: Monitoring, verification and compliance

The design and implementation of the proposed trading system is guided by certain general principles:

- environmental effectiveness (successful evaluation, monitoring and verification),
- economic efficiency (minimisation of transaction costs),
- equity and
- political acceptability.

An effective tradable permit system presumes the existence of a supporting administrative structure.

4.2.1 Emissions monitoring, registration and verification

Emissions monitoring – proposed system

- Basis for assessing compliance
- Self-reporting system, accompanied by direct and/or indirect inspection
- Indirect emissions monitoring – it is cheaper and more precise
- Covered by related activities and estimated relationships between activities and emissions

Emissions must be subject to the future monitoring, verification and reporting obligations among sources covered by the system.

The ability to monitor the process presumes a flow of consistent, reliable and practical information to the monitoring authority. The information flows will be based on a self-reporting system, accompanied by direct and/or indirect inspection. Direct inspections would involve visits to the emissions sources. Indirect inspections can involve the collection of related data (particularly data such as energy consumption by fuel type), which can provide indirect evidence on emissions. Self-reporting involves the submission of reports, which provide details on specific data requested by the monitoring authority.

The reporting function generates a wealth of raw information. The verification function attempts to verify compliance with assigned limits and to recognise uncertainties associated with measuring emissions reductions as well as to design institutional ways of handling those uncertainties to ensure the fulfilment of the assigned limits.

For CO₂ emissions sources, in the Czech republic there is an effective and satisfactory basis for monitoring. Theoretically emissions can be monitored either directly, using monitoring devices, or indirectly, using predictive methods. For domestic emissions trading in the Czech Republic, an indirect emissions monitoring would be used – it is cheaper and more precise. Such monitoring would cover related activities (amount of fuel consumed) and estimated relationships between activities and emissions (multiplying an emissions factor by the level of activity).

In the Czech republic monitoring of pollutants is traditionally provided by the REZZO system (Register of Emissions and Air Pollution Sources). This system, whose core was established in 1982, has been developed gradually, following increased national and international demands on emissions monitoring, e.g. with reference on the CLRTAP convention.

At present the REZZO system is mainly used for monitoring traditional pollutants (e.g. particles, SO₂, CO, NO_x and hydrocarbons). Large and medium sources are monitored individually (point sources), small sources at the local level (area sources) and mobile sources at the national level (line sources). Pollution sources can be further divided into boilers (heat and electrical energy production) and technological sources. Boilers are specified by the installed capacity, by boiler type and by the fuel type used. Technological sources are classified by their own, country-specific nomenclature, defined by Decree No. 117/1997. Fuels are combusted mainly in boilers, nevertheless in many types of technological sources, like furnaces, ovens and kilns some fuel combustion also takes place. The standard output from the REZZO system involves emissions of pollutants, e.g. for a given source category or for a given territorial unit (country, region and district).

This categorisation of sources (large, medium and small) is given by Czech legislation (Decree No. 117/1997). Classification into either a large, medium or small source is evident only for boiler-related sources, as is obvious from the following box. Differentiation of technology-related sources is given explicitly by the Decree. E.g. iron and steel production and inorganic acids production are typical examples of large pollution sources, while soap, glue and ceramics production are typical examples of medium sources.

Register of Emissions and Air Pollution Sources (REZZO)

REZZO 1 – large pollution sources (2 500), > 5 MW and selected large technologies

REZZO 2 – medium pollution sources (30 000), 0.2 - 5 MW and other technologies

REZZO 3 – small pollution sources (area sources) < 0.2 MW and stoves in households

REZZO 4 – mobile sources (area / line sources)

In contrast to traditional pollutants monitoring, the official Czech national inventory of greenhouse gases (Fott, Pretel et al., 2000), particularly CO₂ (other GHG are CH₄, N₂O, HFC, PFC and SF₆), is based on the IPCC methodology regardless of the REZZO system so far. The CO₂ inventory itself is provided by a "top-down" approach based on the official Czech statistics (energy balance). This approach has been generally accepted as reliable and so other alternatives based on a "bottom-up" approach have not been used for official emissions output.

CO₂ emissions results obtained at the national level by the top-down approach cannot be directly used for an emissions trading system. It requires the monitoring and registration of CO₂ emissions for individual sources – i.e. players in the emissions trading system. Although the REZZO system has not been utilised for this purpose yet, in the following paragraphs it will be shown how to obtain CO₂ data for individual sources.

Owing to the conclusions concerning "coverage" from the previous chapter, only the database of large pollution sources - REZZO1 is recommended as a possible tool of CO₂ emissions monitoring for domestic emissions trading. The monitoring is based on registering the amounts of individual fuels (including their characteristics) consumed in individual sources by the existing REZZO system. It enables CO₂ emissions estimates using simple calculations. The following equation is generally accepted for indirect emissions monitoring:

CO₂ emissions = amount of fuel * net calorific value * emissions factor * oxidation factor

When more fuels are combusted in one source, the resulting CO₂ emissions is given by the sum of the contributions from all individual fuels. In principal it is possible to use either default, country-specific or site-specific values of emissions factors defined for individual fuel types. In the demonstration done for this study the default values presented in the IPCC Guidelines (IPCC, 1966) and recommended by the IPCC Good Practice (IPCC, 2000) were applied. Also for oxidation factors, default values (0.98 for solid fuels, 0.99 for liquid fuel and 0.995 for gaseous fuels) were used. Oxidation factors are very often close to 1 especially for gaseous and liquid fuels; only in some cases, concerning the combustion of lumped coal, can they be somewhat lower (e.g. 0.95).

Above all it should be necessary to improve all possible QA/QC (Quality assurance / Quality control) functions including the utilisation of suitable crosschecks. E.g. comparing energy input (energy contained in fuel) with energy output (heat produced) represents a typical example of

one such possible crosscheck. Increased attention should also be paid to the relevant input data quality especially on fuel characteristics (net calorific values). Moreover, default values of emissions factors should be gradually substituted by the rarer country-specific or site-specific values; estimated on the basis of fuel analysis. Some examples of such data for the Czech republic already exist in scientific literature. The existing database structure also needs to be revised. Modification and improvement of the system can be expected, especially in the case of technological sources consuming fuels and emitting CO₂ and they must be accompanied by updating the existing software utilities.

4.2.2 Permit registry and tracking system

Only a part of REZZO1 sources will be involved in the proposed domestic emissions trading system (see section on coverage).

The registry for tracking allowances has to be sufficient not only to monitor and verify actual emissions from individual sources (as analysed above), but it is also necessary to cover two other important functions of the registry:

- registration and verification of transactions and record the number of allowances that each source owns
- reliably detect whether these sources own enough allowances to cover their actual emissions (compliance)

The registry is of course anticipated as a fully automatic system operating on a computer network.

While monitoring actual emissions itself can be provided by modifying the existing REZZO1, the remaining part of the registry has to be newly developed. In contrast to the existing REZZO1, there is no experience with the performance of such a system in the Czech Republic. It will be necessary to adopt experience from other countries (USA, Slovakia) and utilise their assistance (including the assistance and support of the OECD in this project). It should be mentioned that an additional project organised by CCAP (USA) has just been started, following this project. It is expected to be focused more on solving practical issues and specific problems, including the registry design and implementation. Good Czech experience with emissions databases, namely with the REZZO system, seems to be very useful from this respect.

4.2.3 Institutional arrangement of the monitoring and registration system

As discussed in the previous section, the whole monitoring and registration process includes two functions:

1. Monitoring, registration, reporting and verification of actual emissions by sources – entities (players) of the DET system. This function should be provided by modifying the existing REZZO1 system
2. Registry – the system of tracking allowances, transactions and detecting compliance. This part of the system shall be newly developed including the relevant software utilities. The transfer of data from the modified REZZO1 to the registry is expected.

By the term "institutional arrangement" we mean institutions participating in the whole monitoring and registration process. The institutional arrangement for the first topic that already exists will be discussed. The functioning of the REZZO1 system is ensured by two

governmental organisations, the Czech Hydrometeorological Institute and the Czech Environmental Inspection Office, which are managed by the Ministry of Environment.

Ministry of Environment (MoE) undoubtedly plays the leading and supervisory role in the whole pollution prevention policy including climate change issues.

Czech Hydrometeorological Institute (CHMI) assists the MoE in implementing this policy by providing the relevant research and development (R&D) activities and expert service. It is responsible for compiling emissions inventories at both the national and international levels, including an inventory of GHG. The CHMI has been participating in the conceptual development of the REZZO system and on its performance. The REZZO is operated in the CHMI as a part of ISKO (Integrated System of Air Quality Monitoring).

Czech Environmental Inspection Office (CIZP) is in charge of data collection and verification. It collects data from the pollution sources by using a data form called "Summary Assessment of Operational Registration of Air Pollution Sources" under Decree No.117/1997. Similar legislation measures will also be included in the "New Clean Air Act" that is now subject to the approval process of the Czech Parliament. The CIZP co-operates with the CHMI on REZZO performance.

A similar allocation of possible roles between the CHMI and CIZP respectively could also be expected for the prospective registry system tracking allowances. While CHMI is expected to be more oriented to the conceptual development of the system (in co-operation with other research bodies oriented to the economic aspects and software facilities), the likely task of the CIZP will be oriented more towards the technical functions. Establishing a new body oriented in this direction is also not excluded. In the case of operating a registry and tracking system within the current institutional set-up, additional human resources will be necessary.

Monitoring and Registration System

The Government (Ministry of Environment) shall play a supervisory role

Two possible co-operating institutions

- Czech Hydrometeorological Institute
- Czech Environmental Inspection Office

Needs for improvements in personnel capacities and financial resources

4.3 Market rules and institutions for trading

All the above-mentioned institutions will be involved in the process of organising trading. The concrete role of each institution has to be further discussed and clarified. The establishment of a national focal point for emissions trading that would serve as a centre for technical and administrative issues related to trading could also be considered. This question is also connected with the possible necessity to authorise transfers of permits from one entity to another. However, all the above-mentioned institutions should be involved in operating such a centre. The experience of Slovakia has shown, that the existing institutional and legal background, constituted for administrative instruments allows, in an EIT country, quite a simple procedure for implementing a trading scheme.

The actual market rules will be developed in close co-operation with experts on financial markets, where suggestions or experience in working with such markets create a good basis for preparing the rules for a permit market. The market should be organised so that it has enough liquidity to ensure its smooth operation, as was already mentioned before. It can be expected

that brokers will play an important role in operating this market and therefore access of individual entities to trading will be relatively easy and with low transaction costs. The interest of brokers to participate on this future market can clearly be seen even today and it is expected that, given that emissions trading will be seriously considered in the Czech Republic, the interest of broker firms not only from the Czech Republic, but also from abroad will increase significantly. Again, with a positive overall effect on the potential market itself.

5 OTHER ISSUES

This chapter is devoted to the discussion of issues, which are linked to the domestic emissions trading system.

5.1 Linkages with other domestic policies

Because the proposed system is designed as a voluntary one, a set of accompanying incentives has to be established for companies to motivate them to access the system.

The following two sets of incentives are proposed:

1. The right to enter the domestic and/or international GHG emissions market

Only sources that enter the system will be allowed to sell excess emissions on the domestic market or on the international market in the pre-commitment period. The modification of the system will be influenced by the modalities of the (proposed) EU directive on GHG emissions trading.

Only sources that will enter the system will be allowed to bank the emissions and transfer them from the pre-commitment to the commitment period. This will create additional flexibility in the strategic decision making of polluting sources.

2. Access to specific subsidy programs

With respect to the Czech environmental and energy policy context, the following two options can be considered:

Sources entering the domestic trading system will get some relief from air pollution charges for the pre-commitment period with no requirement to take any specific reduction measures (*indirect subsidy*).

Sources entering the domestic trading system will gain access to specific subsidy programs supporting measures aimed at GHG emissions *reduction (direct subsidy)*.

The use of air pollution charges and state subsidies as an incentive for voluntary entry into the trading system

The system of air pollution charges covers almost all the important pollutants in the Czech Republic, however it excludes CO₂. It creates an incentive for reducing pollution by imposing charges on the amount of pollutant emitted into the air, and generates revenue, which is used mainly for purposes of environmental protection. The fiscal function of air pollution charges is the dominant one - the charge rates are not sufficiently high to create a significant pressure for reducing air pollution. Despite this, they still remain one of the most important instruments of environmental policy.

The most important part of the revenue from air pollution charges are the revenues from large and medium sources of pollution, where the revenue goes into the State Environmental Fund and is redistributed back into environmental protection. There might also be charges on small business sources imposed by municipalities with revenue going to the municipal budget, but they represent a negligible amount both from the revenue and pollution reduction point of view.

From the revenue point of view the sulphur dioxide charge is the leader, in second place are solid emissions revenue. The charge is paid by the operator of the emissions source and if the charge exceeds the given limit, there is an additional non-compliance fee imposed.

As the quality of the environment is improving in the Czech Republic, which is also reflected in the priorities of environmental policy, discussions are starting on the possible reform of the charges system. Two strategic approaches are being considered, one comprising of a gradual replacement of charges by energy taxes imposed on a budgetary neutral principle, the second one is to use the revenue from charges for financing programmes for industry.

The second option offers an effective means to connect the systems of charges with a tradable permits system. As the system is considered to be a voluntary one, there must be an incentive for business to enter such a system, which is difficult in the situation when emissions are below the targets.

5.2 Linkages with the international emissions trading system

The system is designed to be flexible enough to be compatible with the international emissions trading at the EU level and with the scheme to be established amongst Parties included in Annex B of the Kyoto Protocol.

The linkages with the international emissions trading system should depend on the voluntary access of entities into the domestic system. Even if the proposed system is prepared as a domestic one, to abandon any future connection with international trading would not be wise. The possible future connection of the system with international trading must respect the voluntariness of the domestic system. In other words, the firm, which would like to enter the international system, has to voluntarily participate in the domestic one and thus accept its rules and contribute to address the emissions on the domestic level first. This option represents, from the firm's point of view, a strategic approach and has to be considered in the wider context of the economic background.

This discussion becomes very serious especially in the case of EU entry, where it can be expected that emissions trading will take place in the relatively near future. Again, the firms have to understand, that emissions trading represents a strategic option for their economic and environmental behaviour in the future and that if they want to participate in future international emissions trading, they have to get some experience with using such an instrument in practice. In our opinion, this will serve as another incentive for firms to enter the voluntary domestic system.

On the other hand, in the case of international emissions trading, the number of both technical and legal, together with political, issues has to be resolved. It can be expected that the experience of other countries with domestic systems will be very worthy for the design of an international one. The situation in economies in transition is even more important because it represents a different situation than in developed countries. At least at the beginning phase there is a surplus supply of emissions and even if they should be put on the international market, they have to be somehow distributed to individual sources and sources themselves have to get some experience on how to behave in such a market. In the study there were a number of very specific problems identified that will have to be discussed or resolved. We believe that they also represent one of the valuable outcomes of the study.

5.3 Estimation of the economic and distributive effects of the trading system

The estimation of effects is possible only using data aggregated for individual companies. However the REZZO system is not designed to track GHG emissions. The data on CO₂ emissions from 1998 were recomputed using fuel consumption and emissions factors. The time series of data necessary for the analysis of impacts (1990 – 2001) is currently being calculated.

5.4 Institutional process

To develop a domestic trading system in the Czech Republic represents a difficult, complex and long-term task. Key players - state administration (different ministries or governmental agencies) and the firms themselves – have to be involved in the design process. The wider public, including NGOs, will have to be "educated" in terms of gaining clear knowledge about the goals and functioning of the emissions trading system. Negative expectations or uncertainty are likely to undermine the whole process.

On the other hand, the experience of Slovakia (which has already established SO₂ trading) has shown, that the introduction of trading is possible within the existing institutional and legal context (which is very similar to the Czech Republic's).

6 CONCLUSIONS AND RECOMMENDATIONS

The emissions trading has never been introduced nor tested in any EIT country before. However, current developments indicate that there are intensive efforts aimed at the analysis and introduction of this instrument.

6.1 General conclusions

The analysis of the development in climate change policies at the international and national level has shown the necessity of long-term strategic adjustment in environmental policy. The design and implementation of domestic emissions trading systems is under discussion in a number of countries and international institutions.

6.2 Conclusions specific to the Czech Republic

The Czech republic is expected to comply with the Kyoto protocol. However, there is an acceptance regarding the strategic approach toward entering the international GHG emissions trading system. The pilot programme for the pre-commitment period should prove the concept of emissions trading in the specific national circumstances, discover the real prices and mitigation costs and help to build and test effective institutions and standardised procedures.

The proposed domestic trading system seems to be a realistic option for the CR and to fit well with the Czech climate policy context. It could be implemented, provided there is political support. Particular attention is given to design and implementation, including further studies and additional resources must be provided for its implementation.

6.3 Recommendations for further work

As the system is proposed to start in 2005 and as it represents a radical intervention into the current structure of state environmental policy instruments, an intensive design period has to start immediately.

The following steps are necessary to prepare the key elements of the proposed system:

- broad political discussion with key stakeholders, including business,
- designing a system of financial incentives for voluntary participation in the system,
- incorporation of trading into the legal system (e.g. revising the current process of the clean air act, special regulations etc.),
- studies on specific design and implementation issues, including national inventory problems, other legal issues, analysis of economic impacts, links with the international emissions trading system.
- Further studies will need to evaluate the impacts on market efficiency or to distortions of competition within economic sectors.

- In the study, sources are defined in terms of emissions and energy output. More analysis is needed to determine to which economic sectors each firm belongs and whether there are risks of distorting competition among firms belonging to the same sector, if only a subset of these firms are included in the system. This may also raise legal issues (e.g. related to the EC competition law).

BIBLIOGRAPHY

- AGO - AUSTRALIAN GREENHOUSE OFFICE (1999),
"National Emissions Trading - establishing the boundaries", Discussion paper 1.
- ALFSEN, K.H. (1999),
"Flexible Instruments in Climate Policy", CICERO policy note 1.
- ANDERSON, D., BRACK, D., GRUBB, M.(1997),
"Emissions trading and the control of greenhouse gases". The Royal Institute of International Affairs. London.
- CARLBRO/DHV CR/SRCI CZ (2000),
"Estimate of the Economic Costs for the Reduction of Greenhouse Gas Emissions (2000)", PHARE OSS No. CZ 9705-05-01-02, Final report, July 2000.
- CCAP - CENTER FOR CLEAN AIR POLICY (1999),
"Design of a Practical Approach to Greenhouse Gas Emissions Trading Combined with Policies and Measures in the EC", Washington.
- CEPS – The Centre for European Policy Studies (2001),
"Implementing an emissions credits trading system in France to optimise industry's contribution to reducing greenhouse gases". Brussels.
- COMMISSION OF THE EUROPEAN COMMUNITIES (2000),
"EU policies and measures to reduce greenhouse gas emissions: Towards a European Climate Change Programme (ECCP)". COM (2000)88 final.
- COMMISSION OF THE EUROPEAN COMMUNITIES (2001),
"Proposal for a directive establishing a framework for the greenhouse gases emissions trading within the EU and amending Council Directive 96/61/EC". COM (2001)581.
- CONSULTATION GREENHOUSE GAS EMISSIONS TRADING (1999),
"Report of the Consultation Group on Greenhouse Gas Emissions trading".
- ČIHÁK, M. (1994),
"Ekologie: Obchodovatelná povolení"[Ecology: tradable permits], Ekonom 23/1994.
- DERWENT, H. (2001),
"Greenhouse Gas Trading in the UK", Proceedings of the Workshop: Emissions Trading and Joint Implementation as a Chance for the central and Eastern European Countries, Leipzig 2001.
- DETR - DEPT. OF THE ENVIRONMENT, TRANSPORT AND THE REGIONS (2001),
"A Greenhouse Gas Emissions Trading Scheme for the United Kingdom: A Summary of Responses to Consultation Document (2001)", UKETS(01)01, May 2001.
- DUCKETT, E.J. (1998),
"Effects of emissions credit trading programs", <http://www.aise.org>.
- DUDEK, D., GOLUB, A. and STRUKOVA, E. (2000),
"Economies in Transition: Pathways for Sustainable Economic Development and Climate Protection", Environmental Defence.
- FOTT, P. and PRETEL, J. at al. (2000),
"GHG Emissions Inventory 1999 in the Czech Republic, Czech Hydrometeorological Institute", Prague.
- ELLERMAN, A.D. (2000),
"Tradable Permits for Greenhouse Gas Emissions: A primer with particular reference to Europe", MIT Joint Program on the Science and Policy of Global Change, Report No.69.
- EUROPEAN COMMISSION (2000),
"Green Paper on Greenhouse Gas Emissions Trading within the European Union (2000)", COM(2000)87 of March 2000.
- FIELD (2000),

- "Designing Options for Implementing an Emissions Trading Regime for Greenhouse Gasses in the EC - final report".
- HÁJEK, M. and CHMELÍK, T,
 "Economic Instruments of Environmental Policy in the Czech Republic", Prague 2000.
- HAUFF, J. (2000),
 "The Feasibility of Domestic CO2 Emissions Trading in Poland", Riso National Laboratory, Roskilde, September 2000.
- HAUFF, J. (2001),
 "The Feasibility of Domestic Carbon Dioxide Emissions Trading in Poland", Proceedings of the Workshop: Emissions Trading and Joint Implementation as a Chance for the central and Eastern European Countries, Leipzig 2001.
- HOLTSMARK, B. and HAGEM, C. (1998),
 "Emissions Trading under the Kyoto Protocol", Centre for International Climate and Environmental Research, University of Oslo, CICERO report 1998:1.
- IEA/SLT/CERT (2001),
 "Major Issues of the Energy Policies of the Czech Republic (2001) 8", Energy Policies of IEA Countries: Czech Republic 2001 Review.
- IPCC TASK FORCE FOR INVENTORY (2000),
 "Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories".
- IPCC/OECD (1996),
 "IPCC 1996 Revised Guidelines for National Greenhouse Gas Inventories".
- IPCC TAR WGIII (2001),
<http://www.ipcc.ch>.
- JÍLKOVÁ, J. (1996),
 "Obchodovatelná emisní povolení" [Tradable permits], Vysoká škola ekonomická v Praze, Fakulta národohospodářská.
- JÍLKOVÁ, J. (1997),
 Tradable permit for large and medium air pollution sources. Study prepared for HIID and US AID. Prague 1997.
- JOHNSTONE, N. (1999),
 "Tradable Permit Systems and Industrial Competitiveness: Review of Issues and Evidence, In: Implementing Domestic Tradable Permits for Environmental protection", Ch.XI, OECD 1999.
- JOSHUA, F. and LOWEN, J. (2001),
 "Leading group of companies launch Emissions Market Development Group (EMDG)", Global Greenhouse Emissions TRADER, Issue 10, May 2001, p. 2.
- KLETZAN, D., KÖPPL, A. and BUCHNER, B. (2000),
 "Ein Erstantatz für Ein Nationales CO2-Emissions-Trading-System", Wien 2000.
- LEBLANC, A. (1998),
 "Market makers in greenhouse gases-rewards for emissions reductions reduction transactions", Global Greenhouse Emissions Trader, Issue 4
- LEFEVERE, J. (2001),
 "GHG Emissions Trading in the EU", Global Greenhouse Emissions TRADER, Issue 10, May 2001, p. 2.
- LEWIS, R. (2001),
 "BP: Practical Experiences with GHG Emissions Trading", Proceedings of the Workshop: Emissions Trading and Joint Implementation as a Chance for the central and Eastern European Countries, Leipzig 2001.
- MOE (1999),
 "Climate Change - Domestic Policy Options Statement", Wellington.
- MoE CR, THE WORLD BANK and SWISS GOVERNMENT (1998),
 "A National Strategy for Joint Implementation in the Czech Republic", Prague.

- MoE CR (1999),
 "Strategy to mitigate climate system of the Earth in the Czech Republic". Prague.
- MoE CR (1999),
 "Approximation Strategy for Environment", Prague.
- MoE CR, CHMI (2000)
 "3rd National Communication" (draft), Prague.
- MoE CR (2001),
 "Implementation plan for Council Decision 1999/296/EC amending Decision 93/389/EEC for monitoring mechanism of Community CO₂ and other greenhouse gas emissions". Prague.
- MoE CR (2001),
 "Statistical Environmental Yearbook of the Czech Republic". Prague.
- MoE/CCAP (2000 and 2001),
 "Workshop on Developing CO₂ Cap and Trade Program in Slovakia".
- MUIR, A.K.M. (2001),
 "European Energy Liberalisation, Environmental Measures and Emissions Trading, and Comparisons for North America", <http://www.ieels.com>.
- OECD (1999),
 "Environmental Performance Reviews. Czech Republic". Paris.
- OECD (1999),
 "Implementing Domestic Tradable Permits for Environmental Protection".
- OECD (1999),
 "OECD Environmental Data Compendium 1999". Paris.
- OECD (2000a),
 "Transition Country Perspectives on the Kyoto Protocol", Workshop Report, Paris 2000.
- OECD (2000b),
 "Strategic Guidelines for the Design and Implementation of Domestic Transferable Permits".
- OECD (2000),
 "Design and Use of Domestic Transferable Permit Systems for Environmental Policy".
- ROLFE, CH. (2000),
 "Upstream Emissions Trading: The great leap forward for Ecological Tax Reform", West Coast Environmental Law Research Foundation, Canada 2000.
- SCHAFHAUSEN, F. (2001),
 "Emissions Trading as a Component of National Climate Policy", Proceedings of the Workshop: Emissions Trading and Joint Implementation as a Chance for the central and Eastern European Countries, Leipzig 2001.
- SHELLABERGER, M., FISCHEROVA, G. (2001),
 „Developing an Emissions Trading Program in Slovakia: A Case Study”, Clean Air Markets Update, Issue 1, Sept. 2001.
- SORENSEN, M.P. (2001),
 "Emissions Trading in Denmark", Proceedings of the Workshop: Emissions Trading and Joint Implementation as a Chance for the central and Eastern European Countries, Leipzig 2001.
- STIANSEN, P. (1999),
 "A Norwegian System for tradable GHG Permits - Background and Challenges".
- TIETENBERG, T. at al. (1999),
 "International Rules for Greenhouse Gas Emissions Trading", UNCTAD, Geneva.
- TPWG - TRADABLE PERMITS WORKING GROUP (2000),
 "Using Tradable Emissions Permits: Options Report (2000)", Canada, April 2000.
- VAN VLIET, M.J. and JOSHUA, F.T. (1999),
 "Domestic emissions trading initiatives", Global Greenhouse Emissions Trader, Issue 7.

- VIS, P. (2001a),
"Report from the ECCP Working Group on Emissions Trading", Climate Change Unit
EC-Environment DG.
- VIS, P. (2001b),
"EU supports emissions trading schemes", Global Greenhouse Emissions TRADER,
Issue 10, May 2001, p. 2.
- WALSH, M., MARQUES, R. and BARON, S. (2001),
"Chicago Climate Exchangesm moves toward launch", Global Greenhouse Emissions
TRADER, Issue 10, May 2001, p. 2.
- WEMAERE, M. (2001),
"Enlargement and Climate Change", Discussion paper, Climate Change Unit EC-
Environment DG.
- ZHANG, Z.X. (1998),
"Greenhouse Gas Emissions Trading and the World Trading System", Journal of World
Trade, 32, No.2.
- ZHANG, Z.X. and NENTJES A. (1999),
"International Tradable Carbon Permits as a Strong Form of Joint Implementation", in
Skea, J. and Sorrell, S. (ed.), Pollution for Sale: Emissions Trading and Joint
Implementation, Edward Elgar, Cheltenham.