»» CO_2 Barometer 2014 – Carbon Edition

New Phase, Old Problems

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KfW/ZEW CO_2 Barometer 2014 – Carbon Edition

New Phase, Old Problems

1. Executive Summary

Since 2009, the KfW/ZEW CO_2 Barometer has been monitoring and analysing the situation of German companies regulated under the European Union Emissions Trading System (EU ETS) on an annual basis. Developed as a cooperative project of KfW Group and the Centre for European Economic Research (ZEW), the study's objective is to closely monitor firm behaviour in carbon markets in order to regularly provide detailed information to policymakers, businesses and the research community. The most recent survey conducted in 2014 addresses a broad spectrum of topics related to company behaviour in carbon markets such as expectations regarding carbon and commodity prices, carbon trading strategies, abatement activities and the regulatory framework. This year's survey covers an eventful and important period. 2013 marked the start of the third phase of the EU ETS that brought significant changes. In addition, the European Commission introduced backloading as an instrument to cope with the oversupply of allowances. The main findings of the KfW/ZEW CO_2 Barometer 2014 – Carbon Edition are:

- Despite the ongoing difficulties in international climate negotiations, national and regional initiatives to price carbon dioxide emissions are planned or have already come into existence. In 2013, the EU ETS was still by far the largest carbon market. However, the market for European Union Emission Allowances (EUAs) was characterised by persistently low prices due to the substantial oversupply of emission allowances.
- With the start of the third trading period of the EU ETS in 2013, several novelties were introduced. Driven by the scope extension, the number of regulated installations and verified emissions increased substantially. Due to the decrease in freely allocated emission allowances, the verified emissions exceeded the freely allocated allowances in most of the activities.
- As in the previous years, the surveyed companies revised their expectations for future EUA prices further downwards. The average price expectations adjusted for inflation for December 2015 and December 2020 are approximately EUR 8 and EUR 13 per tCO_2, respectively. Surveyed firms see the regulatory framework and energy prices as the most important factors that determine EUA price development.
- The number of companies actively participating in the carbon market has increased continuously since 2009. In 2013, more than two thirds of all surveyed companies were trading emission allowances or credits. We identified two essential reasons that prevent firms from actively participating in the carbon market: possession of a sufficiently large amount of freely allocated emission allowances and regulatory constraints on speculations.
- Most of the surveyed companies have already intervened in the production process or invested in order to reduce their CO_2 emissions. Nevertheless, we find that the reduction of carbon emissions remains a side effect in most cases. Asked about how high the carbon price has to be in order to create incentives for abatement measures, respondents reported on average a threshold price of around EUR 32 per tCO_2. This is in the range of the European Union's (EU) estimation of an ef-

fective carbon price prior to the implementation of the EU ETS in 2005, but still above the carbon prices expected by companies – even in the long run.

- The EU ETS plays only a subordinate role in the companies' further strategic considerations such as production process and the location decision. Instead, most of the surveyed companies reported that energy costs are a determining factor for the economic efficiency of their production process and their strategic location decision.
- Most of the surveyed companies expect a binding greenhouse gas (GHG) emissions target for 2030. However, companies that expect a binding target believe that this will be rather moderate and unambitious. No substantial reinforcements of existing policy frameworks are expected, and the expected targets may not force companies to give additional impetus to dedicated carbon abatement investments.

Within the framework of the KfW/ZEW CO_2 Barometer, all German firms regulated under the EU ETS – about 800 – have been invited to participate in the survey every year since 2009. Approximately 30 % of the firms operate more than one regulated installation. In order to avoid contacting a firm multiple times, only one responsible manager per firm is surveyed. On average, approximately 20 % of the companies have responded to the questionnaire per year. Firm behaviour in carbon markets is analysed considering firm size, sector affiliation and allocation status. Therefore, current emission data from the Community Independent Transaction Log (CITL) and the European Union Transaction Log (EUTL) were aggregated and merged with the responses of the participating companies.

The KfW/ZEW CO_2 Barometer 2014 – Carbon Edition is structured as follows: A brief review of the recent market developments is given in section 2. Section 3 shortly describes the development of CO_2 emissions in the EU and especially in Germany. Respondents' expectations concerning the carbon price are analysed in section 4. Section 5 explores how German companies behave in the carbon market. Companies' carbon abatement strategies are outlined in section 6. Section 7 investigates the impact of climate policy regulations on the competitiveness of regulated companies. Finally, possible developments of the EU ETS after 2020 are discussed in section 8. Section 9 offers a conclusion.

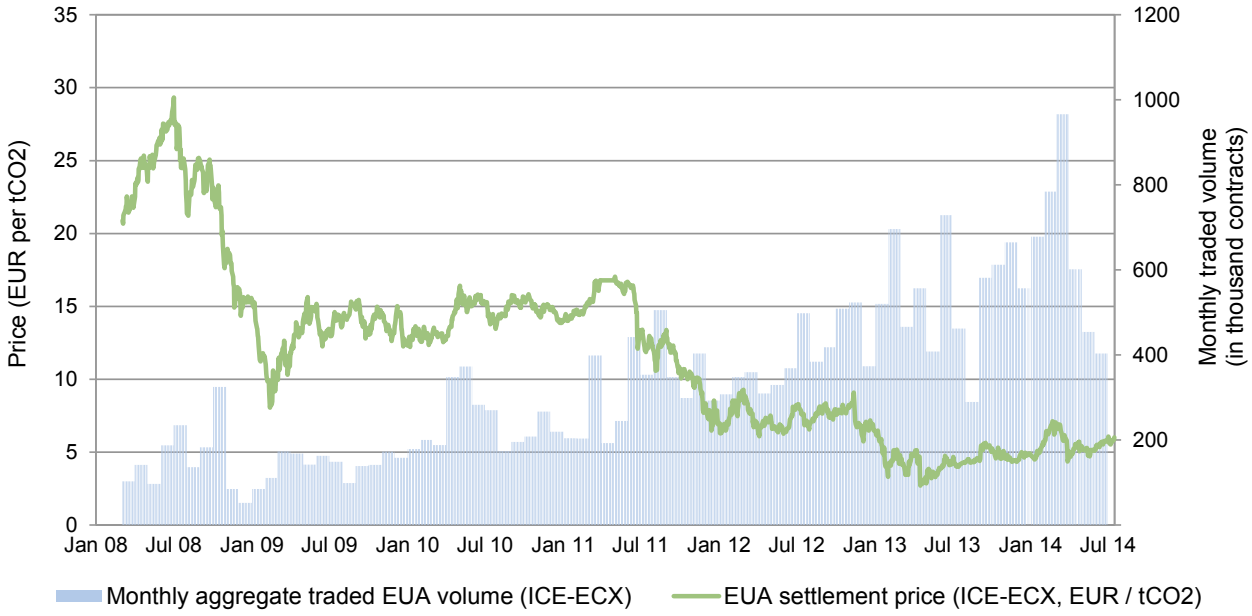
2. Recent Market Developments

The member states of the United Nations Framework Convention for Climate Change (UNFCCC) have agreed to complete negotiations on a new globally binding climate change treaty to take effect in 2020. Progress thus far can be classified as modest. However, despite the ongoing difficulties in international climate negotiations, sub-national, national and regional climate change policies are planned or have already come into existence. All in all, about 40 countries and 20 sub-regions now put a price on carbon by means of a carbon tax or an emissions trading scheme and regulate approximately 12 % of annual global GHG emissions. This corresponds to around 6 $GtCO_2$ emissions and this trend is growing. Among these, 17 emissions trading schemes have been implemented, another 11 schemes are under consideration and eight new carbon markets opened in 2013 alone. Furthermore, carbon pricing instruments can be found in different parts of the world, spanning from North and South America across Europe into Thailand, China and New Zealand. These systems differ substantially in the pricing method, their scope of covered industries, emissions, and finally the price per tCO_2. Prices range from under EUR $0.75/tCO_2$ in the Mexican up to EUR $124.5/tCO_2$ in the Swedish carbon tax system. The majority of prices in carbon tax systems are below EUR $26/tCO_2$. In contrast, prices in existing emission trading schemes are clustering below EUR $9/tCO_2$. Notable is the Tokyo Cap-and-Trade programme with a price of around EUR $70/tCO_2$, which is fourteen times higher than the current carbon price in the EU ETS (World Bank, Ecofys 2014)[1].

With approximately 2,084 million tCO_2 emissions regulated, the EU ETS is by far the largest carbon market. The recent developments in the European carbon market illustrate the vulnerability of the price signal provided by emissions trading schemes to unexpected changes in general economic conditions. A constantly low carbon price might affect incentives to invest in low-carbon technologies and thus might deter the dynamic efficiency of the emissions trading scheme in place. The economic downturn in the EU together with the extensive use of emission credits for compliance under the EU ETS caused a substantial oversupply – corresponding to more than the volume needed for one year – of emission allowances in the European carbon market. The cumulative surplus of emission allowances grew steadily over the last year. In the 2013 compliance year, the overall surplus of allowances adds up to approximately 2,100 million tCO_2 from 2,000 million certificates in 2012 and 950 million in 2011 (EC 2014a). This persistent oversupply of emission allowances in the EU carbon market is reflected by a constant and low EUA price in the last year (cf. Figure 1). In early 2013, the CO_2 price dropped to its all-time low of EUR $2.84/tCO_2$. The price has slightly recovered and stabilised at about EUR $5/tCO_2$ afterwards. The persistently low EUA price gives rise to concerns that the EUA price is too low to stimulate low-carbon investments. Therefore, the European Commission launched the “backloading” proposal in 2012, i. e. to postpone the auctioning of 900 million EUAs from the beginning to the end of the third trading period in order to increase the carbon price and to improve the price signal (EC 2012a). In 2013, the backloading proposal faced several delays and was finally implemented in February 2014. 400 million allowances will be held back from auctions in 2014, 300 million in 2015 and 200 million in 2016. In 2019 and 2020, 300 million and 600 million EUAs will be fed back into the carbon market (EC 2014b). The backloading decision led to a rising CO_2 price, which reached the highest level since December 2012 on 21st February 2014 (EUR $7.11/tCO_2$),

[1] Carbon prices converted into EUR at an exchange rate of US$ 1.35: EUR 1.

actually a few days before the final decision was made. This positive effect did not last for long, and in May 2014 the average EUA price returned to EUR 5.09 / tCO_2. A more ambitious mechanism was proposed by the European Commission in January 2014 aiming to guarantee permanent price stabilisation in the European carbon market. They suggested introducing a market stability reserve in the fourth trading period commencing in 2021 in order to enable the EU ETS to better cope with unexpected economic shocks (EC 2014c).[2]



Source: Thomson Reuter Datastream

Figure 1: EUA price and trading volumes (January 2008–July 2014)

In contrast to prices, trading volumes continue to increase over time in the European carbon market. One reason for the increasing trading volumes could be the positive trend in the number of companies actively participating in the carbon market that has been observed over a number of years.[3] In 2013, an average of approximately 25,750 futures contracts were traded per day at the Intercontinental Exchange (ICE), a 40 % increase on 2012 volumes (18,300 contracts per day). The increase becomes even clearer when 2013 volumes are matched against trading volumes of 2011, as trading of EUAs has grown by more than 70 % since then (15,100 contracts per day). The positive trend in trading volumes has continued in 2014 with up to 33,800 traded futures per day at the ICE in the Jan to May 14 period. The monthly aggregate of traded contracts reached its peak in March 2014, when 966,440 contracts were traded. The reduction of freely allocated emission allowances and the higher proportion of allocations via auctioning might have triggered this increase in trading volumes.

[2] A more detailed discussion on the proposed market stability reserve is provided in section 8.

[3] More details concerning companies' emission allowance trading behavior are provided in section 5.

3. CO_2 Emissions in Europe and Germany

In 2013, phase three of the EU ETS started, covering more than 12,000 stationary installations, i. e. manufacturing industries and power plants, in the 28 EU member states, Iceland, Norway and Liechtenstein. The verified emissions of GHGs from these stationary installations added up to approximately 1,895 million tons of CO_2-equivalent in 2013 (EC 2014a). With the start of the third trading period, several novelties were introduced: the extension of the scope to include Croatia as well as new sectors and gases, the introduction of a single EU-wide cap instead of former nationwide caps and the implementation of auctioning as the default method for allocating emission allowances. More precisely, instead of allocating allowances freely, more than 40 % of all allowances were distributed by auctioning in 2013, and this share will rise each year. Moreover, the allocation of allowances still being given away for free is now based on EU-wide benchmarks of emission performance rather than focusing on historical emissions. The scope extension of the EU ETS had two dimensions. First, additional GHGs, namely N_2O emissions from the production of nitric, adipic and glyocalic acid and perfluorocarbons from aluminium production, are regulated. Second, the type of installations covered is extended towards those producing bulk organic chemicals, hydrogen, ammonia and aluminium (DEHSt 2014).

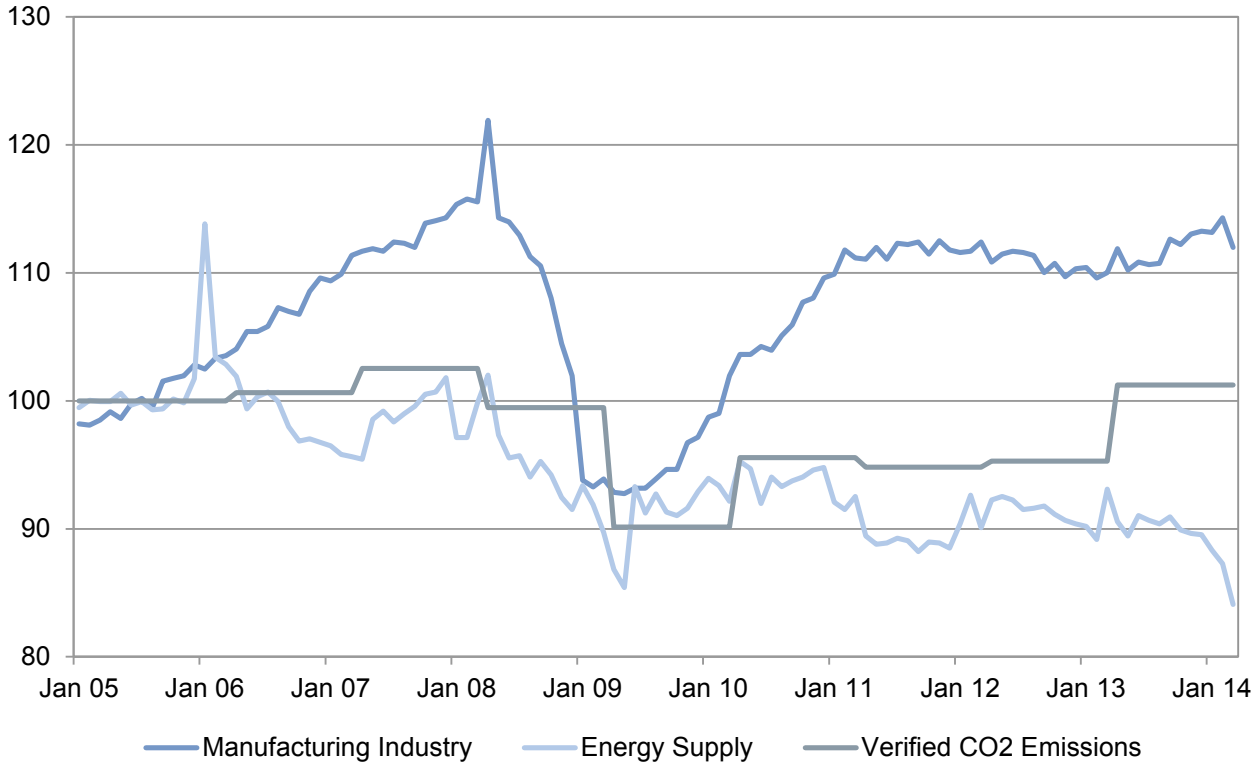
In Germany, 1,929 installations were regulated by the EU ETS in 2013. Driven by the scope extension, around 400 installations entered the carbon market, the remaining approximately 1,500 installations had already been regulated in the second phase of the EU ETS. Due to the increase of regulated installations in Germany, verified emissions increased considerably. The EU ETS-regulated installations in Germany released a total amount of 480.9 million tCO_2, which corresponds to an increase of approximately 6.3 % compared to the verified emissions in 2012 (cf. Table 1). Verified emissions of German installations in sectors included in the second and third phase of the EU ETS increased by only around 1 % from 2012 to 2013 (DEHSt 2014). Production indices of the manufacturing industry and the electricity sector normally are good indicators for the development of verified emissions. As the increase in the amount of verified emissions is largely due to the exogenous change in the scope of the EU ETS, a dampening effect of general economic activity can be derived, if at all, on the level of overall carbon emissions in Germany (cf. Figure 2).

Table 1: Verified emissions and the EU ETS emission cap in Germany

	2005	2006	2007	2008	2009	2010	2011	2012	2013*
Verified emissions (Mio. tCO_2)	475.0	478.1	487.2	472.6	428.3	454.9	450.4	452.6	480.9
Change on the previous year		+0.6 %	+1.9 %	-3.0 %	-9.4 %	+6.2 %	+1.0 %	+0.5 %	+6.3 %

* Includes verified emissions of newly regulated installations after scope extension in 2013.

Source: DEHSt (2014)



Source: Destatis (2014), DEHSt (2014)

Figure 2: Industrial production, power supply and verified emissions in Germany (2005=100)

With a share of nearly three-quarters (74.1 %) of overall emissions, the energy sector has by far the largest share of verified emissions. The amount of verified emissions increased by 2.3 % for large-scale combustion installations compared to the previous year. This stands in contrast to the decreasing energy supply and can be explained by the rise in coal use for electricity generation (DEHSt 2014). Emissions from the production of chemicals, non-ferrous metals, gypsum and other combustions, which use ammonia, are regulated in the third trading period for the first time. These newly regulated installations amount to a share of total emissions of 3.3 %. Additional installations are for example also regulated in the sectors of ceramics, ferrous metal and pulp and paper production. The increase in regulated installations in these sectors explains the observed leap in verified emissions in 2013. In contrast to 2012, when verified emissions decreased in most sectors, in 2013, the cement and the propylene, ethylene and carbon black sectors were the only sectors that reduced their verified emissions by 4.3 % and 2.9 % respectively.

Table 2: Sector development of verified emissions in Germany in 2013

Type of activity	Verified emissions in $ktCO_2$	Share of overall emissions	Change on the previous year°	Long- / short position** in $ktCO_2$	Number of plants
Large-scale combustion installations (> 50 MW FWL*)	349,917	72.8 %	+2.3 %	-321,625	490
Iron / steel / coke ovens	35,741	7.4 %	+14.2 %	+15,656	130
Refineries	26,097	5.4 %	+5.8 %	-5,028	24
Cement	19,012	4 %	-4.3 %	-288	37
Lime	9,348	1.9 %	0 %	-1,470	67
Small-scale combustion installations (20–50 MW FWL*)	6,142	1.3 %	+2.8 %	-1,493	447
Other combustion+	618	0.1 %	-	+27	45
Propylene, ethylene and carbon black	5,774	1.2 %	-2.9 %	-534	15
Gypsum+	268	0.1 %	-	-16	9
Chemicals+	12,333	2.6 %	-	+2,861	176
Pulp / paper	5,542	1.2 %	+0.3 %	+1,503	151
Glass	4,062	0.8 %	+3.5 %	-646	91
Non-ferrous metals+	2,421	0.5 %	-	+45	37
Main engines / turbines	1,530	0.3 %	+14.4 %	-372	55
Ceramics	2,132	0.4 %	+60.4 %	-142	155
Total	480,937	100 %	+6.3 %++	-311,522	1,929

° Changes include additional verified emissions due to the scope extension * Rated thermal input ** incl. redistribution for byproduct gases (blast furnace gas) + regulated since 2013, no change computable. ++ weighted average, including newly regulated installations

Source: DEHSt (2014)

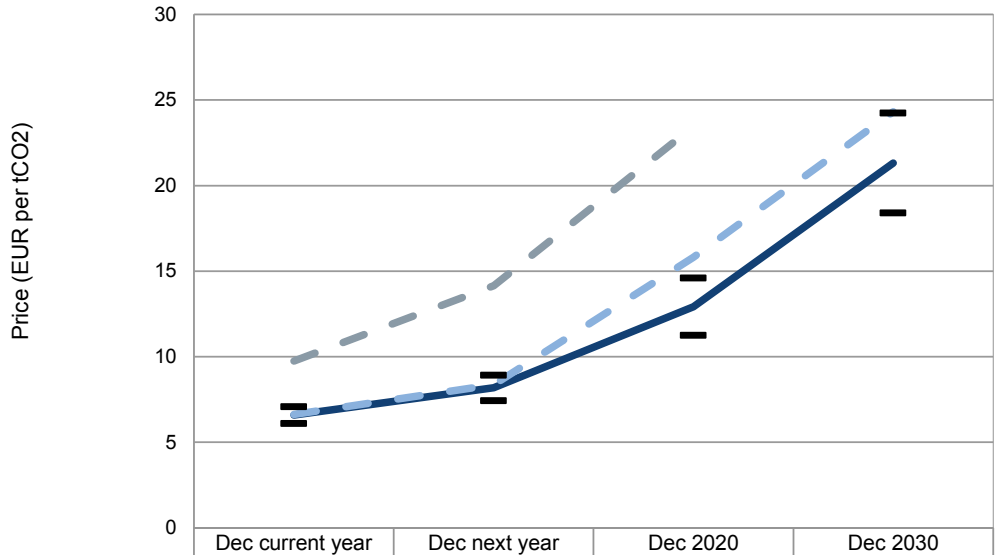
As auctioning is now the default method for allocating emission allowances, the amount of freely distributed EUAs decreased significantly from the end of the second phase of the EU ETS in 2012 to the start of the third phase in 2013. In 2013, the EU ETS regulated companies received a total of 169 million EUAs for free. This corresponds to a decrease of approximately 60 % compared to the amount of freely allocated EUAs in 2012. In addition to the 169 million freely allocated EUAs, 194 million emission allowances were auctioned (DEHSt 2014). Prior to this change, the amount of allocated EUAs exceeded the amount of reported emissions for all sectors, except for large-scale combustion installations. Large scale combustion installations are now short 321.6 million tCO_2 emissions, which is five times the amount in 2012 (-62.9 million tCO_2). For installations that are newly regulated the amount of allocated emissions in most cases exceeds their reported emissions.

4. Expectations and Determinants in the European Carbon Market

In 2013, the EUA price fluctuated around EUR 5 per tCO_2 and did not recover from its strong decline in late 2012. The backloading decision caused a slight upward movement in early 2014. However, this development was not sustainable and the EUA price returned to a level of EUR 5 (cf. Figure 1). The expectations presented in the following section were surveyed shortly after the upward movement reversed.

As in the previous year, the surveyed companies revised their expectations for future EUA prices downwards. On average, they expect the EUA price to gently increase to EUR 6.59 in December 2014 (cf. Figure 3). Furthermore, they expect an average price adjusted for inflation of about EUR 8.18 in December 2015. The 95 % confidence intervals tend to be narrow in the short term, indicating that there is some consensus about the expected development of the EUA price within the next year. Similar to the results of the last surveys, firms expect the EUA price to rise in the medium and long term. However, they also corrected these expectations downwards. Last year, they expected the EUA price to be EUR 15.82 in 2020 and EUR 24.31 in 2030. In this year's survey, the firms assume the price to be EUR 12.93 in 2020 and EUR 21.32 in 2030, respectively. The 95 % confidence intervals for the medium and long term show that the surveyed companies do not expect the price to be above EUR 15 in December 2020 and EUR 25 in December 2030.

Note: In 2012, participating firms have not been asked about their price expectations for 2030.



	Dec current year	Dec next year	Dec 2020	Dec 2030
Lower Conf. Int. (95 %)	6.10	7.44	11.26	18.40
Price Expectations 2014	6.59	8.18	12.93	21.32
Upper Conf. Int. (95 %)	7.08	8.93	14.60	24.24
Price Expectations derived in 2013	6.62	8.36	15.82	24.31
Price Expectations derived in 2012	9.75	14.14	23.45	

Note: In 2012, participating firms have not been asked about their price expectations for 2030.

Source: KfW/ZEW CO_2 Barometer 2014 – Carbon Edition

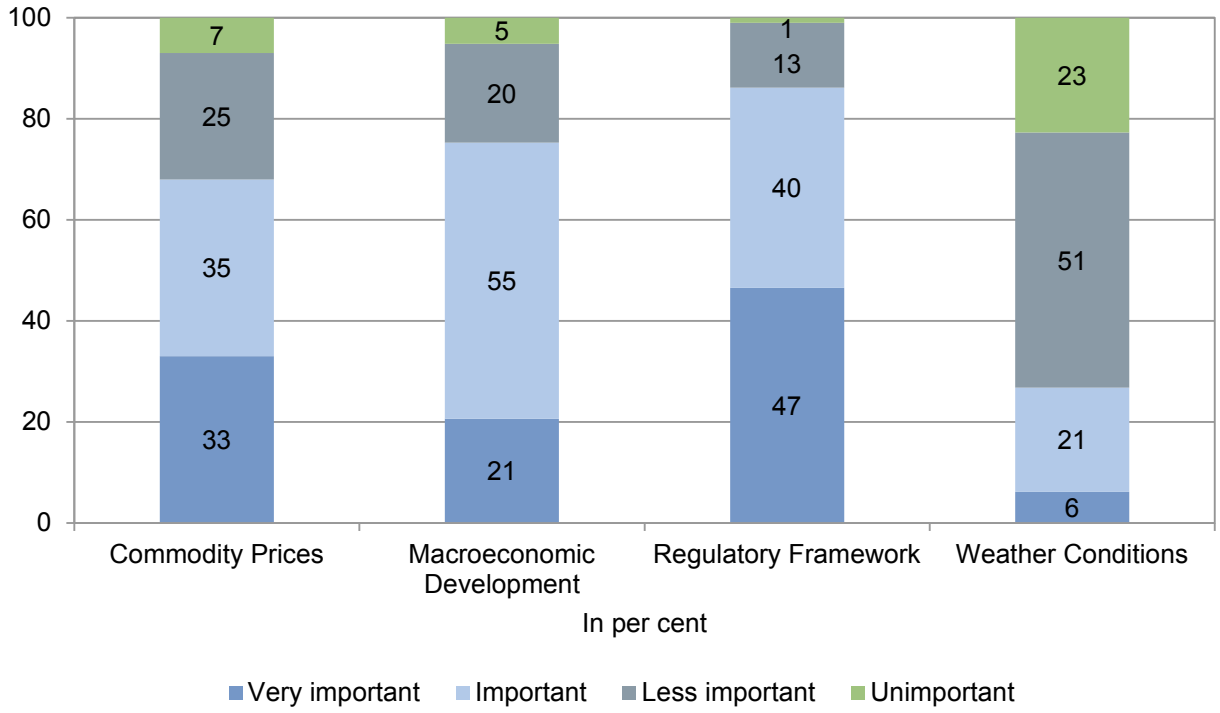
Figure 3: Price expectations for EUAs (inflation adjusted)

In the survey of the KfW/ZEW CO_2 Barometer 2014, the participating firms were asked to evaluate the impact of the following factors on the EUA price: (i) regulatory framework, (ii) commodity prices,

(iii) macroeconomic development in the EU, (iv) weather conditions in the EU and (iv) others. As indicated by Figure 4, the regulatory framework is the most important EUA price determinant. The regulatory framework of the EU ETS directly determines the EUA price. Changes in supply of EUAs or in the allocation mechanism influence the level of the EUA price. However, climate- and energy policy instruments other than the EU ETS can also impact on the EUA price. As shown by Flues et al. (2014), policies that support renewable energy, such as feed-in tariffs, indirectly influence the EUA price by lowering demand for EUAs. This kind of overlapping regulation tends to lower EUA prices and increases their volatility and dependency on other factors.

Besides the regulatory framework, the surveyed firms see absolute and relative commodity prices as an important factor that determines the EUA price development. The link between EUA prices and prices for energy commodities exists mainly because energy carriers are substituted in the energy supply and some industries covered by the EU ETS have the ability to switch between various fuels in their production process. Increasing prices for gas and oil with coal prices constant, for example, will lead to an increasing demand for coal and therefore an increasing demand for EUAs (Lutz et al. 2013).

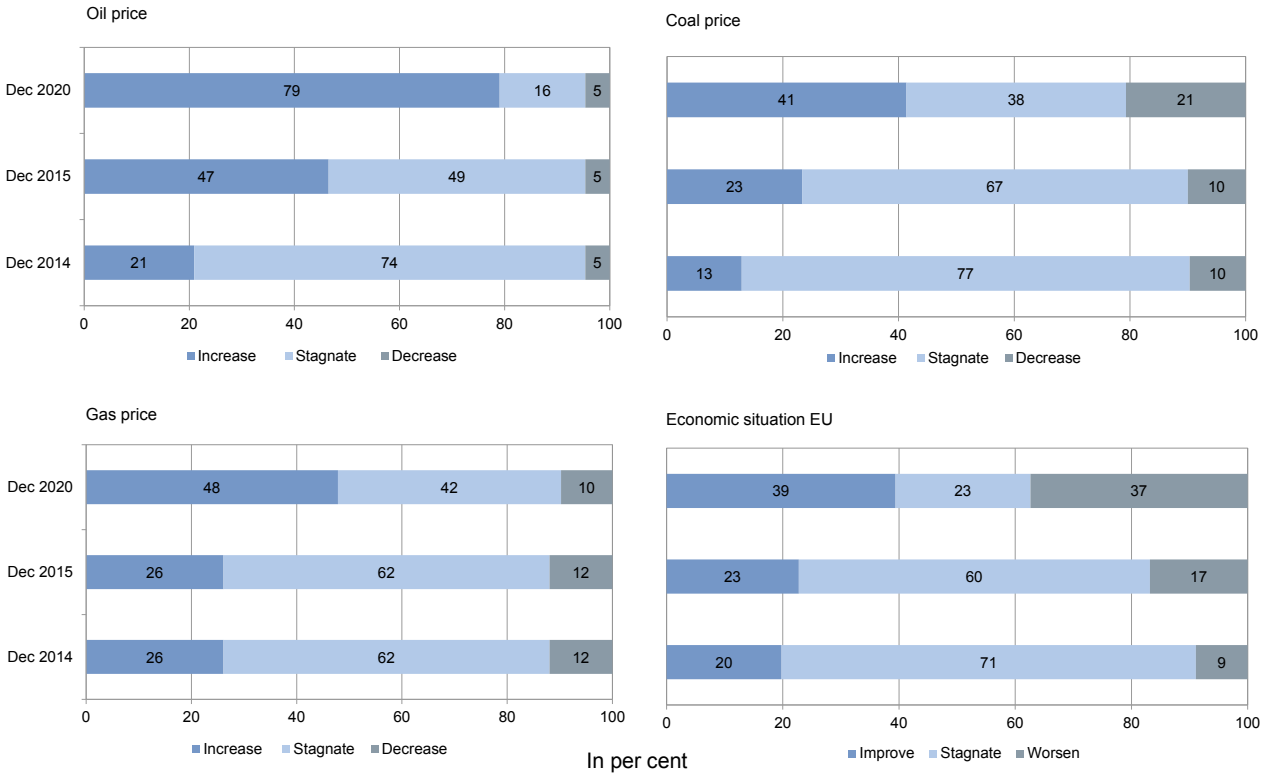
The descriptive statistics in Figure 4 show that macroeconomic development also determines the level of demand for EUAs and therefore its price development. Nevertheless, while expectations of market participants may change over time, so can the impact of determinants of EUA prices (Lutz et al. 2013). Currently, market participants expect the regulatory framework to be most important (cf. Figure 4). Hence, the impact of other factors might be masked by, for example, announcements regarding the future design of the EU ETS or the design of the new climate treaty.



Source: KfW/ZEW CO_2 Barometer 2014 – Carbon Edition

Figure 4: What are the most important factors that influence the EUA price?

Turning toward the firms' expectations of future macroeconomic development in the EU and the development of fossil fuel prices, it becomes clear that they expect no significant change until late 2015. The majority of the surveyed firms expect macroeconomic development in the EU to stagnate in the short-term (cf. Figure 5). Regarding medium-term development until 2020, the picture is less clear. A majority of 39 % expects economic conditions to improve while a similarly high share of about 37 % expects economic conditions to worsen. A smaller proportion of 23 % expects macroeconomic development to stagnate by 2020. Regarding the development of fossil fuels, a small share of firms expect prices to rise in the short-term while the majority of firms expect prices to stagnate (cf. Figure 5). For 2020, however, the ratio changes and the majority of firms expect prices to increase. This applies particularly to oil prices in 2020.



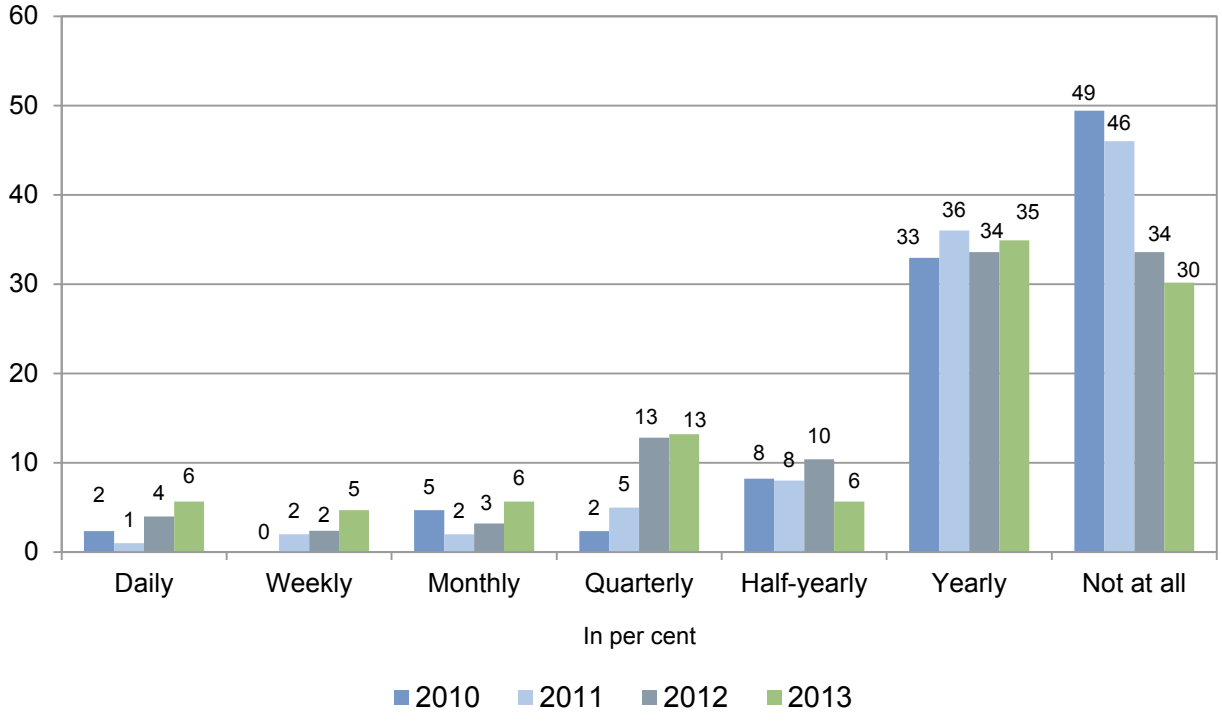
Source: KfW/ZEW CO_2 Barometer 2014 – Carbon Edition

Figure 5: How would you assess the development of energy prices and of the macroeconomic situation in the EU?

5. Trading of Emission Allowances and Credits

The results of the current survey show that the number of companies actively participating in the carbon market has increased continuously over the last years. More precisely, in 2010 only about half (51 %) of all surveyed companies stated that they had been trading emission allowances or credits over the past year (EUAs, Certified Emission Reductions (CERs) or Emission Reduction Units (ERUs)). In this year's survey, more than two thirds (70 %) of all respondents have been trading emission allowances or credits since February 2013. One possible explanation for the increased trading activities could be the reduction of freely allocated emission allowances and the higher share of allocations via auctioning. This trend can be assessed as positive, since liquidity in the market is an important condition for the cost-effectiveness of cap-and-trade systems.

Nevertheless, a considerable amount of 30 % of all surveyed firms still was not active in the carbon market. Additionally, most of the active firms trade emission allowances or credits only infrequently. Half of the firms that stated being active in the market only trade on a yearly basis, while less than 25 % of all active respondents trade emission allowances or credits more than once a month (cf. Figure 6).

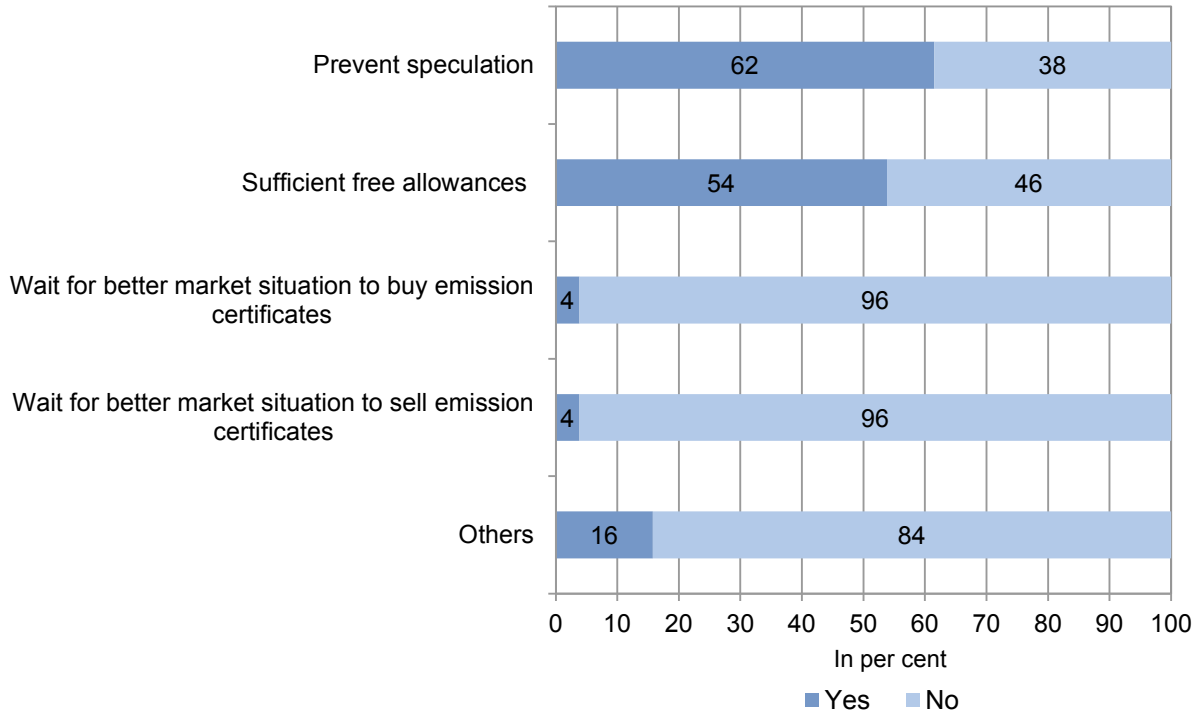


Source: KfW/ZEW CO_2 Barometer 2011, 2012, 2013, 2014

Figure 6: How often has your company traded emissions allowances (EUAs, CERs or ERUs) over the last year?

According to our survey, we identified two essential reasons that prevent companies from actively participating in the carbon market: possession of a sufficiently large amount of freely allocated emission allowances and regulatory constraints on speculations. With more than 60 % agreement, the most frequently stated reason for companies to remain inactive in the carbon market was the prevention of speculations. These companies argue that they do not want to be involved in transactions which they regard as speculative business or actions not belonging to their core business

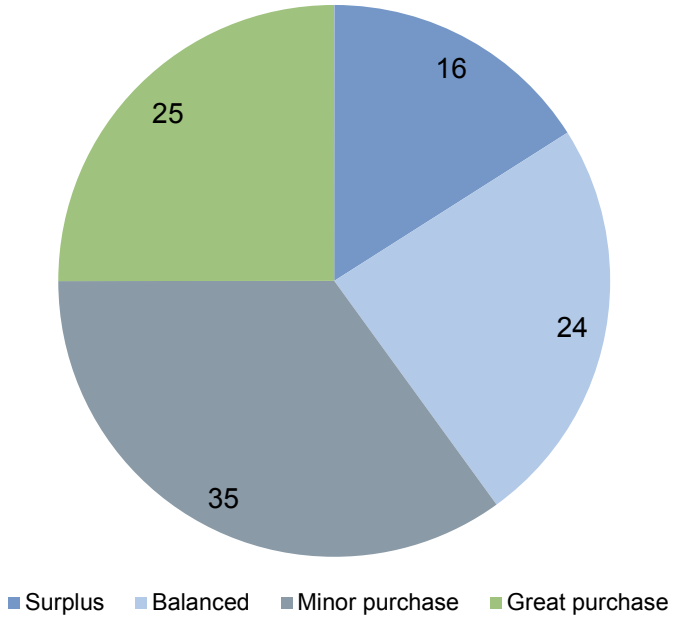
activities. The second most frequently mentioned reason for companies not to become active on the carbon market is possession of a sufficiently large amount of freely allocated emission allowances. More than half (54 %) of the inactive companies reported receiving a sufficiently large amount of free allowances to ensure compliance. In the past years, inactive companies stated they were waiting for better market conditions to sell or buy emission allowances as one major reason for being inactive. In the most recent survey, the number of companies waiting for better market conditions to become active dropped sharply. Down from 20 % in 2012, only four per cent of all respondents reported they were waiting for better market conditions to sell emission allowances (cf. Figure 7).



Source: KfW/ZEW CO_2 Barometer 2014 – Carbon Edition

Figure 7: Why did your company not trade emission allowances in 2013?

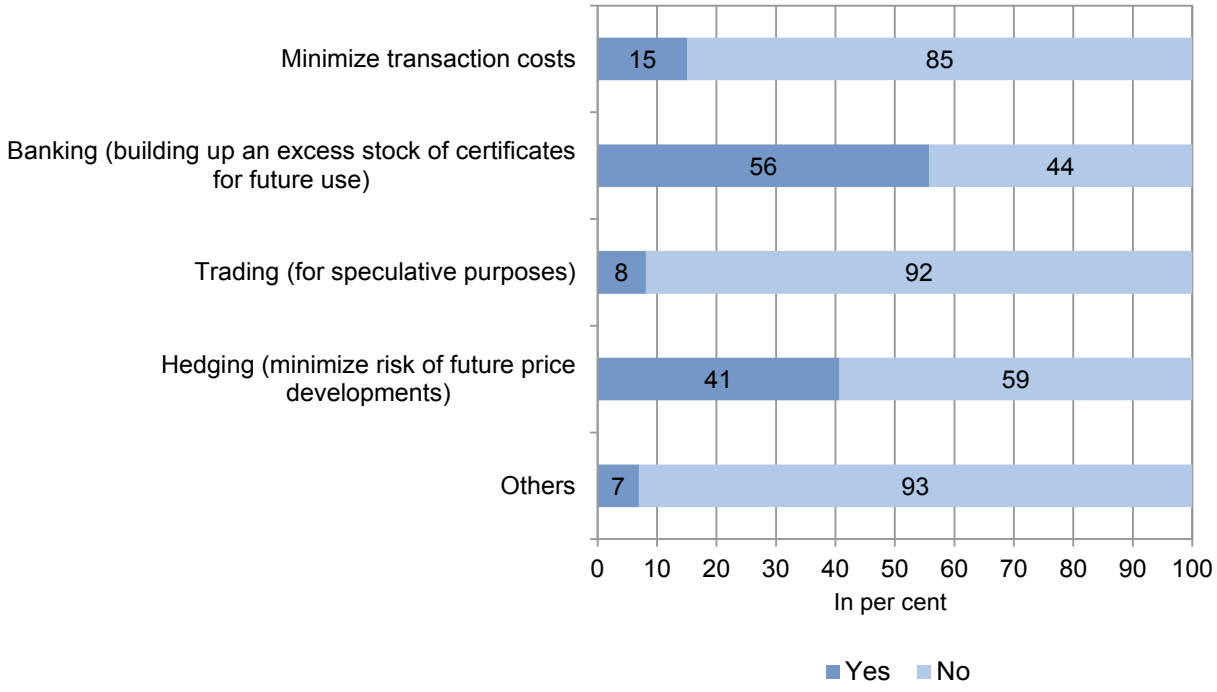
Furthermore, we find that a sufficiently large amount of freely allocated emission allowances not only prevents companies from becoming active on the carbon market but also diminishes the trading frequency of active companies. We observe that companies that have to buy emission allowances in order to be compliant trade more often than those with sufficient free allowances. In 2014, 40 % of all surveyed companies stated that they do not need to buy additional emission allowances to ensure compliance (cf. Figure 8). Only 18 % of these firms traded emission allowances more than once a year. In contrast, more than 50 % of companies without a sufficiently large amount of free emission allowances traded more than once a year.



Source: KfW/ZEW CO_2 Barometer 2014 – Carbon Edition

Figure 8: How would you describe the situation of your company in the EU ETS?

Asked about the strategy they follow when trading emission allowances, the majority (56 %) of all respondents named banking emission allowances, i. e. they reported they were accumulating emission allowances for future use. Noteworthy is that only a minority (eight per cent) of the surveyed companies stated they were trading emission allowances for speculative purposes (cf. Figure 9). This is in line with findings from previous surveys.



Source: KfW/ZEW CO_2 Barometer 2014 – Carbon Edition

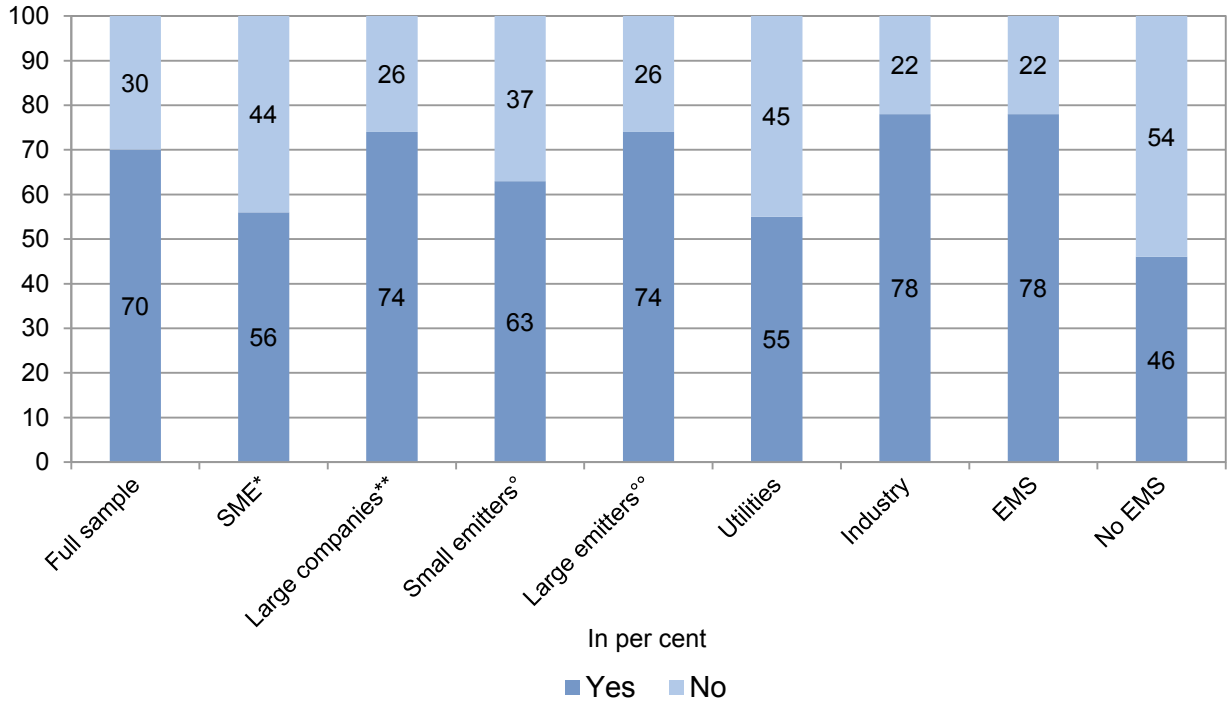
Figure 9: Which strategy has your company pursued regarding trading in emission allowances since the end of February 2013?

As banking of emission allowances is a major trading strategy, most of the surveyed companies accumulated a substantial reserve of emission allowances over the last years. With more than 80 %, a large majority of all respondents stated that they had already built up a reserve of emission allowances. By analysing this in more detail, we find that the reserves of surveyed companies are quite substantial. On average, the surveyed companies have built up a reserve of around 150 % of their verified emissions in the year 2013. Furthermore, we find that the reserve has increased by more than 25 percentage points since the last survey was conducted in 2013.

Regarding the future outlook of emissions trading, it might be likely to expect a decrease in the share of actively participating companies in the carbon market. We find in the most recent survey that less than two-thirds (61 %) of the surveyed companies are planning to trade emission allowances in the next year. In comparison with the results of the survey from 2013, this corresponds to a decrease of about 34 percentage points in the number of companies that are planning to be active in the carbon market next year. One possible explanation could be that the companies that took advantage of the low EUA price in order to build up excess stocks are saturated and do not plan to trade during the next year.

6. Abatement

The results of the current survey reveal that most of the respondents have already intervened in the production process or invested in order to reduce CO_2 emissions. About 70 % of all surveyed companies conducted carbon abatement measures in the past. By analysing this in more detail, we find that large companies (≥ 250 employees) and large emitters (≥ 25,000 tCO_2) have conducted carbon abatement measures to a greater extent than small and medium-sized enterprises (SMEs) and small emitters. Seventy-four per cent of the large companies and emitters have conducted CO_2 abatement measures. In contrast, only 56 % of the small companies and 63 % of the small emitters have conducted CO_2 abatement measures so far. Similarly, we find that utilities (55 %) are less active in conducting carbon abatement measures than companies belonging to the EU ETS regulated industrial sector (78 %). Across industries, we find that an established environmental management system (EMS) increases the likelihood of conducting CO_2 abatement measures. Seventy-eight per cent of all surveyed companies with an established EMS have already intervened in the production process or have invested in order to reduce their carbon emissions. In contrast, only 46 % of respondents without an established EMS have conducted carbon abatement measures (cf. Figure 10).



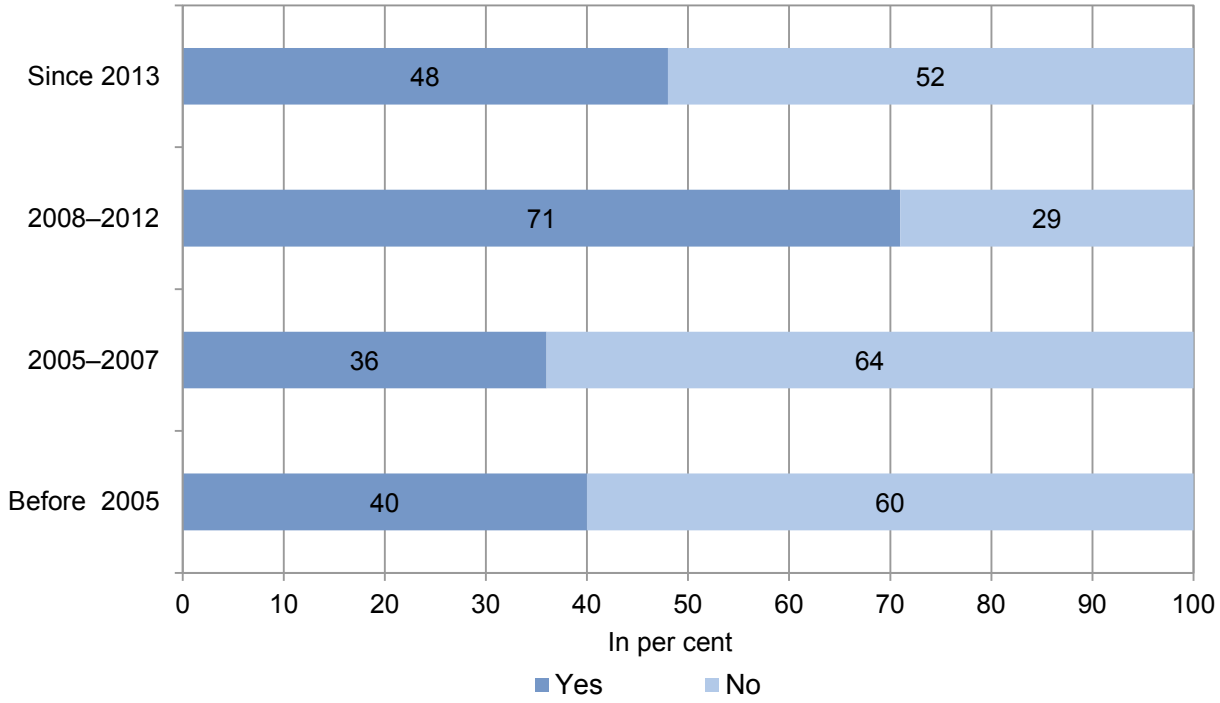
Note: * < 250 employees, ** ≥ 250 employees, ° < 25,000 tCO_2 (2012), °° ≥ 25,000 tCO_2 (2012)

Source: KfW/ZEW CO_2 Barometer 2014 – Carbon Edition

Figure 10: Carbon abatement activities

Asked about the date when the carbon abatement activity was conducted, 40 % of the surveyed firms stated that they conducted abatement measures already before the implementation of the EU ETS in 2005. In the first phase of the EU ETS (between 2005 and 2007), around one-third of respondents intervened in the production process or invested in order to reduce carbon emissions. With more than 70 % of all respondents, the highest level of abatement activity was during the second phase of the EU ETS, from 2008 until 2012. However, in the comparatively young third trading period of the

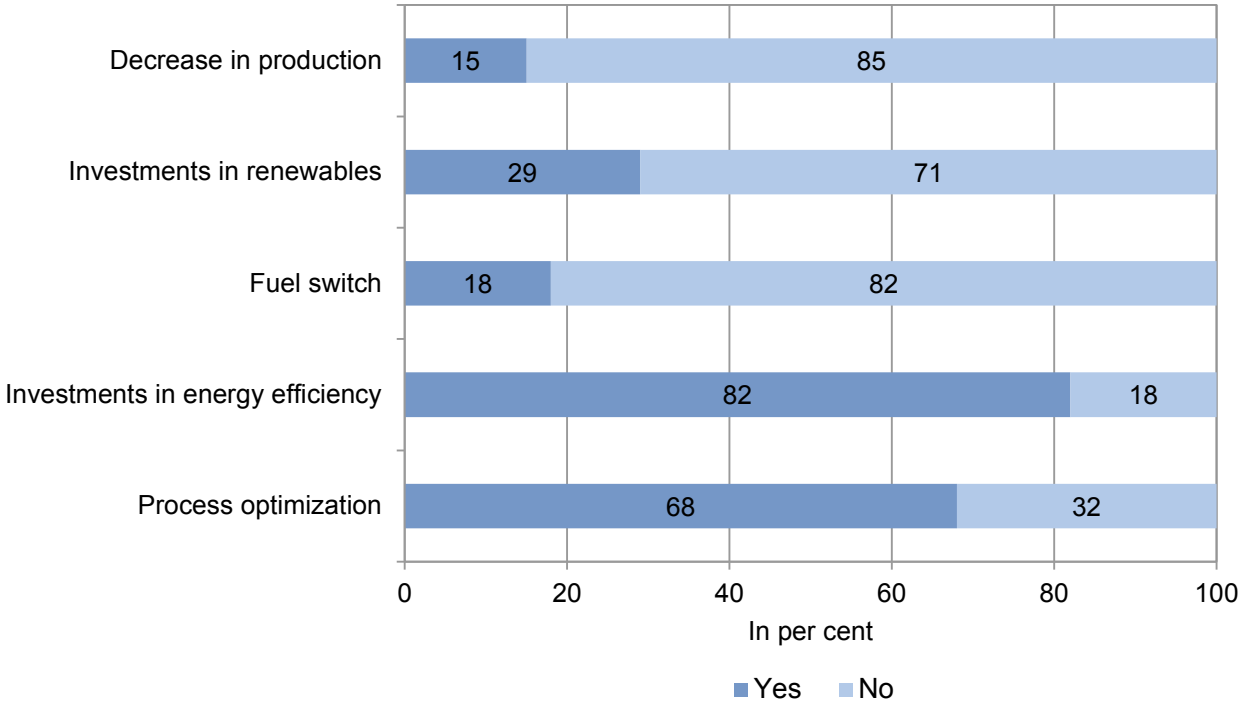
EU ETS starting in 2013, already 48 % of respondents stated that they had conducted carbon abatement measures (cf. Figure 11).



Source: KfW/ZEW CO_2 Barometer 2014 – Carbon Edition

Figure 11: When was the carbon abatement activity conducted?

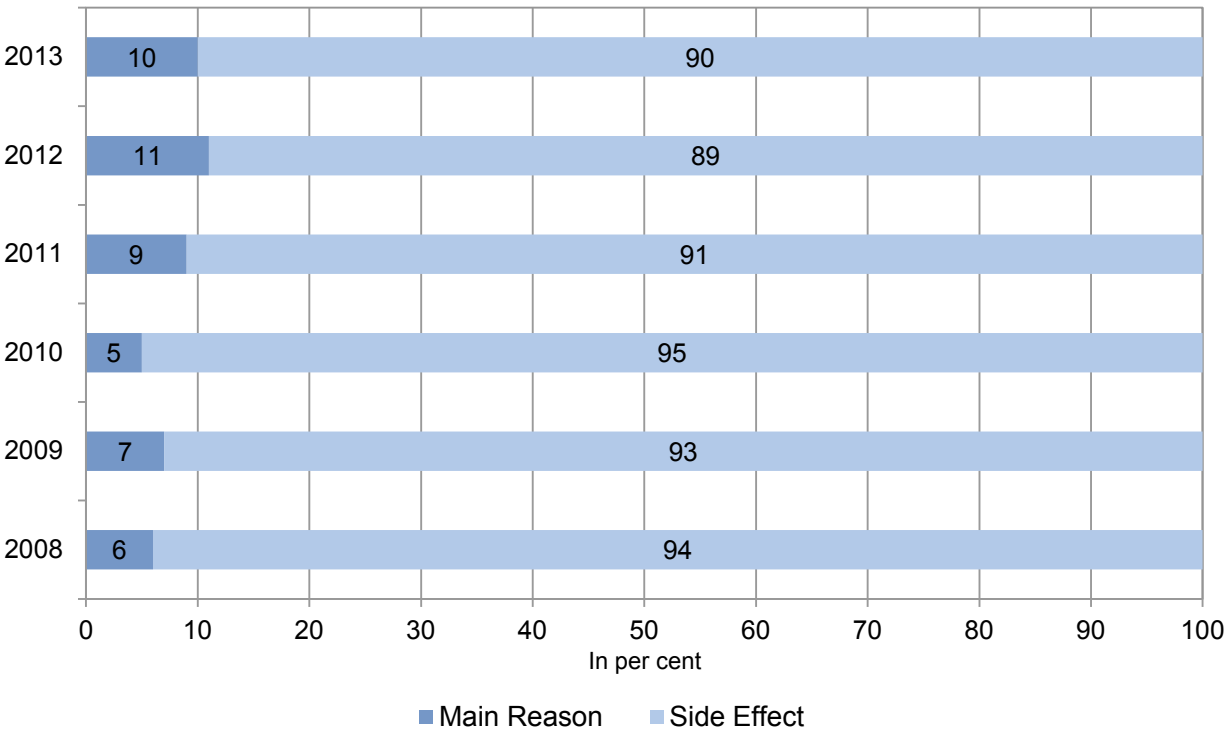
As major carbon abatement activities, most respondents stated investments in energy efficiency measures and process optimisation. More precisely, 82 % of the surveyed companies that have conducted abatement measures so far have stated that investments in energy efficiency lead to the reduction of their CO_2 emissions. Furthermore, process optimisation reduced carbon emissions for 68 % of respondents (cf. Figure 12).



Source: KfW/ZEW CO_2 Barometer 2014 – Carbon Edition

Figure 12: What kind of carbon abatement activity was conducted?

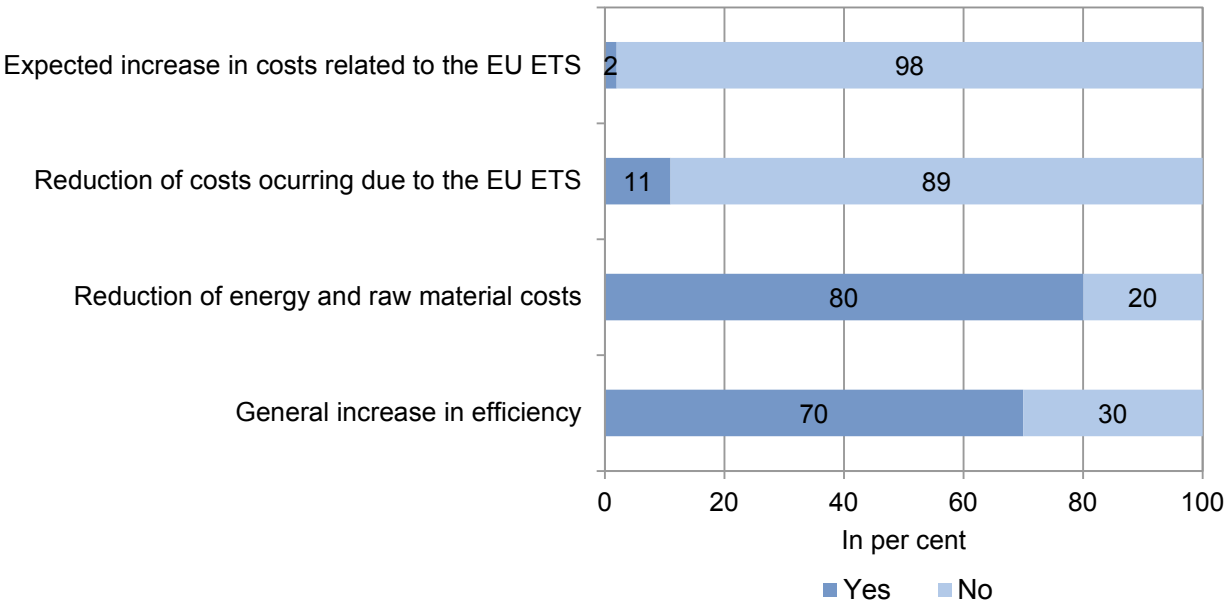
Despite the fact that most of the companies surveyed in 2014 have conducted CO_2 abatement measures in the past, we find that the reduction of carbon emissions remains a side effect in most cases. The reduction of carbon emissions was the main reason for interventions in the production process or investments that lead to the reduction of emissions for only ten per cent of the companies surveyed in 2014. This rate seems to have been constant over the last years. Since the beginning of the second phase of the EU ETS in 2008, the number of companies who state that carbon abatement was the main reason for their abatement measures has never exceeded 11 % (cf. Figure 13).



Source: KfW/ZEW CO_2 Barometer 2009, 2010, 2011, 2012, 2013, 2014

Figure 13: Carbon abatement as the main reason or a side effect?

As reducing CO_2 emissions was not the main driver for activities contributing to carbon abatement, surveyed companies were asked to indicate the main drivers for the CO_2 abatement measures they conducted. We find that reducing energy and raw material costs as well as generally increasing efficiency are the main drivers of carbon abatement measures. Costs associated with climate policy regulations and the EU ETS can be considered as secondary. Only 11 % of respondents stated that the current costs they incurred due to the EU ETS were a driver for their interventions in the production process or investments that lead to a reduction in carbon emissions (cf. Figure 14).



Source: KfW/ZEW CO_2 Barometer 2014 – Carbon Edition

Figure 14: If your company conducted activities contributing to carbon abatement, please name the main reasons for their implementation.

One reasonable explanation for the minor role of the EU ETS and the weak incentives for taking measures to reduce carbon emissions could be the persistently low price for emission allowances. In the survey of the KfW/ZEW CO_2 Barometer 2014, we asked the regulated companies how high the price for emission allowances has to be in order to create incentives for intervening in the production process or investing in order to reduce CO_2 emissions. On average, respondents reported that such a threshold CO_2 price has to be approximately EUR 32/tCO_2. In other words, the price of emission allowances would have to be six times higher than the average price in 2013 in order to consider it as a driver for taking measures to reduce carbon emissions. More precisely, we find that the 95% confidence interval for the threshold CO_2 price ranges between EUR 5 and EUR 100 per tCO_2 and that half of the surveyed companies reported a carbon price lower than EUR 25/tCO_2 in order to create incentives for investing in carbon abatement measures. On average, the reported threshold CO_2 price is in line with the carbon price of EUR 30/tCO_2 which the European Commission aims to reach in order to achieve effective low-carbon activities and still uses in its baseline scenarios for policy recommendations (EC 2012b). Nevertheless, the stated threshold carbon price of EUR 32/tCO_2 on average exceeds the price expectations of the surveyed companies (cf. Figure 3). This indicates that the expected price recovery might not be strong enough to incentivise substantial carbon abatement measures.

Furthermore, we find that the reported threshold price depends on the sector a surveyed company belongs to. With more than EUR 36/tCO_2 on average, utilities report a slightly higher threshold carbon price than firms belonging to the EU ETS regulated industrial sector (EUR 29.60/tCO_2) (cf. Figure 15). This could indicate higher marginal abatement costs in utilities than in companies of the regulated industrial sector and explain the prior observation that utilities are comparatively less active in conducting CO_2 abatement measures.

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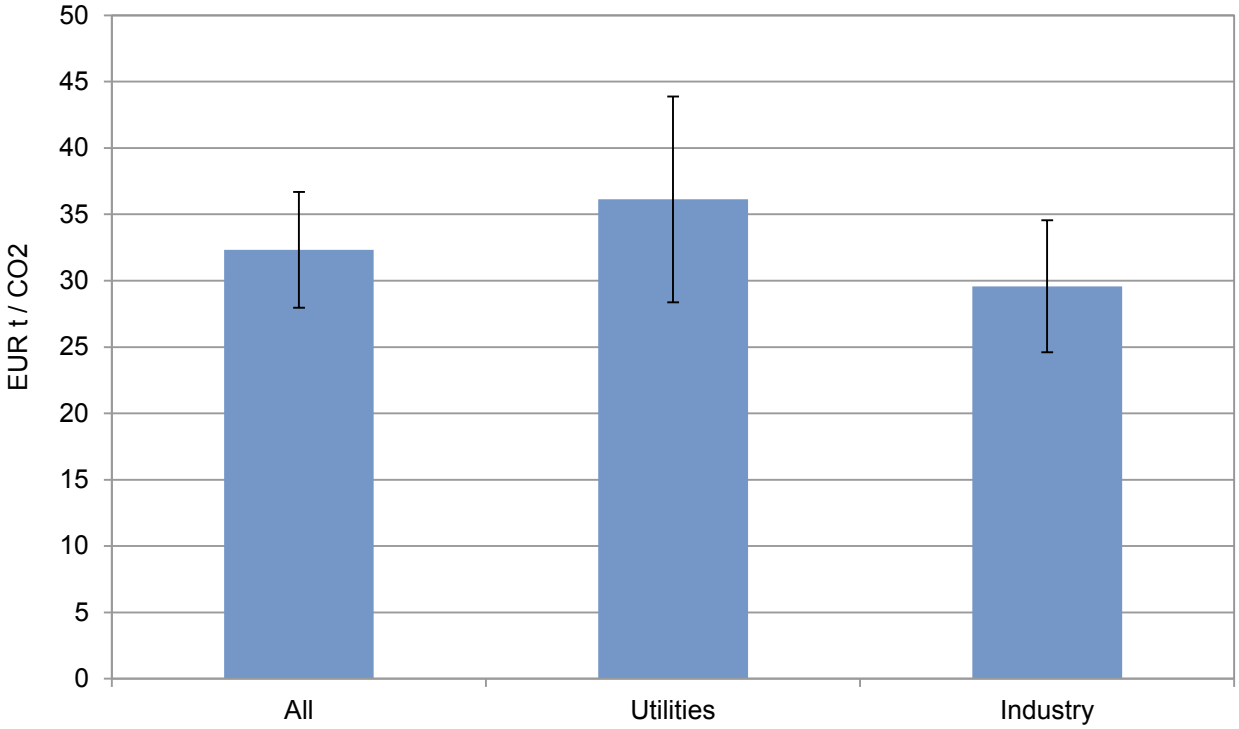


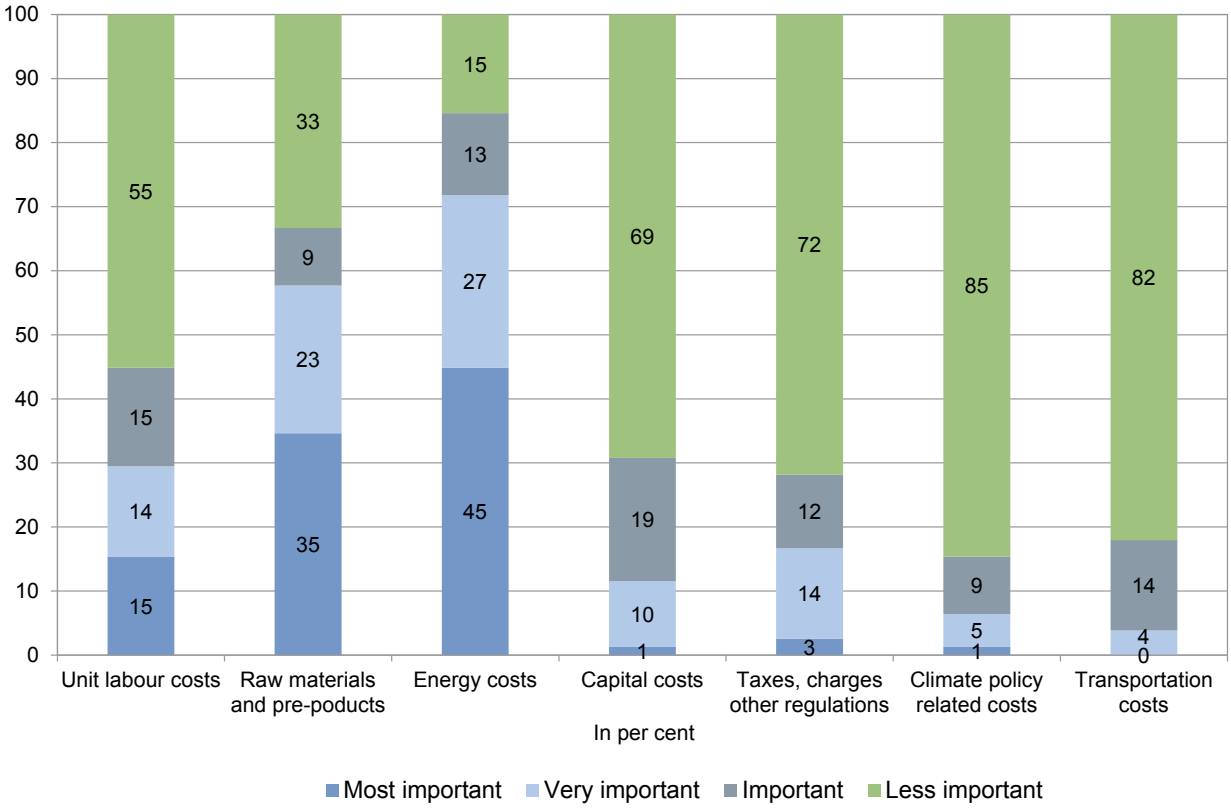
Note: Reported are the average threshold CO_2 prices and the corresponding 95 % confidence intervals.

Source: KfW/ZEW CO_2 Barometer 2014 – Carbon Edition

Figure 15: How high does the CO_2 price need to be in order to incentivise abatement measures?

7. Competitiveness

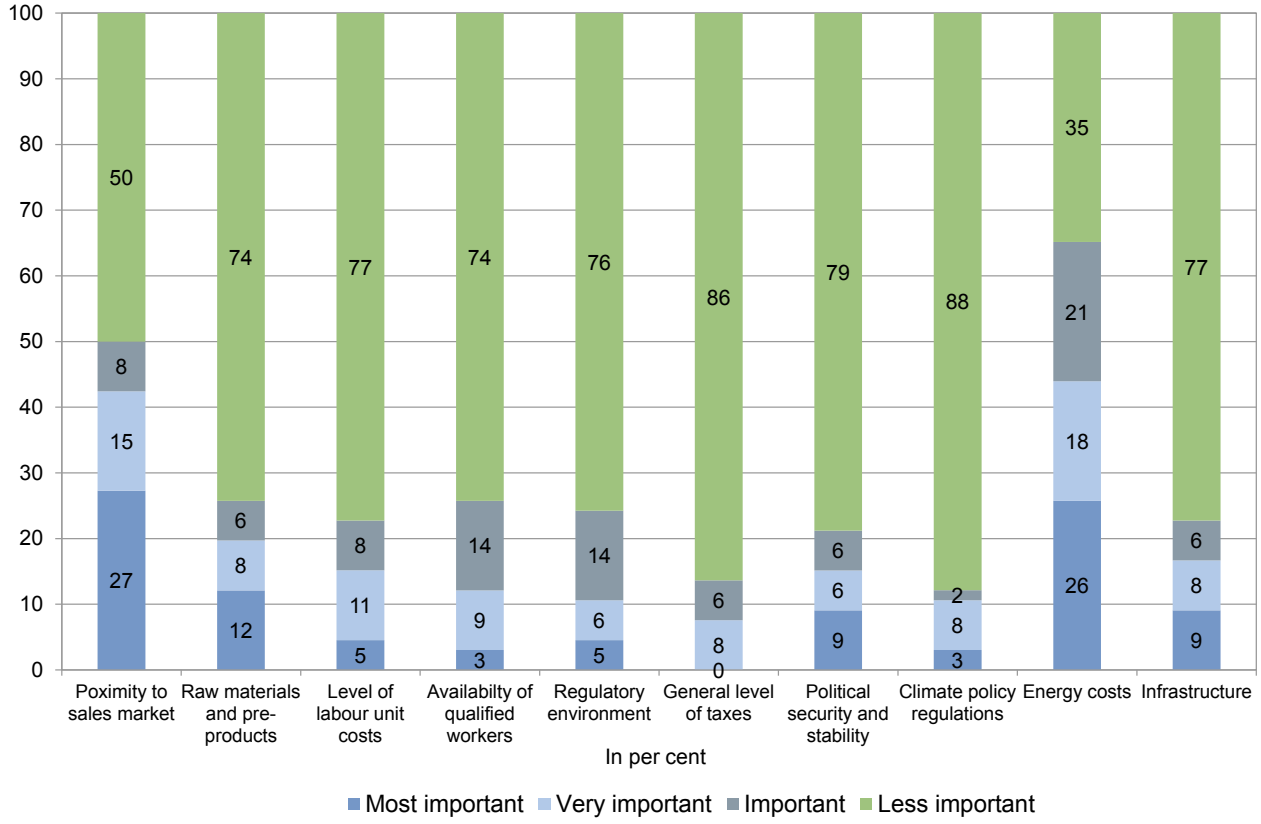
The results of the current survey not only emphasise that the EU ETS generates weak incentives for taking measures to reduce carbon emissions but also plays only a subordinate role in other strategic considerations, i. e. the production process and the strategic location decision. More than 40 % of the surveyed companies reported that energy costs are the determining factor for the economic efficiency of their production process. Furthermore, important factors influencing companies' production costs are the costs of input and raw materials (35 %) as well as labour costs (15 %). In contrast, costs associated with climate policy regulations played only a subordinate role. Fewer than 10 % of respondents consider these costs, which are caused by the EU ETS, an important factor for the economic efficiency of their production process, and they represent the most important factor for only for one per cent of respondents (cf. Figure 16).



Source: KfW/ZEW Barometer 2014 – Carbon Edition

Figure 16: Which cost factors are most important for producing your best-selling product?

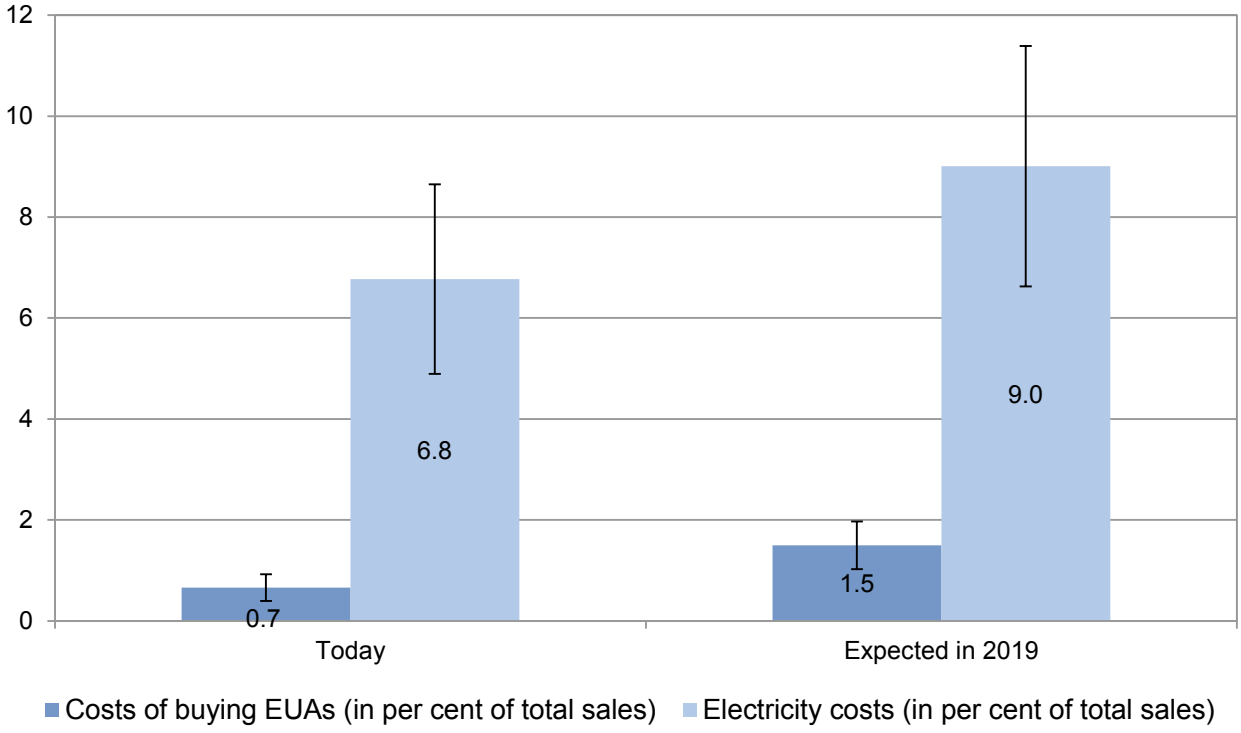
Furthermore, we find that the costs associated with climate policy regulations cannot be considered an important determinant of companies' strategic location decision. Fewer than 15 % of respondents consider the costs associated with climate policy regulations an important determinant of their strategic location decision and only 3 % stated that these costs are the most important factor. Energy costs, in contrast, are again an important factor. Around a quarter (26 %) of the surveyed companies stated that energy costs are the determining factor for their strategic location decision. Only the proximity to the sales market is considered to be more important. For about 27 % of respondents the proximity to their sales market is the most important factor shaping their strategic location decision (cf. Figure 17).



Source: KfW/ZEW CO_2 Barometer 2014 – Carbon Edition

Figure 17: Determinants of firms' strategic location decision

The primary reason for the different level of importance of climate policy regulations and energy prices could be the related costs. This year we asked companies to state their current and expected costs associated with climate policy regulations as well as their electricity costs in per cent of their turnover. The findings are summarised in Figure 18. On average, respondents stated that the costs associated with the EU ETS are currently about 0.7 % of their yearly turnover. In contrast, electricity costs are currently around 7 % of their yearly turnover. Over the next years, respondents expect both, the costs caused by the EU ETS and electricity costs, to increase. Nevertheless, they expect electricity costs to substantially exceed the costs related to climate policy regulations (e. g. buying EUAs). Respondents estimate that in five years the costs caused by the EU ETS and electricity costs will amount to around 1.5 % and 9 % of their yearly turnover, respectively.



Note: Reported are average energy costs as well as the costs associated with climate regulation and the corresponding 95 % confidence intervals.

Source: KfW/ZEW CO_2 Barometer 2014 – Carbon Edition

Figure 18: Costs associated with climate regulation and electricity costs

8. 2030 Framework for Climate and Energy Policies

As the year 2020 approaches and the 2020 climate and energy package expires, a subsequent policy framework is needed. Against this backdrop, the European Commission presented the integrated 2030 framework for climate and energy policies in January 2014. For the period from 2021 to 2030, this framework should ensure regulatory certainty for investors and coordinated approaches among the member states. According to the Commission, it strives to install a “competitive and secure energy system that ensures affordable energy for all consumers, increases the security of the EU's energy supplies, reduces our dependence on energy imports and creates new opportunities for growth and jobs” (EC 2014d). In addition, the framework and its targets shall deliver a strong signal for the upcoming negotiations on a new international climate agreement.

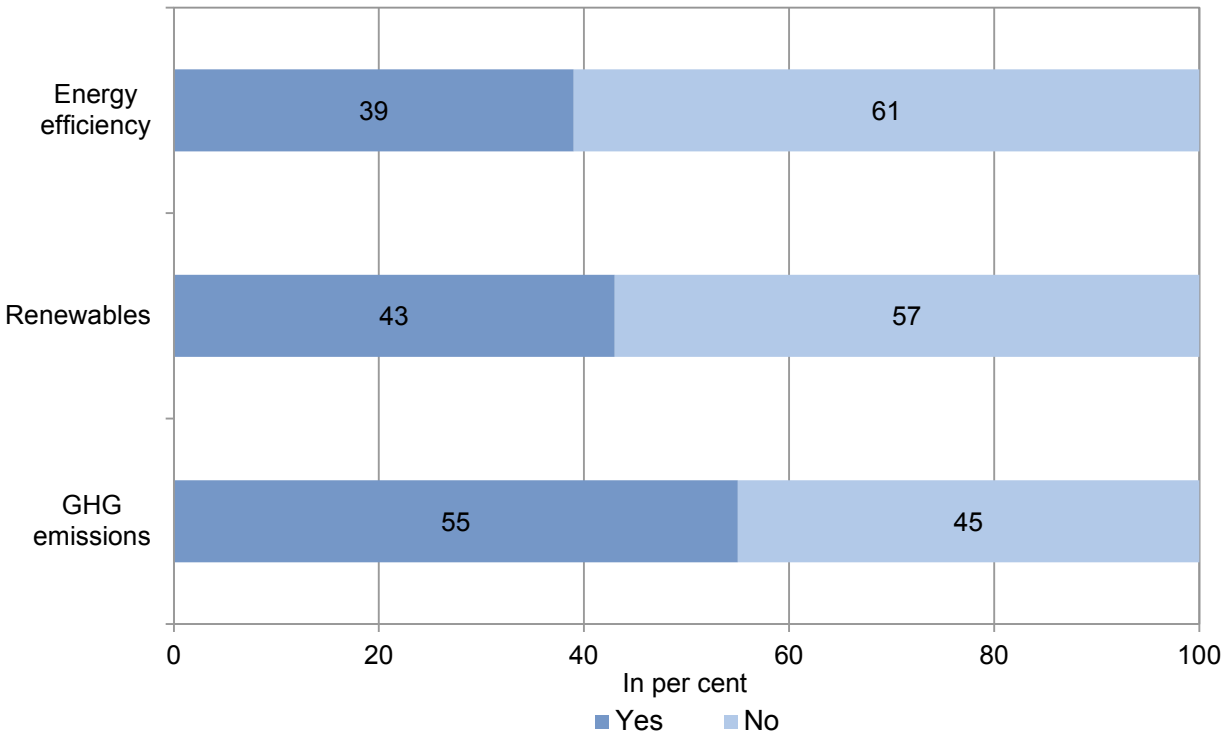
The framework’s main objective is to reduce EU domestic greenhouse gas emissions by 40 % compared to the 1990 level by 2030 and thereby ensure that the EU will meet its 2050 objective of 80 % lower GHG emissions. To achieve this target, the annually linear reduction factor which reduces the amount of allowances in the scheme on a yearly basis has to increase from 1.74 to 2.2 % per year from 2021 onwards. More precisely, by 2030 the installations falling under the EU ETS would need to reduce their emissions by 43 % compared to 2005. Non-EU ETS emissions would have to be reduced by 30 %. In comparison, without structural changes and with all EU climate policies continuing as planned, by 2030 EU GHG emissions will be reduced by 32 % against 1990 levels (EC 2014e).

Moreover, the Commission wants the renewables share to increase to at least 27 % of the EU’s energy consumption in 2030. In comparison, the 2020 climate and energy package aims to raise the share of EU energy consumption produced from renewables to 20 % in 2020. From 2020 onwards, the renewable target would still be binding in the EU but not translated into national targets anymore. Setting an EU-wide target for the renewables share is vital to incentivise investment in renewables. A positive side effect of a higher renewables share would be a better energy trade balance as well as an improved security of supply. Although being binding on the EU level, the member states can, however, structure their individual energy system as they want (EC 2014e).

The role of energy efficiency in the 2030 framework was assessed by the European Commission in its Communication towards the European Council and Parliament in July 2014. According to the European Commission, the 2020 energy efficiency target of 20 % will be achieved. In order to meet the proposed GHG reduction target of 40 % until 2030 at an affordable cost, the European Commission estimated that energy efficiency needed to be increased by 25 % until 2030. But taking into account the EU’s energy dependency and ensuring energy security within the EU, the European Commission proposes a more ambitious energy efficiency target of 30 % until 2030 (EU 2014f). A further important component of the 2030 framework for climate and energy policies is the reform of the European carbon market. Due to the economic downturn and the extended use of carbon credits, the EU ETS has experienced a growing surplus of emission allowances which has put pressure on the carbon price. Therefore, the EU ETS has only generated weak incentives for taking measures to reduce carbon emissions. In order to adapt to this trend, the Commission has proposed the market stability reserve from 2021 onwards which should make the EU ETS more resilient to potential shocks that disturb the balance between supply and demand of emission allowances as a vital part of the 2030 framework. More precisely, the purpose of the market stability reserve is to limit the extensive surplus of emission allowances in the market. The mechanism is based on the “total number of allowances in

circulation", i. e. the difference between allowances issued as well as credits surrendered and historical emissions accumulated since 2008. When the total number of allowances in circulation exceeds the threshold of 833 million, 12 % of this accumulated surplus will be withdrawn from the auction volume and placed in the reserve. If the total number of allowances in circulation is less than 400 million, allowances will be gradually released in a pre-defined volume of 100 million allowances from the reserve into the market (EC 2014c).

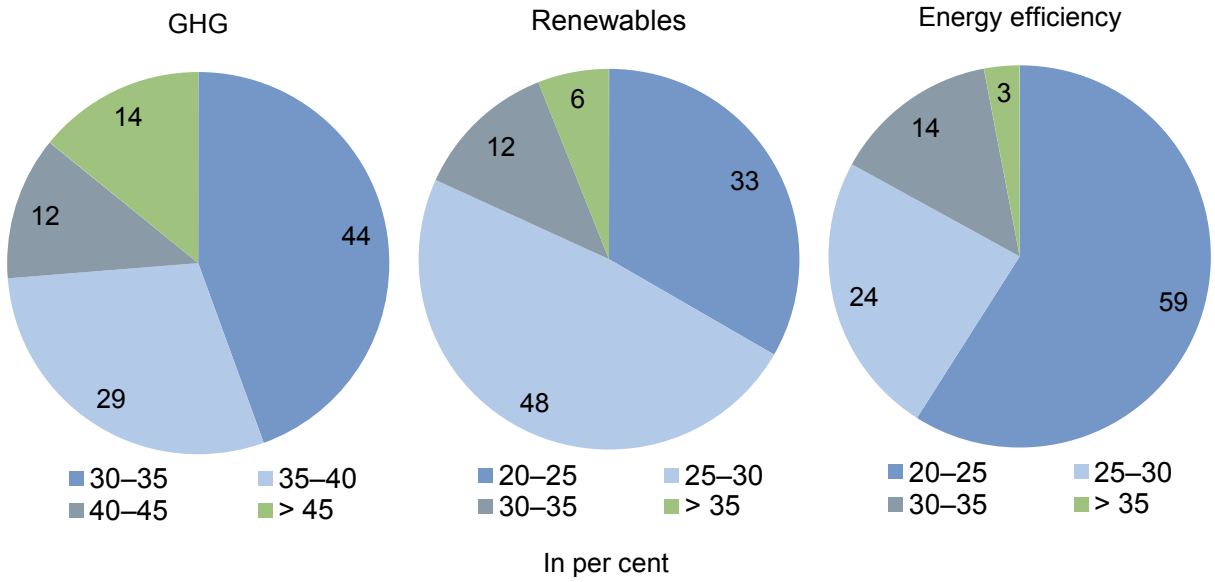
Essential cornerstones of the 2030 framework are published, and the subject is now under discussion in politics and the public. The European Council has scheduled the final decision on the 2030 framework for October 2014. Therefore, we took the opportunity to ask the regulated companies about their expectations concerning the design of the framework. Figure 19 depicts the surveyed companies' expectations on whether there will be binding targets in the final 2030 framework with respect to GHG emissions, renewables and energy efficiency. We find that more than half of the surveyed companies (55 %) believe that the EU is most likely to legally commit to GHG emission reductions. Fewer companies (43 %) expect that targets for the renewables share will be passed. As far as energy efficiency is concerned, only 39 % of the surveyed companies are of the opinion that the EU will achieve binding targets.



Source: KfW/ZEW CO_2 Barometer 2014 – Carbon Edition

Figure 19: Do you expect a binding target in the 2030 framework?

Furthermore, we found that surveyed companies that expect binding targets believe that these will be rather moderate. For example, if they expect a binding GHG target, the major part of respondents (44 %) claimed that they expect a reduction target for 2030 of 30–35 % against 1990 levels to be committed (cf. Figure 20). To illustrate this, without any additional changes in EU climate policies it is expected that a reduction target of 32 % will be reached by 2030. Some 30 % expect a 35–40 % abatement target and only 26 % expect a more ambitious target of more than 40 % of GHG emissions having to be reduced against 1990 levels by 2030.



Source: KfW/ZEW CO_2 Barometer 2014 – Carbon Edition

Figure 20: If expected, what binding target do you expect for GHG emissions, renewable energy share and energy efficiency?

As far as the renewables share is concerned, many of the surveyed companies (48 %) expect a 25–30 % target share to be set. For comparison, within the 2020 strategy the target is set at 20 % until 2020. One third of the companies expects the target to remain constant or increase to 25 %. Only 19 % of companies anticipate a higher share than 30 % to be fixed by the EU.

The vast majority of surveyed companies (59 %) which expect binding targets for energy efficiency improvements expect these targets to be in the range of 20–25 %. Another 24 % assume a target between 25 and 30 %. A target above 30 % is considered less likely. In summary, fewer than half of all surveyed companies expect binding targets to be included in the 2030 framework. Moreover, if targets are implemented they are expected to be quite unambitious and not a substantial reinforcement of existing policy frameworks. Without additional changes in EU climate policies, a GHG reduction target of 32 % against 1990 levels will be reached by 2030 and companies may not be forced to give additional impetus to dedicated carbon abatement and energy efficiency investments.

9. Conclusive Summary

The third phase of the EU ETS began in 2013 and brought some amendments with it. Among the most important modifications are the scope expansion and changes in the allocation approach. The scope was expanded to include Croatia as well as new sectors and additional emissions from further gases. Auctioning, instead of free allocation, is now the default method for allocating emission allowances. Moreover, the allocation of allowances still being given away for free is now based on EU-wide benchmarks of emission performance and not on historical emissions. The scope expansion has contributed to a substantial increase in the amount of regulated installations in Germany and consequently led to an increase in verified emissions. Notwithstanding these novelties, the European carbon market was characterised by persistently low prices for emission allowances in 2013. This reinforced concerns that the carbon price was too low to stimulate low-carbon activities and increased the pressure on the regulatory framework. Therefore, after several delays and amendments, the backloading proposal was put into legislation in February 2014. The decision to postpone the auctioning of 900 million EUAs from the beginning to the end of the third trading period led to a rising EUA price in the short term, but this positive effect did not last for long.

As in the previous years, regulated companies in Germany have adjusted their expectations to the recent market developments and revised their price expectations for EUAs significantly downwards. The average price expectations for December 2015 and 2020 are approximately EUR 8 and EUR 13/tCO_2. In line with the restrained EUA price expectations, we found that although most of the surveyed companies have conducted CO_2 abatement measures in the past, carbon abatement only was a positive side-effect of these measures. The companies' primary aim when conducting these measures was to cut energy costs. At its persistent low level the EUA price is not able to create incentives for firms to invest in carbon abatement technologies. Asked about how high the carbon price has to be in order to be considered a driver for carbon abatement activities and investments, the surveyed companies reported a price of approximately EUR 32/tCO_2 on average. The estimated threshold carbon price significantly exceeds companies' short- and even long-term price expectations. From this we conclude that the expected increase in carbon prices might not be strong enough to generate incentives to invest in substantial low-carbon measures.

The number of companies actively participating in the carbon market has increased continuously over the last years. This is a positive development, since a liquid market is important for the cost-effectiveness of the EU ETS. Despite the increasing number of companies actively participating in the carbon market, a considerable amount of surveyed companies was still inactive in the carbon market in 2013. We identified two essential reasons which prevent companies from participating in the carbon market: Possession of a sufficiently large amount of freely allocated allowances and regulatory constraints on speculations. We found that a persistently high amount of respondents, more than 80 %, have built up a reserve of emission allowances. On average, surveyed companies held a reserve of approximately 150 % of their verified emissions in 2013.

Although the start of the third phase of the EU ETS in 2013 introduced important novelties, the fundamental difficulties of the European carbon market remain unchanged. The economic downturn in the EU together with the extensive use of emission credits for compliance caused a substantial oversupply of emission allowances. This oversupply still exists and is responsible for the persistently low prices in the European carbon market. Therefore, the EU ETS still generates only weak incentives

for measures to reduce carbon emissions. Even the decision to postpone the auctioning of 900 million EUAs could not achieve persistently higher prices, thus further improvements of the regulatory framework are needed. In order to address these long-term structural problems, the proposal for the 2030 framework for climate and energy policies includes a reform of the European carbon market and can be considered an important step in the right direction. Most of the surveyed companies expect a binding GHG emission reduction target to be committed to for 2030. They do not expect any substantial reinforcements of existing policies, however, and it remains to be seen whether companies are forced to give additional impetus to dedicated carbon abatement measures.

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Appendix: Structure of the KfW/ZEW CO_2 Barometer – Carbon Edition

The KfW/ZEW CO_2 Barometer has been analysing the situation of German companies regulated under the EU ETS since 2009. The objective of the study is to monitor firm behaviour in carbon markets. The underlying annual survey addresses a broad spectrum of topics related to firm behaviour such as expectations regarding commodity and carbon prices, carbon trading strategies or abatement activities. For that purpose all German firms regulated under the EU ETS were invited to participate in the survey in March and April 2014. About 30 % of the contacted firms operate more than one regulated installation. In order to avoid contacting a firm multiple times, only one responsible installation manager per firm was surveyed. Of the 934 companies, 137 responded to the questionnaire, a response rate of 15 %. Emissions data from the Community Independent Transaction Log (CITL) and the European Union Transaction Log (EUTL) were aggregated and merged with the responses of the participating companies. Table A. 1 summarises the most important characteristics of the respondents.

Table A. 1: Characteristics of respondents

	Population	Respondents
Companies	943	137 (15 %)
Installations covered by surveyed firms	1,945	579 (30 %)
Verified emissions in 2013	481 mn tCO_2	201 mn tCO_2 (42 %)

Source: KfW/ZEW CO_2 Barometer 2014 – Carbon Edition

The firms covered by the survey run 30 % of the installations and are responsible for approximately 42 % of the verified emissions of all German companies participating in the EU ETS in 2013. The type of activity that is contained in the CITL/EUTL data base does not allow conclusions about sector classification, so the study surveyed the main goods or services produced by the firm. The results show that about 40.2 % of the participating companies classified themselves as belonging to the energy sector (cf. Table A. 2). Furthermore, the report differentiates between small and large emitters, and SMEs and large enterprises, respectively. Small emitters are firms that emit less than 25,000 tCO_2. This definition follows EU Directive 2009/29/EC (EU 2009). Large emitters are firms that emit 25,000 tCO_2 or more. More than 70 % of respondents are large companies with at least 250 employees and almost 60 % are large emitters. The willingness of companies to participate in the survey was lower for small emitters than for large emitters. Eighteen per cent of the large emitters participated in the survey, but only 11 % of the small emitters. Therefore, small emitters are underrepresented in our sample. In total, the emission market is characterised by many small and only a few large emitters. About 90 % of the regulated firms emitted only roughly 10 % of the verified emissions in 2013.

Table A. 2: Sector classification of surveyed firms (NACE)

Sector	NACE-Rev.	Share
Energy and / or heat generation (e. g. power supply companies)	40.1	40.2 %
Food and animal feed, beverage industry	15	5.5 %
Textiles, clothing, leather and leather goods	17, 18, 19	0.8 %
Pulp and paper, paper products, printing and publishing	21, 22	11 %
Manufacture of coke, refined petroleum products and nuclear fuel	23	0 %
Chemical industry	24	15 %
Rubber and plastic products	25	0.8 %
Manufacture of other non-metallic mineral products (glass, ceramics etc.)	26	12.6 %
Steel and non-ferrous metal production	27	7 %
Metal products	28	0 %
Manufacture of machinery and equipment	29	0 %
Automobile industry (incl. automobile suppliers)	34, 35	1.6 %
Office machinery, computers, electrical and optical equipment	30–33	0 %
Other	–	5.5 %

Source: KfW/ZEW CO_2 Barometer 2014 – Carbon Edition

In contrast, the criterion by which SMEs and large enterprises are distinguished is number of employees. The European Union defines SMEs as enterprises with fewer than 250 employees (EC 2003). In general, sales revenue should also be considered but the survey does not collect these figures. Table A. 3 shows that there is only a weak correlation between company size and the amount of carbon they release.

Table A. 3: Sample structure: emissions and number of employees

	Large enterprises ≥ 250 employees	SME < 250 employees	Total (row)
Large emitters ≥ 25,000 tCO_2 p. a.	n=51 (44 %)	n=16 (14 %)	n=67 (58 %)
Small emitters < 25,000 tCO_2 p. a.	n=32 (28 %)	n=16 (14 %)	n=48 (42 %)
Total (column)	n=83 (72 %)	n=32 (28 %)	n=115 (100 %)

Note: 22 enterprises did not provide employment figures.

Source: KfW/ZEW CO_2 Barometer 2014 – Carbon Edition