# Tendances Carbone

The Monthly Bulletin on the European Carbon Market

cdc climat research | Caisse des Dépôts GROUP

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## Understanding the link between macroeconomic environment and the EU carbon price

The reaction of the carbon price to changes in macroeconomic fundamentals can be understood from different levels. My recent academic research has identified two strong linkages.

First, there is a link between the EU carbon price and financial markets, such as equity and bond markets. These analyses emphasize how the volatility of the carbon price is affected when financial markets enter "bull" or "bear" periods. By estimating various volatility models, carbon futures prices may be weakly forecasted on the basis of two variables from the stock and bond markets, i.e equity dividend yields (returns on stocks) and the 'junk bond' premium (spread between BAA- and AAA-rated bonds). Moreover, by assessing the transmission of international shocks to the carbon market, carbon prices tend to respond negatively to an exogenous recessionary shock on global economic indicators. In consequence, for investments managers, carbon assets such as EUA appear to be well-suited for portofolio diversification since they do not match exactly the business cycle.

The second relationship addresses the physical association between industrial production and carbon price changes though the emissions level. The first objective of an academic researcher is to identify the most explanatory variable: in our case, the monthly Eurostat aggregated industrial production index to proxy for changes in macroeconomic fundamentals. In the light of the recent periods of economic expansion (2005-2007) and recession (since 2008), several studies can bring fruitful results:

- **Our results tend to confirm that the carbon market adjusts to the macroeconomic environment with a delay due to the specific institutional constraints of the EU ETS.** It is interesting to relate these states to the underlying business cycle. Indeed, the EU industrial production had been falling since July 2007. However, the carbon market seems to adjust to this situation only in October 2008, when most operators were looking to sell allowances in exchange of cash.
- **The relationship between carbon prices and EU industrial production has changed over the time.** Switches from "high-growth" regime to "low-growth" regime are especially perceptible during January–April 2005, April–June 2006, October 2008 and April 2009 and May 2010 related with the annual compliance event. Moreover, our results indicate that the carbon–macroeconomy relationship may fade for some periods. One possible cause is changes unique to the carbon market that diminish its ability to react to macroeconomic factors. That is to say, sometimes changes in demand and supply fundamentals of allowances initiated by regulatory changes will disturb this relationship.
- **This "carbon-macroeconomy" relationship is robust to the introduction of energy market shocks.**

To improve the understanding of the link between economic activity and carbon pricing, researchers need to delve further into the timing of business cycles and the reasons that may explain why the carbon price reacts immediately (or not) to these fluctuations.

In conclusion, to identify a closer and more permanent relationship between the carbon price and the macroeconomic environment, economists have been advising for a long time already that the role of the regulator should be restricted to create the allowance trading mechanism, and then to let the market operate on its own. Hence, by enforcing long-term targets and without amending the short term allowances supply, the regulatory authority could establish a carbon price signal that would be less sensitive to short term macroeconomic issues.


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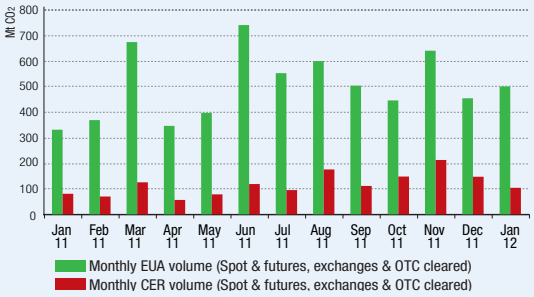
## Key points

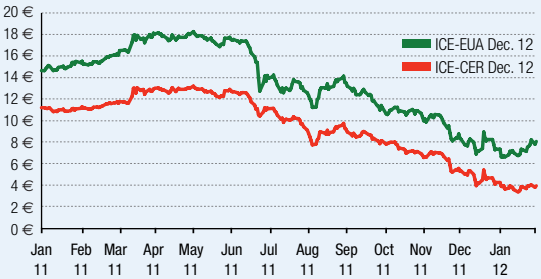
1) **Financial analysts have downgraded their prices forecasts: EUA price is now 10.50 €/t for 2013, 14.20 €/t over Phase III. CER price is now 8.20 €/t for 2013 and 9.70 €/t over Phase III.**
2) **The European Commission has partially opened its central registry, which enables airline companies to open accounts and to receive free allowances from February 28th onwards.**
3) **China has announced that all domestic airlines were banned from taking part in the EU ETS unless given government approval.**
4) **The European Commission is threatening 17 Member States with legal proceedings if they do not disclose their Phase III allowance plan, before March 1st 2012.**

**Trading volumes : EUA + 10%, CER -30%, and ERU -75%**



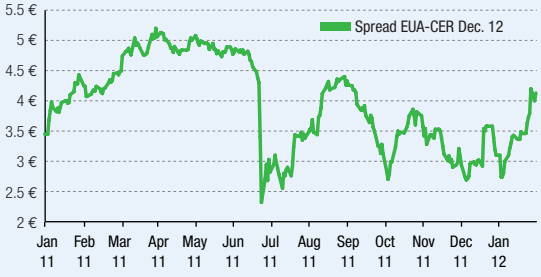

*Source: CDC Climat Research calculation, based on data from BlueNext, EEX, ICE Futures Europe, Green X, Nasdaq OMX, and LCH Clearnet*

**EUA Dec.12: +9.8%; CER Dec.12: –7.3%**




*Source: ICE Futures Europe*

**33.2% increase in the EUA-CER Dec.12 spread**




*Source: ICE Futures Europe*

# Energy

## Primary energy prices and electricity prices

| | | | Jan. 2012 | |
|---|---|---|---|---|
| Coal | API # 2 CIF ARA (First month in USD/t) | | 107.5 | ▼ |
| Natural gas | NBP (spot in €/MWh) | | 22.3 | ▼ |
| | TTF (spot in €/MWh) | | 21.9 | ▼ |
| Crude oil | Brent (First month in USD/b) | | 111.5 | ▲ |
| Electricity | Germany (€/MWh) | Spot | 46.8 | ▲ |
| | | Calendar | 51.6 | ▼ |
| | United Kingdom (€/MWh) | Spot | 50.5 | ▼ |
| | | Next summer | 50.5 | ▼ |
| | | Next winter | 59.3 | ▼ |

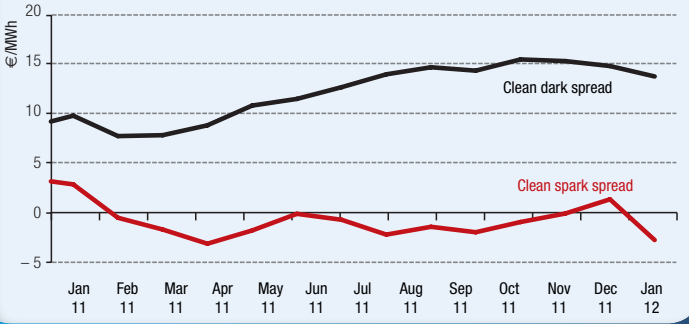
Sources: CDC Climat Research, Thomson Reuters

## Clean dark, clean spark spreads and switching price

| | Clean spark (€/MWh) | | Clean dark (€/MWh) | | Switching Price (€/tCO2) | |
|---|---|---|---|---|---|---|
| | spot | forward | spot | forward | spot | forward |
| Germany* | 0.4 | –2.8 | 11.7 | 13.8 | 19.8 | 25.1 |
| United Kingdom* | 10.0 | 3.3 | 14.4 | 12.2 | 20.2 | 18.2 |

** Germany, 2013 calendar contract, United Kingdom, summer 2012 contract.*

**German baseload – monthly average of Cal. 2013 clean dark and clean spark spreads**




Sources: CDC Climat Research, Thomson Reuters

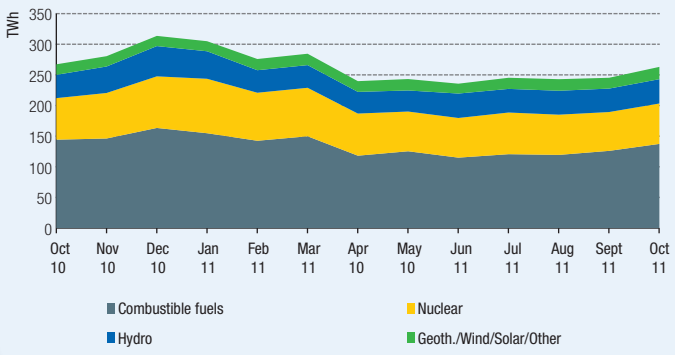
The Brent Crude Month-Ahead price rose by 3.4% in January, boosted by concerns over an interruption in Iranian oil exports to the European Union. The weakness in demand, the fall in the euro versus the US dollar (–1.5% on average), and the deteriorating economy in several European countries led to a fall in gas prices on the spot market (2.5% fall in NBP and TTF prices), as well as in the price of CIF ARA Month Ahead coal. For 2013 contracts, the price of TTF gas is up 7.1%, while the NBP Summer 2012 price recorded an average fall of 7.2% to 53.3 Gbp/therm. The price of 2013 coal posted a slight monthly rise (+0.4%). In Germany, the monthly average day-ahead contract electricity price increased by 5.1%, compared with a 1.8% fall in the 2013 baseload contract. The rise in the cost of coal and gas for delivery in 2013, combined with the fall in electricity prices, dented coal-fired power stations' margins, along with those of gas-fired power stations. The forward $CO_2$ switch price in Germany and the United Kingdom amounted to €25.10 per tonne and €18.20 per tonne respectively.

# Production

## Electricity production (TWh)

| EU 20 (in TWh) | Oct. 11 | Since Jan.11 | Past year (% change) |
|---|---|---|---|
| Production | 263.0 | 2,580.5 | –1.6% |
| of which - Combustible fuels | 137.3 | 1,308.6 | –3.5% |
| - Nuclear | 65.9 | 707.8 | 0.5% |
| - Hydro | 39.7 | 383.8 | –8.6% |
| - Geoth./Wind/Solar/Other | 20.0 | 180.3 | 28.2% |

** Gas, coal, oil.*

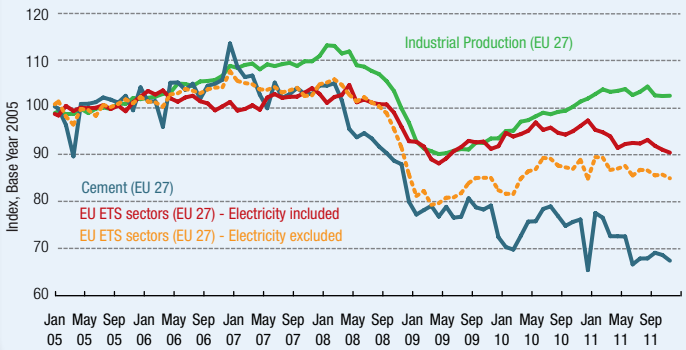



Source: CDC Climat Research, from IEA data

## Production indices (Index base year 2005)

| EU 27 | Nov. 11 | Last month (pts) | Year-on-Year (pts) |
|---|---|---|---|
| Indust. Prod (excl. construction) | 102.6 | 0.1 | –0.5 |
| EU ETS sectors production* | 90.5 | –0.6 | –3.2 |
| Electricity, gas and heating | 93.3 | –0.5 | –3.3 |
| Cement | 67.5 | –1.2 | –3.4 |
| Metallurgy | 93.3 | –1.5 | –1.7 |
| Oil refinery | 91.1 | 0.9 | –0.2 |

** Index weighted by EU ETS sectors's weight in average total allocation over 2008-2012*




Source: CDC Climat Research from Eurostat data

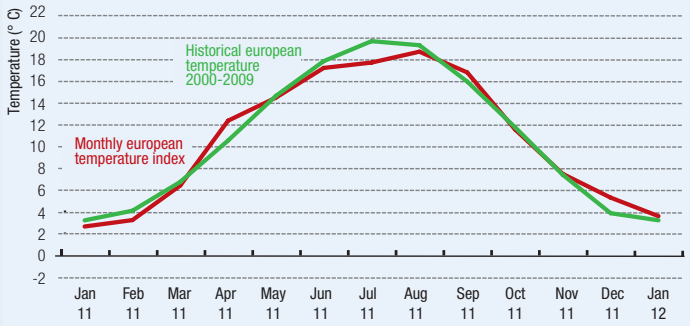
The IMF significantly reduced its growth forecast for the euro zone, to 0.5%. France and Germany also revised their 2012 GDP forecasts, to 0.5% and 0.7% respectively, compared with the original forecast of 1%. The euro zone PMI (Purchasing Managers' Index) rose again in January, and recovered to around 50 for the first time in four months. These signs of economic recovery are fading due to growing concerns over economic developments in Greece and in the Southern European countries (Portugal, Italy and Spain). Our EU ETS Production Index (including electricity generation) was down 3.2 points year-on-year in November 2011. The Eurostat Cement Production Index for the EU 27 recorded a further monthly drop of 1.2 pts. Aggregate gross European electricity generation between January and October 2011 amounted to 2,580.5 TWh, down 1.6 % compared with the same period in 2010.

# Temperature impact

## European temperature index (°C)

- Average of the MetNext Weather indices for 18 European countries, weighted according to the emission allowances allocated to each country.

| | Dec. 11 | Jan. 12 |
|---|---|---|
| Monthly average (°C) | 5.4 | 3.7 |
| Monthly average (°C) 2000-2009 | 4.0 | 3.3 |
| Monthly minimum (°C) | 2.2 | –5.9 |
| Monthly maximum (°C) | 7.9 | 3.4 |

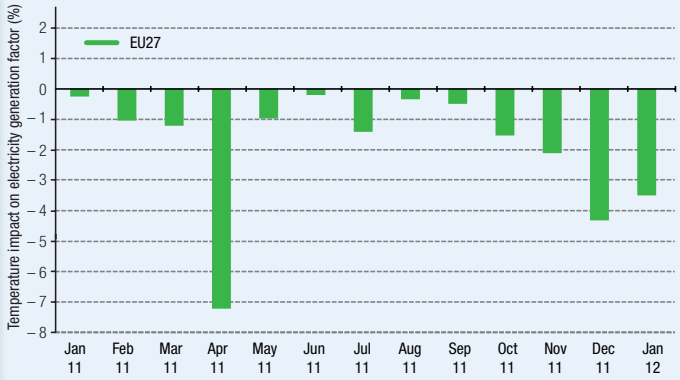



Source: Metnext Weather

## Temperature impact on electricity generation factor (%)

- The impact factor, which is calculated on the basis of a statistical electricity generation model, expresses the temperature impact in relation to average weather patterns for the 10 years between 2000 and 2009.

| | Dec. 11 | Jan. 12 |
|---|---|---|
| EU 27 | –4.3 | –3.5 |




Source: Metnext Weather

The January temperatures recorded in Europe were mild, with the difference between our EU ETS Index for monthly and ten-year temperatures reaching 0.4°C. Temperatures were milder overall compared with the ten-year trend in Continental Europe, especially in Austria (+1.7°C), Germany (+1.3°C), and France (+1.2°C). However, temperatures were lower than the ten-year trend in Southern Europe, especially in Spain (–2.4°C). According to the MetNext weather and economy model, the impact of the temperatures recorded in January was to reduce gross European electricity generation by 3.5%. In January, the low rainfall level in Spain (–22 mm) had a particularly severe effect on water reservoir levels in the Iberian peninsula, where the gap between the fill levels recorded and the ten-year trend reached 6.8%. Conversely, the reservoir fill level in the Nordic region improved markedly, reaching a rate that was 6.8% above the average ten-year rate.

# Institutional environment

## EUA supply

| | 2008 | 2009 | 2010 |
|---|---|---|---|
| **Allowances allocated (kt)** | **1,950,156** | **1,967,787** | **1,984,218** |
| Combustion installation | 1,254,227 | 1,265,113 | 1,278,989 |
| Cement clinker | 209,805 | 212,571 | 214,147 |
| Iron and steel | 184,454 | 184,786 | 184,213 |
| Mineral oil refineries | 153,205 | 153,850 | 156,964 |
| Pulp, paper and board | 37,803 | 38,740 | 39,332 |
| Glass | 24,864 | 25,238 | 25,246 |
| Other activities | 22,531 | 22,508 | 22,845 |
| Coke ovens | 21,928 | 21,982 | 21,978 |
| Metal ore | 18,215 | 18,640 | 18,660 |
| Ceramic products | 23,122 | 24,360 | 21,845 |
| **Allowances auctioned (Mt)** | **44.00** | **72.00** | **85.63** |

Sources: CITL, UK Debt Management Office, EEX

## CER and ERU supply

| | Jan. 12 | Last month change |
|---|---|---|
| **Number of CDM projects** | **9,231** | **+186** |
| *of which - registered* | 3,812 | +69 |
| *with - CER issued* | 1,391 | +37 |
| **Cumulative volume of CER issued (Mt)** | 852 | +36 |
| CER available until May 2013 - CDC Climat Research estimate (Mt) | 1,276* | +8 |
| **Number of JI projects** | 551 | +10 |
| *of which - registered* | 314 | +3 |
| **Cumulative volume of ERU issued (Mt)** | 119 | +10 |
| *via - Track 1* | 106 | +9 |
| *via - Track 2* | 13 | +1 |

** CDC Climat Research's model : http://www.cdcclimat.com/The-risks-of-CDM-projects-how-did-only-30-of-expected-credits-come-through,900.html?lang=fr*

Sources: CDC Climat Research, UNEP Risoe

In order to include the aviation sector, the European Commission has partially opened its central registry, which enables airline companies to open accounts and to receive their free allowances at the end of February. China's State Council has announced that all domestic airlines were banned from taking part in the EU ETS unless given government approval. In preparation for Phase III, the Commission is threatening legal proceedings against 17 Member States, in order to force them to disclose their benchmark-based allowance allocation plans by March 1st. In the wake of the European Parliament ENVI Committee, the Industry Committee will issue an opinion in late February on two amendments to the Energy Efficiency Directive, which involve the withdrawal of 1.4 billion allowances, and lowering the cap by 2.25% rather than by 1.74% from 2014 onwards. The Commission confirmed that reducing emissions by over 20% would cost less than it had anticipated in 2008. The ENVI Committee voted to support the Roadmap for moving to a low-carbon economy by 2050, which subscribes to the target of reducing emissions by at least 40% by 2030, and by 80% by 2050.

# Carbon markets dashboard

## Primary market - EUA auctions ($MtCO_2$)

| Countries | | | Jan-11 | Feb-11 | Mar-11 | Apr-11 | May-11 | Jun-11 | Jul-11 | Aug 11 | Sep-11 | Oct-11 | Nov-11 | Dec-11 | Jan-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| United Kingdom | Price (€/t) | | 14.00 | 14.36 | 15.59 | | | 16.34 | 13.17 | | 12.31 | 10.38 | 9.72 | - | - |
| | Volume (Mt) | | 4.40 | 4.40 | 4.40 | | | 3.50 | 3.50 | | 3.50 | 3.50 | 3.50 | - | - |
| Germany | Price (€/t) | Spot | 14.14 | 14.66 | 15.92 | 16.45 | 16.62 | 15.12 | 12.49 | 11.94 | 11.62 | 10.21 | 9.69 | - | 6.90 |
| | | Futures | 14.51 | 14.87 | 16.54 | 16.92 | 16.69 | 15.55 | 12.63 | 12.41 | 11.67 | 10.35 | (n.a) | - | 6.98 |
| | Volume (Mt) | Spot | 1.20 | 1.20 | 1.50 | 1.20 | 1.50 | 1.50 | 1.20 | 1.50 | 1.20 | 1.20 | 3.27 | - | 1.50 |
| | | Futures | 2.28 | 2.28 | 2.85 | 2.28 | 2.28 | 2.85 | 2.28 | 2.45 | 2.28 | 2.28 | (n.a) | - | 2.58 |
| Others | Price (€/t) | | | | | | | 12.70 * | 12.13 | | 11.34 | 10.37 | 8.55 | 7.13 | 7.36 |
| | Volume (Mt) | | | | | | | 1.10 | 2.95 | | 1.75 | 4.00 | 3.93 | 0.85 | 1.85 |

*Sources: EEX, UK Debt Management Office, Athens Stock Exchange**

## Primary market - CER and ERU issued ($MtCO_2$)

| | | Jan-11 | Feb-11 | Mar-11 | Apr-11 | May-11 | Jun-11 | Jul-11 | Aug 11 | Sep-11 | Oct-11 | Nov-11 | Dec-11 | Jan-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cumulative volume of CER issued UNEP-Risoe (Mt) | | 546 | 553 | 576 | 605 | 624 | 647 | 670 | 708 | 745 | 759 | 783 | 816 | 852 |
| CER available until May 2013 - CDC Climat Research estimate (Mt) | | 1,100 | 1,115 | 1,125 | 1,130 | 1,150 | 1,150 | 1,175 | 1,225 | 1,250 | 1,300 | 1,325 | 1,268* | 1,276* |
| Cumulative volume of ERU issued (Mt) | Track 1 (Mt) | 24.1 | 24.9 | 26.8 | 27.9 | 28.3 | 32.2 | 36.9 | 43.3 | 50.3 | 76.9 | 95.5 | 96.8 | 106.2 |
| | Track 2 (Mt) | 4.7 | 4.7 | 8.3 | 8.5 | 8.6 | 9.1 | 9.6 | 10.0 | 10.0 | 10.2 | 10.2 | 11.6 | 12.7 |

*Sources: UNEP-Risoe, CDC Climat Research*

## Secondary market - Prices (€/t) and volumes: EUA, CER, ERU ($ktCO_2$)

| | | | Jan-11 | Feb-11 | Mar-11 | Apr-11 | May-11 | Jun-11 | Jul-11 | Aug 11 | Sep-11 | Oct-11 | Nov-11 | Dec-11 | Jan-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spot market (BlueNext) | | Price EUA | 14.1 | 14.6 | 15.7 | 16.3 | 16.5 | 15.2 | 12.6 | 12.2 | 11.7 | 10.3 | 9.4 | 7.4 | 6.9 |
| | | Volume EUA | 1,603 | 884 | 7,298 | 5,464 | 2,538 | 4,111 | 4,498 | 6,109 | 4,551 | 3,007 | 2,499 | 2,718 | 1,908 |
| | | Price CER | 11.4 | 11.6 | 12.5 | 13.1 | 12.8 | 11.7 | 10.0 | 8.7 | 8.4 | 7.4 | 6.6 | 4.8 | 3.9 |
| | | Volume CER | 4,633 | 5,117 | 3,127 | 2,950 | 1,483 | 3,952 | 1,055 | 2,921 | 2,439 | 2,528 | 1,256 | 1,618 | 1,546 |
| | | Spread EUA-CER | 2.8 | 3.0 | 3.2 | 3.2 | 3.7 | 3.5 | 2.6 | 3.5 | 3.3 | 2.9 | 2.8 | 2.6 | 3.0 |
| | | Price ERU | 11.4 | 11.5 | 12.5 | 13.0 | 12.7 | 11.6 | 9.9 | 8.5 | 8.2 | 7.2 | 6.4 | 4.8 | 3.7 |
| | | Volume ERU | 115 | 141 | 235 | 330 | 0 | 1 | 150 | 0 | 0 | 23 | 10 | 727 | 34 |
| Futures Markets (ICE) | Dec.12 | Price EUA | 15.0 | 15.5 | 17.2 | 17.8 | 17.6 | 16.0 | 13.3 | 12.9 | 12.3 | 10.8 | 10.0 | 7.8 | 7.2 |
| | | Volume EUA | 67,444 | 69,670 | 123,705 | 70,472 | 75,281 | 148,830 | 108,235 | 113,470 | 100,058 | 115,322 | 175,003 | 193,068 | 345,497 |
| | | Price CER | 11.0 | 11.3 | 12.3 | 12.9 | 12.7 | 11.8 | 10.3 | 8.8 | 8.5 | 7.4 | 6.6 | 4.7 | 3.8 |
| | | Volume CER | 39,993 | 25,014 | 48,272 | 15,872 | 24,143 | 43,733 | 30,800 | 63,087 | 36,361 | 55,588 | 64,442 | 60,857 | 64,537 |
| | | Spread EUA-CER | 4.0 | 4.2 | 4.8 | 4.9 | 4.9 | 4.2 | 3.1 | 4.0 | 3.8 | 3.4 | 3.4 | 3.1 | 3.4 |
| | | Price ERU | 10.91 | 11.208 | 12.23 | 12.77 | 12.57 | 11.74 | 10.16 | 8.66 | 8.3 | 7.2 | 6.5 | 4.6 | 3.6 |
| | | Volume ERU | 436 | 50 | 370 | 0 | 525 | 1,750 | 250 | 3,350 | 3,260 | 200 | 2,625 | 2,446 | 2,070 |
| | Dec.13 | Price EUA | 16.0 | 16.5 | 18.4 | 19.1 | 18.9 | 17.2 | 14.3 | 13.7 | 13.2 | 11.6 | 10.6 | 8.4 | 7.8 |
| | | Volume EUA | 18,143 | 26,090 | 35,657 | 34,401 | 34,612 | 85,200 | 48,253 | 59,362 | 41,790 | 42,578 | 63,891 | 56,595 | 68,819 |
| | | Price CER | 11.9 | 12.2 | 13.6 | 14.2 | 13.9 | 12.7 | 11.0 | 9.8 | 9.3 | 8.3 | 7.4 | 5.3 | 4.6 |
| | | Volume CER | 685 | 1,580 | 2,297 | 1,324 | 5,790 | 11,906 | 3,720 | 25,427 | 11,936 | 17,109 | 64,442 | 11,176 | 12,329 |
| | | Spread EUA-CER | 4.1 | 4.3 | 4.7 | 4.9 | 5.0 | 3.9 | 3.3 | 3.9 | 3.8 | 3.3 | 3.2 | 3.1 | 3.2 |
| | Dec.14 | Price EUA | 16.8 | 17.3 | 19.3 | 20.3 | 20.0 | 18.2 | 15.2 | 14.5 | 13.9 | 12.3 | 10.9 | 8.9 | 8.3 |
| | | Volume EUA | 2,122 | 3,146 | 3,968 | 2,088 | 6,067 | 11,778 | 11,983 | 19,288 | 11,405 | 7,742 | 23,539 | 14,738 | 24,633 |
| | | Price CER | 12.1 | 12.5 | 13.9 | 14.5 | 14.2 | 12.9 | 11.1 | 10.1 | 9.6 | 8.6 | 7.4 | 5.6 | 4.8 |
| | | Volume CER | 150 | 725 | 375 | 200 | 1,940 | 979 | 5,536 | 4,110 | 2,598 | 2,868 | 5,075 | 2,807 | 1,834 |
| | | Spread EUA-CER | 4.7 | 4.8 | 5.4 | 5.7 | 5.9 | 5.4 | 4.1 | 4.4 | 4.3 | 3.7 | 3.4 | 3.3 | 3.5 |

*Sources: BlueNext, ICE Future Europe*

## Emission-to-cap by EU ETS sector and country: difference between distributed allocations of allowances and verified emissions

| | 2008 | 2009 | 2010 |
|---|---|---|---|
| Combustion | –253,550,053 | –113,953,229 | –127,220,592 |
| Cement clinker | 20,182,819 | 59,906,658 | 62,985,897 |
| Iron and steel | 51,597,174 | 90,456,616 | 70,376,100 |
| Mineral oil refineries | –1,831,556 | 7,400,996 | 13,486,862 |
| Pulp, paper and board | 6,559,985 | 10,878,883 | 9,424,977 |
| Glass | 2,328,312 | 5,898,098 | 5,311,627 |
| Other activities | 1,542,298 | 6,750,301 | 2,904,448 |
| Coke ovens | 4,264,021 | 10,949,370 | 8,912,954 |
| Metal ore | 4,931,225 | 9,583,215 | 9,678,352 |
| Ceramic products | 273,567 | 4,300,969 | 125,808 |
| **Total (t)** | **–163,702,208** | **92,171,877** | **55,986,433** |

*Source: CITL*

| | 2008 | 2009 | 2010 |
|---|---|---|---|
| Germany | –84,222,673 | –37,074,525 | –53,462,742 |
| United Kingdom | –52,601,823 | –17,273,131 | –16,955,792 |
| Italia | –9,116,362 | 24,502,770 | 10,910,263 |
| Poland | –3,139,504 | 10,799,547 | 5,481,031 |
| Spain | –9,919,501 | 13,516,237 | 28,641,386 |
| France | 5,880,211 | 18,592,403 | 16,050,484 |
| Czech Republic | 5,116,459 | 13,282,127 | 12,192,415 |
| The Netherlands | –6,278,816 | 2,755,940 | 480,287 |
| Romania | 7,689,008 | 24,829,146 | 27,310,537 |
| Others | –17,109,207 | 38,241,363 | 25,338,564 |
| **Total (t)** | **–163,702,208** | **92,171,877** | **55,986,433** |

*Source: CITL*

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