

Leaving the Trial Phase behind – Preferences & Strategies of German Companies under the EU ETS



BAROMETER

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Executive Summary.

The EU Emissions Trading Scheme (EU ETS) is the first large-scale multi-national greenhouse gas (GHG) trading program and a central instrument of European climate policy. The EU ETS market is still young, but growing rapidly. In the last two years, the average daily trading volume at the ECX has increased enormously, from 4 million tCO₂ (2007) to 20 million tCO₂ (March 2009). From over 11.000 installations covered by the EU ETS, 1.660 are located in Germany being responsible for almost 50 % of national green house gases. One third of the installations under the trading scheme belong to energy intensive industry sectors and two thirds to the energy sector. Compared to 499 million tCO₂ in the years 2005 - 2007 the total number of allowances to be issued within the second trading period has been reduced to 452 million tCO₂ annually. With this tighter emissions cap, the relevance of the carbon market for the covered firms can be expected to increase. Despite its high importance for both market participants and stakeholders, the data basis concerning developments and expectations in supply and demand as well as prices of emission allowances and emission reduction certificates is still lagging behind. The **KfW/ZEW CO₂ Barometer** – a survey among German firms covered by the EU ETS and international carbon experts developed in cooperation between KfW Bankengruppe and the Centre of European Economic Research (ZEW) – intends to close this gap.

The **KfW/ZEW CO₂ Barometer 2009** shows that the majority of German firms under the EU ETS is already participating actively in the European carbon market. Yet, on specific market segments, activity levels have remained low due to uncertainties and high transaction costs. This concerns on the one hand the post-2012 market and on the other hand the possibilities to use Kyoto credits (CERs/ERUs). For the market participants, a longer horizon of legislation which allows long term planning is of the highest priority with regard to market development. An early specification of the regulatory framework for the next trading phase is therefore crucial. In terms of the Kyoto mechanisms, market activity could profit from the reduction of transaction costs and risks of using CERs and ERUs, for example by increasing standardisation of project development procedures. In spite of tighter emissions caps in the second trading phase, the KfW/ZEW CO₂ Barometer 2009 results indicate that monetary incentives for abatement investments by the EU ETS still seem to be weak. Altogether, the EU ETS market in Germany has gathered considerable momentum, although it is not in full swing yet.

Main results of our survey:

Economic downturn impedes emission assessment but spurs trading activities of German firms.

- In contrast to the first trading period, German installations under the EU ETS were generally short in emissions allowances in 2008. Nevertheless only less than one third of German firms expect to be short over the entire trading period 2008-2012. Two thirds of the firms anticipating their allocation to be too low were actually long in 2008 – indicating possible **difficulties to assess actual emissions due to the unexpected strong economic downturn** as well as countercyclical effects of the EU ETS.
- Although three quarters of firms participate actively in carbon markets **only a small minority (13 %) seems to be trading on a more regular basis** - representing mainly larger companies.
- Surprisingly firms being long with respect to their initial allocation were found to be more likely to buy or sell EU allowances (EUAs) than firms being short – a further indication that firms **were actively selling surplus EUAs thus using them as an instrument in their general liquidity management**.
- While **secondary markets are the first choice** for companies' trading activities for EUAs as well as Kyoto credits in general, **intermediaries (e.g. carbon funds) seem to offer comparative advantages when it comes to providing future emission reductions from project-based mechanisms** under the Kyoto Protocol (CDM and JI projects) - especially so for smaller companies.
- Against the background of being short in the first as well as expectedly also in the second period, the **energy sector turns out to be the most active in spot and forward markets for EUA and Certified Emission Reductions (CERs)** from emission reduction projects in developing and transition countries. This does not only apply to secondary markets but also to primary CERs purchased directly from emission reduction projects.

Market development still hampered by inherent risks and uncertain economic outlook.

- The strong presence of German companies in CO₂ markets indicates that firms are adapting to the new regulatory framework under the EU ETS. However, in market segments where the legal framework is still missing (post 2012) or transaction costs and risks dominate, trading activities are still lagging. While the majority of firms are aware of the arbitrage possibilities between EUAs and project-based credits CER/ERU **almost one quarter of the firms explicitly renounce the possibility to swap due to inherent risks and high transaction costs**. Consequently arbitrage possibilities are used only if a compensating spread between 4 to 7 EUR/tCO₂ can be realised.
- Equally, trading activities are still concentrated on the spot and forward markets 2008-2012 while **17 % of German firms are or plan to be active on the post-2012 market**. Intermediaries are contacted predominantly for CER trading. Direct access to CERs via **primary spot and forward markets seems to be an option only for a small fraction of larger companies** (5 % and 14 % respectively).
- Although especially larger companies seem to integrate carbon allowances and credits into their asset and liquidity management, **price signals still seem to be too weak to**

have a significant impact on investment strategies. More than half of the companies (55 %) have already realised CO₂ reduction measures during the first trading period, but a vast majority agrees that CO₂ reduction is only a side effect of these measures (88 %). Only for 6 % of companies, emission reduction was the main reason for investing in abatement measures. With tighter caps, however, prices for emission certificates and their impact on investment decisions of installations under the EU ETS are expected to increase.

Market signals will strengthen – prices expected to increase moderately in the short term but show significant upward trend over the mid- and long term horizon.

- Most German firms and international experts expect that the (inflation adjusted) **EUA prices will not be higher than 18 EUR/tCO₂ in December 2009 and 30 EUR/tCO₂ in the period from 2013-2020.** Prices for CERs purchased at the exchange or over-the-counter (sCERs) are likely to be slightly lower: 16 EUR/tCO₂ in December 2009 and 26 EUR/tCO₂ for 2013-2020, respectively. Different risks and the limit for using Kyoto certificates for compliance determine the current spread between EUAs and sCERs.
- The highest potential for emission certificates generated with CDM projects is expected in China and India, but Africa and the rest of Asia and Pacific will also play a role. Among JI regions, Russia and Ukraine are expected to remain predominant in the future. When assessing the potential, **almost 50 % of the companies consider the type of a CDM project to be relevant**, with “Renewable energy sources”, “Supply-side energy efficiency” and “Demand-side energy efficiency” being among the top three CDM/JI project types. In the future, “Afforestation / Reforestation” is likely to play a more important role.
- Prices for gas, crude oil, coal and electricity are expected to stagnate or to decrease at least until July 2009. Between 56 and 85 % of the respondents forecast increasing prices for coal, oil, gas and electricity in the next five years.

Das Wichtigste in Kürze.

Das Emissionshandelssystem der EU (EU ETS) ist das erste großangelegte, länderübergreifende Handelsprogramm für Treibhausgase und ein zentrales Instrument der europäischen Klimapolitik. Der EU ETS Markt ist noch jung, zeigt aber ein dynamisches Wachstum. Innerhalb von zwei Jahren verfünffachte sich das tägliche Handelsvolumen an der ECX (2007: 4 Mio. tCO₂, März 2009: 20 Mio. tCO₂). Von den insgesamt über 11.000 emissionspflichtigen Anlagen innerhalb des EU ETS entfielen 2008 1.660 auf Deutschland. Diese Anlagen, die zu einem Drittel der energieintensiven Industrie und zwei Drittel der Energiewirtschaft zugeordnet werden, sind für knapp 50 % der Treibhausgase in Deutschland verantwortlich. Mit einem Gesamtbudget von 452 Mio. tCO₂ pro Jahr wurde die Zuteilungsmenge in der zweiten Handelsperiode im Vergleich zu den Jahren 2005-2007 (499 Mio. tCO₂) gekürzt. Mit dieser Verknappung der zugeteilten Emissionszertifikate ist eine steigende Bedeutung des Kohlenstoffmarktes für die beteiligten Unternehmen zu erwarten. Die vorhandene Datenbasis bezüglich der Entwicklung und den Erwartungen von Angebot, Nachfrage sowie von Preisen für Emissionszertifikate und -gutschriften ist allerdings noch sehr lückenhaft. Dieses Informationsdefizit soll durch die Befragung deutscher emissionshandelspflichtiger Unternehmen und internationaler CO₂-Handelsexperten im **KfW/ZEW CO₂ Barometer**, das in Kooperation zwischen der KfW Bankengruppe und dem Zentrum für Europäische Wirtschaftsforschung (ZEW) entwickelt wurde, abgebaut werden.

Das **KfW/ZEW CO₂ Barometer 2009** zeigt, dass die Mehrheit emissionshandelspflichtiger Unternehmen in Deutschland aktiv am europäischen CO₂-Markt teilnimmt. Auf einzelnen Marktsegmenten ist bisher jedoch aufgrund von Unsicherheiten und hohen Transaktionskosten nur eine geringe Handelsaktivität festzustellen. Dies betrifft zum einen den Handel für die Periode nach 2012 und zum anderen die Nutzung von Emissionsminderungsgutschriften aus CDM und JI Projekten (CERs/ERUs). Um längerfristige Planungssicherheit zu erhalten, ist die Verlängerung der Regulierungszeiträume für die überwiegende Mehrheit der Marktteilnehmer von höchster Priorität. Eine frühzeitige Festlegung der rechtlichen Grundlagen für den Emissionshandel nach 2012 ist daher von kritischer Bedeutung für die weitere Marktentwicklung. Im Bereich der Kyoto-Mechanismen könnte die Marktaktivität von einer Reduktion der Transaktionskosten und Risiken der Nutzung von CERs und ERUs profitieren; z.B. durch eine stärkere Standardisierung der Projektentwicklungsprozesse. Trotz Verknappung der Emissionszertifikate in der zweiten Handelsperiode weisen die Ergebnisse des KfW/ZEW CO₂ Barometer 2009 darauf hin, dass die monetären Anreize für CO₂-Minderungsmaßnahmen noch keine deutlichen Auswirkungen auf die Investitionsstrategien

der Unternehmen haben. Insgesamt lassen die Ergebnisse den Schluss zu, dass das EU ETS in Deutschland an Fahrt aufnimmt, wenngleich es noch nicht in vollem Schwung ist.

Die **wichtigsten Ergebnisse** im Überblick:

Der aktuelle wirtschaftliche Abschwung erschwert die Einschätzung der anfallenden Emissionen, führt aber gleichzeitig zu verstärkten Handelsaktivitäten deutscher Unternehmen.

- Im Unterschied zur ersten Handelsperiode waren deutsche Anlagen, die dem EU Emissionshandel unterliegen, im Jahr 2008 insgesamt short an Emissionszertifikaten. Trotzdem erwartet nur weniger als ein Drittel aller Unternehmen, dass ihre Emissionszertifikate für die zweite Handelsperiode 2008-2012 nicht genügen, um die tatsächlichen Emissionen zu decken. Zwei Drittel dieser Unternehmen wiesen im Jahr 2008 tatsächlich einen Überschuss auf. Dies deutet darauf hin, dass der **unerwartet starke wirtschaftliche Abschwung die Schätzung der tatsächlichen Emissionen erschwert und zeigt antizyklische Effekte des EU ETS auf**.
- Obwohl drei Viertel aller Unternehmen aktiv am CO₂-Markt teilnehmen, **handelt nur ein kleiner Anteil (13 %) auf regelmäßiger Basis** – darunter überwiegend größere Unternehmen.
- Unternehmen, die im vergangenen Jahr long waren und damit einen Überschuss an Zertifikaten auswiesen, zeigten eine höhere Handelsneigung als Unternehmen, die short waren und damit weniger EU Emissionszertifikate (EUAs) zugeteilt bekommen hatten als tatsächlich benötigt. Mit dem Verkauf überschüssiger Zertifikate zur Erhöhung der Geldmittel und damit Sicherstellung der Zahlungsfähigkeit werden **EUAs von den Unternehmen inzwischen offensichtlich aktiv als Mittel des Liquiditätsmanagements eingesetzt**.
- Während die Unternehmen EUAs und Kyoto Zertifikate allgemein vor allem auf dem Sekundärmarkt handeln, werden Intermediäre (z.B. spezialisierte Fonds) vor allem für den Handel zukünftiger Emissionsminderungen aus CDM und JI Projekten (CERs, ERUs) eingesetzt – dies gilt insbesondere für kleinere Unternehmen.
- Vor dem Hintergrund ihrer Unterallokation in der ersten und einer (aufgrund der gekürzten Zuteilung) zu erwartenden Unterallokation in der zweiten Handelsperiode sind insbesondere die **Unternehmen aus dem Energiesektor am Spot- und Terminmarkt von EUAs und CERs aktiv**. Dies gilt nicht nur für den Sekundär-, sondern auch für den Primärmarkt von CERs.

Marktentwicklung noch durch inhärente Risiken und unsichere Konjunkturaussichten beeinträchtigt.

- Die starke Präsenz deutscher Unternehmen auf dem CO₂-Markt zeigt, dass die Unternehmen die durch Einführung des EU ETS veränderten Rahmenbedingungen insgesamt angenommen haben. Diese Beteiligung gilt jedoch nicht für alle Marktsegmente gleichermaßen. In den Teilmärkten mit hoher Unsicherheit, weil der gesetzliche Rahmen noch fehlt (post-2012) bzw. Transaktionskosten und Risiken dominieren, lässt sich ein deutlich geringeres Aktivitätsniveau feststellen: So sind die Arbitragemöglichkeiten zwischen EUAs und CERs/ERUs der Mehrheit der Unternehmen zwar bekannt, **fast ein**

Viertel verzichtet jedoch aufgrund der damit verbundenen Risiken und hohen Transaktionskosten auf mögliche Swaperträge. Erst ab einer Preisdifferenz von 4 bis 7 EUR/tCO₂ werden diese Arbitragemöglichkeiten für deutsche Unternehmen attraktiv. Gleichmaßen konzentrieren sich die Handelsaktivitäten der Unternehmen angesichts der Unsicherheiten bezüglich eines zukünftigen Kyoto-Folgeabkommen bisher auf die Spot- und Terminmärkte für 2008-2012. **Weniger als 17 % der deutschen Unternehmen handeln oder planen eine aktive Teilnahme an den post-2012 Märkten.** Intermediäre werden überwiegend für den Handel mit CERs kontaktiert. Der **direkte Zugang zu Emissionsminderungsprojekten und den hieraus generierten Zertifikaten wird hingegen nur von einer kleinen Anzahl größerer Unternehmen genutzt** (5 % beziehungsweise 14 %).

- Auch wenn vor allem größere Unternehmen CO₂-Zertifikate bereits in ihr Aktiva- und Liquiditätsmanagement einbeziehen, scheinen die vorhandenen **Preissignale noch keine deutlichen Auswirkungen auf die Investitionsstrategien zu haben.** Obwohl mehr als die Hälfte aller Unternehmen (55 %) bereits Vermeidungsmaßnahmen realisiert hat, war bei der überwiegenden Mehrheit (88 %) davon die CO₂-Reduktion nur ein Nebeneffekt. Lediglich bei 6 % stand die Emissionsminderung im Vordergrund der Investition. Aufgrund der sinkenden Emissionsobergrenzen ist jedoch in Zukunft von höheren Zertifikatpreisen und damit stärkerem Einfluss auf Investitionsentscheidungen auszugehen.

Marktsignale werden stärker – kurzfristig werden lediglich moderate Preisanstiege erwartet, in der mittleren und langen Frist allerdings ein deutlicher Aufwärtstrend.

- Die Mehrheit der deutschen Unternehmen und internationalen Experten erwarten, dass der inflationsbereinigte **EUA-Preis nicht höher als 18 EUR/tCO₂ im Dezember 2009 und 30 EUR/tCO₂ in der Periode von 2013-2020** steigen wird. Der Preis von an der Börse bzw. OTC gehandelten CERs (sCERs) wird leicht niedriger eingeschätzt: 16 EUR/tCO₂ im Dezember 2009 und 26 EUR/tCO₂ für die Jahre 21013-2020. Die Preisdifferenz zwischen EUAs und sCERS lässt sich vor allem durch unterschiedliche Risiken und Obergrenzen für die Nutzung von Zertifikaten aus projektbasierten Mechanismen erklären.
- Das **größte Potenzial für CDM Projekte liegt nach Einschätzung der Marktteilnehmer in China und Indien**, aber auch Afrika und die restlichen Staaten aus Asien und der Pazifik Region spielen eine Rolle. Unter den JI Regionen wird erwartet, dass Russland und die Ukraine ihre Dominanz auch in Zukunft beibehalten werden. Für fast 50 % der Unternehmen ist der CDM/JI Projekttyp relevant, die **Liste wird angeführt durch die Projekttypen „Erneuerbare Energien“, „Angebotsseitige Energieeffizienz“ und „Nachfrageseitige Energieeffizienz“.** Es wird erwartet, dass Projekte aus dem Bereich „Auf-/Wiederaufforstung“ in Zukunft eine wichtigere Rolle spielen werden.
- Preise für Rohöl, Gas, Kohle und Strom werden den Erwartungen zufolge bis Ende Juli 2009 stagnieren oder sinken. Zwischen 56 und 85 % der Befragten rechnen in den nächsten fünf Jahren aber mit einem Anstieg der Preise für Rohöl, Gas, Kohle und Strom.

1 Introduction.

1.1 Motivation of the survey.

The EU Emissions Trading Scheme (EU ETS) is the first large-scale multi-national greenhouse gas (GHG) trading program and a central instrument of European climate policy. It has been referred to as the “Grand New Policy Experiment” for market-based emission mitigation (Kruger and Pizer, 2004). The EU ETS market is still young, but growing rapidly. Despite the high relevance of the emission market for both market participants and stakeholders, the data basis concerning developments and expectations in supply and demand as well as prices of emission allowances and emission reduction certificates is still lagging behind. Mitigating this information deficit is essential in order to draw lessons on actual experiences of emissions trading and create a solid decision basis for participants in the emissions trading market. The **KfW/ZEW CO₂ Barometer** – developed as part of a cooperative project of KfW Bankengruppe and the Centre of European Economic Research (ZEW) – intends to close this gap.

The survey scrutinises the situation of German facilities within the EU ETS using enterprise data and completes these insights using the expectations of international carbon market experts. Enterprise preferences and behaviour in carbon markets are analysed considering firm size, sectoral affiliation and allocation status, i.e. over- or under-allocation of emissions allowances. For that purpose, emissions data at the installation level from the Community Independent Transaction Log (CITL) were merged with survey data. A central aim of the study is to closely monitor the EU ETS and to provide detailed information about the related markets to policymakers, business and the research community in a timely manner. The results of the **KfW/ZEW CO₂ Barometer** hence complement the growing number of studies on the European and international carbon markets (see for example World Bank, 2008; Point Carbon, 2009; Caisse des Dépôts, 2009; McKinsey, 2009). A long-term goal is to generate panel data and to analyse the evolution of preferences and expectations related to carbon markets by means of advanced statistical and econometric techniques.

1.2 Outline.

This study is structured as follows: After a brief description of the structure of our survey, a short review of recent regulatory and market developments is given in section 2. Current trading behaviour and motivation of German companies analysed in section 3 help to better understand the incentives and the impact of the current trading scheme and its emission caps on enterprise carbon strategy. By linking the EU trading scheme with the Kyoto mechanisms, regulated companies were offered additional flexibility to achieve compliance in the

most cost-efficient manner. The actual importance of CDM and JI for German companies as well as future potential with respect to specific host countries and sectors is further investigated in section 4. Section 5 summarises expectations of market participants concerning short- as well as long-term price movements in carbon markets. The analysis is concluded by an assessment of market participants concerning the effectiveness of the trading scheme and the necessity for further improvement and development in section 6.

1.3 Structure of the survey and the participants.

The survey has been conceptualised in the following way: German companies covered by the EU ETS are included in the survey on an *annual* basis. The **KfW/ZEW CO₂ Barometer** addresses a broad spectrum of topics at the level of individual firms, e.g.:

- Expectations regarding prices and volumes in the relevant carbon and energy markets.
- Strategies for dealing with under-allocation of emissions allowances, especially mitigation activities vs. purchase of certificates (EUAs, CERs and ERUs).
- Requirements to improve access to relevant markets, with a focus on financial, legal and technical aspects.

Additionally, experts and researchers in the field of international carbon markets are surveyed on a *quarterly* basis. The focus is on issues related to price and volume developments in the carbon and energy markets. The survey for experts and researchers complements the annual survey of German companies and will be released quarterly. While the **KfW/ZEW CO₂ Barometer** will serve as an extensive resource of information, the quarterly brief update will enable market participants to keep in touch with the latest development in the market. Thus, the **KfW/ZEW CO₂ Indicator** will continuously provide information on expectations for CO₂ prices in the short run and in the long run.

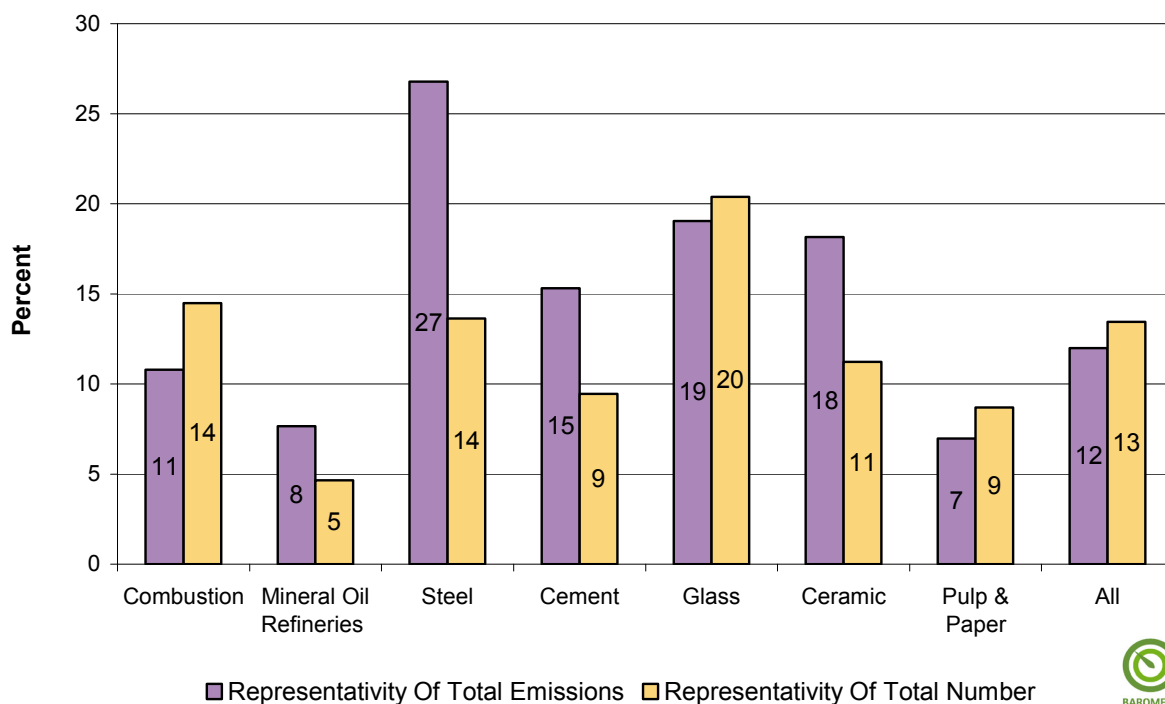
For the **KfW/ZEW CO₂ Barometer 2009**, over 1,100 international experts and all German companies subject to the EU ETS (total 855) were invited to participate in the survey.¹ 179 experts (16 %) and 120 companies (14 %) responded to the questionnaire (total of 299 participants, response rate 15 %).

1.3.1 Companies.

The companies covered by our survey run almost 13 % of all German installations participating in the second trading period of the EU ETS (here: the year 2008). All together they are responsible for roughly 12 % of emissions of all German installations included in the EU ETS.

¹ To reduce complexity for respondents, the survey addressed only the largest installations for those 142 companies which run more than one installation.

Taking sectoral affiliation into consideration, the coverage of emission levels and total number of installations by respondents shows a considerable heterogeneity across sectors: the companies participating in the survey represent between 5 % and 20 % of the total number of firms in the respective sectors and are responsible for up to 27 % of total sectoral emissions (Figure 1). According to main product or service, 37 % of the participating companies belong to the energy sector, while 15 % and 12 % of the companies classified themselves as non-metallic (i.e. cement, glass and ceramic) and pulp and paper sector respectively.²



Source: KfW/ZEW CO₂ Barometer, CITL (3 April 2009)

Representativity was plotted – using the CITL classification – relative to total sectoral emissions level and total number of installations. No active installations of the sector metal ore have been reported in the CITL for Germany. Sector coke ovens contains three installations only which did not participate in the survey.

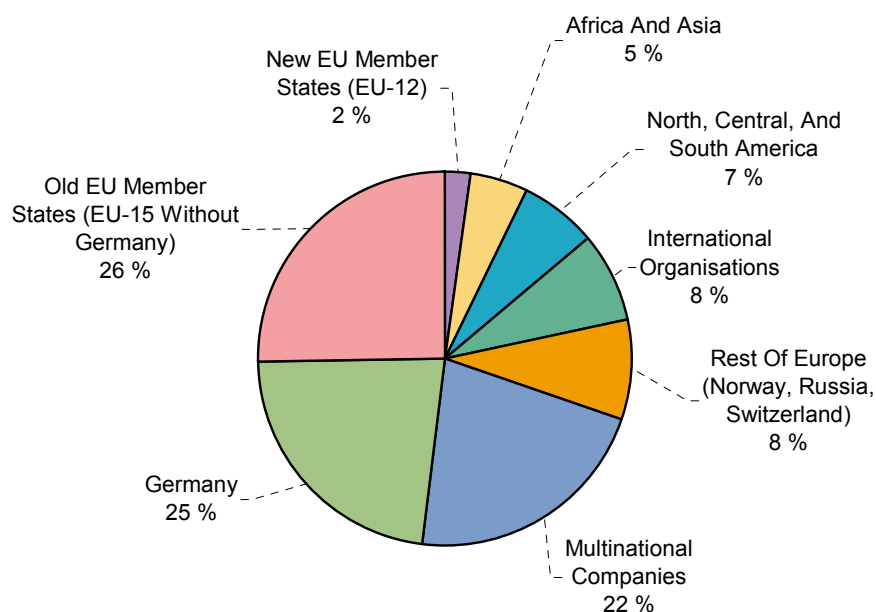
Figure 1: Representativity of respondents by sector

47 % of the enterprise respondents are small- and medium-sized companies with less than 250 employees, 47 % are large firms with 250 or more employees. The remaining 6 % did not indicate their firm-size.

² As two thirds of German installations subject to the EU ETS belong to the energy sector, our survey might give a higher weight to the non-energy sectors. However, activities of installations subject to the EU ETS do not necessarily correspond to sectors of industry. Participating companies were thus asked to indicate their major product or services in order to classify the sample according to different sectors.

1.3.2 Experts.

Figure 2 shows the origin of experts participating in the survey. Most of the respondents are located in the European Union: 51 % are from Old Member States (EU-15), with Germany hosting most of the experts in this category. Only 2 % reside in the New Member States (EU-12). Outside the EU, 7 % of the experts are from North, Central and South America and 5 % are from Africa and Asia. Finally, a relatively large fraction of the respondents belongs to multinational companies and international organisations (30 %).



Source: KfW/ZEW CO₂ Barometer

Figure 2: Experts by origin

Regarding the experts' fields of activity, 77 % are working in the private sector: in consulting firms (34 %), the financial sector (25 %), law firms (4 %) and other companies (14 %). The remaining 23 % belong to ministries and national authorities (8 %), international organisations (8 %) and research institutions (7 %).

This considerable heterogeneity of the experts – with respect to regional coverage and field of activity – ensures the inclusion of potentially diverging views on current and future developments in the carbon markets.

2 The EU Emissions Trading Scheme (EU ETS).

- The first EU ETS trading period was characterised by a general over-allocation at the EU as well as the German level.
- National caps have been tightened for the second trading period. In spite of the production slump due to the economic crisis in the fourth quarter of 2008, German ETS installations were collectively short in 2008.
- Certified Emission Reductions (CER) and Emission Reduction Units (ERU) may play a decisive role in closing the expected short position in EUA in the second phase of the EU ETS in the German Market.
- In the last months, the EUA market was characterised by falling prices and increasing trading volumes.

2.1 The European level.

The EU Emissions Trading Scheme (EU ETS) was launched in January 2005 by the European Union in order to reach emission reduction targets in a cost-efficient manner. The EU ETS consists of several phases: a first (trial) phase from 2005 until 2007, a second one from 2008 until 2012, coinciding with the first Kyoto commitment period, and a third phase from 2013 to 2020. In the first trading period more than 10,000 installations of energy-intensive sectors were covered. These installations were collectively responsible for nearly half of the EU's emissions of CO₂ and 40 % of its total greenhouse gas emissions (EU, 2008a). Table 1 shows the verified emissions for the EU ETS from 2005 to 2008. While the first trading period was characterised by an over-allocation, a tighter cap was set in the second trading period (minus 10 %) in order to generate price signals in the market.

Table 1: Verified emissions (VET) and annual caps in the EU ETS

Million tCO ₂	2005	2006	2007	2008
Verified emissions (VET)	2,012*	2,033*	2,165**	2,099***
Average annual cap	2,299	2,299	2,299	2,083
Difference (%)	-13 %	-12 %	-6 %	1 %

Source: EU (2007), EU (2008a), EU (2008b), EU (2009)

* VET for Bulgaria, Romania, and Malta are not included.

** Including incomplete verified emissions for Bulgaria.

*** VET for Norway and Liechtenstein are not included.

The annual cap and the verified emissions for 2008 indicate that the EU ETS has succeeded in creating under-allocation in the second trading period. While the European cap was set to 2,083 million tCO₂, EU-27 companies under the EU ETS emitted 2,099 million tCO₂ in 2008. In January 2008, the European Commission presented a comprehensive legislative package

implementing the ambitious goals formulated by the European Council by 2020 and strengthening the EU ETS in the third trading period (Table 2).

Table 2: Regulation of the different EU ETS phases

	First Period 2005–2007	Second Period 2008–2012	Third Period 2013–2020
	National caps: National Allocation Plan (NAP)	National caps: National Allocation Plan (NAP)	EU-wide cap
Average cap EU ETS p.a.	2,299 million tCO ₂	2,083 million tCO ₂	1,846 million tCO ₂
Inclusion of greenhouse gases (GHG)	CO ₂	CO ₂ , unilateral inclusion of N ₂ O in the Netherlands	CO ₂ , N ₂ O and PFC
Sectoral coverage	Major CO ₂ producing sites such as power, heat and steam generation, oil refineries, coke ovens, iron and steel plants, mineral industries, pulp and paper plants.	Inclusion of the aviation sector from 2012 onwards.	The chemical industry and producers of non-ferrous metals (i.e. aluminium) are added to the trading scheme. Inclusion of maritime emissions is expected from 2013 onwards.
Auctioning of allowances	Member States shall allocate at least 95 % of the allowances free of charge. 5 % of the allowances were auctioned in Denmark, Ireland, Hungary, and Lithuania.	Member States must allocate at least 90 % of the allowances free of charge. Auctions planned in the UK, Austria, France, Netherlands, and Hungary. In Germany, the auctions will start in 2010. During the years 2008 – 2009, a fraction of allowances were sold by Germany at the CO ₂ markets.	<u>Electricity sector</u> : 100 % auctioning from 2013 onwards.* <u>Sectors, exposed to the risk of carbon leakage</u> : 100 % allowances for free up to an efficiency benchmark. <u>Sectors, not exposed to the risk of carbon leakage</u> : 80 % of allowances for free up to an efficiency benchmark in 2013; linear decrease to 30 % free allocation in 2020; objective: 100 % auctioning in 2027.
CERs/ERUs limit	National decision (NAP)	National decision (NAP): around 1,400 million tCO ₂ in 2008–2012.	EU defines ERs/ERUs limits in % for different categories of sectors under the EU ETS. Supplimentarity principle applies.**
Avoidance of price volatility	No specific regulation	No specific regulation	Under certain conditions: auctions can be brought forward or up to 25 % of the new entrant reserve can be auctioned.

Source: EU (2003, 2004, 2007, 2008, 2008a,b), European Commission (2008a, 2008b), European Council (2008)

* Member States may temporarily deviate from this rule under certain conditions relating to their interconnectivity or their share of fossil fuels in electricity production, and their GDP per capita (EU 2008a).

** The supplimentarity principle requires that the overall use of credits is limited to 50 % of the EU-wide reduction effort over the period 2008-2020.

The main changes of the legislative package were the extended scope and the reliance on auctioning and harmonised allocation, making National Allocation Plans – the allocation

mechanism in the previous periods of the EU ETS – obsolete. The limit for Certified Emission Reductions (CERs) and Emission Reduction Units (ERUs) originally set for the second trading phase 2008–2012 was stretched into the third trading period. In total, the amount of credits imported by the installations must not exceed 50 % of the reduction effort between 2008 and 2020 (supplementarity principle).³ Starting from 2013, installations will be confronted with an annual decrease of the emission cap by 1.74 % leading to an overall reduction of 21 % in the EU ETS by 2020. This implies an upper limit of 1,720 million tCO₂ in 2020, while the average cap in the third phase (2013–2020) will be around 1,846 million tCO₂.⁴ The discounting factor of 1.74 % is going to be applied beyond the end of the trading period in 2020 (EU, 2008a).

2.2 The German market.

In January 2008, 1,665 German installations were covered by the EU ETS.⁵ 1,625 of these installations received free EU Allowances. About two thirds of the freely allocated permits were given to the energy sector (1,072 installations); the remaining third went to industry installations (553 installations) (DEHSt, 2008, 2009, 2009b). Table 3 summarises German regulations related to the first and second trading period of the EU ETS according to the National Allocation Plans I and II (NAP I and II).

Table 3: Regulations for Germany in the EU ETS according to NAPI and NAPII

	First Period 2005–2007	Second Period 2008–2012
Amount of EU Allowances (p.a.)	499 million EUAs	452 million EUAs
Allocation method	Grandfathering	Benchmarking combined with sale of 40 million EUAs p.a. (9 % of the cap) on ECX and EEX. From 2010 on, auctioning will apply.
CERs/ERUs limit	No restriction	22 % of allocated allowances on the installation level.

Source: European Commission (2005), DEHSt (2008), EU (2007)

Important changes include reduction of allowances, combination of grandfathering with the sale of 40 million EUAs on exchanges, and restrictions on usage of CERs and ERUs. The specific conditions for the German installations in the third trading period have not been decided upon as yet. As in the EU in total, the first trading period in Germany was characterised by over-allocation. In 2008, however, emissions of installations exceeded the national cap (Table 4). While the cap has been cut from 499 million tCO₂ during the first period to

³ For a discussion on the CERs/ERUs limit under the EU ETS see Strunz (2009).

⁴ Final figures for emission caps in the third phase will be published in September 2010 (EU, 2008a).

⁵ In the course of the trading year, this number changed to 1,660 (DEHSt, 2009b).

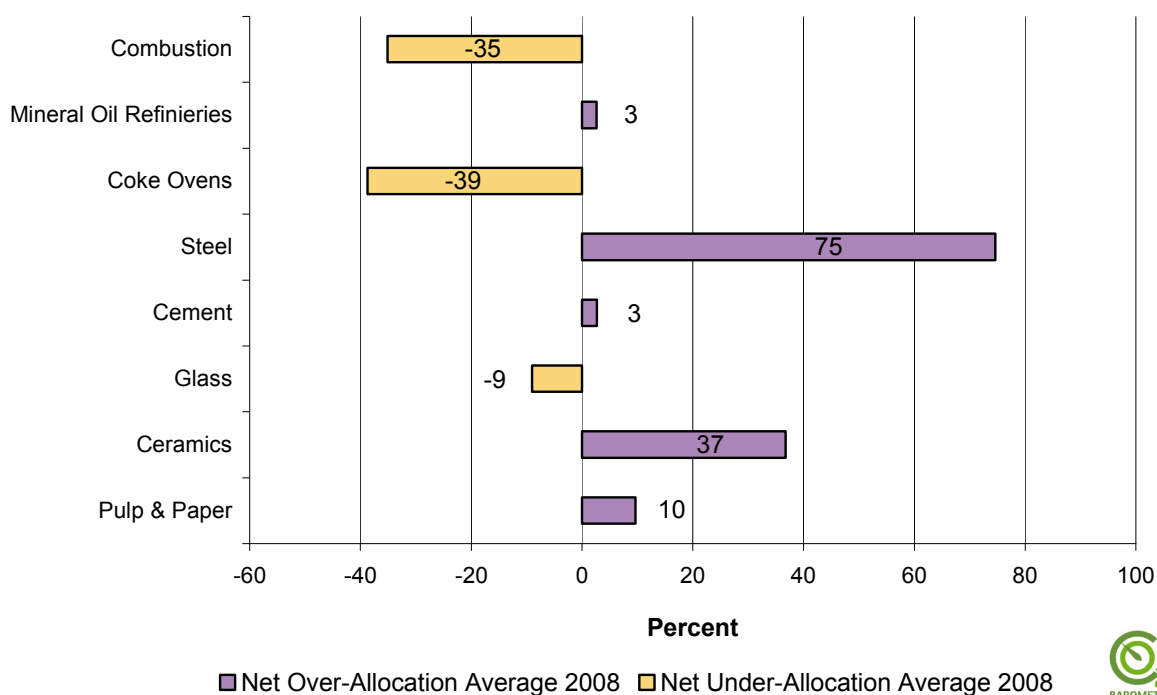
452 million tCO₂ in 2008,⁶ emissions merely decreased from 487 million tCO₂ in 2007 to 473 million tCO₂ in 2008 (minus 14 million tCO₂).

Table 4: Verified Emissions (VET) and cap for Germany in the EU ETS

Million tCO ₂	2005	2006	2007	2008
Verified emissions (VET)	474	477	487	473
Average annual cap	499	499	499	452
Difference (%)	-5 %	-4 %	-2 %	5 %

Source: EU (2008b), DEHst (2009b)

Data on emission allowances and verified emissions from the CITL have been used to assess whether German firms are over- / under-allocated. Firms are considered to be over-allocated (long) if the amount of allocated allowances exceeds verified emissions in a particular year. Vice versa, firms are considered to be under-allocated (short) if the amount of allocated allowances is smaller than the verified emissions of that firm's installation. Short-/long-positions have been calculated for the year 2008 using preliminary CITL data.



Source: own calculations, CITL (3 April 2009)

No installation of the type metal ore exists in Germany under the EU ETS.

Figure 3: Over-/Under-allocation in Germany in 2008

⁶ If taking into account that in the second trading period more installations in Germany were covered by the EU ETS, the reduction of verified emissions in 2008 is equivalent to abatements of more than 3% (Dow Jones, 2009).

Figure 3 shows how over- and under-allocation in 2008 was distributed across different sectors of activity in Germany. While combustion installations, coke ovens, and installations for the manufacture of glass were short in 2008, all other sectors turned out to be long. In absolute terms, most of the short or long positions range between 0.4 and 1.2 million tCO₂. The apparent over-allocation of the iron and steel industry (25 million tCO₂) can be attributed to a change in the specific allocation rules for this sector (DEHSt, 2008). Combustion installations reported a short position of nearly 130 million tCO₂, i.e. approximately 35 % of their emissions in 2008,⁷ while the ceramic sector enjoyed an overall long position of 37 %, which corresponds only to 0.5 million tCO₂ however.

Within certain limits, firms regulated under the EU ETS are able to cover a shortage of EUAs with CERs and ERUs. Especially for the energy sector, the current limit of 22 % per installation will probably not be sufficient to cover the expected shortage of allowances. The energy sector will thus be obliged to either reduce emissions or to buy additional EUAs. In contrast, it is expected that the industry sector will not exhaust its CERs/ERUs limit as the allocation of permits is more generous for this sector. This creates an incentive for companies in the industry sector to swap EUAs against CERs and ERUs by fully exploiting their CERs/ERUs limit and selling the resulting surplus of EUAs - giving rise to additional swap activities in the market.

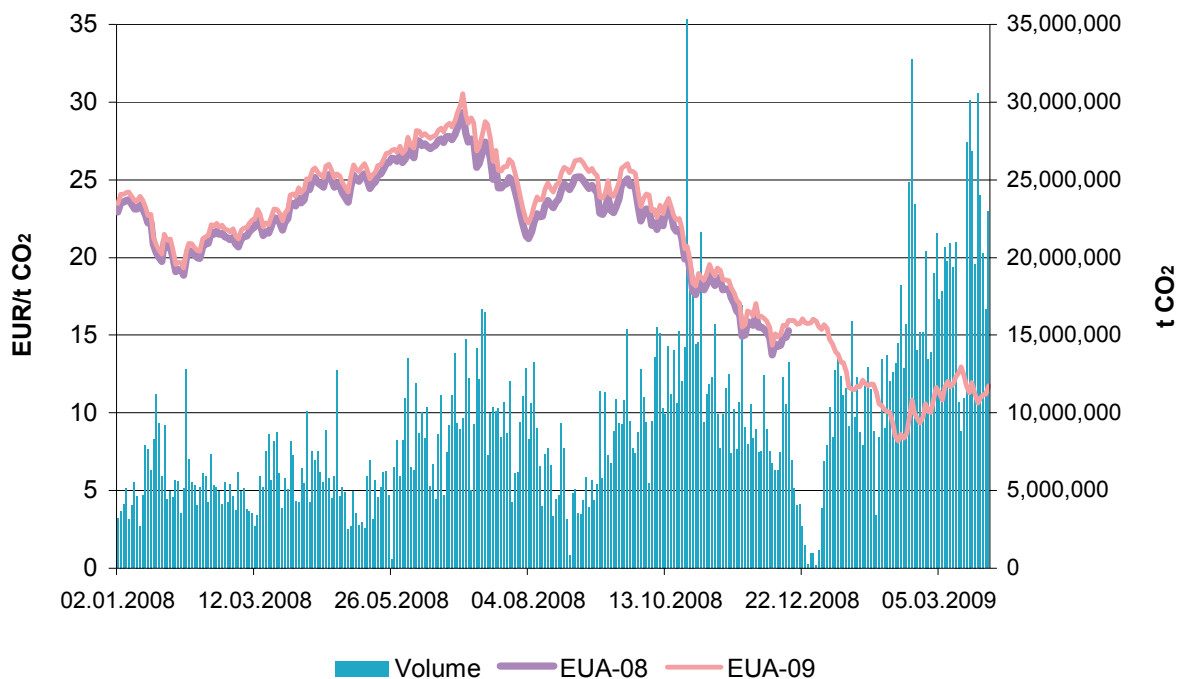
2.3 Falling Prices – Increasing volumes.

Figure 4 shows the development of prices and trading volumes in the EU ETS at the European Climate Exchange (ECX) in 2008 and 2009. The market opened on 2 January 2008 with an EUA-09 price of 23.46 EUR/tCO₂.⁸ In the first half of the year, companies were confronted with rising prices resulting in a peak of just over 30 EUR/tCO₂ in July. Since July, prices had been falling almost continuously until the end of the year. With 15.90 EUR/tCO₂ on 31 December 2008, the EUA-09 price fell by almost 50 % compared to July. The price decline continued until mid-February 2009 when the EUA-09 reached a low of 8.20 EUR/tCO₂. Since then, prices have recovered slowly and finished the first quarter of 2009 at 11.75 EUR/tCO₂. In comparison to 2007, which showed an average trading volume on the ECX of 3.88 million tCO₂ per day, the average trading volume doubled in 2008. The

⁷ This distribution of scarcity appears to be similar at the European level. Point Carbon (2009) shows that especially installations from public power and heat are short. Ellermann and Buchner (2007) determine a similar constellation for the period 2005–2007.

⁸ We refer to the EUA-09 as indicator as the most liquid contract in 2009. Figure 4 shows that the price of the EUA-08 contract has developed very similarly to the EUA-09 contract.

trading volume increased substantially in the first quarter of 2009, from 10 million tCO₂ per day in January 2009 to 20 million tCO₂ per day in March 2009.



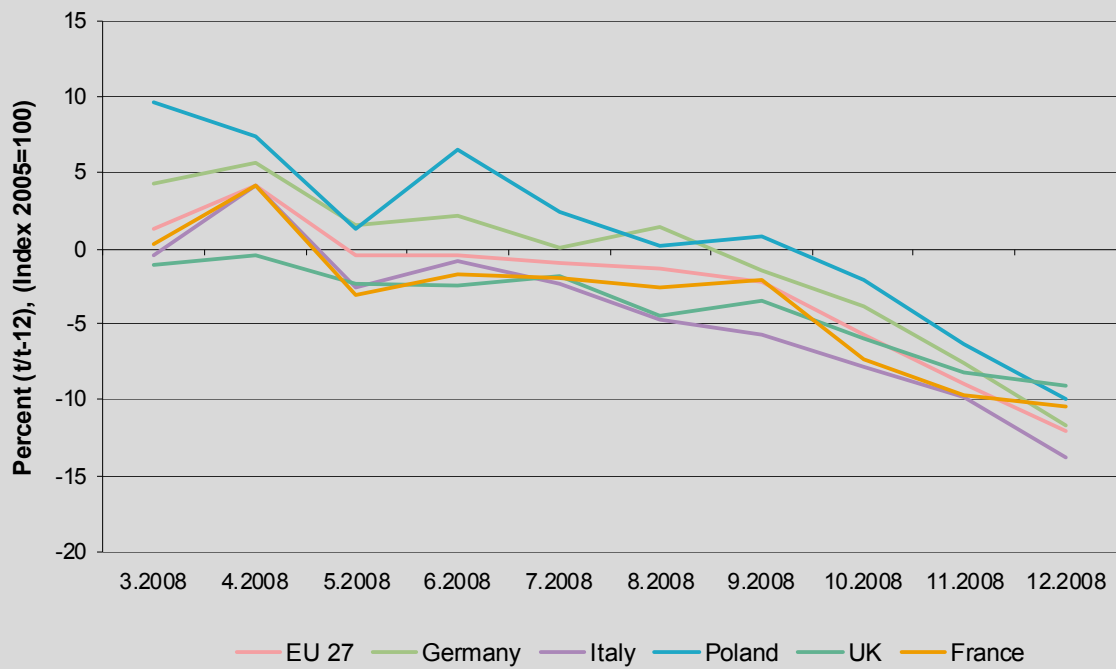
Source: European Climate Exchange (ECX)

Figure 4: EU ETS in 2008/09: Prices and Volumes

Like any other price, the EUA price is primarily determined by supply and demand: The supply of EUAs is fixed by regulation, in particular by the National Allocation Plans (NAPs), which set the maximum amount of allowances in each Member State during the first and the second trading period. The demand for EUAs is mainly determined by the economic development (production level) and carbon intensity of the production processes of installations covered by the EU ETS. Furthermore, price shocks in energy markets that are likely to surpass to carbon markets and specific weather components might have an impact on the EUA price. For more details on price determinants of EUAs see box (also Rickels et al., 2007).

Since mid-2008, the economic downturn has had a predominant impact on the price developments in the EUA market. Due to lower economic production levels, emissions have declined. Consequently, demand for EUAs has dropped. This effect was reinforced by the fact that many companies, faced with a liquidity shortage due to the economic slowdown, sold dispensable permits in the market, thus using them as an additional instrument of liquidity management.

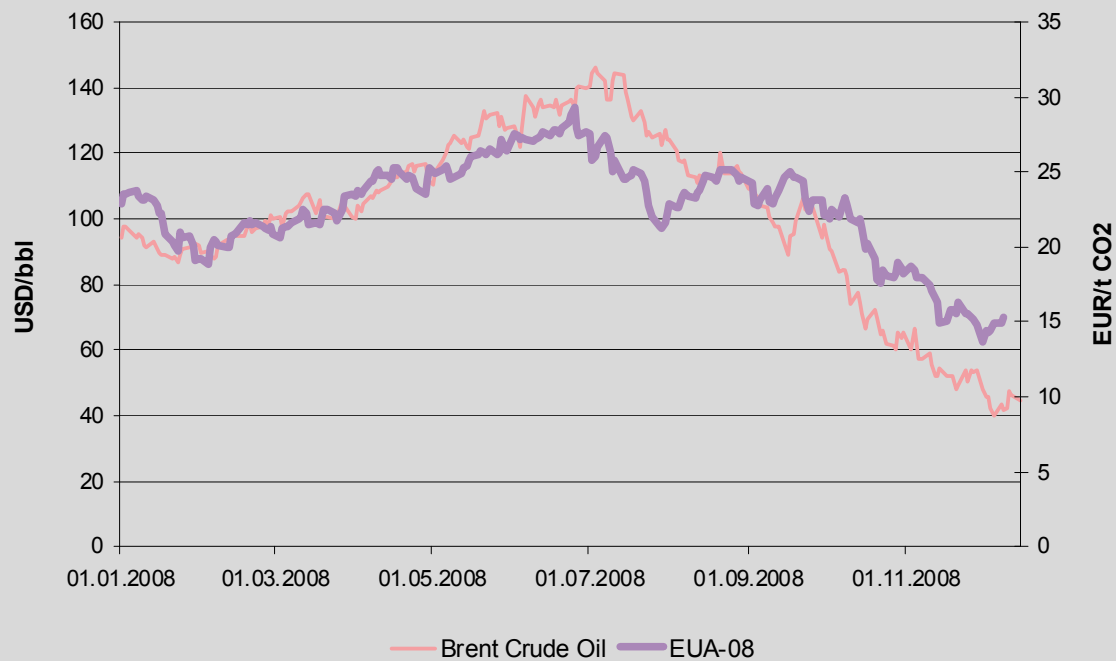
Box: EUA – price determinants.



Source: Eurostat

Figure box 1: Industrial production of countries with highest cap in NAP

Figure box 1 illustrates industrial production and its decline in European countries in 2008. The sharp drop of production in many installations under the EU ETS is resulting in decreasing emissions. Many companies sold surplus allowances on the market, which contributed to the continuous decrease in EUA prices.



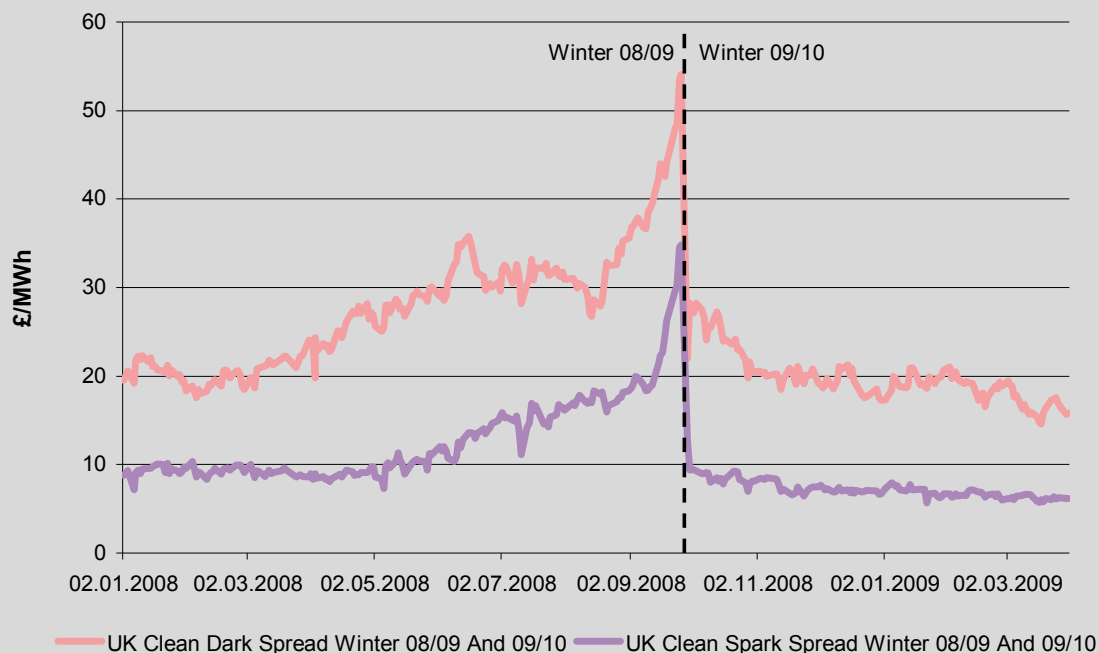
Source: Bloomberg, ECX

Figure box 2: Development of oil prices and EUA-08 in 2008

Figure box 2 depicts the price development for Brent Crude Oil and EUA-08. A higher consumption of oil due to a high production level can be expected to be related to an increased demand in the



CO₂ market. Also, a higher consumption of oil forces oil refineries – included in the EU ETS – to buy EUAs in order to cover their additional emissions thus adding to the demand in the carbon market.

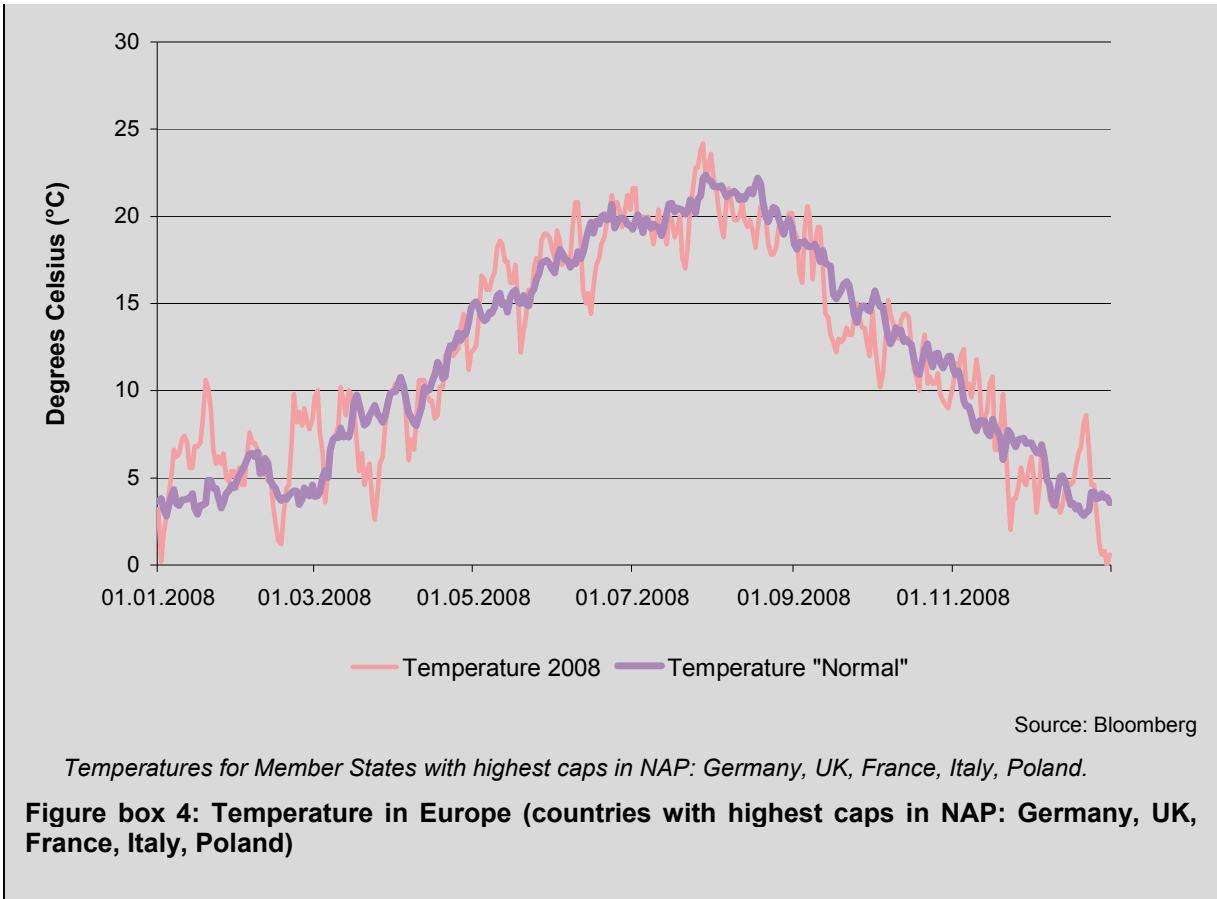


Source: Point Carbon

Figure box 3: Clean dark and spark spread, UK

Emissions of the energy sector are also related to changes in relative commodity prices. Changes in the relative prices of coal and gas, for example, may cause fuel switch processes. Power generation with coal causes higher CO₂ emissions and thus higher CO₂ costs than power generation based on natural gas. Nevertheless, if the coal price is sufficiently low, the use of coal for power generation may be more profitable than gas. The indicators used for determining the incentive for fuel switches are the so-called (clean) spark and dark spreads which show the relative costs of generating power from natural gas versus coal (Figure box 3 for the UK). These spreads are measured as the price of electricity minus the price of natural gas or coal, taking into account the fuel efficiency of natural gas or coal. Clean spark and dark spreads are calculated by adjusting for the costs of carbon credits (EUAs). A higher spread indicates a higher profitability of natural gas or coal. One should, however, take into account that the ability for short-term fuel switching is country-specific. While empirical evidence shows that a short-term or mid-term fuel switch is common practice in the UK, the existing energy infrastructure in Germany does not allow for such short-term optimising behaviour (Rickels et al. 2007).

In the short term, changing weather conditions may have an important influence on the scarcities in the carbon market. Figure box 4 shows the development of the average daily temperature in selected EU countries. Mild winters, for example, lower the necessity of heating and thus lead to relatively low energy demand and decreasing CO₂ emissions in the power generating sector. Different phases in 2008 exhibit lower or higher than “normal” temperatures (average over the years 2000-2005) with respectively more or less emissions. In total, however, temperatures in 2008 followed mostly the normal temperature curve of the years 2000-2005. Furthermore, intense rainfalls would facilitate the use of water power plants in the countries concerned and thus lower CO₂ emissions. Last, but not least, constant wind would allow wind turbines to produce more energy and to decrease ceteris paribus the carbon emissions of power generation.



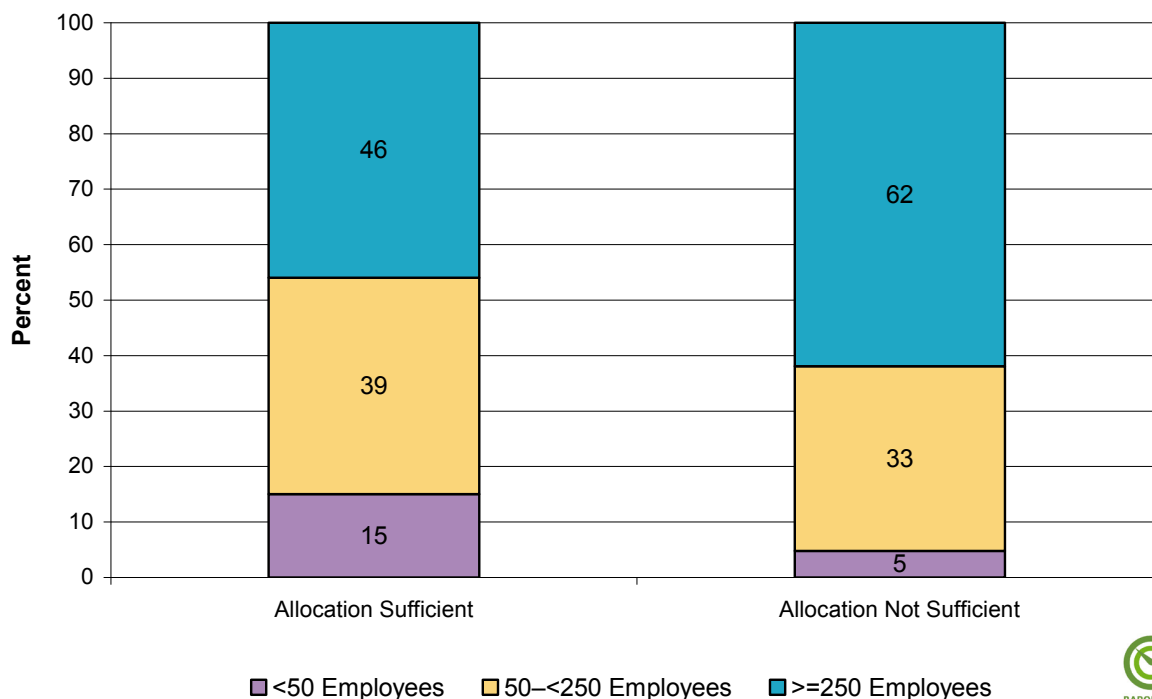
3 Trading activities of German Companies in the EU ETS.

- Despite stricter caps, less than one third of respondents expect to be short in the second trading period. Two thirds of these firms were actually long in 2008 – possibly reflecting the unexpected strong economic slowdown and demonstrating the countercyclical effects of the EU ETS.
- Almost three quarters of respondents participate or plan to participate in trading activities in the EU ETS. Most companies, seem to restrict trading to an annual frequency.
- Trading activity is predominantly taking place in the spot market and forward market 2008-2012. Less than 17 % of firms are or plan to be active on the post-2012 market.
- Most active in spot and forward markets for EUAs and CERs seem to be companies from the energy sector. This applies not only to secondary markets but also for Kyoto certificates purchased directly from emission reduction projects.
- Direct access to CERs via primary spot and forward markets seems to be an option only for a small fraction of larger companies (5 % and 14 % respectively).
- Absence in CO₂ markets is mainly explained by a sufficient endowment with EUAs.
- The majority of respondents are aware of the current and future potential of swaps between EUAs and secondary CERs (sCERs). However, almost one quarter of the firms explicitly renounce the possibility to swap due to inherent risks, high transaction costs and a lack of adequate credits to swap. Arbitrage possibilities are used only if a compensating spread between 4 to 7 EUR/tCO₂ can be realised.

3.1 Allocation and trading participation.

As the first trading period of the EU ETS was characterised by an over-allocation, the EU Commission set tighter caps in the National Allocation Plans for the second trading period. Nevertheless, more than two thirds of the responding companies (71 %⁹) expect that the total amount of EUAs received in the period 2008–2012 will cover their aggregate emissions. Less than a third of the respondents (29 %) assume that the allocation of permits in the second trading period will be below their expected emissions. Figure 5 shows that especially larger companies expect the allocation to be insufficient in the second trading period: While 62 % of the companies assuming to be short have 250 or more employees, only 5 % represent small companies (less than 50 employees).

⁹ If not indicated otherwise, all percentages in this report refer to the share of respondents with a conclusive answer, disregarding missing and “no opinion” answers.



Source: KfW/ZEW CO₂ Barometer

Figure 5: Expected over-/under-allocation by firm size

A closer look at the group of companies that expect the allocation to be sufficient in the period from 2008 to 2012 shows that most of the surveyed companies (88 %) were effectively long in 2008 according to the CITL.¹⁰ In contrast, 67 % of the companies that judge their allocations to be too low compared to their emissions turned out to be long in 2008. The difference between perceived and actual over- or under-allocation may be explained by the fact that companies were asked to assess their compliance situation for the entire period 2008–2012 which we compare to the short/long position in 2008 – merely a snapshot of the companies' position within the second trading period. Furthermore, with the unexpected economic downturn in 2008 companies may find it difficult to assess their current emission levels and thus individual compliance under the new cap for the second trading period.

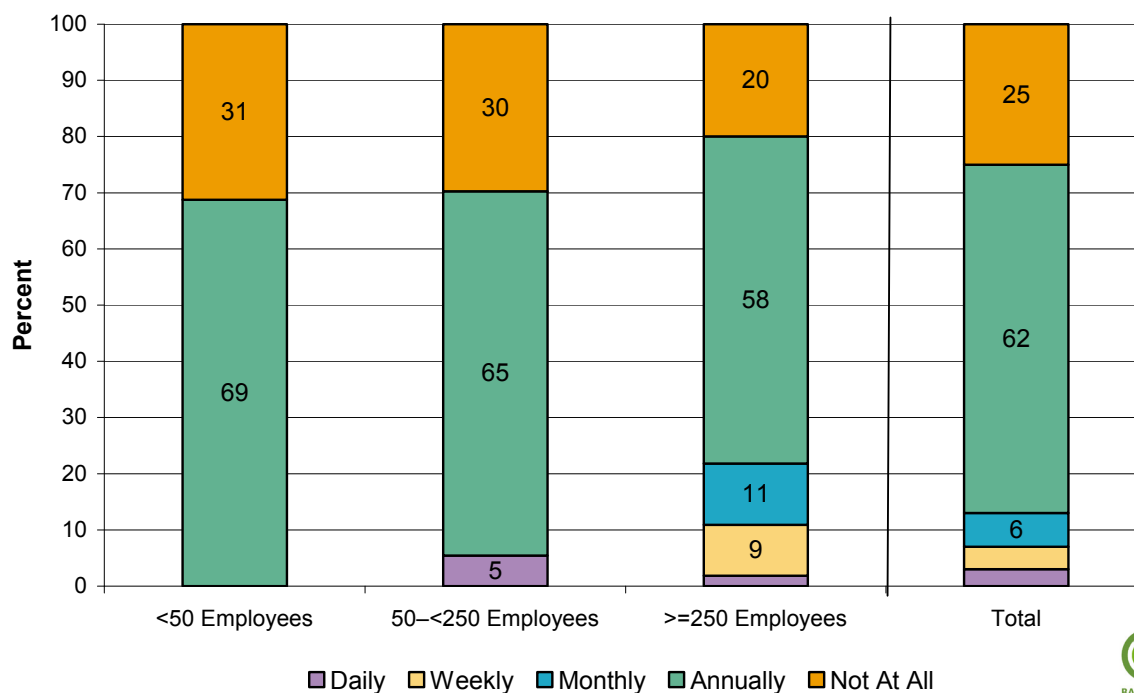
3.2 Trading activities.

Only a quarter of respondents state that they do not trade or plan to trade at all (Figure 6).¹¹ The lion's share of companies buys or sells permits in the carbon market on an annual basis (62 %). In contrast, the share of companies trading on a more regular basis is rather small. Around 13 % of the companies trade more often than once a year. Larger companies, in par-

¹⁰ CITL data as of 3 April 2009. Note that we aggregated installations to companies.

¹¹ Participants were asked about past, current and planned trading activities.

ticular, use the opportunity to trade in the CO₂ market regularly. Small companies with less than 50 employees trade mainly on an annual basis, if they are active at all.



Source: KfW/ZEW CO₂ Barometer

Figure 6: Frequency of trading activities

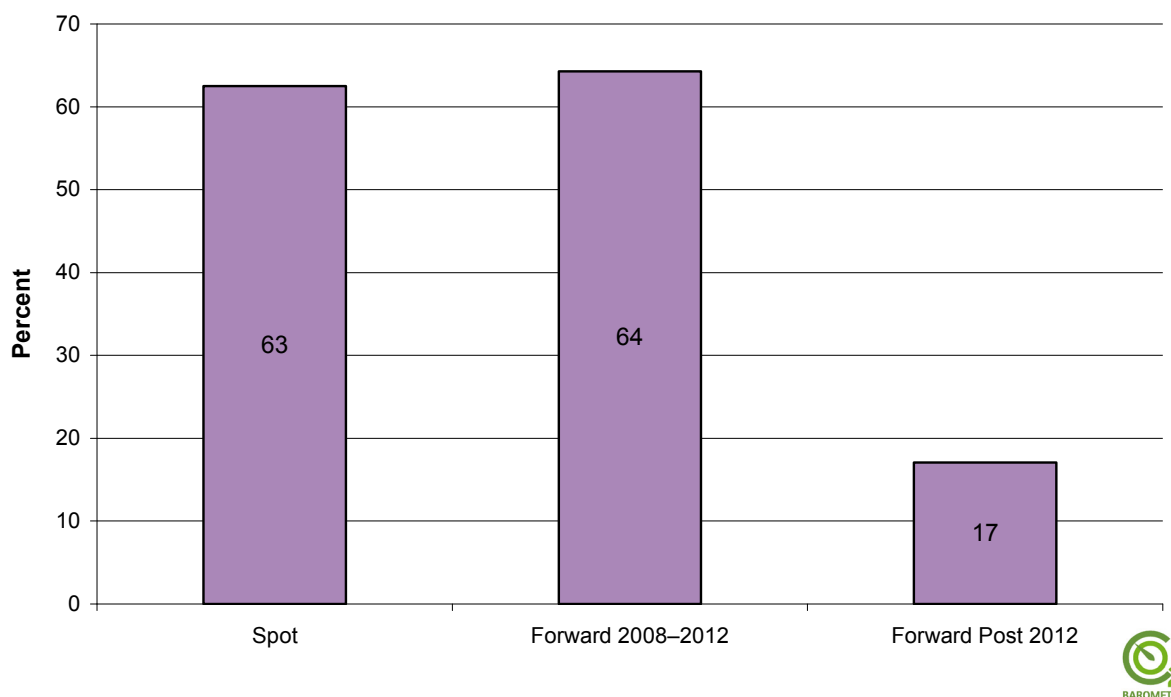
Missing trading activity has been explained mainly by allocation volumes: 74 % of the respondents indicated that allocation was sufficient and that consequently no trading was necessary. Unlike in the first trading period, in which small firms had been particularly slow in building up the necessary human capital to handle trading of CO₂ (Rickels et al. 2007), the lack of capacity or time played only a minor role in 2008, explaining the lack of trading activities in merely 1 out of 10 cases (11 %). This might be interpreted as a first indication, that companies have adapted to the new market situation by engaging more personnel responsible for CO₂ trading. 7 % of the respondents mentioned that the implementation of internal CO₂ reduction measures reduced the necessity of trading.

The survey data also reveal that a higher share of companies that are long in 2008 is trading than the share of companies that are short. A possible explanation of this fact relates to the economic slowdown in 2008. Companies that were long because of reduced economic activity have actively engaged in selling their surplus permits – thus using EUA as a countercyclical

cal instrument for liquidity management.¹² In contrast, companies that are short in 2008 need not engage in trading activities, as they may borrow EUAs from 2009 or invest in CO₂ abatement measures for compliance. If companies assume the EUA price to decrease in 2009, they might choose to borrow EUAs from 2009. However, falling prices are not expected by the German EU ETS firms and international carbon market experts (for more detail see Chapter 5).

3.3 Spot and forward, primary and secondary markets.

Currently, companies most frequently trade in the spot market and the forward market for emission permits in 2008-2012. Figure 7 shows that nearly 65 % of companies actively trading are engaged in both markets. As the share is similar for the spot as well as the forward market 2008-2012, hedging against future price increases seems to be a crucial issue for nearly all companies active in the market. As no legal framework exists for the post-2012 period, it does not come as a surprise to find relatively few activities within the post-2012 market. Nevertheless, 17 % of participants are trading or planning to trade in the post-2012 market. Mostly, these companies are from the energy sector.

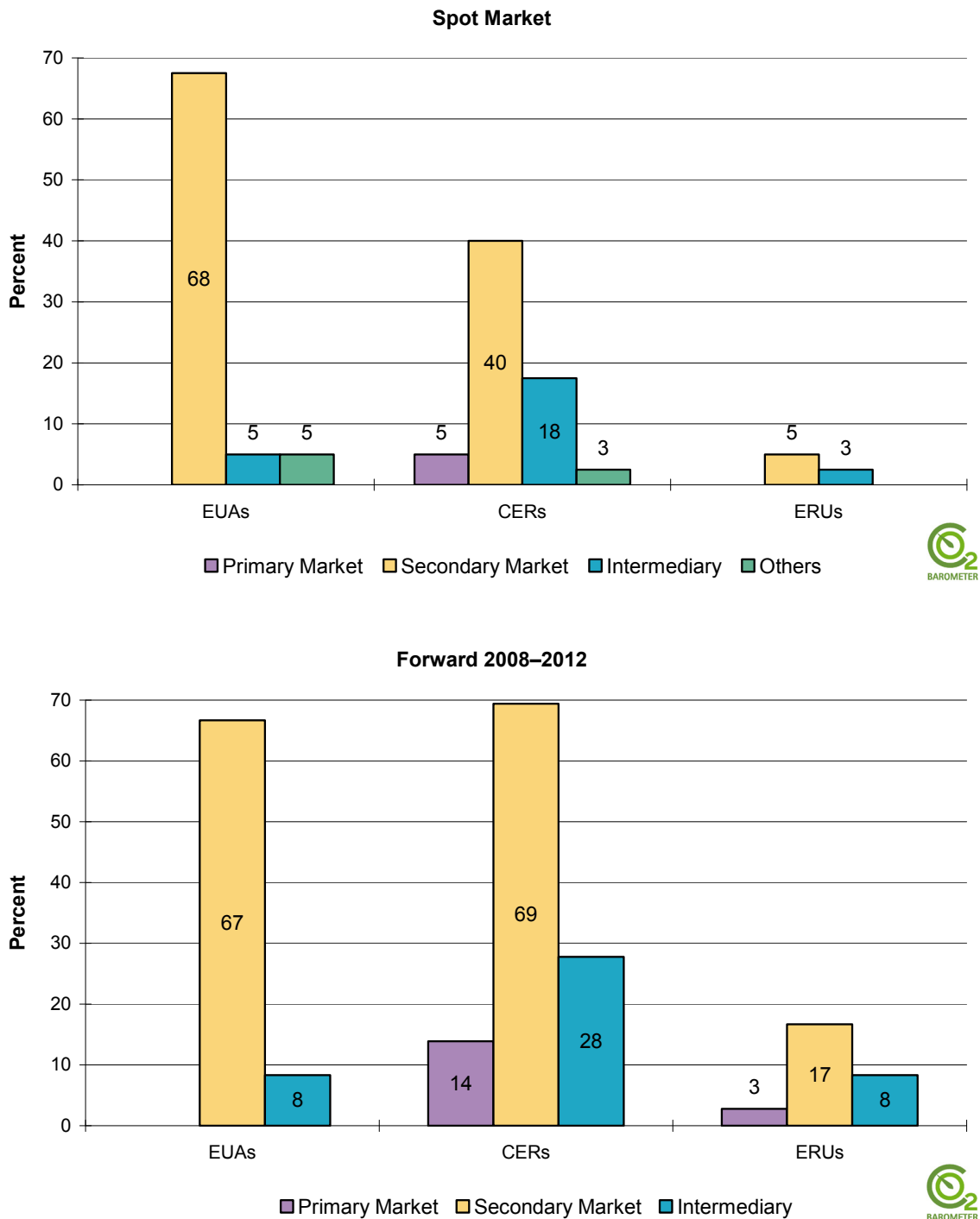


Source: KfW/ZEW CO₂ Barometer

Figure 7: Trading activities by markets (EUAs, CERs and ERUs) (multiple answers)

¹² Market analysts report that industry companies even sell EUAs from future years in order to alleviate their current liquidity shortage due to the effects of the financial and economic crisis.

EUAs and CERs are dominantly traded in secondary markets, i.e. exchanges or OTC (Figure 8). 68 % of companies trading in the spot market and 67 % of firms active on the forward market 2008-2012 buy and sell EUAs through secondary markets. Only 5 % (spot) and 8 % (forward 2008–2012) of companies active on the spot and forward market respectively use intermediaries for EUA trading.



Source: KfW/ZEW CO₂ Barometer

Figure 8: Trading activities by primary/secondary market (multiple answers)



The share of companies from the energy sector in the secondary markets for EUAs is relatively high. Since the installation-based limit for the purchase of CERs and ERUs of 22 % for German installations is expected to be insufficient to cover the shortage of allowances in the energy sector, especially companies from the energy sector are obliged to purchase additional EUAs. As these firms are familiar with the infrastructure of exchanges and OTC transactions, they are mainly referring to secondary markets.

Concerning CERs, the forward market for 2008–2012 is most important. As with EUAs, CER trading activities predominantly take place on secondary markets. The number of companies contacting intermediaries is, however, considerably higher than for EUAs. 18 % (spot) and 28 % (forward 2008–2012) of the companies reported trading activities with CERs through intermediaries. Although both secondary and intermediary markets for CERs are dominated by larger companies from the energy sector, the survey reveals that the relative weight of smaller companies is slightly higher in the intermediary market than in secondary markets. The primary spot and forward 2008–2012 market of CERs is tapped directly by 5 % and 14 % of the companies respectively. Again, larger companies with installations from the energy sector, in particular, trade in the primary market for CERs.

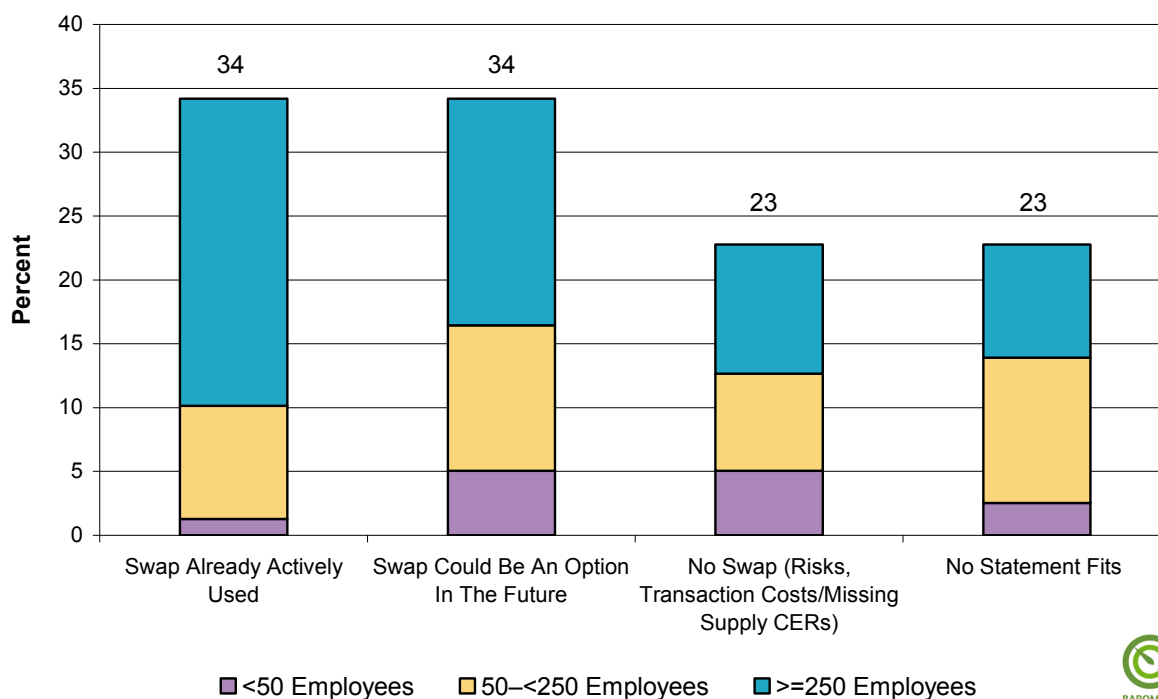
The (planned) trading activities for ERUs are considerably less than for CERs and EUAs. Only 5 % of companies trading in the spot market trade or plan to trade with ERUs. Slightly more companies are active in the ERU forward market for 2008–2012 (19 %). As for EUAs and CERs, the secondary market is the most important trading channel for ERUs, although the occurrence is not as obvious.

The distribution of trading activities over different market types (primary, secondary, intermediary) is fairly similar for the spot and the forward markets. In the case of the post-2012 market the role of intermediaries seems to be slightly more important. No respondent was active in the post-2012 primary market for CERs or ERUs.

3.3.1 Swap activities enjoy high awareness.

As companies may use EUAs and CERs interchangeably up to a certain limit for EU ETS compliance, the coincidence of firms facing over-allocation and firms reaching their respective CER/ERU limit gives rise to arbitrage opportunities. As shown in Chapter 5.3, the spread between EUAs and secondary CERs (sCERs) has ranged between 2 and 9 EUR in 2008. The spread arises due to different risks, legal regulation, and scarcities in the international markets.

According to our findings, the majority of the respondents is aware of the potential for swapping EUAs (Figure 9). While around one third of the companies already actively use the opportunity to swap EUAs against sCERs (34 %), another third stated that swap activities could be an option in the future (34 %).¹³ 23 % of participants indicate that they do not use arbitrage due to specific risks, high transaction costs of swap activities, and a lack of adequate CERs.



Source: KfW/ZEW CO₂ Barometer

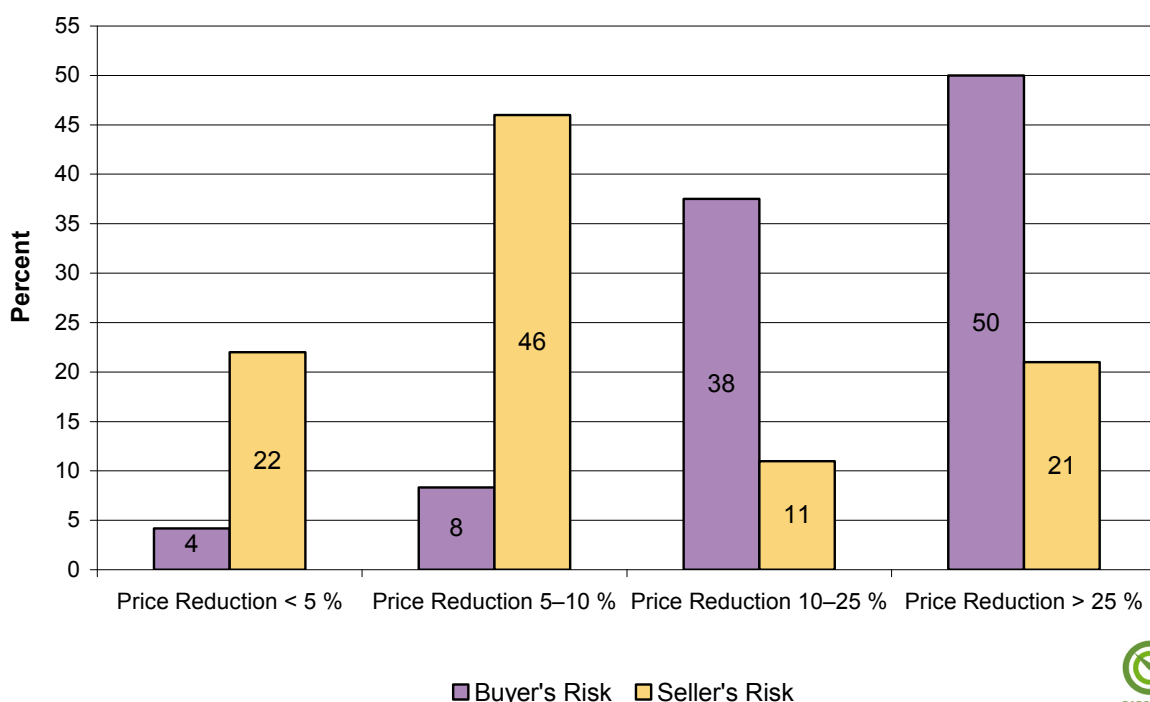
Figure 9: Swap activities of companies by size of company (multiple answers)

Particularly larger companies (250 or more employees) are already actively using the opportunity to swap EUAs. With 70 % of the participants, the share of larger companies (more than 250 employees) using swaps is disproportionately high. In contrast, smaller companies with less than 50 employees are represented by only 4 %. Approximately two thirds of the companies that are willing to swap EUAs against sCERs require a minimum spread of 4 to 7 EUR/tCO₂ in order to actively use the arbitrage opportunities. Given the current spread of around 2 EUR, the incentive to swap EUAs against sCERs seems to be low at present.

¹³ Several companies combined the answer “swap already actively used” with “swap could be an option in the future” or “no swap”. Thus, 13 % of the firms consider swap activities in general as part of their strategy although not pursued at the moment.

3.3.2 Primary CERs: willingness to pay.

While secondary CERs are free of project risk and may thus be traded as a standardised product at the exchanges or OTC, primary CERs (pCERs) vary with respect to the realisation status of the corresponding CDM project. Due to their higher risk, pCERs prices are consistently lower than prices for sCERs. As prices for pCERs are negotiated on a bilateral basis, no precise information on the price development exists, the range is estimated between 5 and 9 EUR/tCO₂.¹⁴ At a sCER price of 10.45 EUR/tCO₂ (31 March 2009), the price for pCERs thus currently lies in the range of 14 % (registered projects) to 52 % (medium risk forwards) under the price of sCERs.



Source: KfW/ZEW CO₂ Barometer

Figure 10: Willingness to pay for primary CERs

Figure 10 shows the deduction from the price of secondary CERs required by respondents of the survey when purchasing primary CERs. This spread depends on whether the buyer or the seller bears the risk of delivery: If the buyer bears the delivery risk, over a third of the participants would claim at least a price deduction of 10-25 %. 50 % of the responding companies would even require a deduction of more than 25 %. In the case that the seller bears the delivery risk, participants would accept a lower price deduction. The majority (68 %) of respondents would accept a price deduction of less than 10%.

¹⁴ For further analysis of prices for pCERs, see Nordseth et al. (2007) or Green (2008). For an approximation of the pCER prices, see the monthly newsletter of the GTZ "CDM Highlights" (<http://www.gtz.de/en/themen/umwelt-infrastruktur/umweltpolitik/14317.htm>).

would even accept a deduction of less than 10 % of the secondary CER price. Nearly one third of the respondents, however, still require a deduction of 10 % or more.

It is worth noting that companies that were long in 2008 expect a higher deduction when buying pCERs than companies that were short in 2008. As companies with a generous allocation of allowances are not obliged to purchase additional CERs, they are in a position to request higher risk premia. Companies with an insufficient allocation rely on the acquisition of additional allowances or certificates and might thus be prepared to accept higher risks for CERs.

4 Mechanisms for Flexibility: CDM/JI as an essential part of the EU ETS.

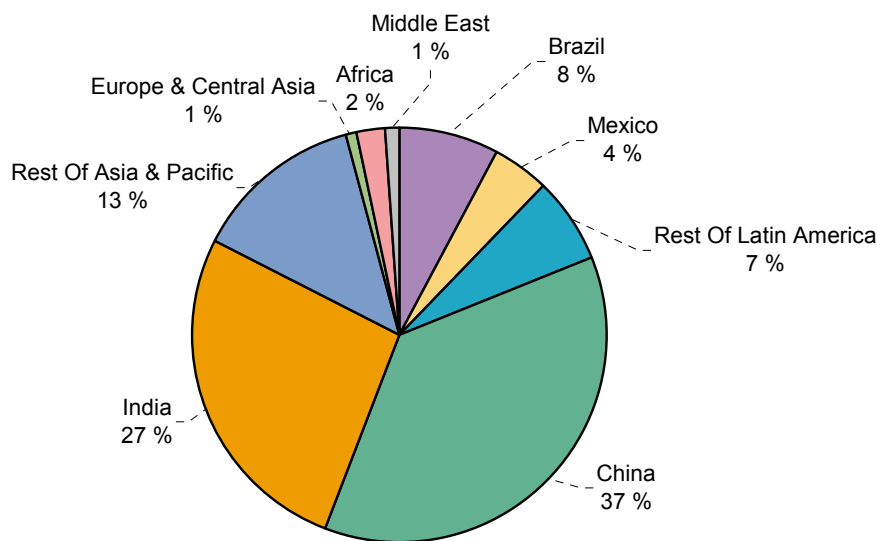
- Brazil, India, China and Africa are regarded as the most attractive regions for CDM projects by German EU ETS firms.
- The leading role of India and China in the global CDM market is likely to prevail. Africa and the rest of Asia and Pacific are expected to become more important in the future.
- High regional potential for JI projects exists in Russia and Ukraine. The Baltic States, the rest of Central and Eastern Europe, Germany and the rest of Western Europe are estimated to be less important in the future.
- Almost 50 % of German EU ETS companies consider the CDM project type to be important. CDM projects of the types “Renewable energy sources”, “Supply-side energy efficiency” and “Demand-side energy efficiency” are the most preferred.
- These project types together with “Afforestation / Reforestation” are also expected to be predominant in the future.

At 1 March 2009, 1,424 CDM projects were registered with a forecasted amount of 1,497 million CERs by 2012 (UNEP Risoe). Compared to the beginning of 2008, the number of issued CERs has more than doubled, to 262 million CERs. At the same time the average amount of CERs forecasted per registered CDM project decreased to 1 million CERs.¹⁵

4.1 How important is the project host country?

The geographical focus of CDM projects lies currently in Asia (77 %), and to a lesser extent in Latin America (19 %, Figure 11). In contrast, Africa is playing only a minor role, being host to only 2 % of recorded CDM projects. With respect to the share of expected CERs generated by CDM projects, the dominant role of Asia is even stronger as China and India are expected to be the geographical origin of 54 % respectively 16 % of CERs by 2012.

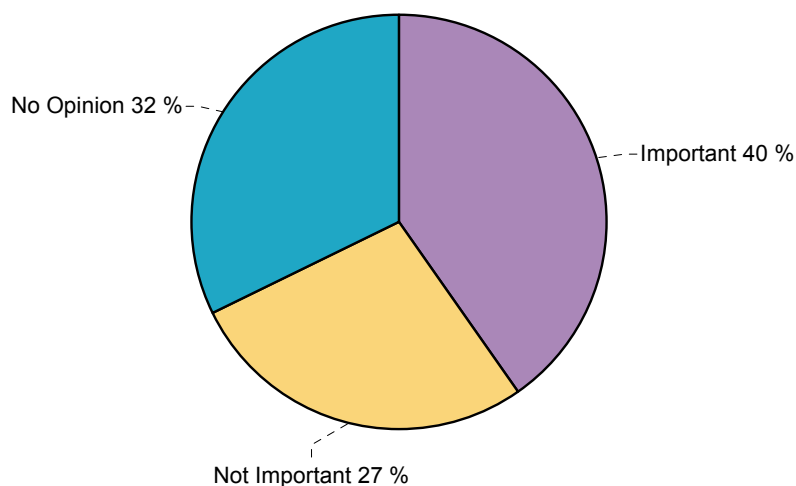
¹⁵ For the development of the CDM market see also Carbon Trust (2009).



Source: UNEP Risoe (1 March 2009)

Figure 11: CDM projects by host regions (4,541 projects)

Given the current regional focus of CDM projects, companies that had already traded CERs or ERUs or intended to do so were asked in the survey about the importance of the host country when selecting CDM and JI projects (Figure 12).

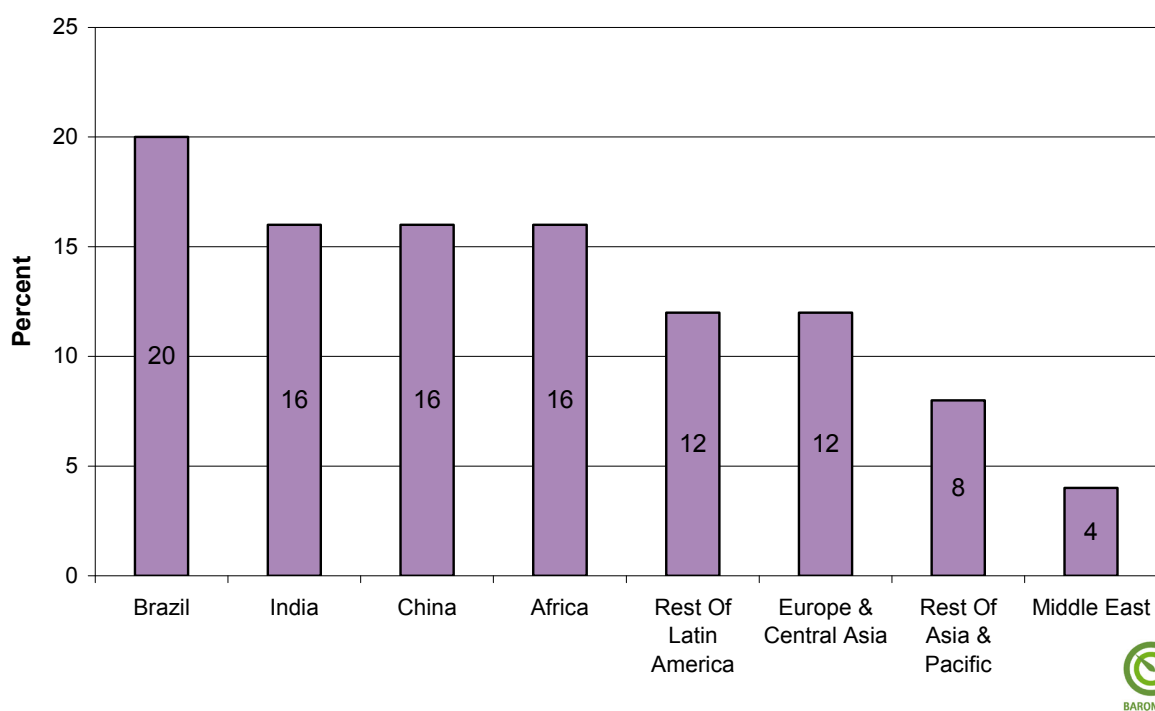


Source: KfW/ZEW CO₂ Barometer

Figure 12: Importance of CDM project host country for German companies

The results in Figure 12 show that only 40 % of the companies consider the CDM host country to be important or very important, whereas more than one quarter of the respondents (27 %) answer that the host country is not important at all. This is unexpected as economic literature suggests that host countries exhibit a considerable heterogeneity in transaction costs, investment risks and additional policy-driven regulations – all factors which might substantially change the attractiveness of conducting a CDM project in a particular country (Böhringer and Löschel 2008, Oleschak and Springer 2007).

The host country preferences for CDM projects among companies that consider the host country to be important are given in Figure 13. The majority of these companies belong to the combustion sector, the remaining two respondents are from the cement and ceramic sectors. Brazil (20 %), India (16 %) and China (16 %) represent the most important host countries for CDM projects. This is consistent with the fact that these regions are among the “biggest players” in the current CDM market. Rather unexpectedly, German companies rank Africa relatively high among preferred CDM countries although this continent currently hosts merely 2 % of all CDM projects (UNFCCC, 2008).



Source: KfW/ZEW CO₂ Barometer

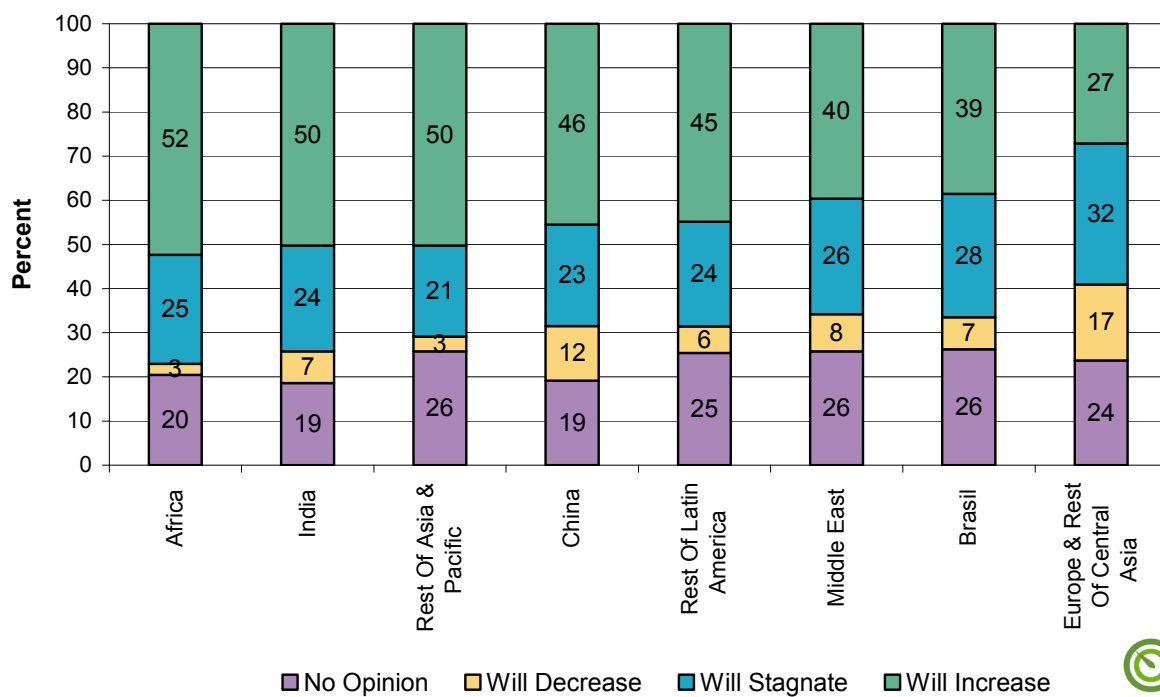
Figure 13: Preferred CDM host countries (multiple answers)

With regard to firm size, China appears to be attractive for both small and large firms while India, Brazil, Africa and the rest of Latin America are mostly preferred by large companies. The compliance situation seems to have no effect on geographical preferences with regard

to CDM projects as host country preferences do not vary substantially among firms that are short or long in 2008.

The situation on the JI market is a substantially different one from the CDM market. So far, only very few JI projects have been carried out by German firms in Ukraine, Lithuania and Hungary (UNEP Risoe 2009). This fact is reflected in a very small number of responses in our sample – hence, an analysis is difficult.

As current international negotiations on the future of the flexible mechanisms might have implications for geographical limitations, companies integrating CDM and JI in their CO₂ strategies closely follow the current climate talks. For an understanding of current expectations among market participants, international experts and German EU ETS companies were asked to give their view on future potentials for regional CDM and JI markets (Figure 14, Figure 15).



Source: KfW/ZEW CO₂ Barometer

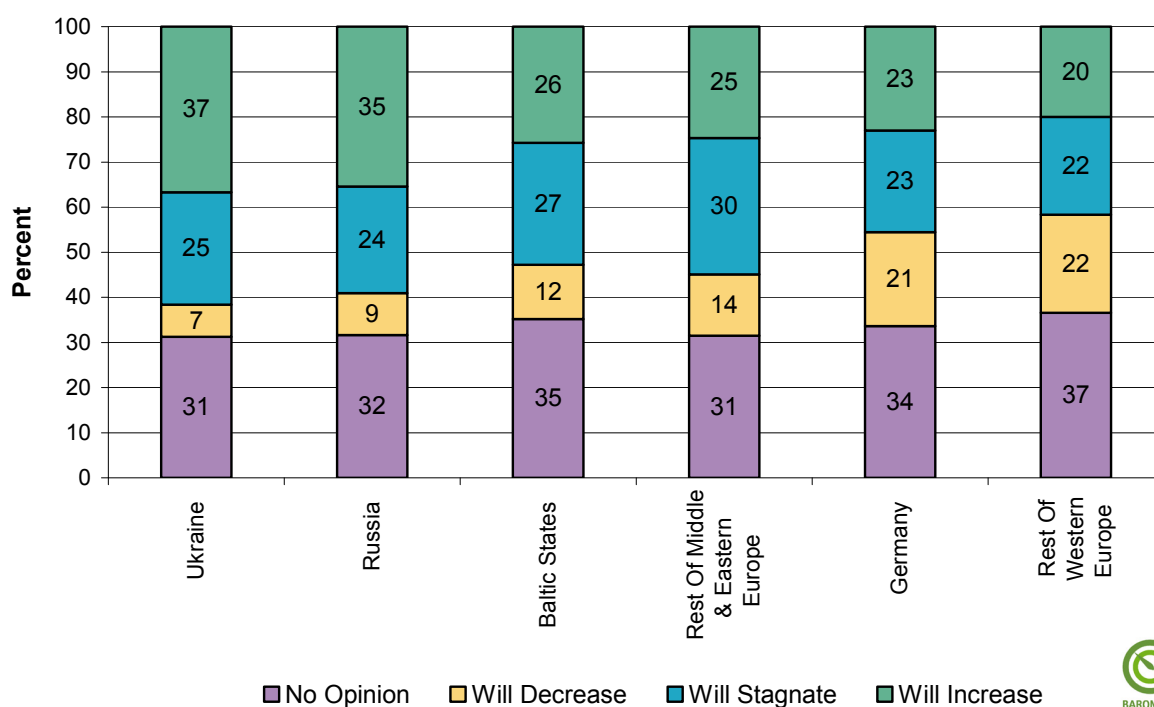
Figure 14: Expected future development of CDM regions (multiple answers)

Consistent with geographical preferences quoted in Figure 13, Africa is ranked among the regions with the greatest potential in the future – more than 52 % of the respondents expect this CDM market to grow. As pointed out above, however, the impact of Africa remains rather marginal to date. The optimism of experts and firms is likely based on the assumption that considerable efforts are undertaken to improve institutional and financial capacity, e.g. with

regional initiatives to make finance for CDM projects available (Africa Partnership Forum, 2008). Moreover, the German Federal Environment Ministry is currently supporting an initiative to promote cooperation between project developers in Africa and purchasers of CDM credits (BMU, 2008).

According to market expectations, India and China are not likely to lose their leading role on the global CDM market: The majority of respondents expect increasing volumes of CDM projects in both regions. Interestingly, Brazil is not expected to improve its situation substantially. This is surprising, given the current discussions on the inclusion of the REDD mechanism, i.e. reduced emissions from deforestation and degradation, in a post-2012 climate agreement during the United Nations climate change conference (COP-15) in Copenhagen. At the moment, REDD credits are eligible only in voluntary carbon markets and not under the CDM. Latin American countries, and Brazil in particular, should benefit most from protecting tropical forests under a Post-Kyoto framework.

Future perspectives of the JI market are expected to be less dynamic. The JI market is currently dominated by Russia and Ukraine, and only a slight majority of respondents (35 % and 37 %) expect these markets to experience continued growth in the future (Figure 15).



Source: KfW/ZEW CO₂ Barometer

Figure 15: Expected future development of JI regions (multiple answers)

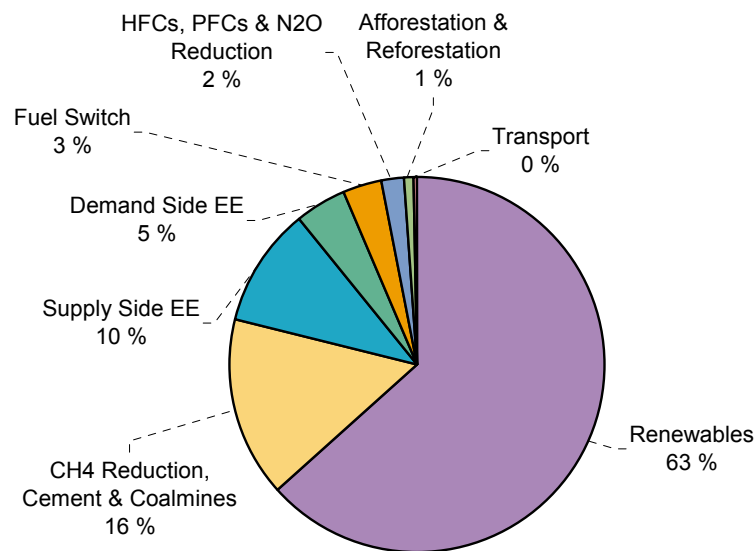


Russian authorities – the Russian ministry of economic development and trade as the focal point for JI projects – are currently finalising the national JI framework. This is an important achievement with a strong message to Russian companies to engage in JI projects. However, international experts and German EU ETS companies seem not to be confident with respect to future JI opportunities in Russia: 33 % of the respondents presume that the Russian market will stagnate or decrease.

In contrast, JI markets in the Baltic States, the rest of Central and Eastern Europe, Germany and the rest of Western Europe are expected to stagnate or to decrease by most respondents. Large companies with 250 and more employees, however, seem to have a diverging position on regional JI markets: They expect an increasing role of the Baltic Region and Germany on the future global JI market.

4.2 How important is the project type?

Based on recent data from UNEP Risoe (2009), Figure 16 shows the distribution of project types in the current CDM market. With 63 %, nearly two thirds of CDM projects are of the project type “Renewables”. This project type generates roughly a third of all CERs (36 %) expected to be realised by 2012.

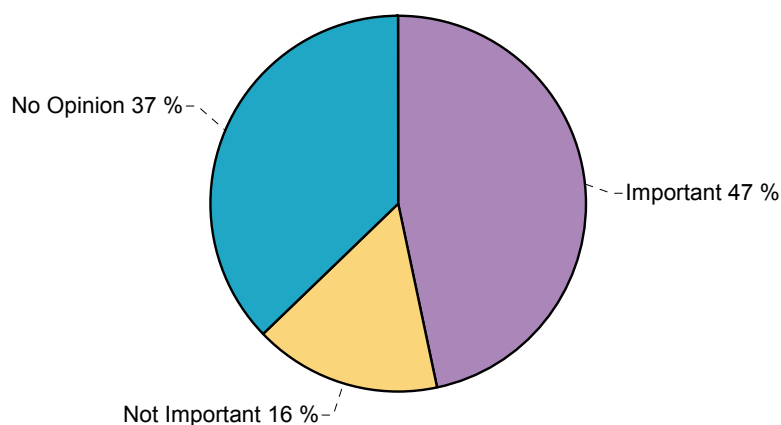


Source: UNEP Risoe (1 March 2009)

Figure 16: Share of the number of worldwide CDM projects in pipeline (4,541 projects)

Projects of the type “CH₄ reduction & cement & coal mine/bed” represent another 16 % of all CDM projects and are expected to produce 19 % of the CERs forecasted for 2012. Energy efficiency projects (demand- and supply-side) account for 15 % of CDM projects; they are expected to generate 12 % of CERs in 2012. Although projects of the category “HFCs, PFCs & N₂O reduction” represent only 2 % of all CDM projects, they are responsible for more than a quarter of expected CERs in 2012.

Against this background, the survey started by exploring to what extent the selection of CDM projects among the German EU ETS participants is affected by the particular project type. Only a small fraction of respondents – slightly more than 15 % – denied the importance of this issue for the selection of a CDM project. In contrast, almost 50 % of respondents considered the specific project type to be an important determinant of their decision (Figure 17).



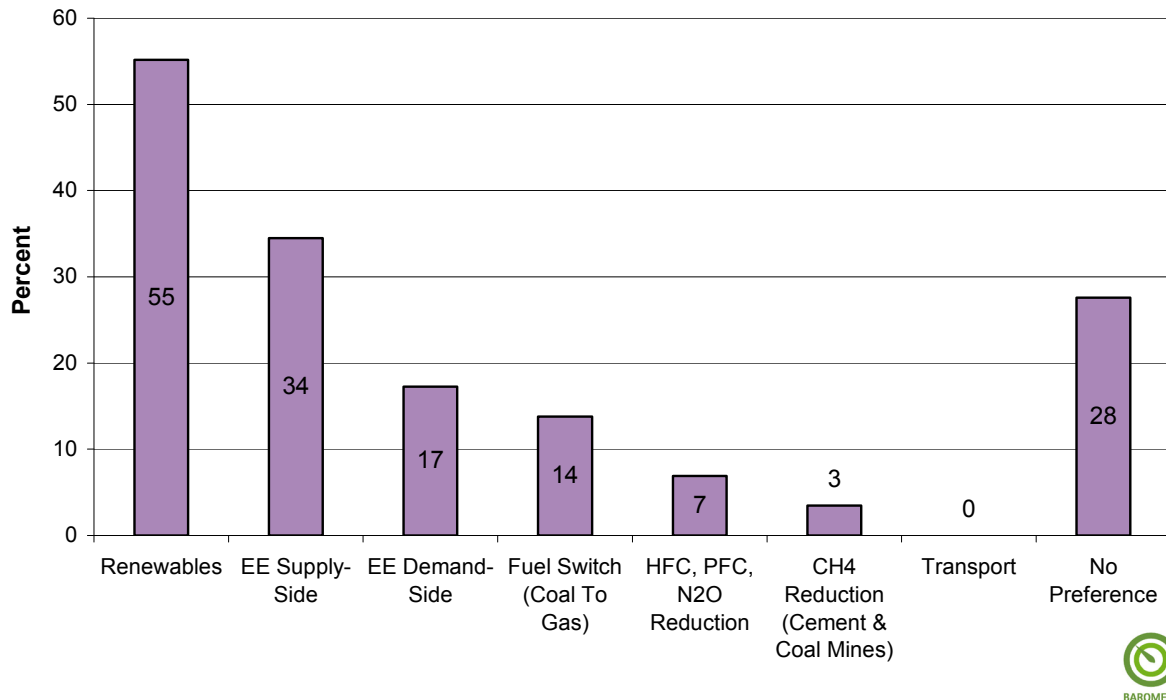
Source: KfW/ZEW CO₂ Barometer

Figure 17: Importance of the CDM project type for German companies

The preferences of firms that consider the project type to be relevant are given in Figure 18. In general, preferences of German companies with respect to the CDM project type are consistent with the current market situation (see Figure 16). Renewable energy related CDM projects represent by far the most important project type. These projects also dominate the preference patterns (55 %). Improving energy efficiency on the supply side is also regarded as a relevant project type (34 %). In contrast, improving energy efficiency on the demand side (17 %) and investing into fuel switching (14 %) are considered less important by firms.



Last but not least, the remaining project types – which aim at reducing HFC, PFC, N₂O, CH₄ and fossil fuel emissions in the transport sector – are barely an option for German EU ETS companies.



Source: KfW/ZEW CO₂ Barometer

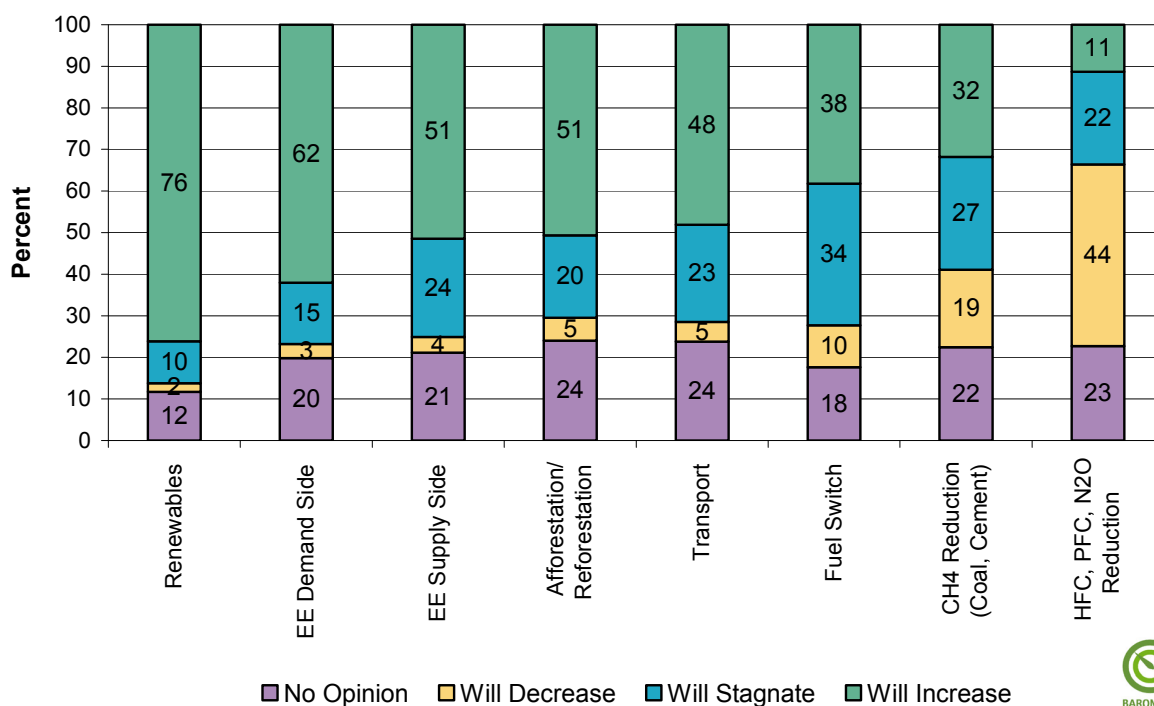
Figure 18: CDM project type preferences of German companies (multiple answers)

A closer look at the sample suggests that issues related to the selection of CDM project types are particularly important in the combustion sector. Moreover, large companies with 250 employees or more are likely to have a pronounced interest in specific types of CDM projects.

In theory, CDM and JI projects offer the opportunity of technology and knowledge transfer to host countries. They may help to substantially reduce GHG emissions globally and enhance sustainable development locally. In practice, the stimulus to sustainable development depends on the project type preferred by investors. An understanding of how different types of CDM and JI projects evolve over time therefore gives an indication of future developments in climate policy – particularly concerning future mitigation efforts and international technology transfer.

According to the expectations of international experts and German EU ETS companies, the highest potential for CDM and JI projects exists in renewable energy technologies (RET), including biomass, hydropower, solar or wind (Figure 19). Although CDM projects with RET

applications are typically characterised by high transaction costs due to their small-scale nature, the majority – more than 76 % of the respondents – assumes that renewable energy projects will become more important in the future. While the penetration of new renewable energy technologies is still very limited in most countries of the world, particularly in developing countries (BMU, 2007), introduction of the flexible mechanisms might lower financial and economic barriers, and thus contribute to a higher dissemination of RET. However, due to a relatively low abatement potential RET projects receive disproportionately small financial flows from these mechanisms: As indicated previously, 63 % of the CDM projects are currently of the project type “Renewables”. Yet, this project type generates a mere third of all CERs (36 %) expected to be realised by 2012. Higher CERs prices – that are expected to reach up to 26 EUR/tCO₂ in the period from 2013-2020 (Figure 21) – would thus provide additional incentives especially for investing into RET projects.



Source: KfW/ZEW CO₂ Barometer

Figure 19: Expected future development of CDM and JI project types (multiple answers)

Energy efficiency projects on both demand and supply side are also expected to become more important by the respondents (62 and 51 %, respectively). 51 % of the respondents agree on a high potential of afforestation and reforestation measures. The expectations for the transport sector are somewhat surprising: 48 % of the respondents expect that this project type will evolve in the future. So far however investing in projects related to the transport sector does not appear to be a real option for German EU ETS companies (Figure 18). Finally, CDM and JI options focusing on fuel switch, and reduction of CH₄ as well as of HFC,

PFC and N₂O are expected to stagnate or to decrease. Large companies with more than 250 employees, however, have a diverging view on the potential of the CDM projects to reduce HFC, PFC and N₂O and expect the volume of these projects to increase.

5 Prices in the Carbon Market: development and expectations.

- 95 % of survey companies and experts forecast that the (inflation-adjusted) price for EUAs will not be higher than 18 EUR/tCO₂ in December 2009 and 30 EUR/tCO₂ during the third trading period (2013-2020).
- Prices for sCERs are expected to be slightly lower than prices for EUAs: 16 EUR/tCO₂ in December 2009 and 26 EUR/tCO₂ for 2013-2020.
- Different risks, installation specific upper limits and different ways of using CERs and EUAs are the most important reasons for the current spread.
- Prices for gas, crude oil, coal and electricity are expected to stagnate or to decrease at least until July 2009, but to increase in the next five years.

5.1 Expected EUA prices.

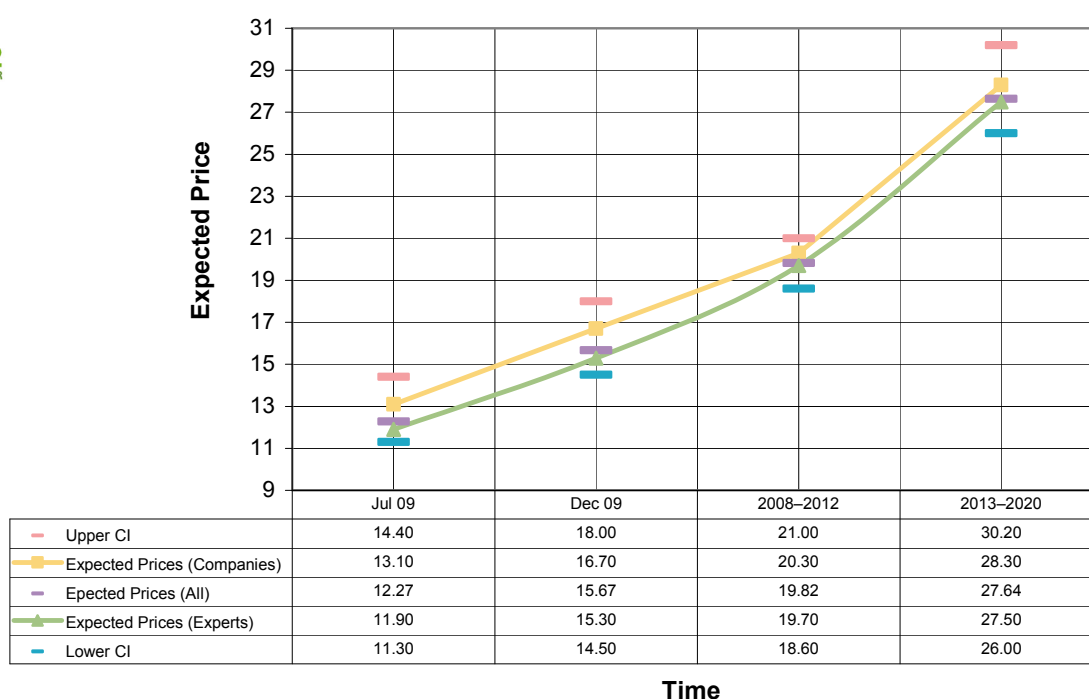
Companies will align their compliance strategies within the EU ETS according to future price signals for CO₂. A better understanding of future price developments is thus an essential prerequisite for maximising cost-efficiency of market instruments such as the EU ETS. In order to further improve the information basis for EU ETS participants, international experts and German EU ETS companies were asked for their short-term and long-term expectations concerning (inflation-adjusted) spot market prices for EUAs (BlueNext Spot, EUR/tCO₂). The short-term horizon encompasses price expectations for the next six months (July 2009) and for the end of this year (December 2009) based on January 2009 as the relevant reference month. As a long-term outlook, price expectations for the second and third trading period of the EU ETS are included. These price expectations are integrated in the **KfW/ZEW CO₂ Indicator** – a key result of the survey – which covers short-term and long-term expectations for EUA spot-prices (Figure 20).

Price expectations of international experts are on average only slightly below those of German companies. This gap is higher in the short-term than in the long-term. Information asymmetries on mitigation costs and potentials between experts and firms might provide an explanation for different results. Obviously, companies are in a better position to estimate the mitigation costs and potentials for CO₂ reductions. However, average price expectations are very similar.

In the short-run, carbon prices are expected to remain at relatively low levels until mid-2009 and to rise moderately by the end of this year. The expected prices – calculated as an *average* value (mean) – among EU ETS companies amount to roughly 13 EUR/tCO₂ in July 2009 and to 17 EUR/tCO₂ in December 2009. This basically represents a side movement over the

six month horizon when compared to prices observed during the survey period (average EUA-09 January 2009: 12 EUR/tCO₂). According to the surveyed experts, prices of 12 EUR/tCO₂ in July 2009 and 15 EUR/tCO₂ in December 2009 are expected, respectively.

The robustness of the results is reflected in the low overall variation in price expectations: As indicated by the 95 % confidence interval (colour bars in Figure 20) most respondents assume that the carbon price will not be higher than roughly 14 EUR/tCO₂ in July 2009 and 18 EUR/tCO₂ in December 2009 (the upper value of the confidence interval). At the same time 95 % of the respondents see EUA spot prices above 11 EUR/tCO₂ in July 2009 and 15 EUR/tCO₂ in December 2009 (the lower value of the confidence interval).



Source: KfW/ZEW CO₂ Barometer

Expected spot market prices for EU allowances (EUAs) are given for experts as a green point and for German EU ETS companies as a yellow point. The green and yellow lines combine the respective values that are calculated as a mean. The 95 % confidence interval (CI) on the mean is plotted as a blue and pink bar. The upper CI corresponds to the price expectations of the German companies, the lower CI of the experts.

Figure 20: KfW/ZEW CO₂ Indicator: expected EUA spot-prices (EUR/tCO₂)

In the medium term (2008 to 2012), the spot market price for EU allowances is expected to rise moderately, with values varying between 19 and 21 EUR/tCO₂. Experts and companies agree, however, that in the long run (2013–2020) a significant increase of the carbon prices will occur. Considering the 95 % confidence interval, the respective range is between 26 and 30 EUR/tCO₂. In line with chapter 2.1 on regulatory developments, the expectations of a carbon price increase from 2013 on are consistent with the fact that emission reduction efforts of the covered installations are assumed to increase during the third trading period. Hence,



respondents expect that future emission reductions will be feasible only at higher emission reduction costs leading to higher carbon prices.

Focusing on the perspective of companies, our findings reveal that firms that are short in 2008 show slightly lower price expectations than companies that are long. Furthermore, small and medium-sized companies expect slightly lower carbon prices than large firms (with more than 250 employees), particularly in the medium term (2008–2012) and in the long term (2013–2020). This result is in line with previous KfW findings on energy efficiency of German small and medium-sized enterprises (KfW, 2005). This study concluded that smaller firms tend to have a relatively higher share of energy in total cost than larger firms. Assuming that all firms in our survey have comparable abatement cost curves, the former would be expected to reduce energy intensity at lower costs than the latter: One would expect that companies with low energy intensity have already used the cheap abatement options.

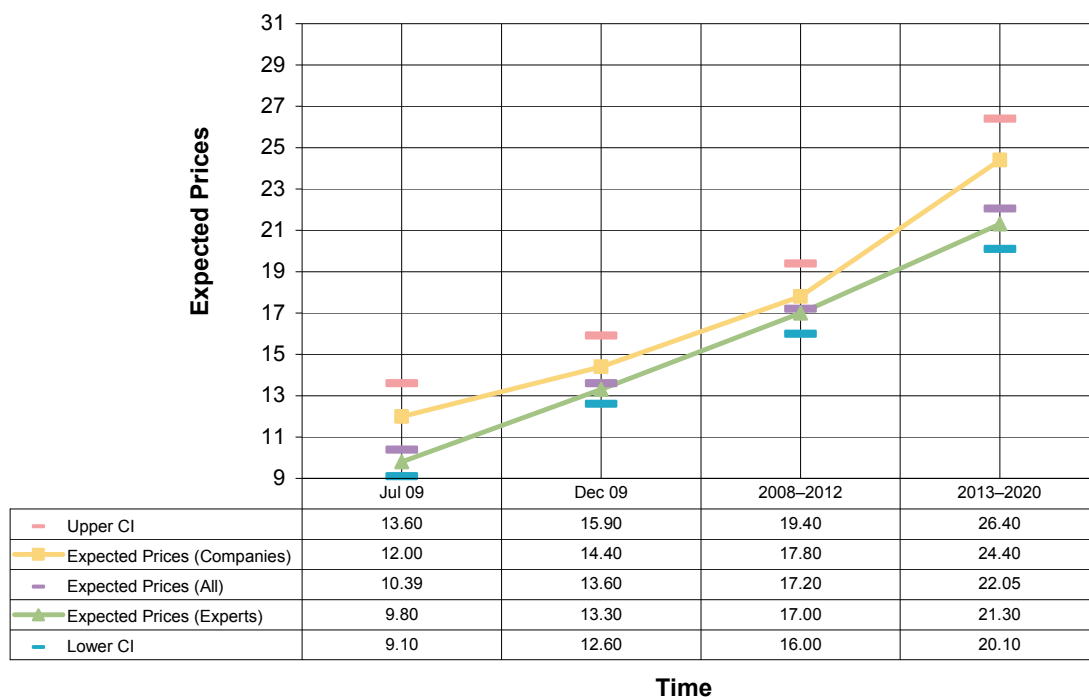
These expectations of German EU ETS companies are substantially lower than EUA price expectations published recently. Point Carbon (2009) estimated the EUA price to range between 15 and 20 EUR/tCO₂ in 2010 and between 35 and 50 EUR/tCO₂ in 2020. The differences may be attributed to the different assessment of the current economic situation. While the Point Carbon study reviews expectations within and beyond the EU, the KfW/ZEW CO₂ Panel focuses on the German EU ETS companies. With their strong focus on exports, German companies have faced a major slump in their orders and their current as well as future production. Thus the bearish price forecasts of our survey might reflect the strong impact of the current economic crisis on German companies. It is also important to keep in mind that German companies and experts were asked to state the expectations with respect to inflation-adjusted prices.

5.2 Expected sCER prices.

According to our survey, secondary markets are the most frequented markets for CERs among the German EU ETS companies. Thus expectations concerning spot market prices (BlueNext Spot, EUR/tCO₂) for Certified Emission Reductions traded on the stock exchange or the OTC market (sCERs) represent an important determinant for future price signals.

As depicted in Figure 21 the respondents agree on sCERs prices varying between roughly 9 and 14 EUR/tCO₂ in July 2009 and between 13 and 16 EUR/tCO₂ at the end of the year. Compared to the price range of sCERs between 11 and 13 EUR/tCO₂ observed in January 2009, respondents thus anticipated an upward movement in prices. In the medium term (2008–2012), almost all of the surveyed experts and firms anticipate sCERs prices in the

range between 16 and 19 EUR/tCO₂. The number of under-allocated installations is expected to increase considerably from 2013 on. Therefore similar to the EUA price expectations, a sharp price increase of sCERs is forecasted during the third trading period by both experts and firms: Within the range between 20 and 26 EUR/tCO₂, the future sCERs prices will more than double in comparison to the recent price level (by the end of April 2009 roughly 11 EUR/tCO₂). As with EUAs, experts expect lower sCERs than companies at any point of time, i.e. over short- and long-time horizon.



Source: KfW/ZEW CO₂ Barometer

Expected spot market prices for secondary Certified Emission Reductions (sCERs) are given for experts as a green point and for German EU ETS companies as a yellow point. The green and yellow lines combine the respective values that are calculated as a mean. The 95 % confidence interval (CI) on the mean is plotted as a blue and pink bar. The upper CI corresponds to the price expectations of the German companies, the lower CI of the experts.

Figure 21: Expected sCER spot-prices (EUR/tCO₂)

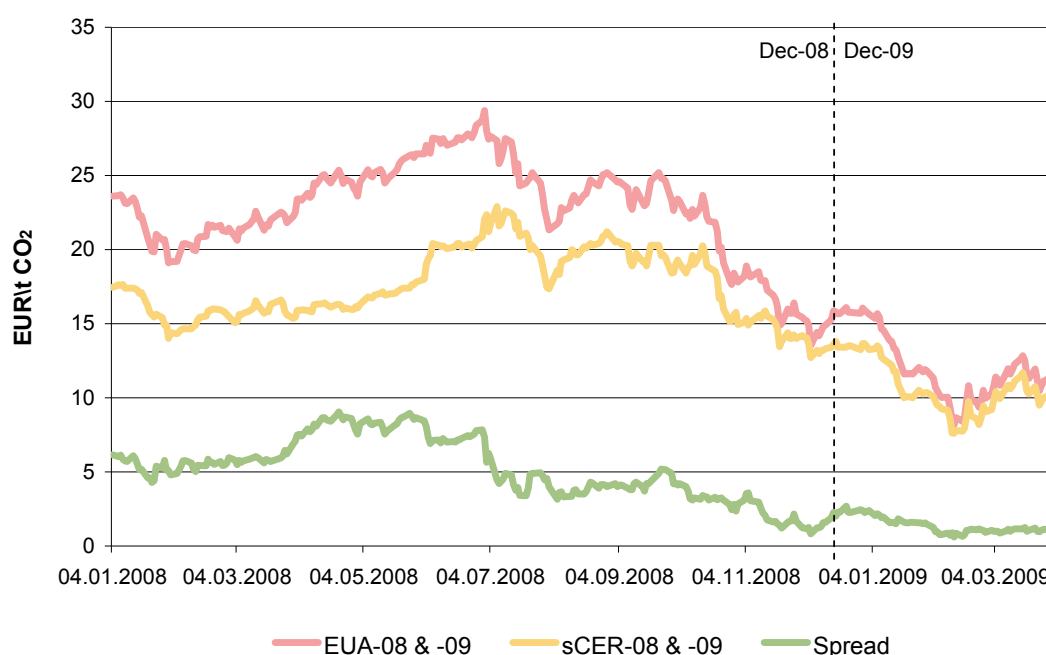
Figure 21 shows a clear upward trend for price expectations for sCERs, although they are expected to increase to a lower extent than prices for EUAs (Figure 20). In principle, buying sCERs instead of EUAs should take place – within the current limitations on the usage of CERs in the EU ETS framework – as long as there is a price difference. Price expectations for EUAs and sCERs were therefore used to assess the attractiveness of secondary markets for CERs in the short- and long-term. The expected price span between EUAs and sCERs (as a difference between both means) is found to increase from roughly 2 EUR/tCO₂ (December 2009) to 4 EUR/tCO₂ (2013-2020). At these rather moderate values, no remarkable cost savings from buying sCERs (instead of EUAs) are possible.



Although secondary markets for CERs are dominated by larger companies, sCER price expectations are found to be positively correlated with firm size. Again, small and medium-sized companies expect, on average, slightly lower sCER prices than large companies. In contrast, analysing price expectations of firms that were short or long in 2008 does not change the overall picture.

5.3 Main drivers of the current spread.

Figure 22 allows a closer look at the price spread between EUAs and sCERs by showing the spread between the future contracts EUA-08 and sCER-08 as well as EUA-09 and sCER-09 (OTC).



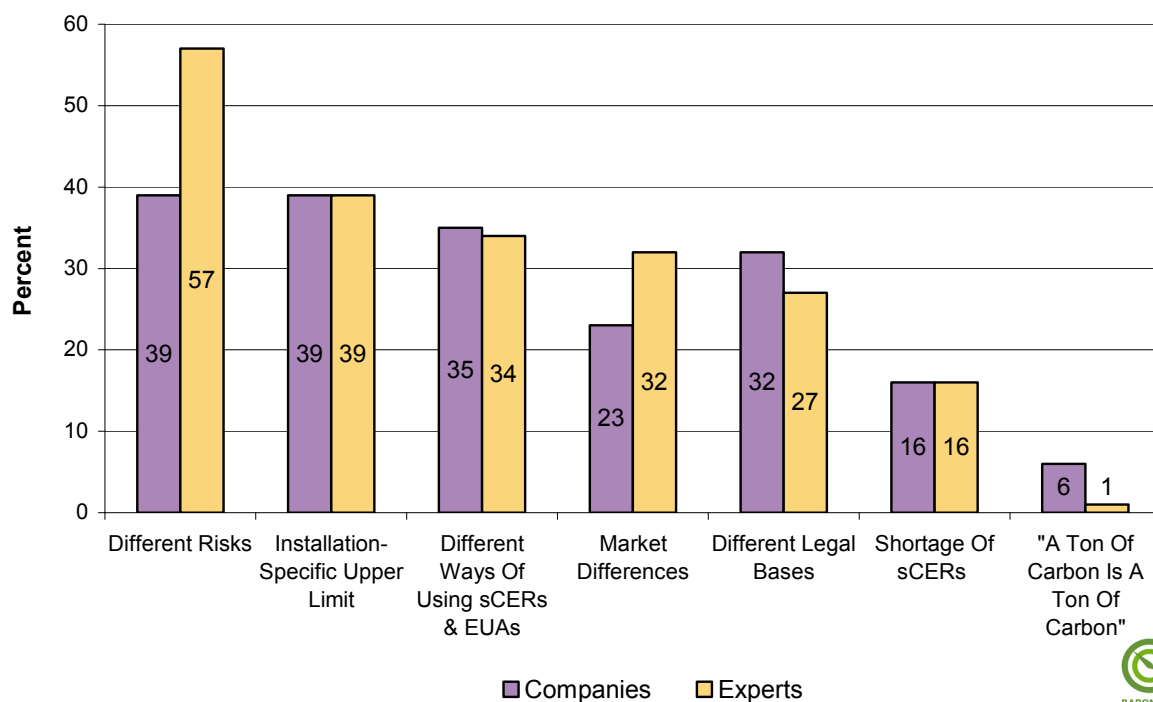
Source: Point Carbon

Figure 22: Spread between EUA-08/-09 and secondary CER-08/-09 (OTC)

At the beginning of the year 2008, the spread between EUA-08 and sCER-08 prices was around 6 EUR/tCO₂. The spread reached its maximum in April with over 9 EUR/tCO₂. Until the end of the year, the spread decreased to a minimum of only 2 EUR/tCO₂. In the first quarter of 2009, the spread between the EUA-09 and sCER-09 prices reached minimum values of less than 1 EUR/tCO₂.

Figure 23 explores the reasons behind the current spread between the EUA and sCER contracts on the European Climate Exchange (both ECX Future 2009). 57 % of experts and 39 % of firms consider different risks associated with the usage of sCERs and EUAs to be

the main reason for the current spread. Given the above, the narrowing of the spread might be at least partly attributed to the reduced uncertainty about the use of CERs during the second trading period of the EU ETS and beyond.



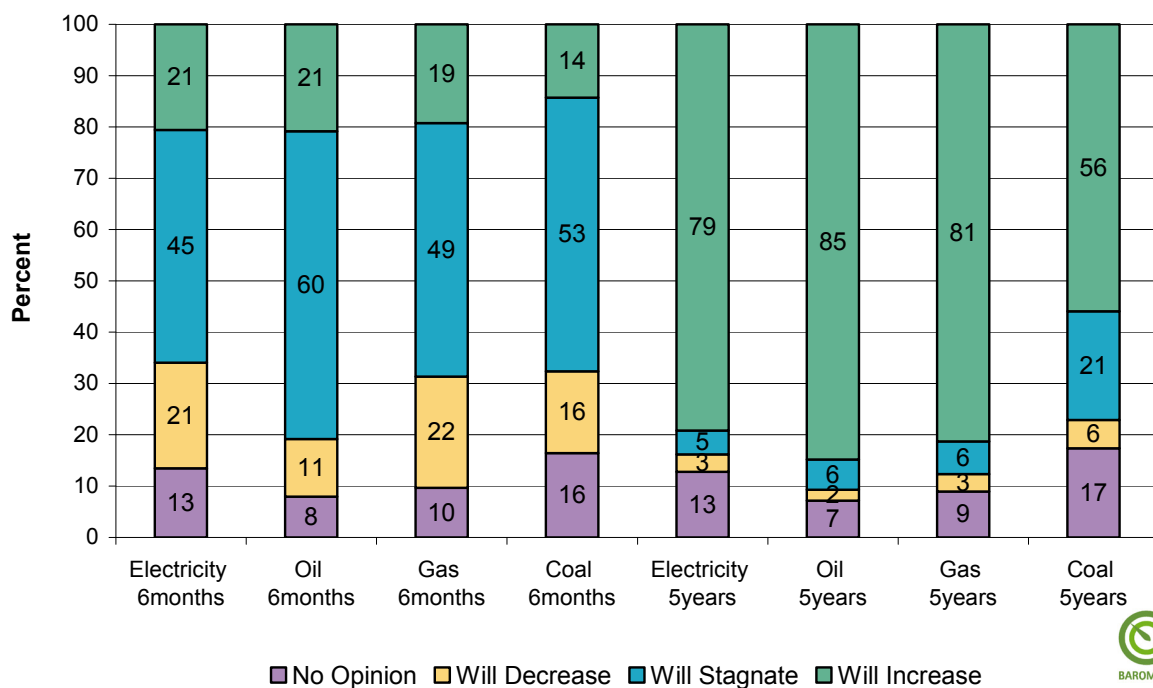
Source: KfW/ZEW CO₂ Barometer

Figure 23: Main reasons for the current price spread between EUAs and secondary CERs (ECX Future 2009) (multiple answers)

CERs are limited by the National Allocation Plan (NAP) at 22 % (of the allocation per installation) during 2008–2012 in Germany. Bearing in mind these specific national regulations, 39 % of the surveyed German EU ETS companies see one of the main drivers of the spread in the installation-specific upper limit. The same percentage of the surveyed experts (39 %) shares this view. Different ways of using sCERs and EUAs, diverging legal basis and different markets are also expected by many respondents (up to 35 %) to influence the development of the spread. In contrast, a shortage of secondary CERs is important only to a relatively small number of experts and firms. Hence, most respondents do not expect a widening of the spread if the CDM supply on secondary markets increases over the time.

5.4 Price expectations in energy and commodity markets.

In the KfW/ZEW CO₂ Panel, companies and experts were asked to give their short- and long-term price expectations (inflation-adjusted) for energy and commodity goods, i.e. crude oil, gas, coal and electricity. The short-term horizon encompasses the next six months – reference point is January 2009 –, while the medium term refers to the next five years (Figure 24).



Source: KfW/ZEW CO₂ Barometer

Reference categories: Electricity (EEX Phelix Day Base), Crude Oil (Brent), Nat. Gas (Zeebrugge Nat. Gas Day Ahead), Coal (API #2 CIF ARA).

Figure 24: Six month and five year price expectations in the energy and commodity markets

The majority of surveyed experts and companies forecasted stagnating prices until July 2009 in all markets. Decreasing prices were expected by roughly a quarter of the respondents for electricity (21 %) and gas (22 %), whereas a (markedly) smaller fraction of experts and firms expected a price drop for oil (11 %) and coal (16 %). The majority of respondents were not expecting prices to increase in the short-term. Looking at the historic price development during 2009, respondents anticipated the economic slowdown and its implications for electricity prices quite well: electricity prices did actually follow a downward trend in January and February while stagnating in March and April.¹⁶

Over a longer time horizon – i.e. in the five year term – all prices are expected to rise again. Between 79 and 85 % of the surveyed experts and firms shared this view for electricity, oil and gas markets respectively. This fraction is lower for the coal market (56 %). Such an outcome is likely to occur in the course of economic recovery and increasing demand for electricity and energy goods. However, one might expect that interactions with carbon markets will play a role for the evolution of electricity and energy prices as well.

¹⁶ European Energy Exchange (EEX Phelix Day Base).

Zachmann and Hirschhausen (2007) evaluated the relationship between EUAs and wholesale electricity prices in the German market using data from the EEX. They provided empirical evidence on the asymmetric cost pass-through of EUAs into electricity prices. Rising prices of EUAs during the first trading period have been found to have a stronger impact on wholesale electricity prices than falling prices. This result was interpreted as a possible indication of market power by German electricity generators resulting in enormous windfall-profits. To set limits to such windfall-profits, the power-generation sector will be obliged to purchase 100 % of their emission allowances by auction from 2013 onwards. Hence, it is very likely that strongly increasing carbon costs in the third trading period of the EU ETS will lead to increased wholesale prices for electricity. Electricity price increases over the next five years are anticipated by 89 % of companies and by 74 % of experts.

Price developments in carbon markets are likely to surpass to other energy markets, especially to gas and coal markets. Experts as well as firms expected EUAs and CERs prices to increase over time (Figure 20, Figure 21). Higher carbon prices may make a firm's own mitigation efforts, particularly a fuel switch from coal to gas, more attractive. Production process generation with coal causes higher CO₂ emissions and thus higher CO₂ costs than with natural gas. Changes in the relative prices of coal and gas are, therefore, expected to have an impact on fuel switching. The incentives to switch rise as the price difference between coal and gas grows.

6 Abatement measures, market development and voluntary activities.

- While the majority of firms have implemented CO₂ reduction measures, price signals for CO₂ seem to have had only minor influence on investment strategies so far.
- Process optimisation and energy saving constitute the most important measures for abatement. Currently, abatement seems to be driven by reduced production activities due to the economic crisis.
- For the further development of the EU ETS, respondents first of all demand a longer horizon for legal rules. Other important concerns are direct access to CDM and JI projects, more specific rules for the ETS, improved information flows between host and investor countries and enhanced access to exchanges.
- Readiness for voluntary CO₂ neutralisation activities is relatively low so far. However, market dynamics are likely to increase as for more than one out of five companies compensation is either already current practice or at least an interesting option in the future.

6.1 Abatement measures and economic downturn.

Approximately 55 % of the companies indicated that they had already realised CO₂ reduction measures in 2005–2007. At least 40 % of the respondents are planning to implement emission reduction measures in the period 2008–2012, while 23 % of the companies have not yet decided upon future emission reduction measures. Approximately one third of the companies explicitly stated that they had no plans for any reduction activities within the current trading period. The data does not reveal any marked differences for companies of different size or sector.

Figure 25 provides information on the use of different abatement measures. Process optimisation and energy saving measures and clearly dominate the abatement strategies of companies.¹⁷ The higher share of companies declaring production reduction as abatement measure in the second trading period reflects the current economic downturn. Many firms have been forced to downsize their production due to decreasing demand, thus reducing their emissions. However, there are reasonable doubts that these “abatement measures” have been or will be taken voluntarily and that they will be of lasting impact.

¹⁷ For further reading on abatement measures in the energy sector under the EU ETS, see Convery et al. (2008).

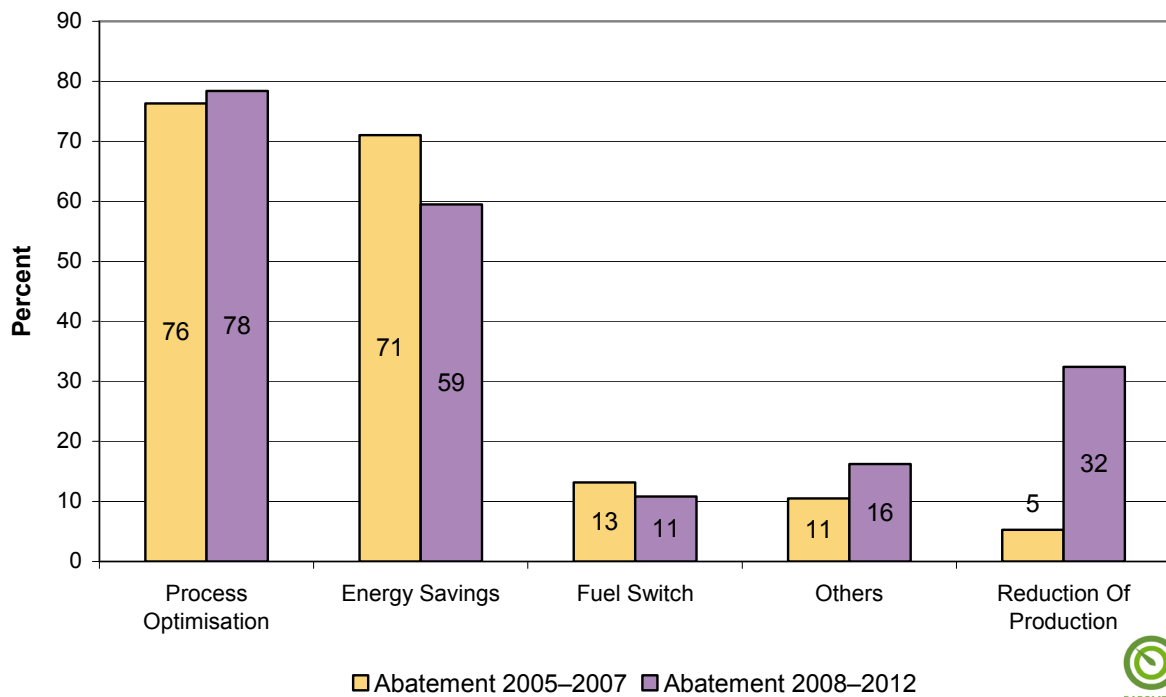
Source: KfW/ZEW CO₂ Barometer

Figure 25: Abatement measures in the period 2005–2007 and 2008–2012 (multiple answers)

In most cases, CO₂ reduction does not play the decisive role when implementing abatement measures. 88 % of the companies stated that CO₂ reduction is only a side effect of measures taken or planned by the companies (Figure 26).

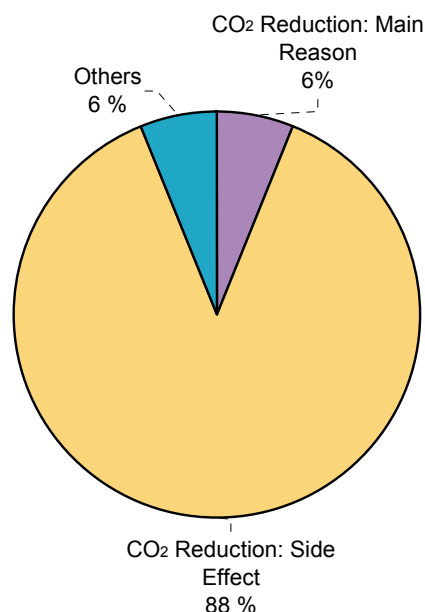
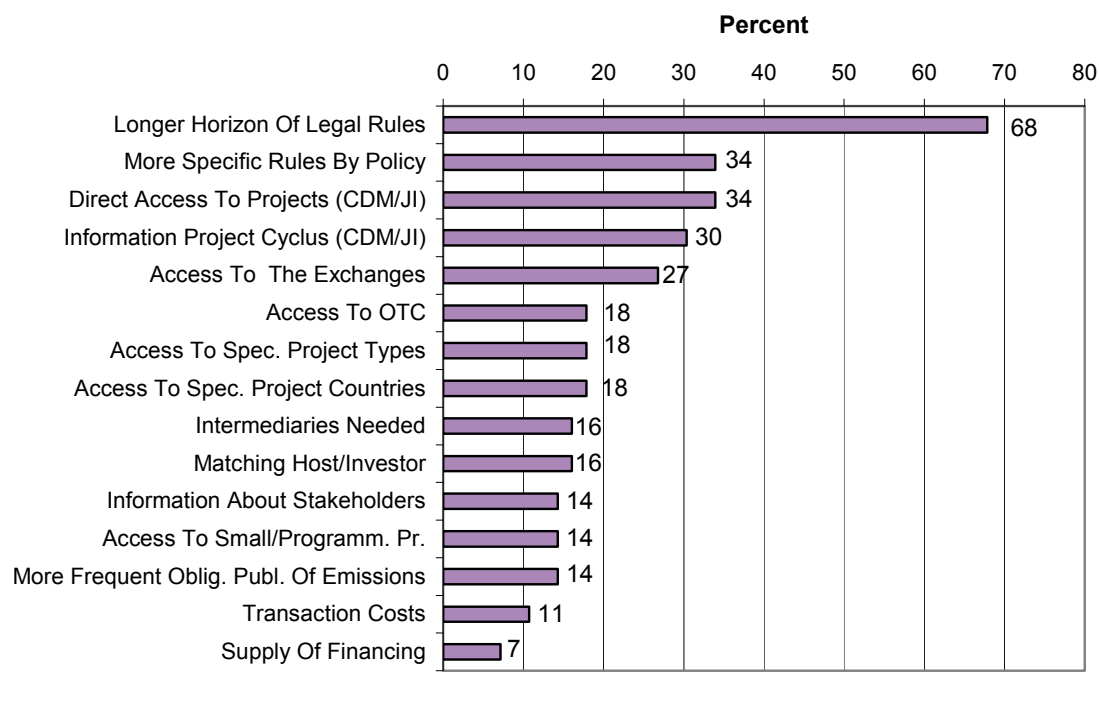
Source: KfW/ZEW CO₂ Barometer

Figure 26: Role of CO₂ reduction for measures implemented in 2005–2007 and 2008–2012

Only 6 % indicated that the reduction of CO₂ has been the main reason for the realisation of a measure. As long as the companies receive a generous amount of allowances, there are few incentives for abatement measures under the EU ETS. With tighter caps and the introduction of auctioning, however, the necessity of installations under the EU ETS to reduce emissions may be expected to increase.

6.2 Need for development within the market.

For the further development of the Emissions Trading Scheme in the EU, it is important to understand the needs of market participants. A large majority of companies sees ample scope for improvement in the political and legal framework of the EU ETS (Figure 27). The by far highest priority is given to long-term legislation of the Emissions Trading Scheme: over two thirds (68 %) of the companies consider a longer horizon of legal rules to be important. Long-term regulation for the EU ETS system would increase planning security decidedly for companies. Also, approximately one third of the companies claim that policy rules need to be more specific.



Source: KfW/ZEW CO₂ Barometer

Figure 27: Need for market development by categories (multiple answers)

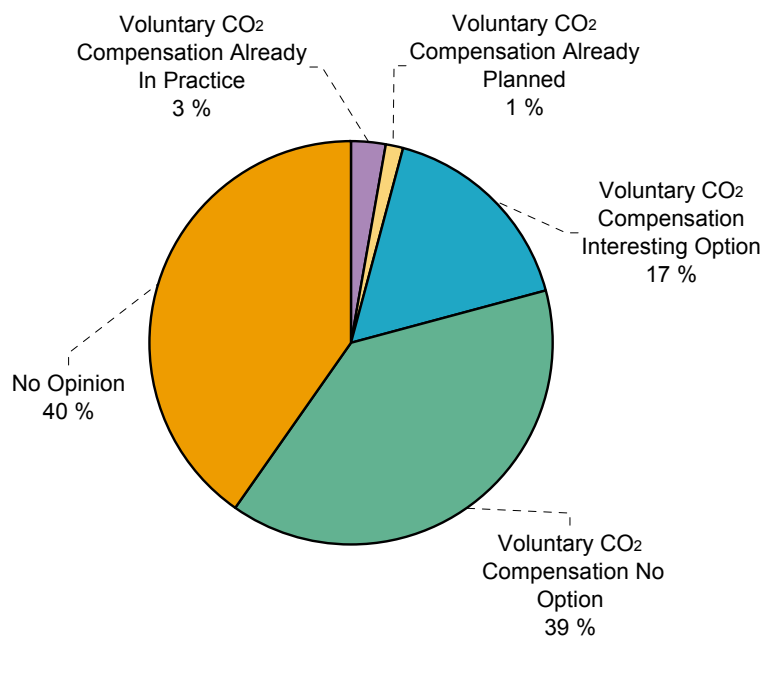
With regard to the CDM and JI market, 34 % of the companies require enhanced direct access to CDM and JI projects. 30 % see room for an improved information flow concerning the

project cycle of CDM and JI projects. Better access to exchanges is postulated by 27 % of the answering companies.

In all other areas, less than a fifth of the participating companies identify need for further market development. While 18 % believe that access to the OTC market and specific project types should be improved, only 14 % call for more information about the stakeholders of CDM and JI projects. 7 % of respondents consider the supply of financing options insufficient. With regard to necessary activities for market development, the data does not show any considerable differences according to firm size, sector or allocation status.

6.3 Voluntary compensation of CO₂ emissions in German companies.

Notwithstanding activities for compliance within the EU ETS, the emerging market for emission certificates also opens up the opportunity for voluntary compensation of CO₂ emissions. Firms – whether they are covered by the EU ETS or not – may voluntarily compensate inevitable emissions, e.g. by investing in CDM or JI projects and retiring the generated credits. The retirement of emission credits guarantees that no other market participant is able to access the credits. The main incentive for firms to engage in such voluntary CO₂ compensation activities are reputation and image effects. As the development of CER and ERU markets might be affected by the demand created by voluntary compensation, the KfW/ZEW CO₂ survey examined the awareness of companies with regard to voluntary CO₂ compensation and the extent of current activities.



Source: KfW/ZEW CO₂ Barometer

Figure 28: Willingness of companies for voluntary compensation of emissions

The interest of firms for voluntary CO₂ neutralisation appears to be rather low. Only 4 % of the respondents have already implemented CO₂ compensation systems or are planning to do so (Figure 28). At least 17 % of the companies regard the implementation of such a system as an option in the future. But nearly 40 % expressed a negative attitude towards voluntarily compensating their CO₂ emissions. However, it has to be taken into account, that the survey included only firms already covered by the EU ETS, for which the incentive for voluntary emission compensation on top of their mandatory compliance activities can be assumed to be lower than for firms outside the EU ETS.

Uncertainty regarding the compensation mechanism remains high: 40 % of the participants had no opinion on this topic. Among the companies that are willing to use voluntary CO₂ compensation (CO₂ compensation already in place, planned or an option), larger companies (more than 250 employees) dominate. It can be assumed that larger companies have larger incentives for reputation effects and also the necessary resources to cover the administration costs of implementing such activities.

7 Leaving the trial phase behind - preferences and strategies of German companies under the EU ETS.

The EU ETS is the largest multi-national emissions trading scheme in the world. Its successful establishment has been a major step on the road towards the EU climate goals for 2020. The EU ETS is based on the recognition that creating a price for carbon through the establishment of a cap-and-trade system and a liquid market for emission reductions will be the most cost-effective way for EU Member States to meet their Kyoto obligations and move towards the low-carbon economy of the future. The results of the KfW/ZEW CO₂ Barometer confirm that **the majority of German firms included in the EU ETS have become active in the carbon market** and that awareness of its profit potentials is high. The higher trading activity of firms that were long on emission allowances in 2008 compared to those that were short may thus, for instance, be taken as an indication that EUAs are already actively used as an instrument of general liquidity management. It also demonstrates the countercyclical effects of the EU ETS.

Yet, as is to be expected for such a large-scale and ambitious endeavour, **market development is still hampered by a range of uncertainties**. The greatest uncertainty concerns the regulation of the EU ETS after 2012. It is therefore not surprising that market participants regard the question of long-term regulation as by far the most important for the further development of the carbon market. As long-term planning is difficult on such a basis, **current trading activities are concentrated on the spot and forward markets for 2008-2012**. At the moment, less than 17 % of German firms are active or plan to be active in the post-2012 market.

Uncertainties exist not only due to lack of long-term regulation but – especially at the moment – also due to the interdependence between economic development and scarcity of emission certificates and the difficulties of economic forecasting. The current financial and economic crisis – the severity of which had not been anticipated beforehand – generated a pronounced uncertainty about the stringency of allocation, as two thirds of the firms anticipating their allocation to be too low were actually long in 2008. This underlines the **difficulties for firms to properly assess emission levels in the course of unexpected economic developments**.

The project-based, flexible mechanisms (CER, ERU) have proven to be essential instruments for linking the EU ETS with other regions in the world. They open up a range of additional opportunities for the market participants while increasing the complexity of the system at the same time. Project risks, transaction costs and lengthy project development proce-

dures have so far impeded the full exploitation of these opportunities. **While the majority of firms is aware of the arbitrage possibilities between EUAs and CERs/ERUs, almost one quarter of the firms explicitly renounce the possibility to swap due to inherent risks and high transaction costs.** Consequently, arbitrage opportunities are used only if a compensating spread between 4 to 7 EUR/tCO₂ can be realised. Direct access to CERs via primary spot and forward markets seems to be an option only for a small fraction of larger companies (5 % and 14 % respectively). **Due to the higher risks and information asymmetries, intermediaries play a larger role in CER markets than in EUA trading.**

Given the considerable heterogeneity of CDM projects depending on the host country and concerning transaction costs, investment risks and national regulations, it is surprising that one quarter of the respondents (27 %) considers the host country to be of little relevance for their CDM investments. Roughly 40 % of German companies specify that the **CDM host country is important for the investment decisions.** The project type, however, is considered to be more relevant: almost 50 % of the companies consider the type of a CDM/JI project in their decision process. Again, uncertainty might play a role, as it has not yet been decided whether all currently approved project types will be creditable post-2012. Based on the new directive on the EU ETS the use of UN-backed emissions reduction projects may be restricted with respect to specific project types as well as to specific host countries after 2012. For CDM projects starting from 2013 a preferred status will be given to projects based in Least Developed Countries. The optimism about the future potential of projects based in Africa revealed by our survey could thus reflect the geographic priorities manifested in the EU climate package. In addition, the EU commission emphasises that credits from CDM and JI projects must guarantee sustainable development benefits as well as additional and permanent emission reductions. This could explain why the **highest priority is given to CDM/JI projects in the fields of “Renewable energy sources”, “Supply-side energy efficiency” and “Demand-side energy efficiency” which are certain to be accepted.**

When the EU ETS was established, the main goal was to create incentives for a cost-efficient reduction of CO₂ emissions. Leaving the trial phase behind and adapting to the tighter regulatory framework of the second trading period, effects on reduction activities are as yet relatively moderate. While 55 % of the companies have implemented CO₂ reduction measures in 2005–2007, currently one third of the companies has no plans for reduction activities at all. Additionally, 88 % of respondents stated that CO₂ reductions were only a side effect of the activities undertaken. Thus, when it comes to investment criteria emission reductions still seem to play a minor role given the current EUA price levels. However, it is to be expected that the influence of the carbon market on investment decisions will increase with

growing scarcity in the next trading period. Due to the successive reduction of the cap, respondents expect a significantly higher price of EUAs in the third trading phase in a range between 26 and 30 EUR/tCO₂. Thus, compared to current prices, companies' incentive for abatement measures might more than double.

After the first trial phase, which may be interpreted as a learning period, the majority of firms is now actively engaged in the carbon market. Sector and size, however, play an important role for the activity levels of a company. Being short of allowances in the first and (with a high probability) in the second trading period, **companies in the energy sector are currently most active in spot and forward markets for EUAs and CERs**. This does not only apply to secondary markets but also to the primary CER market. Across all sectors, three quarters of companies participate actively in carbon markets, yet **only a small minority (13 %) of mainly larger companies is trading on a regular basis**. Generally, larger firms are often engaged in more frequent trading activities, in primary markets of CER and ERU, and in swap activities. This may to some extent be explained by transaction costs, which impede market access for smaller firms. With increasing scarcity and rising EUA prices, it is to be expected that smaller firms will be required to participate more actively in the market as well.

These results with respect to the German carbon market indicate that in order to understand the EU ETS market development consideration of sector, size and allocation status of market participants is essential. Over the next years, the **KfW/ZEW CO₂ Panel** intends to provide such an analysis on a regular basis in order to improve the information basis for participants and stakeholders in the EU ETS and document market developments. Early next year, the 2010 edition of the **KfW/ZEW CO₂ Barometer** will analyse the impact of economic slow-down on German EU ETS companies and its implications for carbon markets as well as post-Copenhagen expectations. In the meantime, the **KfW/ZEW CO₂ Indicator** as a quarterly brief update will enable market participants to learn about most recent CO₂ price expectations and keep in touch with the latest developments in the CO₂ market.

8 References.

- Africa Partnership Forum (2008), Carbon Finance in Africa, 11th Meeting of the Africa Partnership Forum, Addis Ababa, Ethiopia, 17 –18 November 2008, <<http://www.oecd.org/dataoecd/63/16/41656313.pdf>> [Accessed 12 May 2009].
- BlueNext (2009), Historical spot prices for EUAs and CERs, Paris, <<http://www.bluenext.eu/>> [Accessed 2 April 2009].
- BMU (2006), Revidierter Nationaler Allokationsplan 2008–2012 für die Bundesrepublik Deutschland, Berlin.
- BMU (2007), Renewable Energy and the Clean Development Mechanism: Potential, Barriers and Ways Forward – A Guide for Policy-Makers, Berlin.
- BMU (2008), Die CDM/JI-Initiative des BMU: Für mehr Engagement in internationalen Klimaschutzinvestitionen, Berlin.
- Böhringer, C. and Löschel, A. (2008), Climate Policy Induced Investments in Developing Countries: The Implications of Investment Risks, *The World Economy*, 31 (3), pp. 367-392.
- Caisse des Dépôts (2009), Tendances Carbone, No. 35, April 2009, Paris.
- Carbon Trust (2009), Global Carbon Mechanisms: Emerging lessons and implications, March 2009, London.
- CITL (2009), Community Independent Transaction Log, European Commission, Brussels, <http://ec.europa.eu/environment/climat/emission/citl_en.htm> [Accessed 3 & 16 April 2009].
- Convery, F., De Perthuis, C., Ellermann, D. (2008), The European Carbon Market in Action: Lessons From the First Trading Period. Interim Report, Working Paper 0802, MIT CEEPR - Center for Energy and Environmental Policy Research, Cambridge.
- DEHSt (2008), Emissionshandel: Die Zuteilung von Emissionsberechtigungen in der Handelsperiode 2008–2012, Berlin.
- DEHSt (2009), Emissionshandel 2008-2012: Verteilung der Zertifikate für die zweite Handelsperiode, Berlin.

- DEHSt (2009a), Emissionshandel: Auswertung der ersten Handelsperiode 2005-2007, Berlin.
- DEHSt (2009b), Kohlendioxidemissionen der Emissionshandelspflichtigen Anlagen im Jahr 2008, Berlin.
- Dow Jones (2009), Dow Jones TradeNews Emissions, No. 7, Frankfurt.
- Ellermann, A.D. and Buchner, B.K. (2007), Over-Allocation or Abatement? A Preliminary Analysis of the EU ETS based on the 2005-2006 Emissions Data, Regulatory Policy Program Working Paper RPP-2007-03, Harvard University, Cambridge, MA.
- EU (2003), Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC, Brussels.
- EU (2004), Directive 2004/101/EC of the European Parliament and of the Council of 27 October 2004 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms, Brussels.
- EU (2007), Press Release IP/07/1869, Emissions trading: Commission Adopts Amendment Decision on the Slovak National Allocation Plan for 2008 to 2012, 7 December 2007, Brussels.
- EU (2008), Directive 2008/101/EC of the European Parliament and of the Council of 19 November 2008 amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community, Brussels.
- EU (2008a), Press Release MEMO/08/796, Questions and Answers on the Revised EU Emissions Trading System, 17 December 2008, Brussels.
- EU (2008b), Press Release IP/08/787, Emissions Trading: 2007 Verified Emissions from EU ETS Businesses, 23 May 2008, Brussels.
- EU (2009), Press Release IP/09/794, Emissions trading: EU ETS emissions fall 3% in 2008, Brussels.

- European Commission (2005), Further Guidance on Allocation Plans for the 2008 to 2012 Trading Period of the EU Emissions Trading Scheme, COM(2005) 703 final, Brussels.
- European Commission (2008a), Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading system of the Community, COM(2008) 30 final, Brussels.
- European Commission (2008b), Proposal for a Decision of the European Parliament and of the Council on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020, COM(2008) 17 final, Brussels.
- European Council (2008), Energy and Climate Change – Elements of the Final Compromise, 17215/08, Brussels.
- Green, G.A. (2008), A Quantitative Analysis of the Cost-effectiveness of Project Types in the CDM Pipeline, CD4CDM Working Paper Series No. 4, Roskilde.
- IPCC (2007), Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II, and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, R.K. Pachauri and A. Reisinger (eds), IPCC, Geneva.
- KfW (2005), KfW-Befragung zu den Hemmnissen und Erfolgsfaktoren von Energieeffizienz in Unternehmen, KfW Bankengruppe, Frankfurt/Main.
- Korppoo, A. and Moe, A. (2009), Economic Crisis: Boom or Bust for JI? Joint Implementation Quarterly, 15 (1), pp. 5.
- Kruger, J.K. and Pizer, W.A. (2004), Greenhouse gas trading in Europe: The grand new policy experiment, *Environment*, 46, pp. 8–23.
- McKinsey (2009), Kosten und Potenziale der Vermeidung von Treibhausgasen in Deutschland – Aktualisierte Energieszenarien und –sensitivitäten, McKinsey & Company, Duesseldorf.
- Nordseth, M., Buen, J., Lokshall, E. (2007), CER Market Dynamics, in: G. Hodes and S. Kamel (eds) Equal Exchange Determining a Fair Price for Carbon, UNEP Risoe Centre, Roskilde.

- Oleschak, R. and Springer, U. (2007), Measuring host country risks in CDM and JI projects: a composite indicator, *Climate Policy*, No. 7, pp. 470-487.
- Point Carbon (2009), *Carbon 2009 – Emission trading coming home*, E. Tvinnereim, K. Røine and C. Heimdal (eds), Oslo.
- Rickels, W., Duscha, V., Keller, A., Peterson, S. (2007), The determinants of allowance prices in the European Emissions Trading Scheme – Can we expect an efficient allowance market in 2008?, *Kiel Working Paper*, No. 1387, Institut für Weltwirtschaft, Kiel.
- Strunz, M. (2009), The Use of Credits from Flexible Mechanisms within the EU ETS, *WirtschaftsObserver online*, May, KfW Bankengruppe, Frankfurt/Main.
- Trotignon, R. and Delbosc, A. (2008), Allowance Trading Patterns during the EU ETS Trial Period: What does the CITL Reveal? *Climate Report*, No. 13, June 2008, Caisse des Dépôts, Paris.
- UN (1998), *The Kyoto Protocol*, United Nations, New York.
- UNEP Risoe (2009), *CDM/JI Pipeline Analysis and Database*, UNEP Risoe Centre, Roskilde, <<http://www.cdmpipeline.org/>> [Accessed 1 March 2009].
- UNFCCC (2008), *Annual Report of the Executive Board of the clean development mechanism to the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, Fourth Session, Poznan, 1-12 Dec 2008*, FCCC/KPCMP/2008/4, December 2008.
- World Bank (2008), *State and Trends of the Carbon Market 2008*, The World Bank Institute, Washington D.C.
- Zachmann, G. and von Hirschhausen, C. (2007), *First Evidence of Asymmetric Cost Pass-through of EU Emission Allowances: Examining Wholesale Electricity Prices in Germany*, DIW Working Paper 708, DIW, Berlin.

9 Glossary.

Annex I countries: Industrialised countries and transition economies that have agreed to legally binding commitments for the reduction of greenhouse gas emissions. A list of Annex I countries is available at:

http://unfccc.int/essential_background/convention/background/items/1346.php.

Annex II countries: Annex II countries are the subset of Annex I countries that have agreed to financially support developing countries in their efforts to reduce CO₂ emissions. A list of these countries is available at:

http://unfccc.int/essential_background/convention/background/items/1348.php.

Annex B countries: Annex B countries are countries for which individual target levels are listed within the Annex B of the Kyoto Protocol. A list of these countries is available at: <http://unfccc.int/resource/docs/convkp/kpeng.pdf>.

Caps: The emissions cap is the limit on the amount of greenhouse gases an installation or a country is allowed to emit. The cap for the first trading phase of the EU Emissions Trading Scheme (EU ETS) limited the amount of greenhouse gases that were allowed to be emitted from 2005–2007. The cap for the second trading phase of the EU ETS limits the amount of greenhouse gases that can be emitted from 2008–2012.

Certified Emission Reduction (CER): Climate credits which are issued for emission reductions attained by Clean Development Mechanism (CDM) projects. One CER is equivalent to the reduction of 1 tCO₂e. Primary CERs are obtained from the owner of the carbon asset. Secondary CERs are bought from someone who is not the original issuer, either on the exchange or over-the-counter (OTC).

Clean Development Mechanism (CDM): Project-based mechanism under the Kyoto Protocol. The Clean Development Mechanism allows states and companies to acquire Certified Emission Reductions (CERs) through emission reduction projects in developing and transition countries without facing own emission reduction obligations. The CERs can be used to comply with Kyoto Protocol obligations (Article 12 Kyoto Protocol). For an up to date overview of the CDM-pipeline see <http://www.cdmpipeline.org/cers.htm>.

CO₂-Equivalence (CO₂e): A measure for comparing the global warming potential of different greenhouse gases, using carbon dioxide as a reference. The measure functions as a unit for comparing different greenhouse gases.

Community Independent Transaction Log (CITL): The CITL connects all national registries of EU Member States. It monitors, registers, and validates all greenhouse gas emissions trading transactions between EU Member States. The Community Independent Transaction Log also includes the national allocation tables for all EU Member States. See <http://ec.europa.eu/environment/ets/> for further information.

Deutsche Emissionshandelsstelle (DEHSt): Based in the German Federal Environment Agency, the Deutsche Emissionshandelsstelle is the national authority in charge of implementing of the market-based mechanisms of the Kyoto Protocol: emissions trading and the project-based Clean Development Mechanism and Joint Implementation. For further information see <http://www.dehst.de/>.

Emission Reduction Unit (ERU): Emission Reduction Units are issued by projects under Joint Implementation. ERUs are sold by countries with binding emission targets (Annex I countries) once they have reduced their emissions below the level of allowances. They are bought by other Annex I countries and can be used as compliance tools within the EU Emissions Trading Scheme (EU ETS). One ERU corresponds to 1 tCO₂e.

EU Allowance (EUA): EU Emission Allowances are issued to installations which have a cap on their emissions under the EU Emissions Trading Scheme (EU ETS). An installation must hold and surrender EU Allowances and/or project based carbon credits equal to its monitored carbon dioxide emissions by the annual EU ETS reconciliation date. EU Allowances are also the main unit which is traded in the EU ETS. One EU Emission Allowance = 1 tCO₂e (CO₂ equivalent)

EU Emissions Trading Scheme (EU ETS): The European Union's Emissions Trading Scheme commenced operation in January 2005 as a mechanism of the Kyoto Protocol. The first phase of the scheme ran from 2005–2007. The second trading phase runs from 2008–2012, coinciding with the Kyoto Protocol commitment period. Next to EU Allowances (EUAs), Kyoto flexible mechanism certificates (Certified Emission Reductions and Emission Reduction Units) are accepted as compliance tools within the EU ETS.

European Climate Exchange (ECX): The European Climate Exchange is the leading marketplace for trading CO₂ emissions in Europe. While EU Allowances (EUAs) have been traded on the ECX since April 2005, futures and options on Certified Emission Reductions (CER) were introduced in 2008. Other marketplaces for trading greenhouse gas emissions are the European Energy Exchange (EEX), BlueNEXT, Nord Pool, and Energy Exchange Austria (EXAA).

European Energy Exchange (EEX): Based in Leipzig, the European Energy Exchange provides a spot and derivatives market for products such as power, natural gas, coal, and CO₂ emissions. The EEX is the most influential energy exchange in continental Europe. It was created as a result of the merger between the Leipzig Power Exchange and the Frankfurt-based European Energy Exchange in 2002.

Executive Board (EB): The Executive Board supervises the Clean Development Mechanism (CDM). The representatives of the Executive Board are elected by countries party to the Kyoto Protocol. It accredits CDM projects and decides how they are regulated. Besides maintaining the approved methodologies and procedures, the Board may approve new baseline and monitoring methodologies.

Hydrofluorocarbon (HFC): Hydrofluorocarbon is one of six greenhouse gases covered by the Kyoto Protocol. It is emitted by industrial manufacturing. While Hydrofluorocarbons do not significantly deplete the stratospheric ozone layer, they are powerful greenhouse gases with global warming potentials. Under the Kyoto Protocol these potentials are measured in CO₂ equivalence. Hydrofluorocarbon-23, for instance, has around 12,000 times the warming potential of carbon dioxide over 100 years.

Intergovernmental Panel on Climate Change (IPCC): Intergovernmental body which provides information on climate change by assessing the latest scientific, technical, and socio-economic literature relevant for understanding the risk of human-induced climate change. The reports of the IPCC have a strong influence on the negotiations under the United Nations Framework Convention on Climate Change (UNFCCC). For further information see <http://www.ipcc.ch/>.

International Transaction Log (ITL): Administrated by the United Nations Framework Convention on Climate Change (UNFCCC), the ITL links national registries to Clean Development Mechanism (CDM) and Joint Implementation (JI) registries. The ITL verifies transactions proposed by the individual registries in order to ensure consistency with

Kyoto Protocol rules. The ITL was launched in 2007. For further information see http://unfccc.int/kyoto_protocol/registry_systems/itl/items/4065.php.

Joint Implementation (JI): Project-based mechanism under the Kyoto Protocol by which countries with binding emission targets (Annex I countries) obtain credits (Emission Reduction Units) for investing in emission reduction projects in other Annex I countries.

Joint Implementation Supervisory Committee (JISC): UN-supervisory committee for Joint Implementation (JI) projects. The responsibilities of the JISC include verification of ERUs generated by JI projects, accrediting independent verification institutions at the national level and recommending revisions to JI guidelines to the Supreme Body of the Kyoto Protocol. For further information see http://ji.unfccc.int/Sup_Committee/index.html.

Kyoto Protocol: In 1997, the protocol was adopted at the Third Conference of the United Nations Framework Convention on Climate Change in Kyoto, Japan. It entered into force on 16 February 2005 and constitutes the first worldwide binding agreement aimed at reducing greenhouse gas emissions. The Kyoto Protocol requires Annex B countries to reduce greenhouse gas emissions, on average, by 5% from 2008–2012 compared to 1990 levels. The European Union committed itself to a reduction of 8%. Three so called flexible mechanisms can be used within the context of the Kyoto Protocol: emissions trading and the project based mechanisms Joint Implementation and Clean Development Mechanism. For further information see http://unfccc.int/kyoto_protocol/items/2830.php.

National Allocation Plan (NAP): In the first two trading periods of the EU Emissions Trading Scheme (EU ETS), each Member State is obliged to develop a National Allocation Plan which establishes the emissions target for the specified period. National Allocation Plans decide on the allocation of emission allowances across sectors and covered installations. A NAP furthermore sets limits to the usage of Certified Emission Reductions and Emission Reduction Units, decides on the allocation mechanism, and contains information on the new entrants reserve. Each NAP is subject to the approval by the European Commission.

Over-the-counter (OTC): Over-the-counter trading occurs outside the stock exchange. The bulk of trading in the EU Emissions Trading Scheme (ETS) occurred in the brokered

over-the-counter market. To strike OTC deals, traders negotiate directly with one another on a bilateral basis.

Perfluorocarbon (PFC): One of six greenhouse gases covered by the Kyoto Protocol. Perfluorocarbons are emitted as by-products of industrial processes, for instance during the production of aluminium, and used in manufacturing. Under the Kyoto Protocol regulations the emissions of Perfluorocarbons are measured in CO₂ equivalence.

United Nations Framework Convention on Climate Change (UNFCCC): The Convention provides a framework for intergovernmental efforts to tackle climate change. The convention was established at the Rio Earth Summit in 1992 and has been ratified by 192 countries. Its aim is to avoid man-made interference with the climate system. For further information see <http://unfccc.int>.

Verified Emissions Table (VET): The VET contains the number of Verified Emissions that have been entered onto the system for a particular installation for a particular year. The verified emissions of the installations under the European Emissions Trading Scheme (EU ETS) may be found in the Community Independent Transaction Log (CITL, <http://ec.europa.eu/environment/ets/>) or in the national registers (for Germany, see www.register.dehst.de).