STRENGTHENING THE EUROPEAN UNION EMISSIONS TRADING SCHEME AND RAISING CLIMATE AMBITION

Facts, Measures and Implications

Report by Öko-Institut
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Executive Summary

EU energy and climate policy faces manifold challenges. The debate on tougher emissions reduction targets for 2020 is gaining momentum, the need for an integrated framework and long-term targets as well as consistent and interim targets for 2020 and 2030 is becoming clear and adjustments to the EU's Emissions Trading Scheme (EU ETS) seem to be indispensable to preserve its role as a central pillar of the EU's energy and climate policy mix.

The EU is very close to fulfilling its recent greenhouse gas emission commitments for 2020. Including the committed and projected use of external emissions reduction credits, only a gap of three percentage points remains, which is theoretically already gap-filled with the cap of the EU ETS by 2020. The current situation is also challenging for the EU ETS, which is facing significantly falling allowance prices. The fundamental reason for this price trend is the massive supply of EU emission allowances (EUA) and emission reduction credits which exceeds the demand significantly. This surplus was 950 million EUA in 2011, will reach approx. 2 billion EUA in 2013 and still amount to 1.4 billion EUA in 2020. It results from huge entitlements for the use of external emission reduction credits from CDM and JI and the long-term impacts of the economic crisis. Only a minor contribution to the surplus results from the support for renewable energy sources (RES) with complementary policies to the EU ETS because the recent growth plans for RES match quite well with the assumptions made for cap-setting in 2008.

Two different approaches were used to analyse potential interventions and adjustments of the EU ETS. Firstly, a set aside of 1,400 million allowances combined with a tighter cap for the EU ETS by increasing the linear reduction factor from a recent 1.74 % to 2.25 % from 2014 onwards. Secondly, the adjustment of the linear reduction factor was derived from more ambitious goals for the total domestic emission reductions. An increase of the linear reduction factor from 1.74 % to 2.6 % would be consistent with a 25 % domestic emission reduction, compared to 1990, and a linear reduction factor of 3.9 % would refer to a domestic target of -30 %. The analysis clearly shows that a significant and timely reduction of the surplus is only possible with the combination of a set aside and adjustments of the cap by increasing the linear reduction factor. Stand-alone measures like a set aside on the one hand or the adjustments of the linear reduction factor on the other hand will have only extremely limited impacts on the surplus for the next decade. However, set asides will only have an impact if the market participants believe that the respective amount of allowances will be held back for a sufficient period of time (at least a decade) or will be retired. Furthermore, tighter caps for the EU ETS will only achieve the intended effects if they are not complemented by an increase in the entitlements for the use of external credits.

An assessment of the different options with a relatively simple allowance price model enables key lessons on different types of interventions to emerge:

- A stand-alone approach for a set aside which will be fully reintroduced to the market before 2020 will have negligible price effects. The EUA price would remain at a level of less than 8 €/EUA in 2013 and approx. 14 €/EUA in 2020.

- A set aside for a decade or longer will increase prices by about 2.50 €/EUA in 2013 and by about 4 €/EUA in 2020.
- If the linear reduction factor is increased to 2.25 % alone, the price effect in 2013 would be very low (1 €/EUA) and slightly higher in 2020 (2 to 3 €/EUA).
- If a long-term set aside is combined with a tighter linear reduction factor of 2.25 %, the price effects would be approx. 4.50 €/EUA for 2013 and about 15 €/EUA for 2020.
- A tighter cap for aviation (applying the linear reduction factor of 2.25 % also to the sub-cap for aviation) would further increase the EUA price by € 0.50.
- The EUA price effects of a long-term set aside and an increase of the linear reduction factor to 2.6 % could increase the price in 2013 by about 5 €/EUA and by up to 17 €/EUA in 2020.
- The combination of a long-term set aside and an increase of the linear reduction factor by 3.9 % would lift the EUA price by up to € 7 in 2013 and potentially and with comparatively high uncertainties by more than € 20 by 2020.

Based on this analysis a set of four recommendations can be put forward for adjustment of the EU ETS:

- Firstly, a set aside can reduce the allowance surplus within the EU ETS in the short term. However, the respective amount of allowances should be held back for a period of a decade or more or retired at the earliest point in time.
- Secondly, the long-term cap should be tightened by a significant increase of the linear reduction factor, preferentially from 2014 onwards. The effective increase is subject to fundamental political decisions on the overall emission reduction targets. However, an increase of the linear reduction factor to less than 2.6 % will be not consistent with overall targets of 25 % domestic emission reduction and a factor of less than 3.9 % will not be consistent with an overarching target of 30 % domestic action by 2020.
- Thirdly, no additional entitlements for the use of external emission reduction credits should be created in the process of tightening the EU ETS cap.
- Fourthly, the implementation of high impact complementary policies (e.g. the impact of the upcoming Energy Efficiency Directive on emissions in the EU ETS sectors), a long-lasting change in fundamental drivers for baseline emissions (e.g. a significantly lower economic growth for a longer period) or other changes in the regulatory framework (e.g. the discontinuation of significant parts of the aviation sector as net buyers in the market) should be reflected by a strictly rule-based and high-threshold provision to lower the cap in the EU ETS.

These kinds of structural improvements could help to preserve the key role of the EU ETS in an enabling policy mix for ambitious, effective and efficient climate policy.

Zusammenfassung

Die Energie- und Klimapolitik der Europäischen Union steht vor vielfältigen Herausforderungen. Mit zunehmender Intensität werden ambitionierte Emissionsreduktionsziele für 2020 diskutiert, die Notwendigkeit eines integrierten Ansatzes und langfristiger Klimaschutzziele sowie damit konsistenter Zwischenziele für 2020 und 2030 werden immer deutlicher. Gleichzeitig erscheinen Veränderungen am Emissionshandelssystem der Europäischen Union (EU ETS) unabdingbar, wenn dieses Instrument seine Rolle als zentrales Element im Portfolio der europäischen Energie- und Klimapolitik behalten soll.

Die bisherigen Treibhausgas-Emissionsminderungsziele für das Jahr 2020 hat die EU bereits sehr weitgehend erfüllt. Unter Berücksichtigung der bereits realisierten und erwartbaren Minderungsgutschriften aus externen Projekten verbleibt nur noch eine Zielerreichungslücke von etwa 3 Prozentpunkten, die faktisch durch das feste Emissionsziel des EU ETS bereits geschlossen ist. Aus dieser aktuellen Situation entsteht jedoch für das EU ETS eine durchaus problematische Situation, vor allem angesichts massiv zurückgehender Preise für die Emissionsberechtigungen des EU ETS (European Union Allowances – EUA). Fundamental sind diese Preisentwicklungen durch das sehr große Angebot an Emissionsberechtigungen und externen Minderungsgutschriften erklärbar, das den Bedarf erheblich überschreitet. Dieser Überschuss belief sich auf 950 Millionen EUA im Jahr 2011, wird bis 2013 auf etwa 2 Milliarden EUA ansteigen und im Jahr 2020 immer noch 1,4 Milliarden EUS betragen. Hauptgründe dafür sind die umfangreich zugelassene Nutzung externer Emissionsminderungsgutschriften aus dem Clean Development Mechanism (CDM) und Joint Implementation (JI) sowie die längerfristigen Auswirkungen der Finanz- und Wirtschaftskrise. Eine nur untergeordnete Rolle spielt dagegen der Überschuss, der sich aus der Förderung erneuerbarer Energien mit Instrumenten jenseits des EU ETS ergibt, entsprechen doch die aktuellen Ausbaupläne für erneuerbare Energien vergleichsweise gut den Annahmen, die im Jahr 2008 bei der Festlegung des Emissionsziels für den EU ETS (Cap) getroffen wurden.

Die Analyse unterschiedlicher Veränderungen bzw. Anpassungen des EU ETS erfolgte aus zwei unterschiedlichen Perspektiven. Erstens wurde die Herausnahme (Set aside) von 1,4 Milliarden EUA aus dem EU ETS in Kombination mit einem ambitionierteren Cap untersucht, die sich aus einer Erhöhung des linearen Reduktionsfaktors von bisher 1,74 % auf 2,25 % ab 2014 ergibt. Zweitens wurden Anpassungen des linearen Reduktionsfaktors aus stärkeren Minderungszielen für die Gesamtemissionen der EU abgeleitet. Eine ausschließlich in der EU erbrachte Emissionsminderung von 25 % gegenüber 1990 entspricht dabei einer Erhöhung des linearen Reduktionsfaktors von 1,74 auf 2,6 %, eine Erhöhung des entsprechenden Ziels auf -30% wäre konsistent mit einem Anstieg des linearen Reduktionsfaktors auf jährlich 3,9 %. Die Analysen verdeutlichen, dass eine maßgebliche und rechtzeitige Rückführung des Überschusses an Emissionsrechten nur mit der Kombination eines Set aside und einer Anpassung des Caps mittels Verschärfung des linearen Reduktionsfaktors erreicht werden können.

Isolierte Ansätze wie ein Set aside für sich oder die Anpassung des linearen Reduktionsfaktors allein haben dagegen für die nächste Dekade nur sehr begrenzte Wirkungen auf die Entwicklung des Überschusses an Emissionsberechtigungen. Dessen ungeachtet kann ein Set aside nur dann eine Wirkung entfalten, wenn die Marktteilnehmer zu der Einschätzung gelangen, dass die entsprechenden Zertifikatsmengen für einen ausreichend langen Zeitraum (mindestens eine Dekade) aus dem Markt genommen oder stillgelegt werden. Darüber hinaus werden verschärfte Caps im EU ETS nur dann die intendierten Effekte zeitigen, wenn sie nicht mit einer Erhöhung der Nutzungsberechtigungen für externe Emissionsminderungsgutschriften einhergehen.

Die Bewertung der unterschiedlichen Modelle mit einem vergleichsweise einfachen Modell zur Abschätzung von Preisen für Emissionsberechtigungen führt zu folgenden zentralen Ergebnissen:

- Ein Set aside ohne weitere Ergänzungen, das vor 2020 wieder vollständig dem Markt zur Verfügung gestellt wird, hat nur vernachlässigbare Effekte auf den Preis für Emissionsberechtigungen. Der Preis für Emissionsberechtigungen würde auf einem Niveau von unter 8 €/EUA im Jahr 2013 und ungefähr 14 €/EUA im Jahr 2020 verbleiben.
- Ein Set aside, das für eine Dekade oder länger aus dem Markt genommen wird, erhöht die Zertifikatspreise um etwa 2,50 €/EUA im Jahr 2013 und ungefähr 4 €/EUA in 2020.
- Wenn nur der lineare Reduktionsfaktor auf 2,25 % erhöht wird, ergibt sich für das Jahr 2013 nur ein geringfügiger Preiseffekt (1 €/EUA) und für 2020 eine etwas größere Zertifikatspreiserhöhung (2 bis 3 €/EUA).
- Wenn ein längerfristig angelegtes Set aside mit einem verschärften linearen Reduktionsfaktor von 2,25 % kombiniert wird, so ergeben sich Preiserhöhungen von etwa 4.50 €/EUA für 2013 und ungefähr 15 €/EUA für 2020.
- Ein ambitioniertes Cap für den Flugverkehr (über die Anwendung des linearen Reduktionsfaktors von 2,25 % auch für diesen Teil des EU ETS) würde den EUA-Preis um weitere 0,50 € erhöhen.
- Als Effekt eines längerfristig angelegten Set aside in Kombination mit einer Erhöhung des linearen Reduktionsfaktors auf 2,6 % könnte sich der Zertifikatspreis im Jahr 2013 um 5 €/EUA und um bis zu 17 €/EUA im Jahr 2020 erhöhen.
- Das Zusammenwirken eines längerfristig angelegten Set aside und einer Verschärfung des linearen Reduktionsfaktors auf 3,9 % würde die EUA-Preise in 2013 um etwa 7 € und bis 2020 – bei vergleichsweise hohen Unsicherheiten – um mehr als 20 € erhöhen.

Auf der Grundlage dieser Analysen ergeben sich für das EU ETS insgesamt vier Empfehlungen:

- Erstens kann mit einem Set aside der Zertifikatsüberschuss im EU ETS kurzfristig reduziert werden. Die entsprechende Menge an Emissionsberechtigungen

sollte jedoch für eine Dekade oder mehr zurückgehalten oder frühestmöglich stillgelegt werden.

- Zweitens sollte das langfristige Cap über eine deutliche Erhöhung des linearen Reduktionsfaktors verschärft werden, die vorzugsweise ab 2014 wirksam werden sollte. Das Ausmaß dieser Erhöhung resultiert aus grundlegenden politischen Entscheidungen zum übergeordneten Minderungsziel für die gesamten Treibhausgasemissionen. Eine Erhöhung des linearen Reduktionsfaktors von weniger als 2,6 % wäre jedoch nicht konsistent zu einem Minderungsziel für die Emissionen in der EU von 25 %, eine Erhöhung um weniger als 3,9 % wäre nicht konsistent mit einem Ziel für Emissionsminderungen in der EU von 30% bis zum Jahr 2020.
- Drittens sollten die Budgets für die Nutzung externer Emissionsminderungsgutschriften im Zuge einer Verschärfung des Caps für den EU ETS nicht erhöht werden.
- Viertens sollte die Umsetzung von zusätzlichen Politiken und Maßnahmen mit weitreichenden Emissionsminderungswirkungen (z.B. die anstehende EU-Richtlinie zur Energieeffizienz) sowie langfristig wirksame Veränderungen entscheidender Treibergrößen für die Referenzentwicklung bei den Emissionen (z.B. ein längerfristig deutlich verringertes Wirtschaftswachstum) oder andere Änderungen (die z.B. den Wegfall eines Teils der Nachfrage aus dem Flugverkehr bewirken könnten) über eine entsprechende Eingriffsregelung für eine Verringerung des Caps berücksichtigt werden, die jedoch strikt regelbasiert sowie mit hohen Eingriffsschwellen ausgestaltet werden sollte.

Solcherart ausgestaltete, strukturellen Verbesserungen könnten dazu beigetragen, die Schlüsselrolle des EU ETS in einem nachhaltigen Portfolio ambitionierter, effektiver und effizienter Klimapolitik zu bewahren.

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1 Introduction, scope and structure of the analysis

The climate and energy policy of the European Union (EU) and its Member States is framed by the energy and climate package of 2008 which includes a set of binding targets for greenhouse gas emission reductions and the deployment of renewable energy sources and a broad range of respective policies and measures. However, the European climate and energy policy faces a series of challenges:

- The EU has made significant progress towards meeting its unilaterally envisaged target of 20 % greenhouse gas reduction for the period from 1990 to 2020. However, the broad range of domestic action in many countries worldwide, among them some important emerging countries (China, India, Brazil, South Africa etc.) as well as key OECD countries (parts of the USA, Australia, South Korea, Mexico etc.) challenge to the EU to tighten its emission reduction efforts.
- Due to several factors the greenhouse gas-based European Union Emissions Trading Scheme (EU ETS) faces serious challenges in terms of its role as a central and EU-wide pillar of the EU's climate policy mix. The significant drop in emission allowance prices and the obvious lack of scarcity in the market create a need for appropriate action.

The EU ETS is thus at the core of a debate on the wider topic of future emissions reduction efforts of the EU (which are significantly framed by the EU ETS) as well as on the EU ETS as a key economic instrument which combines environmental effectiveness and economic efficiency:

- The EU ETS generates a price on carbon dioxide (CO_2) and other greenhouse gases released into the atmosphere by the regulated entities. The market-based price discovery for the costs of emission abatement creates a dynamic long-term framework for emission reductions in the regulated sectors.
- The EU ETS creates an extremely transparent quantitative framework for long-term emission reduction strategies. The cap and its development over time without a sunset clause provides clear signals for policy makers, the regulated entities and the public of the trajectory of emissions and the contribution to emission reduction that will be delivered by the regulated sectors.
- The EU ETS will generate significant revenue streams after the main allocation mechanisms of the scheme are shifted to the auctioning of allowances from 2013 onwards. Significant parts of these revenue streams should be available for national, European and international climate financing.

This threefold role of the EU ETS should also be considered in the framework of the recent challenges to the EU ETS.

- After the significant price drop of CO_2 allowances within the EU ETS (European Union Allowances – EUA) after the financial and economic crisis, the price signal from the EU ETS no longer delivers sufficient price signals for investments

in low-carbon technologies. Given the emerging re-investment cycle for sectors with long-lasting capital stocks (e.g. the power sector) this creates a major challenge for the EU ETS because of a risk of lock-in into CO_2-intensive infrastructures.

- The contributions of the EU ETS to climate financing will be much less significant than originally assumed. This creates a problem for specific support programmes set up by the European Union (e.g. the financing of innovative technologies from the auctioning of 300 million allowances from the new entrants reserve) as well as the wide range of climate financing efforts by the Member States (e.g. the national and the international climate initiative from the German energy and climate fund which will absorb fully the revenues from allowance auctions in Germany).
- The recent trajectory for the cap of the EU ETS is not fully consistent with the long-term emission target of the EU to reduce greenhouse gas emissions by 80 to 95 % by the middle of this century, compared to 1990 levels, as well as consistent interim emission reduction targets for 2020 and 2030, e.g. 30 % and 55 %, respectively. Furthermore, the emission reduction pathway of the EU ETS is subject to change if the EU needs to increase its efforts in the context of the activities abroad (which often include the set-up of EU ETS-like mechanisms and underline the important function of the EU ETS as a role model).

After eight years of operation (2005-2012) and even after a major re-adjustment for the trading periods from 2013 onwards, the EU ETS faces an emerging debate on how to fix the problems mentioned above. However, these debates should reflect different dimensions which interact with each other:

- What are the main drivers for the recent problems that the EU ETS is facing?
- What are the options for addressing these problems, which effects would these options have over time and how could these options fit into the needs for adjustments of the overall climate policy framework?

The analysis presented in this study is based on a detailed analysis of a range of issues, which are related to the two questions specified above:

- In chapter 2 the most recent trends as well as the targets for total greenhouse gas emissions and the evolution of the long-term cap for the EU ETS are described in some detail.
- Chapter 3 deals with the supply and demand for emission allowances and offset credits in the first four years of the recent trading period and specifies the balance between demand and supply based on historical data.
- In chapter 4 a comprehensive analysis is presented on the demand and supply of allowances for the remaining year of the second period and the upcoming third period up to 2020.

- Chapter 5 summarizes the demand and supply situation for the whole period from 2008 to 2020 and specifies the main sources for the surplus of emissions allowances by 2020.
- Chapter 6 presents the analysis of some options for adjustments of the EU ETS to address the key challenges for the next decade, including the effects on allowance prices which can be assumed. The starting points for this analysis are prominent political proposals taken from the recent debates on the EU ETS.
- In chapter 7 the approaches to addressing the specific EU ETS challenges are set into context with tightened overall emission reduction targets for the European Union by 2020 and beyond. These proposals on adjustments for the EU ETS are derived from ambitious greenhouse gas reduction targets for domestic action by 2020 based on a back-casting approach.
- Chapter 8 provides a series of conclusions derived from the quantitative and qualitative analysis.

It should be highlighted that the analysis is focused on key issues of demand and supply of allowances in a longer-term perspective.

- Broader options for approaching the EU ETS, like active price management based on price floors or price corridors or a carbon market version of open market policy (Grubb 2012, Perthuis/Trotignon 2012) are explicitly not subject to the analysis presented in this study.
- Within the framework of a more ambitious climate policy, broader approaches in terms of appropriate targets as well as policies and measures will be necessary. This is relevant for policies and measures beyond the EU ETS as well as for policies and measures addressing sectors which are not regulated by the EU ETS. These issues are not covered by the scope of the analysis presented in this paper.

Last but not least, the issues handled in this paper are highly political and at the same time highly technical ones. This tension creates a strong need for transparency. Therefore the analysis and documentation presented in this paper has a two-fold purpose. Firstly, the information should be usable as a compendium for key data and data links which are important to navigate across the debates. Secondly, the findings should support specific action and thus be as explicit as possible.

The authors benefitted enormously from a broad range of discussions with many colleagues and partners and wish to thank them for this. This paper has been edited by Vanessa Cook (Öko-Institut). However, any errors or inaccuracies remain the sole responsibility of the authors.

2 Trends and targets for the greenhouse gas emissions of the EU

2.1 Trends and targets for total greenhouse gas emissions of the EU

The historical trends for greenhouse gas emissions of the European Union (27 Member States) are characterized by three phases (Figure 1)[1]:

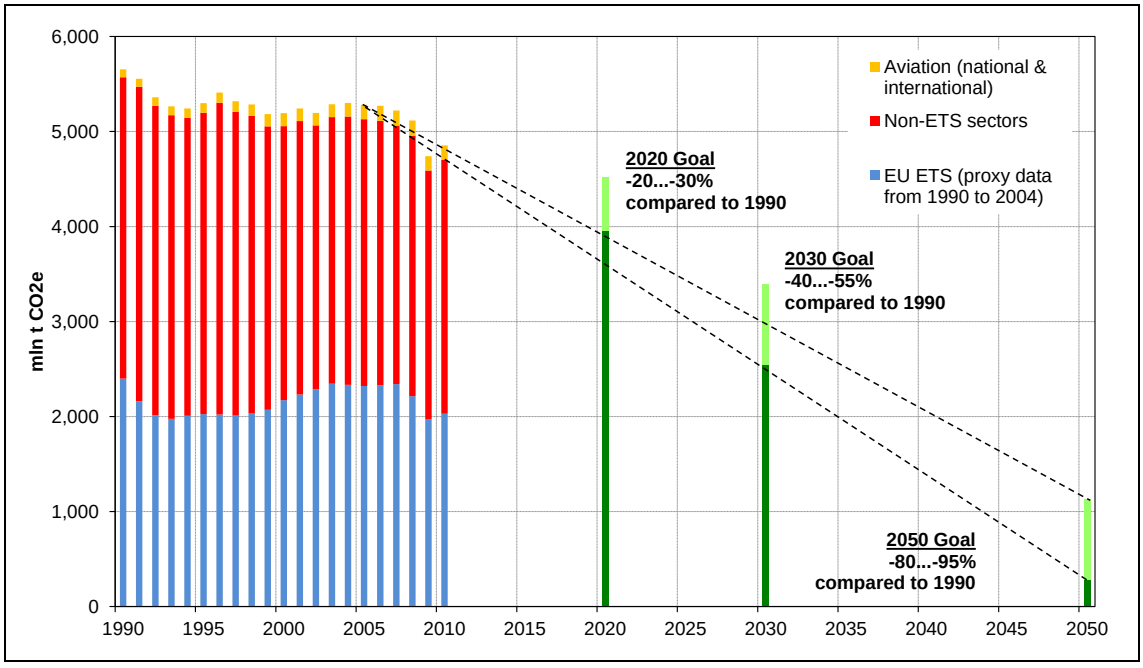
- In the early 1990s the greenhouse gas emissions decreased significantly, mainly due to the transformation process in Eastern Germany and the Member States who entered the EU in 2005 and 2007 (new Member States) and mainly in sectors which have been regulated by the EU ETS since 2005. From 1990 to 1995 the emissions decreased by approx. 6 %.
- During the period from 1995 to 2005 the emissions at the aggregate level tend to stagnation or a slight decrease but indicate different sectoral patterns. For the sectors regulated later under the EU ETS (power sector, energy intensive industries) a slight increase occurred, the emissions from aviation increased significantly and the emissions from the non-ETS sectors decreased. For the whole period from 1990 to 2005 the total greenhouse gas emissions reduction amounted to 7 %.
- From 2005 the emissions drop significantly, in the first years exclusively from non-ETS sectors and from 2008 dominantly in the ETS-regulated sectors whereas the latter trend was obviously but not exclusively triggered by the financial and economic crisis from 2008 onwards. In 2009 the total emissions reduction compared to 1990 reached 16 %, in 2010 the respective level was 14 % below 1990 levels.

The EU ETS for stationary installations represents (at the scope of the scheme from 2013 onwards) a share of 42 - 45 % in the total greenhouse gas emissions, the inclusion of the aviation sector (from 2012 onwards) increases this share to 45 - 48 %. The European Union has defined a set of greenhouse gas reduction targets for different time horizons:

[1] For the purpose of consistency with the ETS-related analysis the quantitative analysis of greenhouse gas emission trends includes the emissions from international aviation (which is not accounted for under the provisions of the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) but excludes the emissions from land use, land use change and forestry (LULUCF)). However, it should be pointed out that the scope of the greenhouse gas inventories under the UNFCCC covers the fuel deliveries to aircrafts and differs from the emission accounting for aviation under the EU ETS. In order to make these two data sets compatible, relative change rates were applied when certain trends or patterns from the one database had to be transferred to the other one.

- For 2020 the EU has committed itself to an emission reduction of 20 % below 1990 levels on a unilateral basis (CEU 2007, EU 2009a, EU 2009b). An increase of the ambition level to 30 % is a subject of recent debate.
- No formal commitment of the EU exists yet for 2030. However, the range from 40 to 55 % is discussed within the scope of debates surrounding the Low-Carbon Economy Roadmap and the Energy Roadmap 2050 (CEC 2011d, CEC 2011e, Öko-Institut 2011).
- The EU declared and re-affirmed on several occasions a long-term emission reduction target of 80 to 95 % below 1990 levels by 2050 (CEU 2010, CEU 2011, EP 2010).

Figure 1 Total greenhouse gas emission trends and goals for the European Union (excluding LULUCF and including international aviation), 1990-2050



Source: UNFCCC, European Commission, calculations by Öko-Institut

The comparison of the historical emission patterns (Figure 1) and the medium- and long-term emission reduction targets highlights on the one hand that the sectors regulated by the EU ETS must deliver a significant share of the required reduction efforts. On the other hand the general trajectory towards the long-term targets is not fully consistent with the 2020 targets as defined and addressed in recent debates. Given the fact that the EU ETS is essentially parameterized in the framework of the 20 % emissions reduction target for 2020 (as laid down in the energy and climate package of 2008) it will potentially require adjustments to maintain the appropriate investments, which fit into the long-term trajectory towards an 80 to 95 % emission reduction by 2050.

2.2 Cap under the EU ETS from 2005 to 2020 and beyond

The emissions target of the EU ETS – the cap – is determined by the total amount of allowances (European Union allowances – EUA) which are available to the regulated entities either from free allocation or purchases or auctions. However, for the second period of the EU ETS the exact number of these allowances is subject to changes, depending on the decisions on the National Allocation Plans (NAP) of the Member States which form as a total the EU-wide cap for the second period from 2008 to 2012.

Table 1 Cap references for the second trading period of the EU ETS

	NAP decisions (2006/2007)	NAP table decisions (2008, 2009, 2010)	CITL "NAP Info" (2012)
	mln EUA		
Austria	30.70	30.73	30.96
Belgium	58.50	58.49	58.49
Bulgaria	42.30	38.09	39.29
Cyprus	5.48	5.25	5.35
Czech Republic	86.80	86.74	86.74
Denmark	24.50	24.50	24.50
Estonia	12.72	13.10	13.10
Finland	37.60	37.56	37.56
France	132.80	131.99	134.37
Germany	453.10	451.47	452.34
Greece	69.10	68.31	68.31
Hungary	26.90	26.65	26.65
Ireland	22.30	22.28	22.29
Italy	195.80	201.59	201.59
Latvia	3.43	3.41	6.25
Liechtenstein	0.00	0.02	0.02
Lithuania	8.80	8.58	8.58
Luxembourg	2.50	2.49	2.49
Malta	2.10	2.14	2.14
Netherlands	85.80	87.47	87.47
Norway	15.05	15.05	15.05
Poland	208.50	205.70	205.70
Portugal	34.80	34.81	34.81
Romania	75.90	74.06	74.05
Slovakia	30.90	32.54	32.54
Slovenia	8.30	8.30	8.29
Spain	152.30	152.25	152.25
Sweden	22.80	22.47	22.47
United Kingdom	246.20	245.62	245.62
EU-27	2080.93	2076.60	2084.21
All EU ETS countries	2095.98	2091.66	2099.28

Note: The cap for Austria was corrected downwards for the allowances purchased by the Austrian government to replenish the new entrant reserve and that are included in the NAP table decision and the CITL "NAP Info" for Austria. Reserves for the use of emissions reduction credits from Joint Implementation are not taken into account when calculating the caps. The total for all EU ETS countries includes Norway and Liechtenstein.

Source: NAP decisions[2], NAP table decisions[3], CITL "NAP Info"[4], calculations by Öko-Institut

[2] http://ec.europa.eu/clima/policies/ets/allocation/2008/documentation_en.htm.

[3] http://ec.europa.eu/clima/policies/ets/registries/documentation_en.htm.

Table 1 summarizes the evolution of the cap in the EU ETS over time, which is characterized by a slightly increasing trend. Based on the NAP decisions by the European Commission in 2006/2007, the total of the national caps for the participating states amounted to 2,096 million EUA. Based on the respective decisions on the so-called NAP tables submitted by Member States in the years 2008 to 2010 (containing individual allocations for each installation) the total quantity slightly decreased to 2,092 million EUA. However, over time the cap for the EU ETS undergoes further changes which are documented in the Community Independent Transaction Log (CITL). As of May 2012 the exact cap amounted to 2,099 million EUA. The main reason for this increase is that the cap of Latvia has doubled to 6 million EUA annually, according to the most recent changes in the CITL (Table 1).[5] The methodology and the transparency on the cap of the EU ETS will increase significantly from 2013 onwards because the total cap will no longer result from decentralized cap-setting in National Allocation Plans by the participating countries. From the start of the second trading period (2008-2012) the EU-wide cap is centrally set by European legislation. This new cap-setting approach is based on the EU-wide cap for the second period (expressed as the annual average of the respective number of allowances) and a linear reduction factor (LRF). The linear reduction factor is applied to the cap level at the midpoint of the second trading period to calculate a fixed number of allowances which is annually deducted from the cap for the previous year. This annual deduction is also applied mathematically for the second half of the second trading period but first takes effect in 2013. It is worth mentioning that the EU ETS Directive as the legislative basis for the EU ETS does not specify any endpoint for the application of the linear reduction factor and the linear reduction factor provides long-term visibility of the emission reduction targets to be implemented by the EU ETS.

Although this general approach is complemented by some special provisions, e.g. for installations which fall under the scope of the EU ETS from the beginning of the third trading period, the transparency of the cap should significantly increase from 2013 onwards because the European Commission has to explicitly publish the respective cap amounts.

For the analysis presented in this paper, the following approach was taken to specify the cap: In order to not overestimate the cap from 2013 onwards the quantity of EUAs stated in the NAP table decisions are taken as the average cap in the second trading period of the EU ETS. This cap is reduced annually by a fixed amount of allowances consistent to the linear reduction factor of 1.74 % annually in accordance with recent

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[4] CITL; Nap Info; Search; Country; First Commitment Period; History of the NAP; Total in NAP. http://ec.europa.eu/environment/ets/napMgt.do?languageCode=en.

[5] However, the total cap derived from the CITL data is likely to overestimate the cap because in some cases governments (e.g. in Austria) bought allowances from the market to replenish the reserve for the free allocation to new entrants (new entrant reserve). In this case the EUAs are recorded twice in the CITL. On the one hand allowances are accounted for when they are initially issued (or auctioned/sold); on the other hand the allowances are recorded in the CITL when they are bought by governments and are issued to new entrants.

legislation. The respective cap from 2013 onwards has been published by DG Clima (CEC 2010c and CEC 2010d) but it is important to note that this cap-setting is not the final one. The most recent calculation of the cap (CEC 2010d) does not include allowances from new entrant reserves that have not yet been allocated. This means that the cap level published up to now is a preliminary one and it is very likely that it will be increased in order to take into account allocations or auctions and sales from new entrant reserves.

Table 2 Comparison of approaches to quantify the cap for the third trading period of the EU ETS (scope of the second period), 2013-2020

	2nd period	3rd trading period								Total
	average	2013	2014	2015	2016	2017	2018	2019	2020	2013-2020
	mln EUA									
Cap decision	2,039	1,932	1,897	1,861	1,826	1,790	1,755	1,719	1,684	14,464
Own calculation	2,077	1,968	1,932	1,896	1,860	1,824	1,788	1,751	1,715	14,734
Difference	38	36	35	35	34	33	33	32	31	269
Note: Own caculation is based on CITL data.										

Source: CEC (2010b+d), calculations by Öko-Institut

Table 2 compares the cap from 2013 onwards for installations that already participated in the second trading period (EU ETS II scope), including installations that opted-in to the EU ETS in the second period (not including EUAs attributed to the non-EU countries Norway and Liechtenstein). The data compilation illustrates that compared to the most recent cap decision it is likely that the final cap for the second and third trading periods will increase by up to 38 million EUA per year.

Table 3 indicates the cap data estimates for the EU ETS from 2013 onwards which were used for the analysis. It should be highlighted that the analysis must reflect the fact that the scope of the EU ETS changes over time (increasingly broadening the scope of stationary sources as well as the inclusion of new sectors like aviation). In detail the cap estimates are based on the following data and assumptions:

- The cap data for stationary installations already participating in the second trading period from 2008 to 2012 (Stationary ETS II scope) are taken from Table 2 (the “own calculation” column).
- The quantity of allowances available for stationary installations participating from the third trading period onwards (Stationary ETS III scope) is based on CEC (2010d).
- The quantity of allowances available for Norway and Liechtenstein is based on a multiplication of the linear factor and the cap for the second trading period as documented in Table 1.
- The cap for aviation (which is included in the EU ETS from 2012 onwards) is based on EEA JC (2011) and includes flights starting from or landing in the EU-27, Iceland, Norway and Liechtenstein. It should be noted that the sub-cap for

aviation is not subject to an annual adjustment by the linear reduction factor and remains constant in accordance with recent legislation.

Table 3 Cap for the EU ETS in the third trading period, 2013-2020

	3rd trading period								Total
	2013	2014	2015	2016	2017	2018	2019	2020	2013-2020
	mln. EUA								
Stationary ETS II scope	1,968	1,932	1,896	1,860	1,824	1,788	1,751	1,715	14,734
Stationary ETS III scope	106	104	102	100	98	96	94	92	794
Norway & Liechtenstein	14	14	14	13	13	13	13	12	107
Aviation	210	210	210	210	210	210	210	210	1,683
Total	2,299	2,260	2,222	2,184	2,145	2,107	2,069	2,030	17,317
Note: The data for the stationary ETS scopes II and III reflect installations in EU-27 countries only.									

Source: CEC (2010d), EEA JC (2011), calculations by Öko-Institut

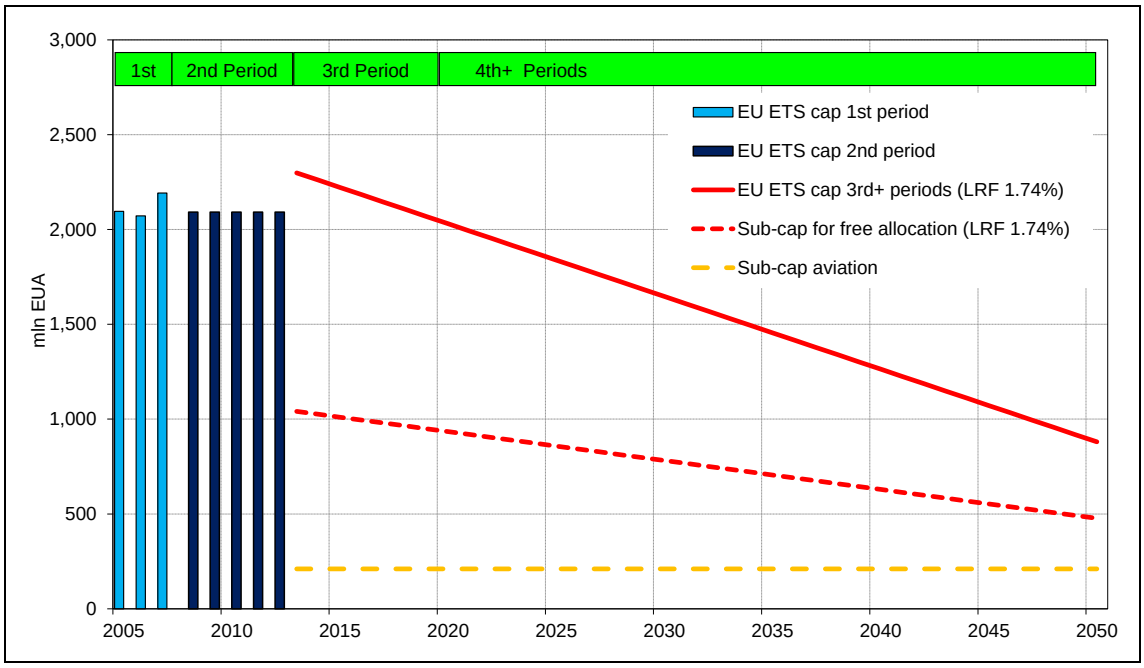
Figure 2 illustrates the implicit long-term reduction targets resulting from the cap-setting approaches for the first, the second, the third and the subsequent trading periods:

- The first trading period (2005-2007) is characterized by comparatively high caps and the expansion of the scheme to include Romania and Bulgaria in 2007. However, the cap for the first trading period exceeded the verified emissions from the regulated installations significantly.
- The second trading period (2008-2012) is characterized by the inclusion of additional installations as well as Norway and Liechtenstein on the one hand and a significantly tightened cap on the other hand. Compared to the scope-adjusted emissions for 2005 the cap represents an emission reduction of approx. 6 %.
- The third and the subsequent trading periods are again characterized by a broadened scope for the stationary installations as well as the inclusion of aviation (from 2012 onwards). For the stationary ETS III scope the scope-adjusted emission reduction compared to 2005 amounts to 21.5 % for 2020, 38 % for 2030 and 71 % for 2050. However, if the non-decreasing sub-cap for the aviation sector is taken into account (the cap for aviation is set at a level of 95 % of the 2004/2006 average emissions from 2013 onwards), the total reduction of EU ETS-regulated and scope-adjusted emissions compared to 2005 is 20 % for 2020, 35 % for 2030 and 65 % for 2050.
- Furthermore, the recent legislation foresees a sub-cap for free allocation to stationary sources in the EU ETS which should not exceed the share in emissions from installations which are not subject to full auctioning from 2013 onwards.
- However, if the emission reduction contributions from the EU ETS are seen in context with the medium- and long-term minimum emission reduction goals for the European Union (20 or more by 2020, 80 or more by 2050) the long-term consistency of the recent linear reduction factor must be questioned: In the framework of a total 20 % emissions reduction by 2020, compared to 1990, the stationary installations regulated by the EU ETS would deliver about 66 % of

the total required emissions reduction from 2005 to 2020. Aviation would deliver about 1 % and the non-ETS sectors 33 %.

- For an 80 % emission reduction by 2050 the EU ETS would deliver only 40 % of the necessary emission reduction from 2005 to 2050. If the 2020 target would be tightened to 30 % and the cap of the EU ETS, i.e. the linear reduction factor would not be subject to change, the EU ETS would only deliver about 38 % of the necessary emission reduction. Aviation would contribute less than 1 % and the non-ETS sectors 60 % of the total emission reduction.

Figure 2 Evolution of the caps for the EU ETS, 2005-2050



Source: CEC 2010b, EU 2009a, calculations by Öko-Institut

Consequently the debate on EU ETS caps must focus on the short- and medium-term aspects (cf. chapter 3 to 6) as well as the longer-term consistency (cf. chapter 7).

3 The recent problem: Allowance surplus from 2008 to 2011

3.1 Introduction, scope and structure of the analysis

The analysis presented in the following chapters focuses on the surplus of allowances which occurred from 2008 to 2011. For this period a consistent set of historical data is available for the EU ETS. The analysis does not reflect the respective data from the first trading period of the EU ETS because banking was not allowed from the pilot period (2005-2007) to the second trading period (2008-2012) and is consequently not relevant for the surplus analysis.

The specification of the surplus for the period from 2008 to 2011 is based on the following analysis:

1. The trends of verified emissions in the EU ETS specify the demand for emissions allowances by the regulated entities (cf. chapter 3.2).
2. The supply of emissions allowances or substitutes arises from different sources which are documented separately:
    a. A major share of emissions allowances were made available by free allocation to the operators of the respective installations (cf. chapter 3.3).
    b. Some allowances were supplied by auctions or government sales at market prices (cf. chapter 3.4);
    c. The operators were entitled to use a certain amount of lower-priced emissions reduction credits from the Clean Development Mechanism (CDM) and Joint Implementation (JI) as a substitute for EU emission allowances (cf. chapter 3.5).

The comparison of demand and supply (cf. chapter 3.6) allows the surplus accumulated by the end of 2011 and its pattern to be specified.

3.2 Trend of verified emissions in the EU ETS for 2008 to 2011

Data on verified emissions is available from the Community Independent Transaction Log (CITL) on an installation level. Data on an aggregated level is published by the European Environment Agency (EEA) in its EU ETS Dataviewer (EEA 2012).

In its current scope the EU ETS covers the 27 EU Member States, Norway and Liechtenstein. Verified emissions of all installations covered by the EU ETS were 2,123 million tons of carbon dioxide (t CO_2) in the year 2008. Due to the economic crisis emissions dropped to 1,888 million t CO_2 in the year 2009 and recovered to a level of 1,939 million t CO_2 in the year 2010 (EEA 2012). In 2011 emissions decreased again to a level of 1,903 million t CO_2.

3.3 Free allocation for 2008 to 2011

Data on free allocation is also available from the Community Independent Transaction Log (CITL) on an installation level. Data on an aggregated level is published by the European Environmental Agency (EEA) in its EU ETS Dataviewer (EEA 2012).

Free allocation as recorded in the EU ETS Dataviewer was 1,961 million t CO_2 in the year 2008, increasing to 1,976 million t CO_2 in the year 2009, 1,998 million t CO_2 in the year 2010 and 2,001 million t CO_2 in the year 2011.

3.4 Auctions and sales for 2008 to 2011

Data on auctioned or sold volumes of EUAs are not provided by the CITL or by another comprehensive data compilation. However, Member States generally publish the amount of allowances which were brought to the market by auctions or sales. In addition, the website of DG Clima also keeps track of the amount of EUAs auctioned by Member States.

Based on the data compiled by EEA (2012) the amount of EUAs auctioned or sold in 2008 was 45 million EUAs, exclusively from Germany and the UK. In 2009 this volume increased to nearly 80 million EUAs in 2009, 92 million EUAs in 2010 and 83 million EUAs in 2011. However, in some Member States auctions or sales were planned but the set-up of auctions and sales was and is still delayed.

3.5 Use of CDM and JI credits from 2008 to 2011

Data on the amount of CDM and JI credits surrendered by operators is recorded and published by the Community Independent Transaction Log (CITL) on an installation level. Data on an aggregated level is published by the European Environmental Agency (EEA) in its EU ETS Dataviewer (EEA 2012). In the years 2008 to 2011 operators covered by the EU ETS surrendered a total of 456 million offset credits from the CDM (Certified Emissions Reduction Units – CER) and a total of 99 million emission reduction units from JI (Emission Reduction Units – ERU) to the competent authorities. Total use of flexible mechanisms equals to 556 million CERs and ERUs in the four years from 2008 to 2011.

3.6 Demand and supply balance for 2008 to 2011

Table 4 compares the amount of EUAs, CERs and ERUs available in the years 2008 to 2011 with the verified emission data for this period. In 2009, 2010 and 2011 the verified emissions were lower than the free allocation to operators. As EUAs were auctioned on top and operators used CERs and ERUs to cover their emissions a significant surplus of EUAs has been accumulated.

Table 4 Surplus of allowances in the EU ETS, 2008-2011

	2nd trading period				Total
	2008	2009	2010	2011	2008-2011
	mln EUA, CER, ERU or t CO2				
Free allocation	1,961	1,976	1,998	2,001	7,938
Auctions and sales	45	79	92	83	300
CDM & JI	83	81	137	255	556
Total available units	2,090	2,137	2,227	2,340	8,793
Verified emissions	2,123	1,882	1,939	1,903	7,846
Surplus	-33	255	289	436	947
Cumulated surplus	*-33*	*222*	*510*	*947*	

Source: Calculations by Öko-Institut

The cumulated surplus of EUAs at the end of 2011 was nearly 1,000 million units. The major share of this surplus (556 million EUAs) can be attributed to the fact that operators were allowed to surrender CERs and ERUs despite the fact that verified emissions were below the available amount of EUAs.

The rest of the surplus (about 400 million EUAs) stems from the reduced emissions in the years 2009 to 2011. This can mainly be attributed to the economic crisis during this period.

4 The future challenge: Projection for the EU ETS surplus until 2020

4.1 Introduction, scope and structure of the analysis

In contrast to the period from 2008 to 2011 no historical data can be used to specify the potential surplus of allowances for the period from 2012 onwards and a projection for the supply and demand must be developed.

1. The key determinant on the demand side is the baseline projection for emissions regulated by the EU ETS. With respect to the baseline, three aspects are of special importance: firstly the underlying assumptions on economic growth as a key driver for greenhouse gas emissions, secondly the penetration of renewable energies as well as energy savings as a result of complementary policies to the EU ETS and thirdly the effects of the extended scope of the EU ETS from 2013 onwards (cf. chapter 4.2).
2. The supply side for allowances and offset credits is analysed in respect of the different sources of supply:
    a. The decreasing share of free EUA allocation to the operators of the regulated installations (cf. chapter 4.3);
    b. The increasing share of allowances supplied at market prices via auctions (cf. chapter 4.4);
    c. The qualitatively and quantitatively restricted supply of offset credits from the CDM or JI at prices lower than for EUAs (cf. chapter 4.5);
    d. The free allocation to eligible new entrants from the new entrant reserve (cf. chapter 4.6).

The compilation of all sources for demand and supply enables an integrated projection for the balance of demand and supply from 2012 to 2020 (chapter 4.7).

4.2 Baseline emission trends for the EU ETS from 2012 to 2030

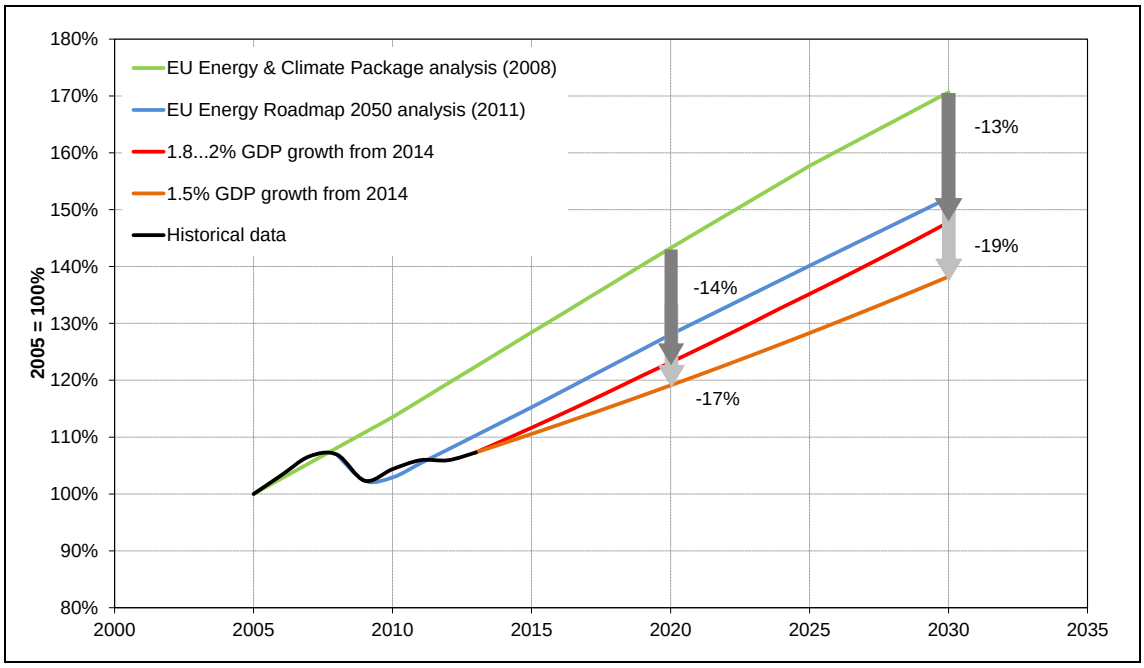
The emission reduction effort within the EU ETS results from the difference of the emission levels in a baseline trend and the cap. The baseline scenario is the counterfactual scenario of what would occur in a regulatory environment without a price on greenhouse gas emissions. Key determinants for the baseline emission trend in the sectors regulated by the EU ETS are:

- the demographic and economic trends as essential driving forces;
- the energy and investment costs as significant factors influencing energy supply and demand patterns; and

- the general regulatory framework and complementary instruments to the EU ETS, especially separate support schemes for renewable energies and energy efficiency.

The cap definition for the EU ETS from 2013 onwards was based on an integrated analysis for the 2008 climate and energy package of the European Union (Capros et al. 2008) which reflected both the overarching greenhouse gas emission reduction targets for the EU as well as the plans to increase the share of renewable energy sources in the energy mix and particularly in the power sector.

Figure 3 Comparison of GDP projections for ETS-relevant modelling exercises for the European Union, 2005-2030



Source: Eurostat, European Commission, calculations by Öko-Institut

However, some of the assumptions for the integrated modelling exercise carried out in 2008 no longer reflect the real trends for some key determinants of the baseline scenario.

First of all, the short-, medium- and long-term economic outlook for the EU-27 has changed significantly since 2008. Figure 3 indicates a range of projections for the development of the gross domestic product (GDP), the key indicator for economic activities in a country or region.

- For the modelling exercises on the EU energy and climate package in 2008 the assumption for GDP growth from 2005 to 2030 amounted to an increase of approx. 43 % by 2020 and 71 % by 2030;

- For the numerical analysis on the EU Energy Roadmap 2050 in 2011 (CEC 2011d) the modelling assumption was a total GDP growth from 2005 to 2020 of approx. 28 % by 2020 and 52 % by 2030;
- With respect to the most recent developments and trends two additional variants were analysed, the return to an annual of growth of 1.8 to 2.0 % during the next two decades and a rather slow economic growth of about 1.5 % annually, which results in a total GDP growth of approx. 17 to 21 % by 2020 and 38 to 48 % by 2030.

As a result, the total economic activity represented by GDP will be 14 to 17 % lower by 2020 and 13 to 19 % lower by 2030 than assumed in the analysis for the 2008 EU energy and climate package and thus for the cap of the EU ETS. Such changes for one of the major driving forces for the baseline emission trend must result in a major change of the emission reduction effort built into the cap of the EU ETS.

Furthermore, the massive support of renewable energy sources (RES) in the framework of the 2008 EU energy and climate package could have a major impact on the respective emission reduction efforts to be delivered by the EU ETS. For renewable energy the following dimensions must be considered:

- In terms of the EU ETS the EU-wide target for the expansion of renewable energies will mainly have an effect on the power generation from renewable energy sources; the share of renewables in the heat and transport market is of much less or of no significance for the installations regulated by the EU ETS.
- When the modelling for the 2008 EU energy and climate package was conducted, the analysis was based on certain assumptions for the power generation from renewable energy sources. Subsequently and within the framework of the EU Directive on Renewable Energies (EU 2009c) the Member States developed National Renewable Energy Action Plans (NREAP) which include sectoral targets and projections for the different sectors. The deployment trends and targets for the renewable energies are not necessarily consistent with the underlying assumptions of the 2008 modelling exercises.
- Last but not least, the historical data for the development of renewable energies in the power sector must not necessarily fit into the projections in terms of levels and structures of RES deployment.

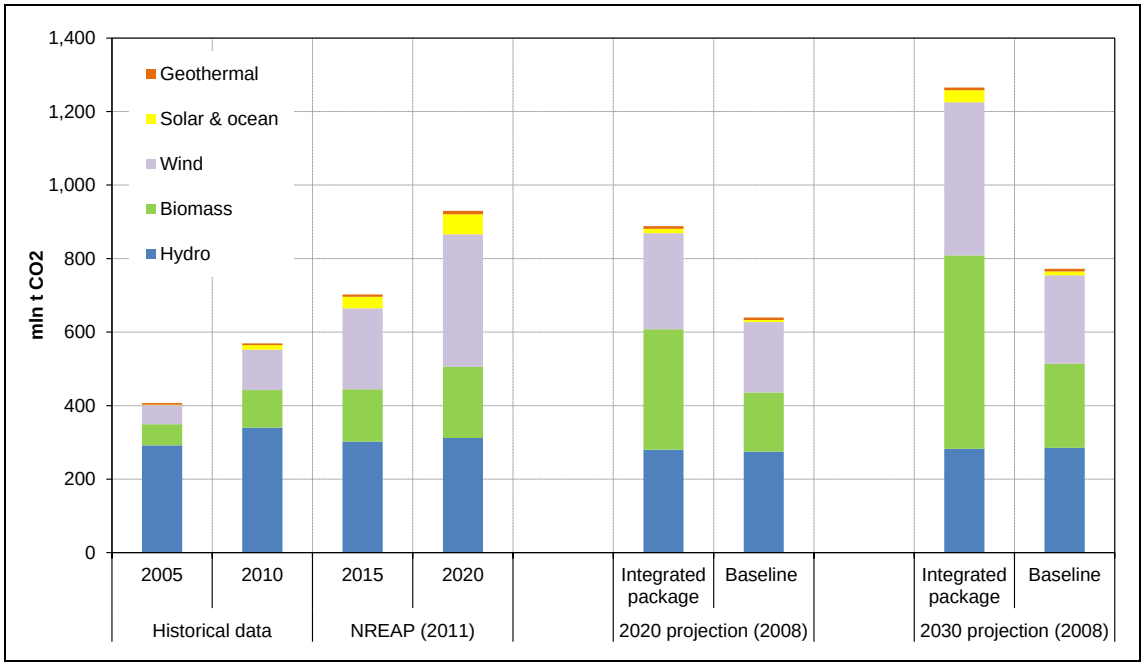
In order to make the data comparable for the purpose of the analysis presented in this paper, the power generation from different renewable energy sources was transformed into avoided CO_2 emissions based on the following assumptions[6]:

- Power generation from solar energy was assumed to substitute natural gas-fired power plants;

[6] These assumptions are in line with our own modelling exercises as well as the respective literature (ISI 2005+2009).

- Power generation from hydro, biomass, geothermal heat and ocean energy was assumed to substitute hard coal-fired power plants; and
- Power generation from wind energy was assumed to substitute a mix of hard coal-fired plants (75 %) and natural gas-fired power plants (25 %).

Figure 4 Comparison of CO_2 emission abatement contributions from renewable energy sources in the power sector for the EU, 2005-2020



Source: Eurostat, European Commission, calculations by Öko-Institut

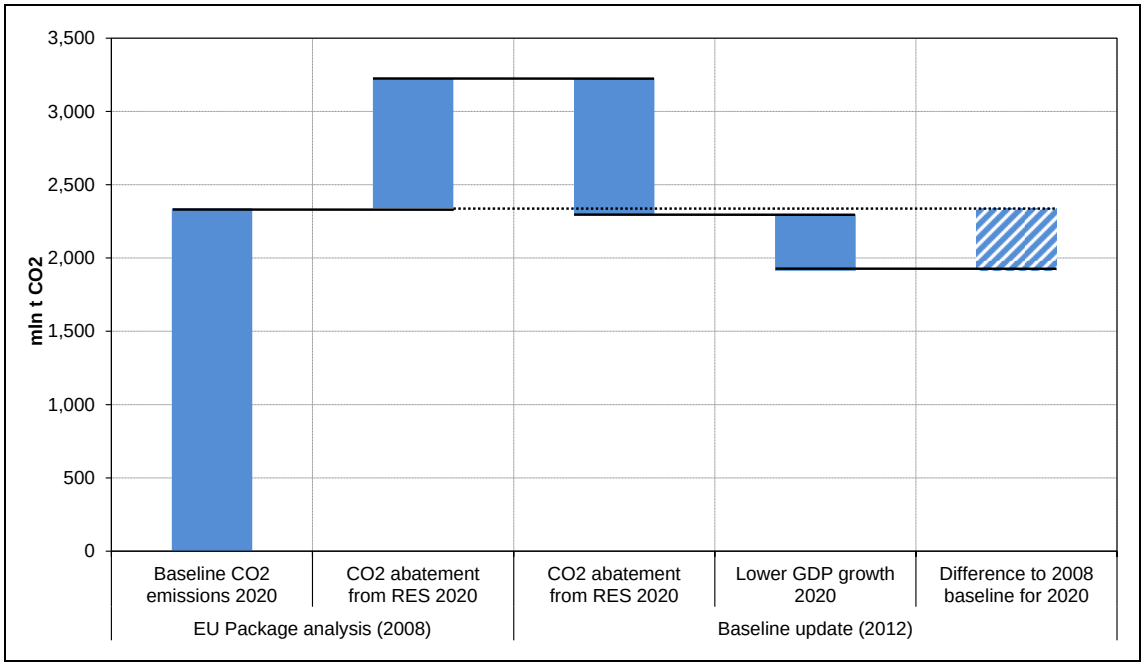
Figure 4 provides an overview of the RES deployment trends in the EU power sector from the three data sources mentioned above:

- The data indicate that the trend of historical data is all in all consistent with the projections submitted by the Member States in the National Renewable Energy Action Plans (NREAP) in 2011 (EEA 2011).
- The 2008 modelling for the EU energy and climate package and its integrated targets for greenhouse gas emission reduction, the revision of the EU ETS and the deployment of renewable energy sources for 2020 indicate that the effects of an increased support for renewable energy sources are significant in terms of CO_2 emission abatement.[7]

[7] For the modelling of the "Integrated package" projection a broad range of policies and measures was considered while the "Baseline" modelling describes a projection in absence of these new policies and measures at EU level. The "Integrated package" projection refers to the CSE scenario in the documentation of the modelling exercise (Capros et al. 2008) and the "Baseline" projection refers to the respective baseline case.

However, the result of this analysis shown in Figure 4 underlines that the projections submitted by the EU Member States in their NREAPs represent in total a level of CO_2 emission abatement which only differs slightly (approx. 40 Mt CO_2 or 5 % in 2020) from the assumptions for the 2008 modelling exercise conducted for the integrated energy and climate package, which was also the basis for the cap setting within the EU ETS from 2013 onwards. However, the data compilation also shows that the pattern of RES deployment differs significantly (the NREAPs present a much more significant role of wind and solar energy and a significantly lower share of biomass), but due to the different substitution patterns this does not result in a major difference in emission abatement effects by RES which would be relevant for the cap assessment.

Figure 5 Update of the baseline projection for the EU ETS (scope of the second trading period), 2020



Source: European Commission, calculations by Öko-Institut

Based on a decomposition analysis the 2008 baseline projection was updated to the new assumptions on GDP growth (reflecting the 1.8 to 2.0 % growth pathway presented in Figure 3[8]) and the (slightly) changed projections for the deployment of renewable energy sources. The potential effects of a transition of the recent indicative energy efficiency target to a mandatory efficiency target, as recently negotiated in the framework of the proposal for an energy efficiency directive, were not included in the updated baseline for two reasons. Firstly, the overall effect of such a binding target on energy efficiency cannot be quantified at the recent stage of negotiation at an appropriate level

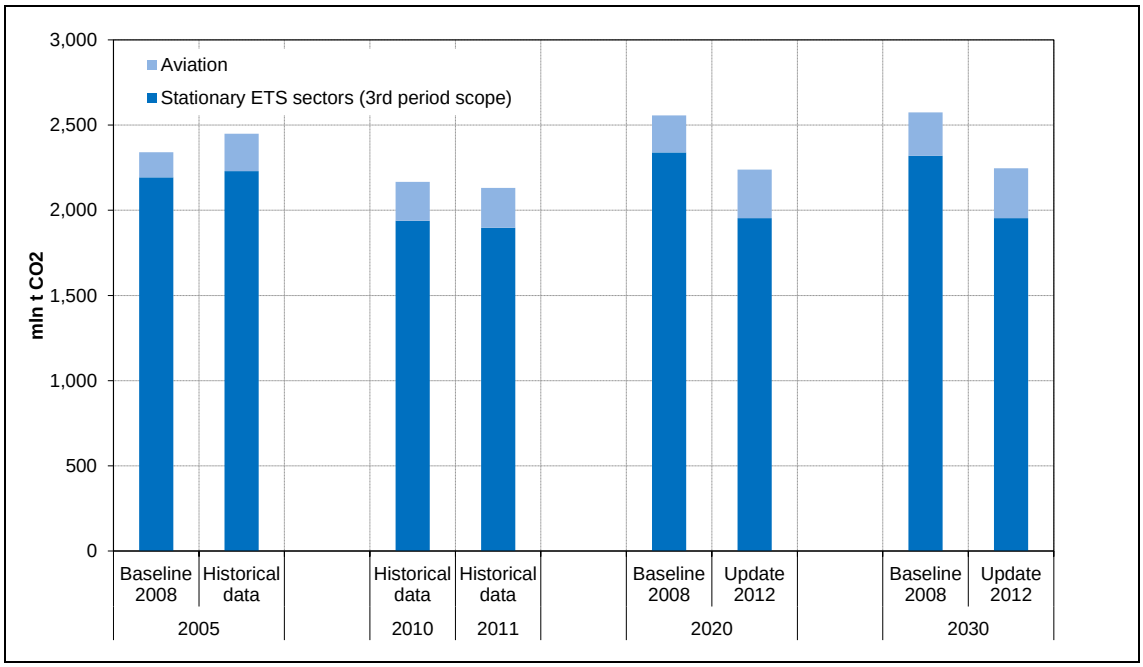
[8] This assumption is slightly below the historical trend in the last decade before the financial and economic crisis (approx. 2.5 %).

of uncertainty. Secondly, and more importantly, it is rather impossible at the current stage to translate the emerging additional energy efficiency efforts in additional greenhouse gas emission abatement for the sources regulated by the EU ETS, especially the electricity generation sector.

Therefore, the updated baseline assumes no further changes in energy and carbon intensity (with the exception of the respective effects of renewable energies) and represents a difference to the originally used baseline of about 425 Mt CO_2 for 2020 which results essentially from the lower GDP growth assumptions and is significant with respect to an assessment of the EU ETS cap.

Furthermore, the projection for the emissions from aviation was updated, considering the different system boundaries of the aviation sector in energy balances and emission inventories on the one hand and the scope of the EU ETS with respect to aviation. The updated projection is based on the average emissions from 2004 to 2006 (220 Mt CO_2), which form the basis for the aviation-specific part of the cap in the EU ETS. The projection for the emissions from aviation is based on this 2005 emission level and the growth rates for the final energy use by aviation from the modelling exercise for the EU Energy Roadmap 2050, which represents the most recent EU-wide trends for aviation (CEC 2011d).

Figure 6 Comparison of historical CO_2 emissions data and baseline projections for the EU ETS (scope of the second period and aviation), 2005-2030



Source: European Commission, calculations by Öko-Institut

Figure 6 summarizes the historical data and the updated baseline projections for the sectors regulated by the EU ETS for the scope of the second trading period as well as the aviation sector which falls in the scope of the EU ETS since 2012. For the station-

ary part of the EU ETS the counterfactual (reflecting the updated GDP growth assumptions as well as the updated emission abatement from RES) is an emissions trend which increases slightly over time but remains more or less at emission levels which were observed during the last few years. The difference to the baseline trends used for the definition of the cap from 2013 onwards amounts to 385 Mt CO_2 in 2020 and 365 Mt CO_2 in 2030 which equals a 16 % reduction. This significant reduction of the baseline levels is partly compensated by an increased baseline assumption for the aviation sector (+67 Mt CO_2 in 2020 and +38 Mt CO_2 in 2030). However, with respect to the fact that the cap for aviation was derived separately and is based on data which have no direct link to the 2008 modelling of the baseline, the offsetting effects of the increased aviation baseline are not relevant for the assessment of the 2008 baseline assumptions.

Last but not least, emissions from new sectors will fall under the scope of the EU ETS in 2013 (e.g. N_2O from industrial gases, PFC from Aluminium and others). The starting point for specifying the respective increase of the cap is 107 million EUA in 2013, which reflects the fact that the UK, the Netherlands, Austria, Italy and Norway already opted in their nitric acid and adipic acid production during the second trading period of the EU ETS.

According to Article 9a (2) of the revised EU ETS Directive Member States had to notify verified emissions of new installations entering the EU ETS from 2013 to determine the increase of the cap. For non-CO_2 gases Member States were allowed to *"notify a lower amount of emissions according to the reduction potential of those installations" (*Article 9a (2)). Unfortunately there is no information available on the extent to which Member States took the reduction potential into account when the cap increase for nitric acid and adipic acid production was determined.

Recently implemented or announced JI projects for the abatement of N_2O within the EU have resulted in impressive emission reductions which are part of the baseline because they were mainly triggered by non-ETS policies. Therefore, it can be expected that emissions from nitric acid and adipic acid production will be drastically reduced in the third trading period of the EU ETS. In 2008 N_2O emissions from nitric acid and adipic acid production was 33 million tons of carbon dioxide equivalent (t CO_2e) in the EU-27 without installations opted in by the Netherlands and Austria (ETC/ACC 2010). Based on data from ETC/ACC (2010) the emission reduction could be as high as 30 million t CO_2e in the years from 2013 onwards compared to emissions in the year 2008. If Member States have taken this reduction potential into account, there will be no surplus from installations entering the EU ETS from 2013 onwards. If Member States have not taken this reduction potential into account, the annual surplus could be 30 million EUA. It is assumed that half of the reduction potential was taken into account. Thus emissions are estimated at a level of 91 million EUA for the years 2013 to 2020 (deducting 15 million EUA from the level of 107 million EUA mentioned above).

Table 5 Updated baseline emission trends for the EU ETS sectors, 2005-2030

	2005	2010	2011	2012	2013	2014	2015	2020	2025	2030
	mln t CO2e									
Stationary ETS II scope	2,230	1,939	1,903	1,892	1,886	1,898	1,912	1,954	1,954	1,954
Stationary ETS III scope	-	-	-	-	91	91	91	91	91	91
Aviation	221	-	-	239	245	251	257	285	295	293
Total	-	-	-	-	2,222	2,240	2,260	2,330	2,340	2,338
Note: Due to the different scope of the EU ETS (stationary sources, aviation) no totals are given for the years before 2013.										

Source: Calculations by Öko-Institut

Table 5 summarizes the updated baseline emission trends for the different scopes of the EU ETS. The total emissions in the baseline increase by 50 million t CO_2 for stationary installations and by 54 million in the aviation sector by 2020 compared to the current emission level (2011/2012). For 2030 the baseline emissions are almost constant compared to the 2020 levels.

4.3 Free allocation from 2012 to 2020

As a starting point it is assumed that the free allocation for the year 2012 will be equal to the free allocation in the year 2011. Thus free allocation would be 2,001 million t CO_2 in the year 2012.

Table 6 Amount of free allocation, 2008-2020

	2nd trading period					3rd trading period				Total
	2008	2009	2010	2011	2012	2013	2014	2015	2020	2008-2020
	mln EUA									
Stationary ETS II scope	1,961	1,976	1,998	2,001	2,001	820	799	778	639	15,839
Stationary ETS III scope						77	77	77	72	607
Aviation					183	179	179	179	179	1,613
Power generators EU-12						221	190	158	0	885
Total	1,961	1,976	1,998	2,001	2,184	1,297	1,244	1,192	890	18,943

Source: Calculations by Öko-Institut

From 2013 onwards auctioning will be the rule for electricity generation. Free allocation in the industrial sector and for heat generation will be based on benchmarks. Based on Öko-Institut's ARRA-Model[9] the free allocation for installations that already participated in the second trading period of the EU ETS will decrease from 820 million EUA in 2013 to 639 million EUA in 2020. According to Article 10c of the EU ETS Directive (EU 2009a) some (mainly eastern European) Member States can allocate free allowances for electricity generators. Only the decisions for Cyprus, Estonia and Lithuania have

[9] ARRA stands for Auctioning Revenues and Redistribution Analysis; the model provides projections for free allocation and auctioning revenues at the level of EU Member States.

been published (CEC 2012). Therefore, the free allocation to electricity generators in the EU-12 was estimated (Table 6).[10]

Table 7 Amount of free allocation from the new entrant reserve, 2013-2020

	3rd trading period								Total
	2013	2014	2015	2016	2017	2018	2019	2020	2013-2020
	mln EUA								
Stationary ETS II scope	13	25	38	51	64	76	89	102	457
Stationary ETS III scope	1	1	2	3	3	4	5	5	24
Total	13	27	40	54	67	80	94	107	482

Source: Calculations by Öko-Institut

Additionally there will be free allocation to new entrants from industrial sectors from the new entrant reserve. The total size of the new entrant reserve is 5 % of the cap for stationary installations. This equals 782 million EUA for the period from 2013 to 2020. Of this total 300 million EUA will be auctioned to finance CCS and innovative renewable projects. As a result 482 million EUA are available that can be allocated to new entrants for free (Table 7).

4.4 Auctions and sales from 2012 to 2020

In the year 2012 auctions and sales can be assessed based on the publication of auctions on the DG Clima website or announcements by the member states. To calculate the amount of auctions from 2013 onwards the free allocation and the new entrant reserve is deducted from the cap. In the aviation sector 15 % of the cap will be auctioned, leading to annual auctions of 32 million units.

Of the new entrant reserve – equaling 5 % of the cap – 300 million EUAs will be auctioned or sold to finance CCS and innovative renewable energy projects. A first tranche of 200 million EUAs will already be auctioned or sold by October 2012 (CEC/EIB 2010). However, as these allowances can only be used from 2013 onwards they are attributed to the auctions and sales in 2013 (Table 8).

[10] It is assumed that in 2013 allowances equal to 70 % of historic emissions in the power sector are allocated for free. This percentage decreases linearly to 10 % in 2019, leading to no free allocation to the power sector in 2020. In its guidance document (CEC 2011f) the European Commission has allowed slight deviations from the rule that free allocation has to decrease linearly. However, the assessment of decision for Cyprus, Estonia and Lithuania shows that for these countries deviations from the rule that free allocation has to decrease linearly are rather low. It will be necessary to update the estimated free allocation for power generation once all decisions are published.

Table 8 Amount of allowance auctions and sales, 2008-2020

	2nd trading period					3rd trading period				Total
	2008	2009	2010	2011	2012	2013	2014	2015	2020	2008-2020
	mln EUA									
Stationary ETS II scope	45	79	92	83	72	1,064	1,050	1,036	1,003	8,571
Stationary ETS III scope						24	22	20	16	147
Aviation					32	32	32	32	32	285
NER phase III auctions						300				
Power generators EU-12						-221	-190	-158	0	-885
Total	45	79	92	83	105	898	914	929	1,050	8,118

Source: Calculations by Öko-Institut

Auctioning quantities are calculated as the difference between the cap and the free allocation. As free allocation to electricity generation in the Central and Eastern Member States decreases over time the total amount of EUAs available for auctioning increases from 898 million EUAs in 2013 to 1,050 million EUAs in 2020.

4.5 Use of CDM and JI credits from 2012 to 2020

The total use of emission reduction credits from CDM or JI projects in the EU ETS for the period from 2008 to 2020 is restricted in quantitative and qualitative terms. Article 11a paragraph 8 of the revised EU ETS Directive states that the overall use of these credits shall not exceed 50 % of the reduction effort in the EU ETS compared to the emissions in the year 2005 for the EU ETS scope II or compared to the emission levels at the date of inclusion for further scope extensions of the EU ETS. This top-down quantity restriction indicates an upper bound. The exact quantity of CDM or JI credits (CERs or ERUs) that can be used by operators is regulated bottom-up on an installation level (Article 11a paragraph 8).

This provision sets the following rules for allocating the entitlements for the use of CERs and ERUs to the operators:

- All existing operators are allowed to use credits in the period 2008 to 2020 up to the amount permitted to them in the second trading period according to the respective provisions in the National Allocation Plans. Operators can also use the left-overs from their entitlements for the second trading period in the third trading period. The National Allocation Plans for the second trading period define the entitlements for the use of CERs and ERUs in general as a percentage of the free allocation for each operator in the period 2008 to 2012. The exact percentage for each country is published in the NAP table decisions and varies from 0 % in Estonia to 22 % in Germany. Based on the data on free allocation from the CITL and the estimated allocation to new entrants (assuming that all allowances from the new entrant reserve will be allocated for free) in the second trading period the total allowance for the use of credits can be derived.
- In some countries operators received comparatively low entitlements for the use of CERs and ERUs for the second trading period (e.g. operators in the UK).

Operators from these countries will be allowed to use additional credits from 2013 onwards. These additional entitlements are limited to an amount that ensures that the total entitlement does not exceed a percentage of 11 % of the free allocation of the respective installations in the period from 2008 to 2012.

Table 9 Entitlements for the use of CDM and JI credits for operating installations from the EU ETS scope II, 2008-2020

	CER/ERU use 2008-2012	Additional CER/ERU use 2013-2020	Total CER/ERU use 2008-2020	Total free allocation 2008-2012	Total CER/ERU use 2008-2020	Use of CER/ERU 2008-2011	Available CER/ERU use 2012-2020
	% of free allocation in Phase II			mln EUA	mln CER or ERU		
Austria	10%	1%	11%	160	18	5	13
Belgium	8%	3%	11%	281	31	9	22
Bulgaria	13%	0%	13%	190	24	14	10
Cyprus	10%	1%	11%	27	3	1	2
Czech Republic	10%	1%	11%	431	47	16	31
Denmark	17%	0%	17%	120	20	5	16
Estonia	0%	11%	11%	67	7	0	7
Finland	10%	1%	11%	188	21	8	12
France	14%	0%	14%	657	89	43	46
Germany	22%	0%	22%	1,983	436	162	274
Greece	9%	2%	11%	324	36	14	21
Hungary	10%	1%	11%	121	13	7	7
Ireland	10%	1%	11%	104	11	4	7
Italy	15%	0%	15%	1,011	152	49	103
Latvia	10%	1%	11%	21	2	1	1
Liechtenstein	11%	0%	11%	0	0	0	0
Lithuania	20%	0%	20%	39	8	4	3
Luxembourg	10%	1%	11%	12	1	1	1
Malta	10%	1%	11%	11	1	0	1
Netherlands	10%	1%	11%	423	47	8	38
Norway	11%	0%	11%	40	4	6	-2
Poland	10%	1%	11%	1,023	113	56	57
Portugal	10%	1%	11%	160	18	8	10
Romania	10%	1%	11%	370	41	17	24
Slovakia	7%	4%	11%	162	18	9	9
Slovenia	16%	0%	16%	41	6	3	4
Spain	20%	0%	20%	757	151	69	82
Sweden	10%	1%	11%	111	12	3	9
United Kingdom	8%	3%	11%	1,099	121	34	87
EU-27					1,447	549	898
All countries			15%	9,934	1,451	555	896

Source: EEA (2012), NAP table decisions, calculations by Öko-Institut

- From 2013 to 2020 new entrants that start operation from 2013 onwards are allowed to use credits for up to 4.5 % of their annual verified emissions. New entrants from the period from 2008 to 2012 that received a free allocation or an

entitlement to use credits in the period from 2008 to 2012 can use this entitlement but do not receive any additional entitlements. From 2013 to 2020 operators of installations from new sectors that enter the scope from 2013 onwards are allowed to use credits for up to 4.5 % of their annual verified emissions. The percentage used for new entrants that start operation from 2013 onwards and for new sectors can also be increased in the comitology procedure.

- In the year 2012 aviation operators are allowed to use CERs and ERUs for up to 15 % of their annual verified emissions. From 2013 to 2020 aviation operators are allowed to use credits up to 1.5 % of their annual verified emissions. This percentage can also be increased in the comitology procedure.

It is important to note that the legally binding quantity is the bottom-up quantity. In theory the comitology procedure could be used to increase the entitlements for the use of credits from CDM and JI. For the purpose of this study it is assumed that this will not occur.

The use of entitlements for the use of CDM/JI credits can easily be calculated for the different groups of installations (Table 10).

- For all existing operators the free allocation is available from the CITL. In order to calculate the CER and ERU entitlements the allocation for each year is multiplied with the country-specific percentage for the use of credits. This gives the total amount of credits that has been allowed to operators already in the second trading period from 2008 to 2012;
- The expected use of credits by new entrants that start operation in the period from 2008 to 2012 is expected to be approx. 27 million CER and ERU for 2008 to 2020. This quantity is calculated by multiplying the difference between the cap on the one hand and the free allocation and auctioned allowances on the other hand in the period from 2008 to 2012 (this should equal the size of the new entrants reserve) with the average specific percentage for the CER and ERU entitlements (14 % of free allocation);
- The baseline emissions of new entrants starting operation from 2013 onwards are difficult to estimate. It is assumed that the total emissions in the period from 2013 to 2020 of new entrants starting operation from 2013 onwards will be about 962 Mt CO_2e[11] Since new entrants are allowed to use credits equal to 4.5 % of their verified emissions the use of credits by this group will be 43 million credits at maximum.

[11] The new entrant reserve is defined as 5% of the cap (781 million EUA for the scope of the second and third trading period). Of this total, 300 million EUAs will be auctioned. The remaining quantity (481 million EUA) is doubled in order to correct for the fact that electricity generators do not receive a free allocation from 2013 onwards but can still use CERs and ERUs.

- In order to make a conservative estimate for the use of credits by new sectors it is assumed that the emissions of the new sectors entering the scope of the EU-ETS will be reduced to a level of 91 Mt CO_2e up to 2020. Since new sectors are allowed to use credits equal to 4.5 % of their verified emissions the use of credits by this group could be about 4 million CERs and ERUs annually.
- In 2012 aviation operators are allowed to use credits for up to 15 % of their annual verified emissions. From 2013 to 2020 aviation operators are allowed to use credits up to 1.5 % of their annual verified emissions. Based on the assumption that the emissions of the aviation sector will increase by 29 % by 2020 compared to 2005 (CEC 2011d) the allowed use of CDM/JI credits amounts to 68 million credits in the period from 2008 to 2020.

Table 10 Total entitlements for the use of CDM and JI credits, 2008-2020

	2008-2020
	mln CER or ERU
Stationary ETS II scope	1,522
of this existing installations	1,451
of this new entrants in phase II	27
of this new entrants in phase III	43
Stationary ETS III scope	33
Aviation	68
Total	1,622

Source: Calculations by Öko-Institut

The entitlements for the use of flexible mechanisms total more than 1,600 million CERs and ERUs from 2008 to 2020 (Table 10). As 555 million CERs and ERUs have already been surrendered by operators under the EU ETS in the four years from 2008 to 2011, a further 1,065 million CERs and ERUs are available for surrender from 2012 to 2020.

4.6 New entrant reserve for the second trading period

Table 11 compares the cap in the second trading period with the amount of EUAs allocated for free and auctioned or sold. A key finding from this comparison is that the total cap for the second trading period from 2008 to 2012 is 185 million EUAs higher than the amount of EUAs allocated for free and auctioned.

Table 11 Comparison of cap, free allocation, auctions and sales, 2008-2012

	2nd trading period					
	2008	2009	2010	2011	2012	total
	mln EUA					
Cap	2,099	2,099	2,099	2,099	2,099	10,496
Free allocation	-1,961	-1,976	-1,998	-2,001	-2,001	-9,939
Auctions and Sales	-45	-79	-92	-83	-72	-372
Difference (= reserves)	93	43	9	15	25	185

Source: CITL, EEA (2012), calculations by Öko-Institut

The reasons for this difference are not fully clear. One important explanation is that there are still allowances in the new entrant reserves which were not yet allocated to operators. However, there are very likely other factors that explain this difference (for example that not all new entrant allocations are recorded in the CITL). In order to calculate a full demand and supply balance, these 185 million EUAs are attributed to the year 2012.

4.7 Total supply and demand balance for 2012 to 2020

Table 12 provides an overview of the available amount of emissions allowances (EUA) as well as the entitlements for the use of credits from CDM or JI projects (CERs or ERUs) and the projected baseline emissions for 2012 to 2020.

From 2012 to 2020 a total of approx. 20,860 emissions allowances or CDM or JI credits will be available for the operators regulated by the EU ETS. Although free allocation is significantly reduced from 2013 onwards, the total free allocation (free allocation to existing installations as well as free allocation from the new entrant reserves) exceeds half of all available units for 2012 to 2020 (55 % for 2012 to 2020 and 51 % for the third trading period). The allocation at market prices via auctions and sales represents about 40 % of the total supply of allowances (39 % for 2012 to 2020 and 44 % for the third period).

A total amount of 1,066 million CER and ERU, i.e. low-cost emissions credits from CDM and JI will be available for surrender in the EU ETS from 2012 to 2020. This amount exceeds significantly the projected oversupply by 2020. Without further entitlements for the use of CERs and ERUs there would have been a scarcity (and a higher price) in the EU ETS from 2014 onwards.

Table 12 Demand and supply balance, 2012-2020

	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total 2012-20
	mln EUA, CER and ERU									
Free allocation	2,184	1,297	1,244	1,192	1,140	1,085	1,019	954	890	11,006
Auctions and sales	105	898	914	929	945	963	993	1,022	1,050	7,818
NER auctions phase III	0	300	0	0	0	0	0	0	0	300
CDM and JI credits	278	98	98	98	99	99	99	99	99	1,066
Free allocation NER III	0	13	27	40	54	67	80	94	107	482
Left-over NER II	185	0	0	0	0	0	0	0	0	185
Total available units	2,752	2,606	2,283	2,260	2,237	2,214	2,191	2,168	2,145	20,857
Baseline emissions	2,131	2,222	2,240	2,260	2,278	2,293	2,307	2,322	2,330	20,382
Surplus	620	384	43	0	-41	-78	-116	-154	-185	475
Cumulated surplus	*620*	*1,005*	*1,048*	*1,049*	*1,007*	*929*	*813*	*659*	*475*	
from 2008	*1,567*	*1,952*	*1,995*	*1,995*	*1,954*	*1,876*	*1,760*	*1,606*	*1,422*	

Source: Calculations by Öko-Institut

The baseline emissions reach the level of allowance and credit supply in 2015 and exceed this level from 2016 onwards. In other words: without the availability of the surplus from the period before 2015 a scarcity would occur for the years after 2015.

The surplus created from 2012 to 2020 peaks in 2015 and reaches a level of approx. 1,050 million EUAs. Due to the decreasing cap the oversupply is reduced over time and reaches a level of less than 475 million EUAs by 2020. However, the surplus created from 2008 to 2011 must also be considered, which adds up to a total surplus of about 1,425 million units in 2020.

5 Interim summary: Demand and supply balance 2008 to 2020

The balance for supply and demand from 2008 to 2020 is shown in Table 1. It clearly shows that even the supply from free allocations in the second trading will exceed the total emissions and all other supplies will further increase the surplus of this period, which amounts to 16 % of the total demand from 2008 to 2012. For the third trading period the total fresh supply of allowances and offset credits will be only 0.8% less than the baseline emissions from 2013 to 2020. Due to the significantly increased share of auctions in the total supply of allowances in third trading period, 44 % of all available units will be available at the full prices only. However, for the whole period from 2008 to 2020 the supply still exceeds demand by 5 %. Three quarters of the demand for allowances will be available free of charge or at low prices (free allocation and CDM/JI credits, respectively).

Table 13 Demand and supply balance for the second and third trading period, 2008-2020

	2nd period		3rd period	Total	
	Historical data	Projection			
	2008-2011	2012	2013-2020	2008-2020	
	mln EUA, CER, ERU or t CO2e				% of demand
Free allocation[a]	7,938	2,184	9,304	19,425	68.8%
Auctions and sales[b]	300	105	8,013	8,418	29.8%
CDM and JI credits	556	278	789	1,622	5.7%
Left-over NER II	-	185	-	185	0.7%
Total available units	8,793	2,752	18,106	29,650	105.0%
Emissions[c]	7,846	2,131	18,251	28,229	100.0%
Surplus	947	620	-146	1,422	5.0%
Cumulated surplus	*947*	*1,567*	*1,422*		

Notes: [a] Including free allocation from NER in the 3rd period. - [b] Including auctions from NER in the 3rd period (NER 300 autions). - [c] Verified emissions for 2008-2011, baseline emissions from 2012-2020.

Source: Calculations by Öko-Institut

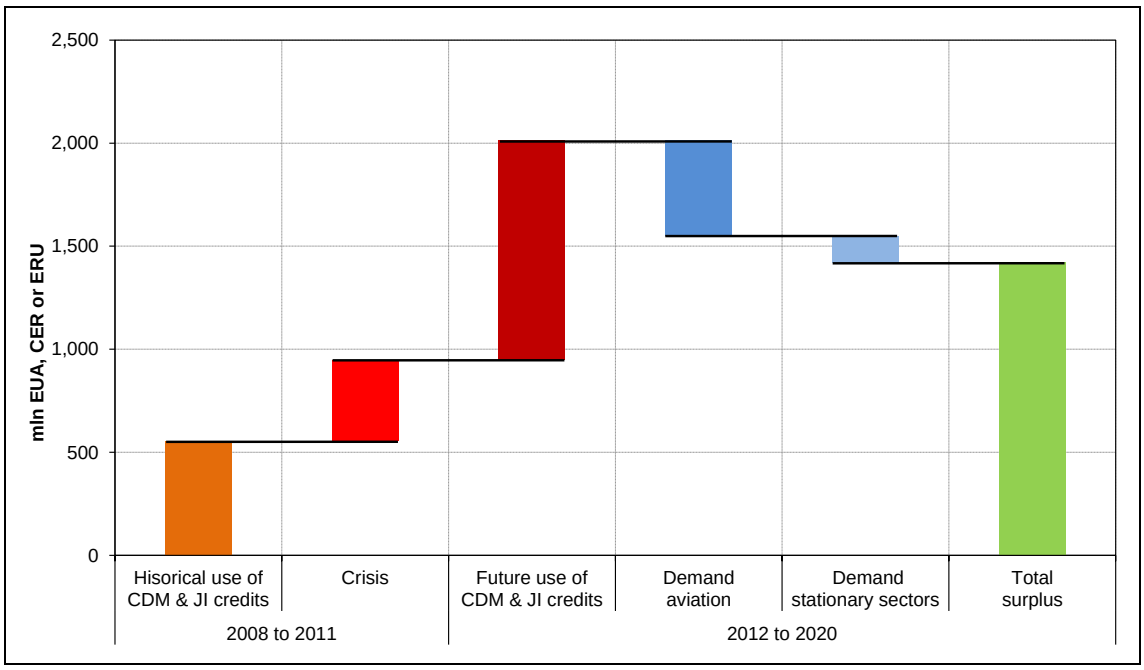
Figure 7 summarizes the different factors contributing to the surplus of allowances and emissions reduction credits in the EU ETS. The cumulated surplus at the end of 2011 amounts to 1,000 million EUAs. The major share of the surplus accrued by 2011 (555 million EUA) is a result of the use of CDM and JI credits. The effects of the economic crisis in the period from 2008 to 2011 (the number of available allowances exceeded significantly the verified emissions) contributed a share of approx. 400 million EUAs to the surplus.

According to the recent legislation the surplus will continue to increase by 2015 and will still be significant in 2020.

- The major reason for the increase of the surplus is that 1,000 million additional CDM and JI credits can be surrendered by operators from 2012 to 2020;

- This additional inflow of credits is only partly complemented by an additional scarcity from ETS-regulated entities. It is worth mentioning that the major scarcity from 2012 onwards will be created by the growing emissions from aviation and only a comparatively low share results from the fact that the EUA supply is lower than the baseline emissions from stationary sources under the scope of the EU ETS.

Figure 7 Evolution of the surplus in the EU ETS, 2008-2020



Source: Calculations by Öko-Institut

Overall the surplus in the EU ETS will be 1,420 million EUAs in 2020. The uncertainties about the size of the surplus from 2008 to 2011 are obviously rather low. The effects of the economic crisis and the total use of CDM and JI credits can be quantified well. For the period beyond 2011 the uncertainties are significantly higher, namely on the demand side of the balance:

- The aviation sector contributes to a reduction of the surplus as cumulative emissions are estimated to be approx. 450 million t CO_2 higher than the number of allowances provided by the sub-cap for the aviation sector from 2012 to 2020. If the aviation sector does not deliver the projected demand because significant carriers pull out of the EU ETS (as a result of a political deal or because other states take comparable action which would make the respective carriers no longer subject to regulation by the EU ETS), the surplus of the EU ETS would exceed the level of 1,400 million allowances significantly.
- As emissions from stationary sources are projected to increase the available number of allowances will be about 129 million t CO_2 lower than baseline emis-

sions. If the economic recovery in the EU lasts longer than projected for the updated baseline, this would also increase or prolong the surplus.

It is important to note that the majority of the projected surplus in the EU ETS results from the additional inflow of emission reduction credits from CDM and JI projects. For many of these projects the additionality of emission reductions has been questioned. The major share of CDM credits surrendered under the EU ETS since 2008 was created by projects which are now excluded from use under the EU ETS because of major integrity concerns (Öko-Institut 2010, CEC 2011c). Although some more qualitative restrictions apply for the use of CDM credits from 2013 onwards (EU 2009a), this challenge will remain a significant one and should be reflected in the debate on the future use of emission reduction credits in the EU ETS.

6 Analysis of current proposals for intervention

6.1 Introduction, overview and structure of the analysis

If countermeasures are to be taken to deal with the existing or the emerging surplus of allowances within the EU ETS, these interventions could address different issues:

- The baseline emissions could be adjusted. With regard to the fundamental drivers of the baseline emission trends (GDP etc.) this is obviously not a real option but could be an option with a view to the complementary policies and measures which are part of the baseline. If the complementary support for renewable energies or energy efficiency (or for other low-carbon options) is limited or removed the efforts within the EU ETS would increase and the surplus would disappear more quickly. However, given the existing political and legal framework which explicitly addresses complementary measures (for strong and good reasons) this is neither an appropriate nor a realistic way to take action on the EU ETS surplus.
- The cap could be tightened. If the number of available allowances is significantly reduced (over time), this could accelerate the reduction of the surplus. Within the architecture of the EU ETS from 2013 onwards the mechanism for tightening the cap is an increase of the linear reduction factor. Provisions for an adjustment of the linear reduction factor for various reasons exist in the recent EU ETS legislation and could be applied without major problems if the political will exists.
- The restrictions on the inflow of external units which are fungible to EU ETS allowances could be tightened, which means that the entitlements for using emission reduction credits would be reduced. Against the background of the very disparate distribution of entitlements for using these credits in the second trading period a limitation of these entitlements for the period from 2013 to 2020 would lead to major distributional effects between operators in different Member States and is probably one of the options which is difficult to implement.
- As a temporary measure a share of the allowances could be held back (set aside) and brought back to the market later or retired in the context of, for example, a tightened cap for the EU ETS.

Two of these four general options are prominently subject to recent debates on surplus-related adjustments of the EU ETS:

- The European Parliament's Committee on the Environment, Public Health and Food Safety (ENVI) has tabled the concept of a set aside in its opinion on the draft directive on energy efficiency (EP 2012). According to this proposal 1,400 EUAs would not be auctioned to the market and held back for future use or retirement. Technically this proposal would be implemented by an adjustment of the auctioning calendar laid down the auctioning regulation on the EU ETS.

- In the same document ENVI proposed an adjustment of the linear reduction factor from 1.74 % to 2.25 annually. An adjustment of the linear reduction factor would require a respective revision of the EU ETS Directive.

Both proposals have received support as well as resistance from both policy makers and stakeholders. Therefore the analysis presented in this paper is focused on these two options, their combination and different implementation approaches. It is structured as follows:

- Both proposals need specification to enable a more in-depth analysis. In chapter 6.2 different implementation options and their combination are specified for the following analysis.
- In chapter 6.3 the effects of these options and their combinations on the EU ETS surplus are analysed, based on the data and data structures presented in the previous chapters.
- The potential effects of the different options and their combinations on the EUA prices are analysed in chapter 6.4, based on a simple methodological approach presented in section 6.4.1. The results of this analysis are documented in section 6.4.2.

The specification variants for the two general options mentioned above or their parametrization as well as the potential combinations are manifold. For the sake of pragmatism and illustration the analysis refers to the proposals specified by the European Parliament.

6.2 Specification of the options for the analysis

The analysis of the set aside requires three specifications: the number of allowances held back, the respective change in the auctioning calendar and the plan for bringing the allowances back to the market or to retire them.

The analysis of the set aside option and its combination with other options is based on the following assumptions:

1. The set aside is defined as a total of 1,400 million EUAs;
2. It is built up from four equal tranches in four years from 2013 to 2016;
3. For the key question on the treatment of the set aside three approaches are defined:
    a. The set aside is brought back to the market during the third trading period, e.g. in four equal tranches from 2017 to 2020;
    b. The set aside is reintroduced to the market with a ten year delay, in equal tranches from 2023 to 2026;
    c. The set aside is retired and is not brought back to the market.

The analysis of the adjustment for the linear reduction factor and its combination to other options is based on the following assumptions:

- Based on the proposal from the European Parliament the linear reduction factor is increased from 1.74 % to 2.25 %. As a result the cap will be decreased annually by 50 million EUA instead of 38 million EUA from 2014 onwards.
- The increased linear reduction factor is applied for the years from 2014 onwards as was proposed by the European Parliament with respect to the necessary legislative process[12]. Compared to 2005 this equals an emission reduction of 25 % for the EU ETS-regulated stationary installations by 2020 and in the absence of any further changes of the cap a reduction of 89 % by 2050.
- The increased linear reduction factor is applied to the stationary ETS-regulated installations; for a variant it is assumed that the sub-cap for aviation is also adjusted annually with the linear reduction factor.

The additional reduction efforts triggered by a set aside and an increase of the linear reduction factor are shown in Table 14. This compilation indicates some key aspects:

- A set aside of 1,400 million EUA has an immediate effect on the reduction effort and could reduce the surplus within a rather short time frame, especially if compared to the effects of an increased linear reduction factor.
- However, the schedule for the return of the set aside is of key importance. A return of the set aside within the third trading period would have no significant effect on the surplus.
- The adjustment of the linear reduction factor delivers major effects over a longer period of time. An increase from 1.74 % to 2.25 % leads to an additional cumulated emission reduction of 315 million t CO_2e from 2013 to 2020 and approx. 1,720 million t CO_2e from 2013 to 2030.
- In the long term the application of a more ambitious linear reduction factor to the ETS-regulated aviation sectors can significantly increase the effort built into the EU ETS. Applying the adjusted linear reduction factor of 2.25 % also for the aviation sector increases the cumulated reduction effort by 139 million t CO_2e for 2013 to 2020 and approx. 762 million t CO_2e for 2013 to 2030.

As an interim conclusion it can be stated that both interventions can be effective on a significant scale (approx. 1.4 to 1.7 billion EUAs) for the next two decades on the one hand. But on the other hand the time horizon for the respective effects is significantly different. A set aside can deliver an increased effort within the EU ETS at a scale of 1.4 billion EUAs in a time frame of a few years whereas the increase of the linear reduction

[12] It makes a significant difference if the adjusted linear factor reduction factor is applied from 2010 onwards or later. The reduction effort until 2020 is 315 million EUA with a linear factor starting in 2014 and 584 million EUAs with a linear factor starting in 2010; the difference between these two options is 269 million EUAs from 2013 to 2020.

factor to tighten the cap is effective on this scale in a time frame of about 15 years. However, an increased linear reduction factor would lead to much greater reduction efforts for a period of two decades or more.

Table 14 Additional reduction efforts resulting from different options to reduce the surplus in the EU ETS, 2013-2030

Annual				2013	2014	2015	2016	2017	2018	2019	2020
				mln EUA							
Set-aside	delayed 4 years			350	350	350	350	-350	-350	-350	-350
	delayed 10 years			350	350	350	350				
	retired			350	350	350	350				
Increase LRF to 2.25%	EU ETS scope II			0	11	21	32	43	53	64	75
	EU ETS scope III			0	1	1	2	2	3	3	4
	Aviation			0	5	10	15	20	25	30	35
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
		mln EUA									
Set-aside	delayed 4 years										
	delayed 10 years			-350	-350	-350	-350				
	retired										
Increase LRF to 2.25%	EU ETS scope II	85	96	107	117	128	139	149	160	171	181
	EU ETS scope III	5	5	6	6	7	7	8	9	9	10
	Aviation	40	45	50	55	60	65	70	75	80	85
Cumulative				2013	2014	2015	2016	2017	2018	2019	2020
				mln EUA							
Set-aside	delayed 4 years			350	700	1,050	1,400	1,050	700	350	0
	delayed 10 years			350	700	1,050	1,400	1,400	1,400	1,400	1,400
	retired			350	700	1,050	1,400	1,400	1,400	1,400	1,400
Increase LRF to 2.25%	EU ETS scope II			0	11	32	64	107	160	224	299
	EU ETS scope III			0	1	2	3	6	9	12	16
	Aviation			0	5	15	30	50	75	105	139
		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
		mln EUA									
Set-aside	delayed 4 years	0	0	0	0	0	0	0	0	0	0
	delayed 10 years	1,400	1,400	1,050	700	350	0	0	0	0	0
	retired	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400
Increase LRF to 2.25%	EU ETS scope II	384	480	587	704	832	971	1,120	1,280	1,451	1,632
	EU ETS scope III	21	26	31	38	44	52	60	68	78	87
	Aviation	179	224	274	329	389	453	523	598	678	762

Source: Calculations by Öko-Institut

With respect to the different time horizons and the scale of the existing and projected surplus a series of combinations were analysed:

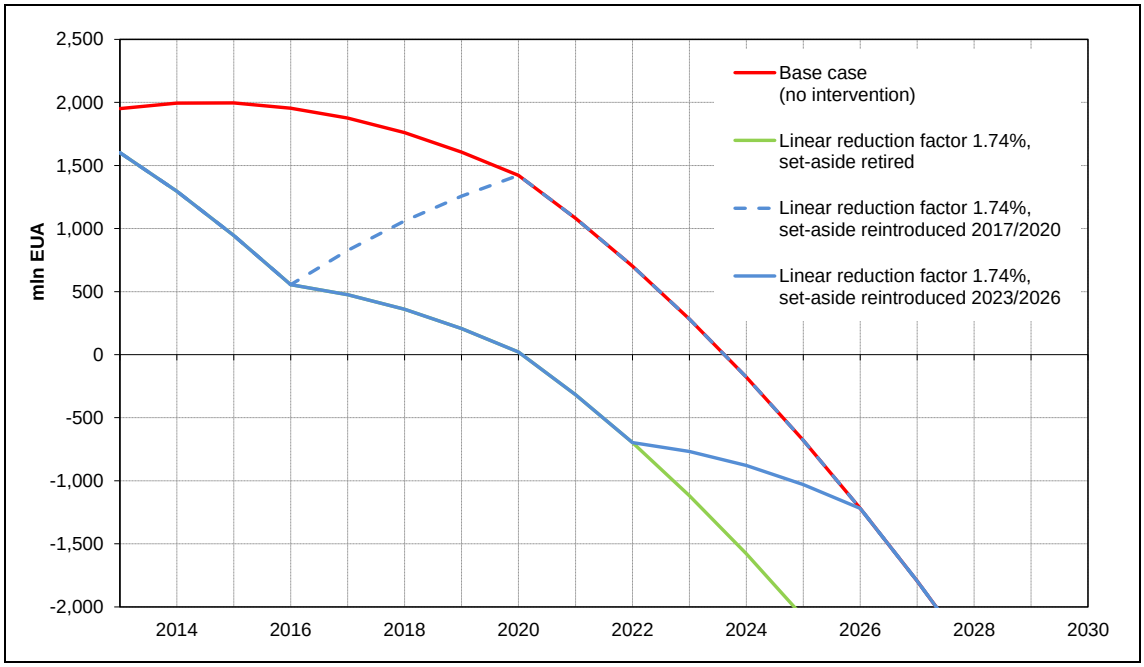
1. The three variants for a set aside of 1,400 million EUAs (returning 2017/2020, returning 2023/2026, retired) for a cap based on the recent linear reduction factor of 1.74 % for stationary sources regulated by the EU ETS;
2. The three variants for a set aside of 1,400 million EUAs (returning 2017/2020, returning 2023/2026, retired) for a cap based on an adjusted linear reduction factor of 2.25 % as the base case and an application of this linear reduction factor for the aviation sector from 2014 onwards.

All analysis reflects the third trading period of the EU ETS (2013-2020) as well as the subsequent decade.

6.3 Reduction of the surplus in the EU ETS

The starting point for the analysis of interventions to reduce the surplus of allowances in the EU ETS is the surplus of approx. 2,000 million EUAs in 2013. Without any intervention (Base case) the EU ETS will be characterized by a surplus until 2024 (Figure 8). In other words: no scarcity will occur in the scheme before 2024. Even in 2020 the surplus will amount to approx. 1,400 million EUAs.

Figure 8 Comparison of the effects of different options to reintroduce the set aside on the surplus in the EU ETS at a cap level based on the linear reduction factor of 1.74 %, 2013 to 2030



Source: Calculations by Öko-Institut

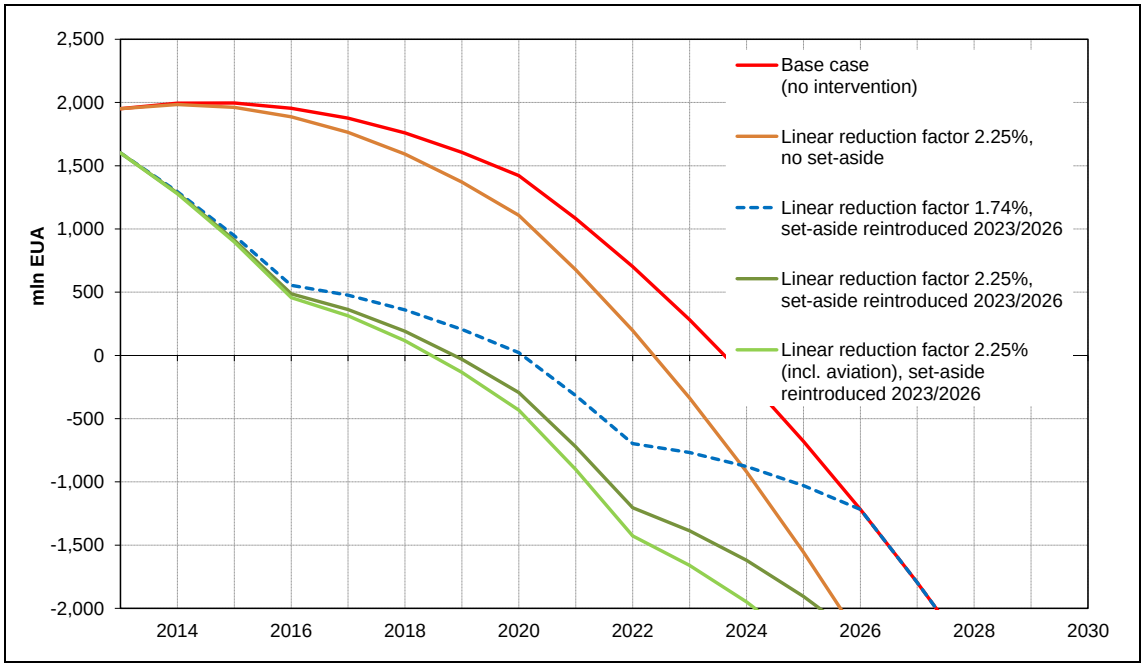
Figure 8 provides an overview of the effects of those intervention options which do not include any adjustment of the cap, i.e. the linear reduction factor:

- The set aside reduces the surplus in the scheme to 500 million EUAs in 2016.
- If the set aside is brought back to the market before 2020, the turning point towards scarcity in market is not reached and the surplus trajectory remains the same as in the base case. There will still be a surplus in 2024 for this approach.
- If the auctioning of the set aside is delayed for 10 years, the surplus will be fully removed by 2020. A reintroduction of the set aside from 2023 onwards will not lead to a surplus; the scarcity of allowances in the scheme would be maintained. The emission reduction effort in the EU ETS will slightly decrease by

2026 when the trajectory of cumulated demand is identical to the base case again.

- If the set aside were finally retired in 2023 a more ambitious emission reduction trajectory would apply for the subsequent years.

Figure 9 Comparison of the effects of options to implement an increased linear reduction factor on the surplus in the EU ETS, 2013 to 2030



Source: Calculations by Öko-Institut

Figure 9 illustrates the potential for reducing the surplus by an increase of the linear reduction factor to 2.25 % from 2014 onwards and the combination of this intervention with a set aside.

- An isolated increase in the linear factor to 2.25 % delivers a long-term effect but the point in time when the surplus turns into scarcity of allowances is only shifted by about one year. In this case the surplus would be maintained by 2023.
- If the increase of the linear reduction factor is combined with a set aside of 1,400 million EUAs from 2013 which enters the market ten years later, the surplus is completely reduced by 2019, i.e. one year earlier than for the same set aside approach combined with the linear reduction factor of 1.74 %. This difference seems to be small but the further trajectory of the scarcity of allowances in the scheme indicates a significantly higher effort for the subsequent years. The same effect occurs at a slightly higher level of ambition if the set aside is retired.
- If the latter option is combined with a steady reduction of the cap for the aviation sector by applying the linear reduction factor of 2.25 % to this cap as for the stationary sources, the scarcity is slightly increased again.

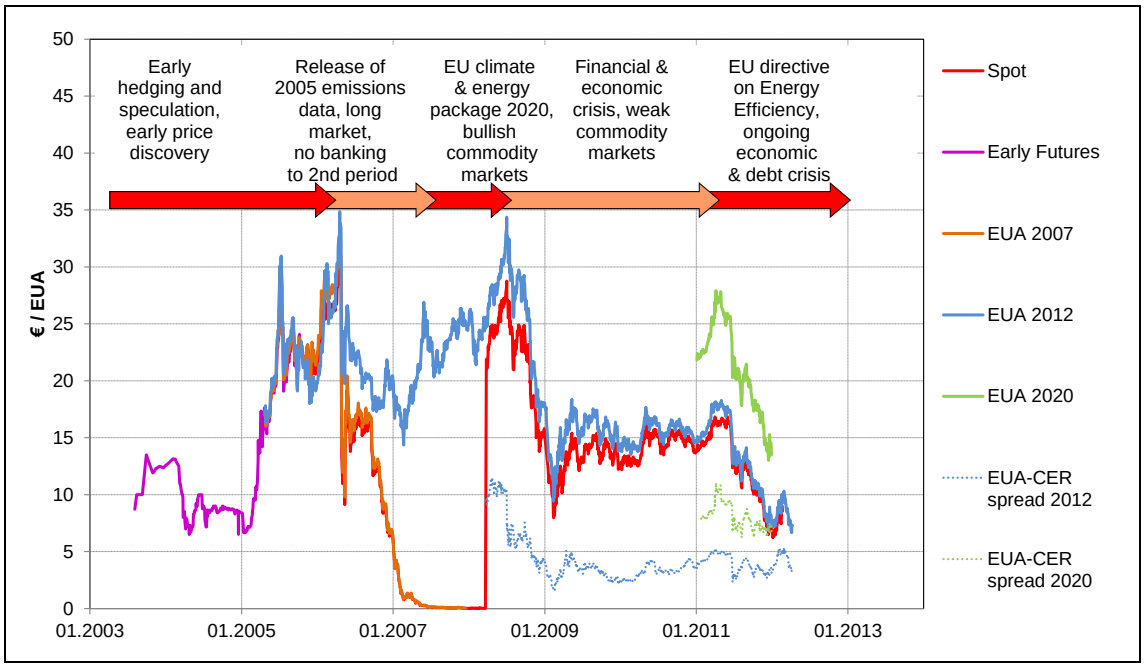
As a result, an effective and sustainable intervention in the EU ETS to reduce the surplus should have three elements. Firstly, a set aside should be implemented as early as possible. Secondly, the respective amount of allowances should not re-enter the market for the duration of at least a decade. If the set aside is reintroduced to the market in the third trading period this will have a lower effect. Thirdly, the set aside should be combined with a tightened cap of the EU ETS by a significantly increased linear reduction factor.

6.4 Potential range of price effects

6.4.1 Methodological approach

The effects of the different options to manage the surplus of emission allowances on the allowances prices is assessed with a simple model derived from the analysis of recent market trends.

Figure 10 Price trends for European Union Allowances (EUA) and EUA-CER spreads, 2003-2012



Sources: Evomarkets, European Energy Exchange (EEX), European Climate Exchange (ECX), calculations by Öko-Institut

The allowance price in the EU ETS has passed through different phases since the startup of the scheme in 2005 (Figure 10):

- The first market data on EUA trades have been available since late 2003 when obviously the first hedging trades took place. After a lengthy process of price discovery, to some extent determined by the stepwise and partially late notification and approval process for the National Allocation Plans (NAP) of the Mem-

ber States, the EUA price reached levels of € 20 to 25 in 2005 and from € 25 to 30 in the first months of 2006.

- After the first information on the level of verified emissions for the EU ETS-regulated installations were made available in April 2006 it became clear that the scheme would face a massive surplus of allowances and no scarcity of emission allowances would exist for the pilot phase of the EU ETS. Given the fact that banking was not allowed between the first and the second trading period, the price collapsed and decreased to levels of almost zero up to the end of 2007.
- The start of the second trading period was characterized by significantly tightened caps and by a bullish market for many commodities, specifically sharply increasing prices for key fundamentals for the allowance price (petroleum products and natural gas) as well as a growing interest in speculation with emission allowances from the EU ETS. EUAs were traded for € 25 to 30 for most of the time but peaked at € 35 (for 2012 future contracts) in July 2008.
- After the crash of the financial and commodity markets in the second half of 2008 and the following financial and economic crisis, the EUA price dropped to € 10 and recovered to levels of around € 15 by mid-2010.
- In summer 2010 it became clear that the economic crisis in Europe would last much longer than expected and that the cumulated surplus of emission allowances would not disappear for a longer term. At the same time a proposal for an ambitious energy efficiency directive was tabled which could result in additional emission reductions in the EU ETS sectors. The EUA price dropped to levels of around € 7.

With a view to the large surplus the question arises of why the EUA prices did not drop to zero as observed between the first and the second trading period.

- It could be argued that a major share of the cumulative surplus resulted from the observed and estimated inflow of offsets from the CDM and JI and the respective CER or ERU prices could work as a bottom line for the price decrease for EUAs. However, Figure 10 indicates that the spread between EUA and CER prices has been rather constant during the last three years. For 2012 deliveries, the difference between EU ETS allowances and offsets from the CDM was in a comparatively narrow range from € 3 to 5. With a view to the (future) supply of CERs (Table 15), which exceeds significantly the entitlements for use in the EU ETS, the availability of CERs cannot be assumed to be a price stopper for EUA prices.

Table 15 Projection for the supply of Certified Emission Reductions (CERs) eligible under EU ETS rules from 2013 to 2020

		Available offsets from CDM projects eligible under EU ETS rules from 2013
		mln CER
From existing least-developed country (LDC) projects	produced before 2013	3
	produced 2013-2020	116
From future least-developed country (LDC) projects	May 2012 to end 2020	100
From existing allowed registered projects in non-LDC countries		2,230
From new allowed registered projects in non-LDC countries	May 2012 to end 2012	100
Total		2,549
Memo items		
From existing higher efficiency coal power plants		*200*
From existing hydro power projects >20 MW		*1,300*

Source: UNEP Risoe CDM/JI Pipeline Analysis and Database, May 1st 2012

- The recent EUA price could be a result of medium-term hedging strategies. Against the background of a steadily decreasing cap, according to the recent legislation based on a linear reduction factor of 1.74 % annually, there will be a point in time when the allowance surplus turns into a scarcity, additional and significant emission reduction will be necessary and the EUA price formation will return to fundamentals. In this case, investors could be interested in acquiring allowances at the recent low price levels and bank them until the need for additional emission abatement triggers higher EUA prices again. Operators with a long EUA positions could bank EUAs with the expectation of higher prices in the future. The recent price levels for allowances would result from a discounting of future values of EUAs.
- Last but not least, the recent EUA price could already reflect the future option of increasing the level of ambition of the underlying EU climate policy and as a result tightened caps and higher or earlier scarcities in the allowance market. However, this explanation is extremely difficult to validate and the most recent trends indicate the opposite: Although the debate on adjustments of the EU ETS cap emerged significantly during the last months, it has not been reflected by any move in the allowance markets.

Against this background the numerical analysis of price responses to different options to adjust the EU ETS is based on a rather simple model. According to the second option discussed above, the recent price depends on three factors:

- The point in time when the surplus of allowances turns into scarcity is a key input parameter. The information on this point in time can be derived from the detailed analysis in the previous chapters.

  The assumption of the allowance price at this point in time must reflect the fundamentals for emission abatement in the subsequent period of time. The range

of recent analysis on this is broad but the range of respective price forecasts for the time horizon of 2020 shows a comparatively narrow range.

- Table 16 shows the EUA prices resulting from the recent modelling for the EU Energy Roadmap 2050 (CEC 2011d), other analysis (BNEF 2012, Deutsche Bank 2011) conclude comparable, scarcity-driven price levels.

  Furthermore, the data shown in Table 1 indicate the links between emissions reduction efforts in the EU ETS and the respective allowance prices. As general and approximate rules the following rough parameters were derived from the EU Energy Roadmap 2050 modelling exercises: Emission reduction efforts of about 20 % (by 2020), compared to 2005, are consistent to prices levels of 15 to 20 €/EUA; emissions reduction efforts of about 30 % (by 2020) refer to price levels of 20 to 25 €/EUA; emissions reduction efforts of about 40 % (by 2030) to 35 to 40 €/EUA and reduction efforts of about 50 % (by 2030) are consistent with prices levels of 50 to 60 €/EUA.[13]

Table 16 Allowance price projections for the EU ETS from the EU Energy Roadmap 2050, 2020-2040

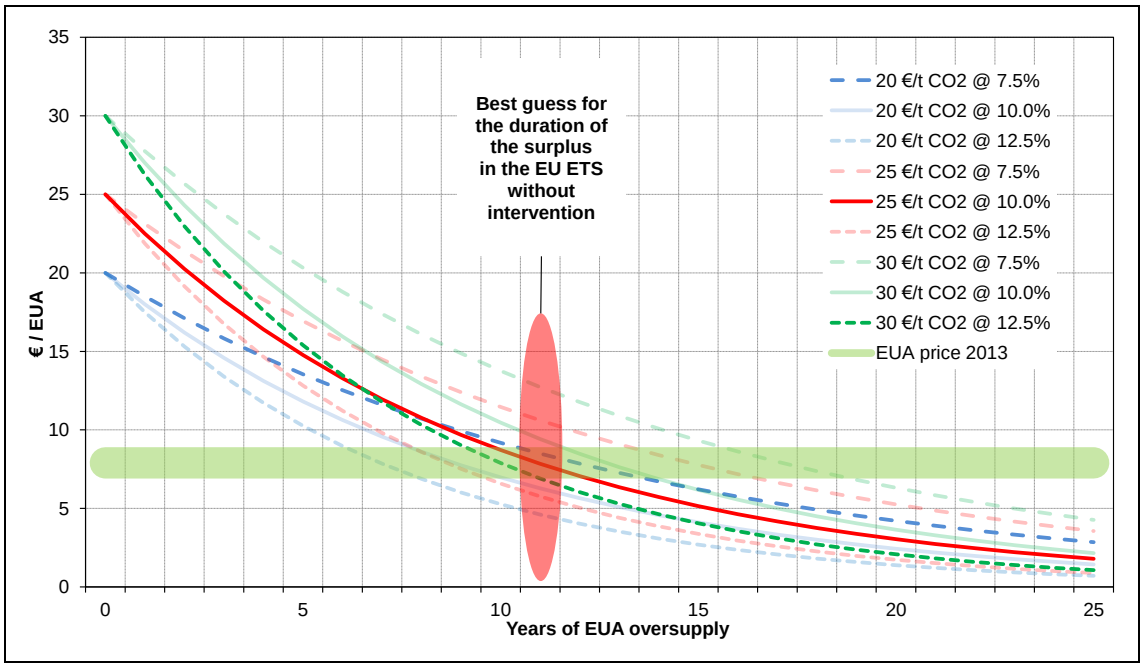
	EUA price			Reduction effort		
	2020	2030	2040	2020	2030	2040
	€(2008) / EUA			compared to 2005		
Reference Scenario	18	40	52	-23%	-37%	-55%
Current Policy Initiative Scenario	15	32	49	-28%	-38%	-52%
High Efficiency Scenario	15	25	87	-32%	-51%	-74%
High Renewables Scenario	25	35	92	-32%	-56%	-76%
High Nuclear / Delayed CCS Scenario	25	55	190	-32%	-54%	-76%
High CCS / Low Nuclear Scenario	20	63	100	-30%	-51%	-74%
Diversified Supply Options Scenario	25	52	95	-32%	-53%	-74%
Note: The reduction efforts refer to stationary sources regulated by the EU ETS.						

Source: European Commission

- For the discount factor a wide range of options exists. Figure 11 shows the interaction of different discount factors, three different fundamentally based abatement cost levels, different periods of time for the oversupply of allowances and the recent range of allowance prices. For a period of 11 years until the oversupply of allowances in the EU ETS will be removed under the recent legislation, the recent price levels would be consistent with a 10 % discount rate and a scarcity-based price level of 25 €/EUA or a 12.5 % discount rate and a future price of 20 €/EUA or a 7.5 % discount rate and future price of 30 €/EUA.

[13] It should be highlighted that the CO_2 prices are significantly determined by the range and the intensity of complementary measures to the EU ETS. In the High Efficiency and the High Renewables Scenario of the analysis for the EU Energy Roadmap 2050 the role of such complementary policies is more significant than in the other scenarios. Consequently the allowance prices for these scenarios are lower compared to the other scenarios.

Figure 11 Discounted CO_2 allowance prices for different periods of oversupply



Source: Calculations by Öko-Institut

Based on these classifications, the numerical analysis is based on the following assumptions:

- Future scarcity-based allowance price levels from 20 to 30 €/EUA, the lower range representing the lower (recent) ambition level and the upper range reflecting tighter caps (e.g. in the framework of a 25 % domestic reduction target for the total greenhouse gas emissions of the EU).
- Discount rates of 7.5 % for the 20 €/EUA trajectory and 10 % for the higher range of scarcity-based allowance prices.

The model calculates EUA prices at 2012 prices levels, depending on the point in time when the surplus of allowances turns into a scarcity of allowances, compared to baseline emissions.

6.4.2 Results of the allowance price effects estimates

Table 17 provides an overview of the results of the numerical analysis based on the modelling approach presented in the previous chapter.

Table 17 CO_2 allowance price effects of the different options, 2013 and 2020

	Projected EUA price		Remarks
	2013	2020	
	€(2012) / EUA		
Recent legislation: Base case (2013 future)	7.90	**14.30**…19.50	
Base case & set aside (2013/2016) reintroduced 2017/2020	7.90	**14.30**…19.50	Price effects tend to the lower range
Base case & set aside (2013/2016) reintroduced 2023/2026	**10.50**…11.20	**18.40**…28.80	ditto, prices are slightly dampend after 2020
LRF 2.25% from 2014	8.70…**8.90**	15.60…**22.30**	Price effects tend to the upper range
LRF 2.25% from 2014 & set aside (2013/2016) reintroduced 2017/2020	8.70…**8.90**	15.60…**22.30**	
LRF 2.25% from 2014 & set aside (2013/2016) reintroduced 2023/2026	11.50…**12.70**	19.20…**31.10**	ditto, prices are slightly dampend after 2020
LRF 2.25% from 2014 (incl. Aviation) & set aside (2013/2016) reintroduced 2023/2026	11.90…**13.20**	19.60…**31.70**	

Source: Calculations by Öko-Institut

From these modelling results some key lessons can be derived from different types of interventions:

- If the market participants believe that the set aside of allowances will not re-enter the market for a longer time or lead to retirement of the respective allowances and will not ultimately be complemented with tighter caps, the price effect of such a set aside strategy will be negligible.
- If there is a clear announcement by lawmakers or a belief by the market participants that the set aside will not be brought back to the market before a 10 years' time and no tighter cap will be implemented for the foreseeable future, the short-term price effect (2013) will lead to higher prices of approx. 2.50 €/EUA and approx. 4 €/EUA for 2020. If the set aside is not cancelled and the respective allowances were to re-enter the market after a period of 10 years, it would lead to (slightly) dampened EU prices for the period beyond 2020.
- If no set aside strategy is implemented and only the cap is tightened based on a linear reduction factor of 2.25 % annually from 2014 onwards, the price effect in 2013 would be very low (1 €/EUA at maximum) and necessarily more significant (2 to 3 €/EUA) for 2020.
- If the set aside is brought back to the market before 2020 this would trigger no additional price effects even for the more ambitious linear reduction factor.

- If a more long-term set aside is combined with a tighter cap the price effects for 2013 will be significant for both the 2013 (4.50 €/EUA) and the 2020 (approx. 15 €/EUA) time horizon. Again, if the set aside is not cancelled and the respective allowances were to re-enter the market after a period of 10 years, this would lead to (slightly) dampened EU prices for the period beyond 2020.
- A tighter cap for the aviation sector within the EU ETS would further increase the EUA price by € 0.50.

The ranges shown in Table 17 also indicate that the price effects are obviously subject to uncertainties, depending on the parametrization of the model, which reflects the different assumptions on future trends of key fundamentals for abatement costs:

- future price levels and price patterns for fuels and energy (especially the ratio between natural gas and hard coal prices as well the ratio between hard coal and lignite in the continental European market); and
- future investment price levels for installations and plants regulated by the EU ETS.

However, some sensitivity analysis shows that the central results described above are rather robust.

Last but not least, it should be pointed out that the increase of the linear reduction factor from 1.74 % to 2.25 % (reflected by a scarcity-based allowance price increase from € 20 to 30 by the time when scarcity would occur) is complemented by the assumption, that no additional entitlements for the use of offsets from CDM or JI would be introduced. Otherwise the oversupply of allowances would be maintained for a longer time and the allowance price effects indicated above would significantly overestimate the EUA price increase.

7 More ambitious greenhouse gas emission reduction targets for the EU: Analysis of implications for the EU ETS

The analysis presented in chapter 6 is based on a specific starting point: two prominent proposals from the European Parliament on a set aside and an adjustment of the linear reduction factor from 1.74 to 2.25 %. The key motivation behind these proposals is to fix the recent problems in the EU ETS.

However, this approach is only one of a broad range of alternative or complementary options to provide a solution to the recent problems in the EU ETS. This chapter presents analysis which is based on a different starting point. In a back-casting exercise two options were analysed on their implications on the EU ETS, both options are based on stronger ambitions of the EU climate policy and the corresponding targets:

- For the first option it was assumed that the EU would strengthen the overall greenhouse gas emissions reduction target from 20 % to 25 % by 2020, compared to 1990 levels. However, this option also includes a change in the architecture of the target. Whereas the existing 20 % target includes the (restricted) use of emission reduction credits from abroad, the 25 % emissions reduction target is understood as a domestic reduction target. In other words, the 25 % emissions reduction should be achieved exclusively within the EU.
- For the second option the domestic target for the EU is set at 30 % by 2020. This means that emitters in the EU must reduce their emissions in total by 30 % for the period from 1990 to 2020.

As for the whole analysis in this study, these targets are understood as reduction goals for all greenhouse gases, including the whole aviation sector[14] but excluding the emissions from land use, land use change and forestry.

As the focus of the analysis presented in this chapter is on domestic emission reductions, the first step is to quantify the domestic emission reductions that will be achieved by the Climate and Energy Package agreed in 2008:

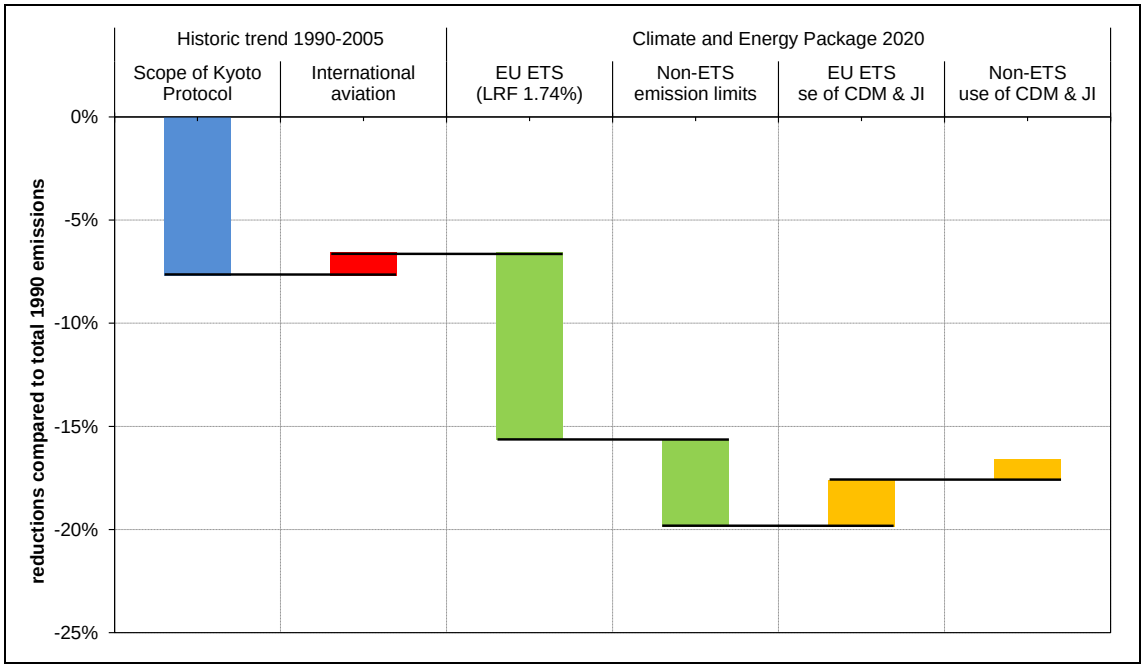
- The starting point of the analysis is the total emissions reduction achieved from 1990 to 2005, including the emission trends from aviation.
- The total contribution of the EU ETS is defined by the cap. The use of emission reduction credits from abroad must be separated to differentiate between total

[14] In the Climate and Energy Package emissions from international aviation have been included in the reduction target of the EU-27. In order to address this, the 2020 targets discussed in this chapter are compared to 1990 emissions of the EU-27 including emissions from international aviation (flights departing from the EU as reported in the inventories). In order to compare the contribution of different sectors to achieving the emissions reduction target all emission reductions are expressed as a share of 1990 emissions including international aviation.

and domestic emission reduction efforts. However, this data is available and transparent from the entitlements for the use of CERs and ERUs within the EU ETS.

- The legally binding targets for the emission sources not regulated by the EU ETS (effort sharing targets) are also defined. The domestic contributions must also be separated from the total emission reduction efforts for these sectors. The maximum amount of offsets from CDM and JI which could be used by the Member States for their contribution to the effort sharing targets is also legally defined and transparent.

Figure 12 Total and domestic emission reductions according to the 2008 Climate and Energy Package, 2020



Source: Calculations by Öko-Institut

Figure 12 provides an overview of the different contributions to the emission reductions for the period from 1990 to 2020:

- The EU-27 had achieved an emission reduction of 8 % below 1990 levels by 2005, based on the accounting rules of the Kyoto Protocol which exclude emissions from international aviation. Taking into account the significantly increased emissions from international aviation, the total emissions reduction from 1990 to 2005 decreases to 7 %.
- With the agreed targets for the EU ETS and the non-ETS emission limits laid down in the Effort Sharing Decision, the EU-27 will achieve an emission reduction of 20 % below 1990 levels by 2020. The EU ETS contributes approx. 9 percentage points of emissions reduction, based on the linear reduction factor of

1.74 %. The sectors not regulated by the EU ETS have to achieve an additional emission reduction of about 4 percentage points.

- However, the additional emission reductions from 2005 to 2020 also include the use of emissions reduction credits from CDM and JI. Total offset use in the EU ETS from 2008 to 2020 can be estimated at 1,622 million CERs or ERUs. This is an equivalent of 2 percentage points in the total emission reduction.[15] For the non-ETS sectors the use of offsets is limited to 3 or 4 % of the 2005 non-ETS emissions (EU 2009b). Expressed as the contribution to the 2020 target it is equivalent to approx. 1 percentage point of the total emission reduction.[16]

With respect to these contributions the domestic emission reduction effort from the 2008 Energy and Climate Package amounts to 17 % by 2020, compared to the 1990 levels.

The adjustments for the EU ETS analysed in the previous chapter obviously has an impact on the emission reductions by 2020.

- An increase of the linear reduction factor from 1.74 to 2.25 % increases the emission reduction effort by 2020, which equals an additional reduction of approx. 1.5 percentage points.
- If the set aside of 1,400 million EUAs is calculated as an average annual effort for 2013 to 2020, it equals an emission reduction of about 3 percentage points. This assumption is based on a long-term approach for the set aside, which means that the set aside or parts of it are not introduced to the market before 2020.

Under the assumption that these additional provisions for the EU ETS will not be complemented by additional efforts in the non-ETS sectors, the total emissions reduction from 1990 to 2020 would amount to almost 24 % in total and approx. 21 % at the domestic level. However, if the set aside is not retired after 2020 it would result in a need for additional emission reduction efforts for the decade beyond 2020 (e.g. an increased reduction effort of 2.5 percentage points in 2030).

In this context two additional provisions for the EU ETS and the non-ETS sectors were analysed:

- The EU commits to a 25 % domestic emission reduction by 2020, the share of the EU ETS in the additional reduction efforts would continue to be two thirds of

[15] In order to quantify the contribution of offsets to emission reductions in 2020 the total allowed offset use in the EU ETS was calculated as the annual average use for the 13 years from 2008 to 2020.

[16] According to the recent policies it was assumed that Germany, the UK and France will not use offsets to reach their non-ETS targets. Therefore, the potential use of offsets by these countries was not taken into account in this calculation. The use of offsets for the remaining countries was considered as the annual average of the total allowed use for the period from 2013 to 2020.

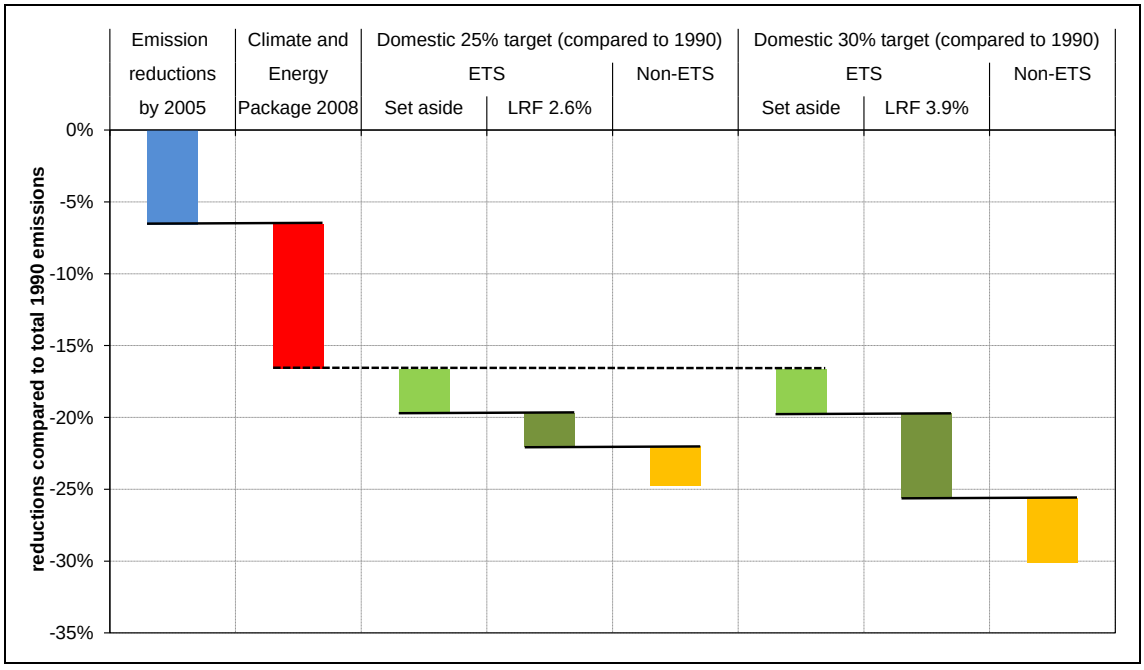
the total additional effort (CEC 2011d+e, Öko-Institut 2011) and a set aside of 1,400 million EUA would be separated from the market and not introduced before 2020.

- The EU sets a target of a 30 % domestic emission reduction by 2020, the share of the EU ETS in the additional reduction efforts would also continue to be two thirds (CEC 2011d+e, Öko-Institut 2011) of the total additional effort and a set aside of 1,400 million EUA would be separated from the market and not introduced before 2020.

Based on these assumptions the implications for the EU ETS can be derived with a back-casting approach.

- For the case of the 25 % domestic emission reduction the linear reduction factor must be increased to 2.6 % from 2014 onwards. This represents an annual decrease of the cap by 57 million EUA. Without consideration of the set aside the scope-adjusted cap of the EU ETS would represent an emission reduction of 27 % from 2005 to 2020 and the complete abatement of greenhouse gas emissions by 2050.
- For the case of the 30 % domestic emission reduction goal the implicit linear reduction factor is 3.9 % from 2014 onwards, representing an annual decrease of the cap by 86 million EUA. Without the effects of the set aside this would result in an emission reduction of 36 % from 2005 to 2020. The emissions from sources regulated by the EU ETS must be completely abated by 2038, in a period of 25 years from now.

Figure 13 Adjustments of the ETS and the switch to more ambitious EU targets for greenhouse gas emission reductions in 2020



Source: Calculations by Öko-Institut

Figure 13 provides an overview of the different contributions to the overall domestic reduction. Starting from a domestic emissions reduction of about 17 % compared to 1990 levels, the emissions reductions would be allocated as follows:

- The set aside would again represent a contribution of 3 percentage points (based on the emission levels of 1990);
- The increase of the linear reduction factor from 1.74 to 2.6 % would represent an emission reduction of about 2 percentage points (referring to the total emissions in 1990). Depending on the emission reduction delivered by the EU ETS the reduction efforts in the non-ETS sectors (buildings, transport, agriculture, waste management etc.) would amount to 2.5 percentage points;
- If the linear reduction factor is increased to 3.9 % the respective emission reduction amounts to 6 percentage points by 2020. Accordingly the contribution of the non-ETS sectors increases to 4.5 percentage points.

With a set aside in the EU ETS of 1,400 million EUA, an increase of the linear reduction factor from 1.74 to 2.6 % for the EU ETS cap and increased efforts in the non-ETS sectors the EU would be able to achieve a domestic emission reduction of 25 % below 1990 levels by 2020.[17] The additional efforts in the non-ETS sectors represent one third of the additional reduction effort to step up to a more ambitious reduction target of 25 % domestically. With an increased linear reduction factor of 3.9 % for the cap of the EU ETS and consistently increased efforts in the non-ETS sectors, the EU would able to achieve domestic emission reduction of 30 % below 1990 levels by 2020.[18]

However, it should be carefully considered that the emissions reductions from the set aside of about 3 percentage points of the total target of 25 or 30 % are non-permanent if the set aside is not retired. Otherwise the reintroduction of the set aside (after 2020) to the market would have to be compensated in the next decade by additional efforts.

The significantly tightened caps for the EU would obviously have price effects in the market for emission allowances. Considering the efforts and the methodological approach used in this study two reflections are necessary:

- The model and its parametrization can be used for the case of a linear reduction factor of 2.6 % (consistent to the domestic reduction target of 25 %) for the short-term price effects as well as the price projection for 2020.
- For the case of an increase of the linear reduction factor to 3.9 % the model can only be used for the estimation of the rather short-term price effects. For the

[17] The reduction effort of the set aside in 2020 is calculated by distributing the total size of the set aside (1,400 million EUA) equally to the eight years of the third trading period. An increase of the linear reduction factor to 2.6 % delivers an emission reduction of 133 million t CO_2 in 2020. Expressed as a share of 1990 emissions including international aviation this translates into an emission reduction of 2.3 percentage points in 2020.

[18] Again the non-ETS sectors cover one third of the additional reduction effort to step up to a more ambitious reduction target of 30 %.

longer-term projection the underlying assumption of scarcity-based EU prices in the range of € 20 to 30 is not applicable in the framework of a cap trajectory that leads to full decarbonisation of the EU ETS-regulated stationary sources within 25 years. Therefore and because of the wide range of possible policy specifications for this level of ambition (e.g. the contributions deriving from complementary policies to the EU ETS), the projection of EU prices is based on a rough guess based on the data referred to in Table 16.

Table 18 Key implications for the EU ETS from the back-casting calculations for the 25 % and 30 % domestic reduction targets by 2020

		Base case[c]	Domestic target by 2020[d]	
			25% below 1990	30% below 1990
Linear reduction factor from 2014 onwards		1.74%	2.6%	3.9%
Cap in 2020 (stationary EU ETS III scope)[a]	mln EUA	1,820	1,687	1,487
	compared to 2005	-21.6%	-27.3%	-35.9%
Scarcity of allowances from		2024/2025	2019/2020	2017
EUA price effects[b]				
2013	€(2012)/EUA	7.90	12.10…**13.40**	13.30…**15.30**
2020	€(2012)/EUA	**14.30**…19.50	19.70…**32.00**	35.00…40.00[e]
Notes: [a] The cap data do not consider the effects from the set aside. - [b] The EUA price effects consider a set aside of 1,400 mln EUA in 2013/2016 which is not reintroduced before 2020. - [c] The EUA price effects tend to the lower range. - [d] The EUA price effects tend to the upper range. - [e] The EUA price effect is a rough estimate based on a range of other studies				

Source: Calculations by Öko-Institut

Table 18 summarizes some of the key results from the analysis for the EU ETS. The significantly increased reduction efforts (from 21.6 % below 2005 levels to 27.3 % and 35.9 %) will accelerate the cutback of the allowance surplus in the EU ETS and trigger significant price increases for allowances. Although the caps are significantly tightened the immediate price reactions will be limited; the prices for 2013 increase in the range of 5 to 6 €/EUA. However, the long-term price effects must be significant if the linear reduction factors should be increased from 1.74 % to 2.6 or 3.9 %. In 2020 the EUA prices could increase to more than 30 €/EUA in the framework of the 25 % domestic target and to significantly higher levels for the 30 % domestic target.

All in all, the analysis shows that the most prominent proposals on EU ETS adjustments are not fully in line with a 25 or 30 % domestic reduction target for the EU. A stand-alone package for the EU ETS, consisting of a set aside and an increase of the linear reduction factor from 1.74 to 2.25 % would only provide a domestic reduction of about 21 %. If the linear reduction factor were increased to 2.6 % and complementary efforts made in the non-ETS sectors, the 25 % domestic reduction target could be achieved. The same situation applies for a linear reduction factor of 3.9 % and the 30 % domestic target. The stabilizing effects for the EU prices would be significant for all options in the short term and much more important in the longer term.

8 Summary and conclusions

EU energy and climate policy faces manifold challenges. The debate on tougher emissions reduction targets for 2020 is emerging, the need for an integrated framework and long-term targets as well as consistent and interim targets for 2020 and 2030 is becoming obvious and the adjustments to the EU ETS seem to be indispensable to preserve its role as a central pillar of the EU's energy and climate policy mix.

The EU is on its way to meeting its recent greenhouse gas emission targets for 2020. In 2010 the total greenhouse gas emissions were at a level of 14 % below the 1990 levels. Including the contributions from the entitlements for the use of emission reduction credits from abroad, namely the Clean Development Mechanism (CDM) and Joint Implementation (JI), in the EU ETS the total compliance effort increases to 16 %. The foreseeable use of foreign credits by the governments to comply with their non-ETS emission reductions adds another percentage point; the total progress in compliance to the 20 % reduction target in 2020 totals 17 %. The remaining effort of 3 % is theoretically already gap-filled with the cap of the EU ETS by 2020.

The current situation is also challenging for the EU ETS, which is facing significantly falling allowance prices. These price trends and the emerging investment needs in the European power markets raise the question of the fundamental reasons for this price development as well as the concern of whether the EU ETS will be able to maintain its role as a central pillar of climate policy in the EU. The key reason is the massive supply of emission allowances and emission reduction credits, which exceeds the demand significantly. From 2008 to 2011 a surplus of about 950 million allowances was accumulated and creates major impacts on the markets. A detailed analysis of demand and supply indicates that this surplus of supply will continue for the next decade or more if no adjustments to the EU ETS are implemented. The major reasons for the massive supply are the huge entitlements for the use of external emission reduction credits from CDM and JI as well as the long-term impacts of the financial and economic crisis, which changed the baseline emission trend and consequently reduced the emission reduction effort built into the EU ETS in its actual parameterization. By 2020 the major share of the remaining surplus[19] will stem from the inflow of external credits and a smaller part can be attributed to the economic crisis. Only a minor contribution to the surplus results from the support for renewable energy sources with complementary policies to the EU ETS. The recently projected contribution of renewable energies to emissions reduction in the sectors regulated by the EU ETS matches more or less perfectly with the assumptions made for the cap-setting in the integrated analysis for the Energy and Climate Package in 2008. However, this matching results from diverging trends for the deployment of different sources of power generation from renewable en-

[19] Purchases of EUAs from the aviation sector that will reduce the surplus are not yet substracted here.

ergies, which are coincidently compensating each other. This coincidence must not necessarily also occur in the future, i.e. for the time horizon beyond 2020.

However, the need for some adjustments of the parametrization of the EU ETS is emerging. Two approaches were used to analyse potential interventions.

The first approach refers to a prominent proposal in the recent debate, put forward by the European Parliament and consisting of two key elements. This proposal includes firstly a set aside of 1,400 million allowances and secondly a tighter cap for the EU ETS, implemented by an increase of the linear reduction factor from a recent 1.74 % to 2.25 % from 2014 onwards.

The second approach starts from a more ambitious emissions reduction target for the overall greenhouse gas emissions for the EU by 2020, i.e. a reduction of 25 % and 30 % by domestic measures, based on 1990 emission levels. Such overarching emission reduction targets can be translated into an increase of the linear reduction factor from 1.74 % to 2.6 % (25 % target domestically) and 3.9 % (30 % target for domestic emission reductions).

The analysis clearly shows that a significant reduction of the surplus is only possible with the combination of a set aside and adjustments of the cap by increasing the linear reduction factor. Stand-alone measures like a set aside on the one hand or the adjustments of the linear reduction factor on the other hand will have only extremely limited impacts on the surplus for the next decade. However, the effectiveness of both interventions is subject to some caveats:

- A set aside will only have an impact if the market participants believe that the respective amount allowances will be held back for a sufficient period of time (at least until the surplus is fully removed) or will be retired.
- Tighter caps for the EU ETS will only achieve the intended effects if not complemented by an increase of the entitlements for the use of external credits, which would increase the surplus again and decrease the allowance prices.

An assessment of the different options with a relatively simple allowance price model (which nevertheless explains the recent price levels comparatively well) leads to some key lessons on different types of interventions:

- If the market participants believe that the set aside of allowances will re-enter the market or will not be retired and will not ultimately be complemented by tighter caps, the price effect of such a set aside strategy will be negligible.
- If there is a clear announcement by lawmakers or a belief by the market participants that the set aside will not be brought back to the market before a 10 year time period has passed and no tighter cap will be implemented for the foreseeable future, the short-term price effect (2013) will lead to higher prices of approx. 2.50 €/EUA and approx. 4 €/EUA for 2020. If the set aside is not cancelled and the respective allowances were to re-enter the market after a period of 10 years, it would lead to (slightly) dampened EU prices for the period beyond 2020.

- If only the cap is tightened based on a linear reduction factor of 2.25 % annually from 2014 onwards, the price effect in 2013 would be very low (1 €/EUA at the maximum) and necessarily more significant (2 to 3 €/EUA) for 2020.
- If the set aside is brought back to the market before 2020 it would trigger no additional price effects even for the more ambitious linear reduction factor.
- If a more long-term set aside is combined with a tighter linear reduction factor of 2.25 %, the price effects for 2013 will be significant for both the 2013 (4.50 €/EUA) and the 2020 (approximately 15 €/EUA) time horizon. Again, if the set aside is not cancelled and the respective allowances were to re-enter the market in the medium term, it would lead to (slightly) dampened EU prices in future.
- A tighter cap for aviation (applying the linear reduction factor of 2.25 % also to the sub-cap for aviation) would further increase the EUA price by € 0.50.
- The EUA price effects of a set aside, not re-entering the market before 2020, and a tighter cap based on an increase of the linear reduction factor from 1.74 % to 2.6 % could increase the price in 2013 by approx. 5 €/EUA and by up to 17 €/EUA in 2020.
- The combination of a set aside, which is held back for a decade or more or is finally retired, and an increase of the linear reduction factor from 1.74 % to 3.9 % from 2014 onwards would lift the EUA price by up to € 7 in 2013 and potentially by more than € 20 by 2020. However, the uncertainties regarding the assessment of price effects for this option are comparatively high because of specific modelling issues and the wide range of potential policy specifications for these kinds of emission reduction trajectories.

Based on this analysis a set of four recommendations can be put forward for adjustments of the EU ETS:

Firstly, a set aside can reduce the allowance surplus within the EU ETS in the short term. However, the respective amount of allowances should be held back for a period of a decade or more or retired at the earliest point in time.

Secondly, the long-term cap should be tightened by a significant increase of the linear reduction factor, preferentially from 2014 onwards. The effective increase is subject to fundamental political decisions on the overall emission reduction targets. However, an increase of the linear reduction factor to less than 2.6 % will be not consistent with overall targets of a 25 % domestic emission reduction and a factor of less than 3.9 % will not be consistent with an overarching target of 30 % domestic action by 2020.

Thirdly, no additional entitlements for the use of external emission reduction credits should be created in the process of tightening the EU ETS cap.

Fourthly, the implementation of high impact complementary policies (e.g. the impact of the upcoming Energy Efficiency Directive on emissions in the EU ETS sectors), a long-lasting change in fundamental drivers for baseline emissions (e.g. a significantly lower

GDP growth for a longer period) or other changes in the regulatory framework (e.g. the discontinuation of significant parts of the aviation sector as net buyers in the market) should be reflected by a strictly rule-based and high-threshold provision to lower the cap in the EU ETS.

These kinds of structural improvements could help to preserve the key role of the EU ETS in an enabling policy mix for ambitious, effective and efficient climate policy.

9 References

Bloomberg New Energy Finance (BNEF) (2012): The cost of meeting a 30 % emission reduction target in Europe. 16 March 2012.

Capros, P., Mantzos, L., Papandreou, V., Tasios, N. (2008): Model-based Analysis of the 2008 EU Policy Package on Climate Change and Renewables. Economics-Energy-Environment Modelling Laboratory (E3MLab), National Technical University of Athens.

Commission of the European Communities (CEC) (2010a): Analysis of options to move beyond 20 % greenhouse gas emission reductions and assessing the risk of carbon leakage. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. COM(2010) 265 final, Brussels, 26.5.2010.

Commission of the European Communities (CEC) (2010b): NAP tables decisions – published at: http://ec.europa.eu/environment/climat/emission/citl_en_phase_ii.htm

Commission of the European Communities (CEC) (2010c): Commission Decision of July 2010 on the Community-wide quantity of allowances to be issued under the EU Emission Trading Scheme for 2013. C(2010) 4658 final, Brussels, 09.07.2010

Commission of the European Communities (CEC) (2010d): Adjusting the Union-wide quantity of allowances to be issued under the Union Scheme for 2013 and repealing Commission Decision 2010/384/EU. C(2010) 7180 final. Brussels, 22.10.2010.

Commission of the European Communities (CEC) (2010e): EU energy trends to 2030 — UPDATE 2009; EUROPEAN COMMISSION Directorate-General for Energy in collaboration with Climate Action DG and Mobility and Transport DG; completed on 4 August 2010.

Commission of the European Communities (CEC) (2011a): Commission decision of 27 April 2011 determining transitional Union-wide rules for harmonised free allocation of emission allowances pursuant to Article 10a of Directive 2003/87/EC of the European Parliament and of the Council pursuant to Article 10a of Directive 2003/87/EC of the European Parliament and of the Council.

Commission of the European Communities (CEC) (2011b): Commission Decision of 11 November 2011 amending Decisions 2010/2/EU and 2011/278/EU as regards the sectors and subsectors which are deemed to be exposed to a significant risk of carbon leakage (notified under document C(2011) 8017).

Commission of the European Communities (CEC) (2011c): Commission Regulation (EU) No 550/2011 of 7 June 2011 on determining, pursuant to Directive 2003/87/EC of the European Parliament and of the Council, certain restrictions applicable to the use of international credits from projects involving industrial gases.

Commission of the European Communities (CEC) (2011d): Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Energy Roadmap 2050. COM(2011) 885. Brussels, 15.12.2011.

Commission of the European Communities (CEC) (2011e): Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. A Roadmap for moving to a competitive low carbon economy in 2050. COM(2011) 112 final. Brussels, 8.3.2011.

Commission of the European Communities (CEC) (2011f): Communication from the Commission, Guidance document on the optional application of Article 10c of Directive 2003/87/EC (2011/C 99/03), 31.3.2011.

Commission of the European Communities (CEC) (2012): Emissions Trading: Commission clears temporary free allowances for power plants in Cyprus, Estonia and Lithuania; MEMO/12/350; Brussels, 16 May 2012.

Commission of the European Communities (CEC), European Investment Bank (EIB) (2010): Cooperation agreement on the implementation of Commission Decision C(2010) 7499 between the European Commission and the European Investment Bank (2010/C 358/01). Official Journal of the European Union, 31.12.2010.

Council of the European Union (CEU) (2007): Presidency Conclusions 8/9 March 2007. http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/ec/93135.pdf

Council of the European Union (CEU) (2010): Climate change: Follow-up to the Copenhagen Conference (7-19 December 2009). Council (Environment) Conclusions, 7562/10, Brussels, 15 March 2010.

Council of the European Union (CEU) (2011): Conclusions – 4 February 2011; http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/119175.pdf.

de Perthuis, C., Trotignon, R. (2012): The European CO2 allowances market: issues in the transition to Phase III. Les Cahiers de la Chaire Economie du Climat, Information and debates Series, no. 14, Paris, March 2012.

Deutsche Bank (2011): EU Emissions: What is the value of a Political Option? 29 November 2011.

European Economic Area Joint Committee (EEA JC) (2011): Decision of the EEA Joint No 93/2011 of 20 July 2011 amending Annex XX (Environment) to the EEA Agreement.

European Environment Agency (EEA) (2011): National Renewable Energy Action Plan (NREAP) Data, http://www.eea.europa.eu/data-and-maps/figures/national-renewable-energy-action-plan.

European Environment Agency (EEA) (2012): EU ETS data EEA greenhouse gas data viewer, http://dataservice.eea.europa.eu/pivotapp/pivot.aspx?pivotid=473http://dataservice.eea.europa.eu/PivotApp/pivot.aspx?pivotid=475.

European Parliament (EP) (2010): Towards a new Energy Strategy for Europe 2011 – 2020. Resolution 2010/2108(INI), Brussels, 25 November 2010.

European Parliament (EP) (2012): Opinion of the Committee on the Environment, Public Health and Food Safety for the Committee on Industry, Research and Energy on the proposal for a directive of the European Parliament and of the Council on energy efficiency and repealing Directives 2004/8/EC and 2006/32/EC (COM(2011)0370-C7-0168/2011 – 2011/0172(COD)). Brussels, 18.1.2012.

European Topic Centre on Air and Climate Change (ETC/ACC) (2010): Cap adjustments in the EU-ETS according to Article 9a of the EU-ETS Directive. ETC/ACC Technical Paper 2010/2, June 2010.

European Union (EU) (2009a): Directive 2009/29/EC of the European Parliament and of the council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community. Official Journal of the European Union, 5.6.2009.

European Union (EU) (2009b): Decision No 406/2009/EC of the European Parliament and of the council of 23 April 2009 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. Official Journal of the European Union, 5.6.2009.

European Union (EU) (2009c): Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. Official Journal of the European Union, 5.6.2009.

Fraunhofer Institut für Innovations- und Systemforschung (ISI) (2005): CO_2-Minderung im Stromsektor durch den Einsatz erneuerbarer Energien. Karlsruhe, Januar 2005.

Fraunhofer Institut für Innovations- und Systemforschung (ISI) (2009): CO_2-Minderung im Stromsektor durch den Einsatz erneuerbarer Energien im Jahr 2006 und 2007. Karlsruhe, Februar 2009.

Grubb, M. (2012): Strengthening the EU ETS. Creating a stable platform for EU energy sector investment. Climate Strategies, Cambridge.

Öko-Institut (2010): Free allocation of emission allowances and CDM/JI credits within the EU ETS. Analysis of selected industries and companies in Germany. Study for WWF Germany, Berlin, December 14, 2010.

Öko-Institut (2011): The Vision Scenario for the European Union - 2011 Update for the EU-27. Berlin, January 2011.

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