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EU climate policy impact in 2020

With a focus on the effectiveness of emissions trading policy in an economic recession scenario

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June 2009

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by order of:

Planbureau voor de Leefomgeving (Netherlands Environmental Assessment Agency)

Summary

PBL's Environmental Balance 2009 provides information on the current status and trends of environmental and climate policies. Ecofys contributes to the climate policy section of the report by developing the following three indicators:

1. ex-post and ex-ante policy impacts until 2020 at EU level (wedge diagram);
2. business-as-usual emissions of EU ETS sectors until 2020, revised for the current economic recession;
3. a latest literature review of EUA price band expected until 2020.

Based on the latter two analyses, a brief note on the impact of the current economic recession on the effectiveness of the EU emission trading scheme until 2020 is presented.

1. Policy impacts until 2020 at EU level

Figure 1 provides an overview of the ex-post (1990-2005) and ex-ante (2005-2020) impact of climate policies on the total greenhouse gas emissions in the European Union (EU).

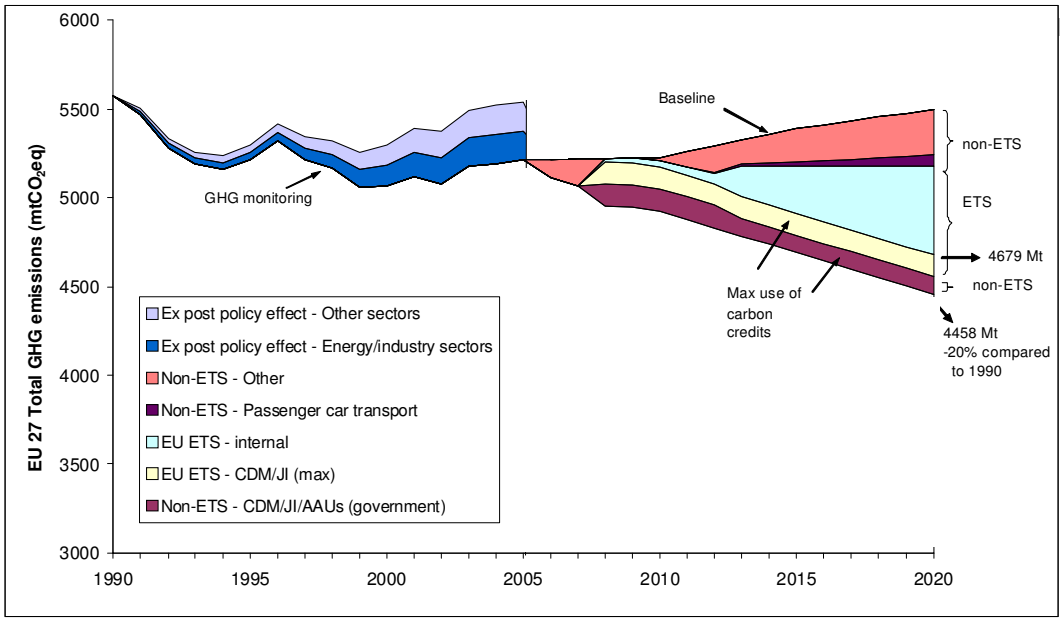

Figure 1 Indicator 1. 1990-2005 showing ex-post impact of environmental policies (split is CO_2 and non-CO_2 GHG emissions) and 2005-2020 ex-ante baseline and expected policy effect

Key messages

- The required policy impact in the period 2005-2020, to reach the overall 2020 EU target is, taking the PRIMES baseline[1] as a reference, a factor 2.6 higher than the impact of environmental policies in the EU in the period 1990-2005.
- Compared to the 1990-2005 period, policies up to 2020 focus stronger on the energy and industry sectors, with the EU-ETS and renewable energy policies as the prime policy instruments.
- The target of 20% reduction of greenhouse gas emissions in the EU in comparison to 1990 level would point to a level of 4458 Mtonne CO_{2eq} greenhouse gas emissions in 2020.
- When the maximum allowed volume of carbon credits from flexible mechanisms is used, emissions in the EU would be 4679 Mtonne in 2020. This is a reduction of 16% in comparison to the 1990 level (5572 Mtonne).
- When compared with the PRIMES baseline emission trend, a maximum of 36% of the cumulative required EU wide abatement between 2005 and 2020 could be fulfilled by the use of flexible mechanisms (like CDM/JI/ AAUs), the rest of the efforts required would be EU internal.
- In case no post-2012 international agreement is reached, the use of CDM/JI credits is limited to sourcing from Least Developing Countries (LDCs) for compliance under the EU emission trading scheme (ETS). In this scenario, the abatement effort share shifts entirely towards EU internal, as the potential for LDCs to generate credits is insignificant.

The above conclusions are valid against the PRIMES baseline, which follows the economic growth trend of 1990-2005. Figure 1 shows that under this scenario, EU ETS is an important policy instrument to meet the 2020 EU GHG target. However, in recent months, the EU economic outlook has changed drastically. Indicator 2 therefore analyses how the current recession could impact the effectiveness of the EU ETS policy instrument till 2020.

[1] PRIMES baseline refers to the baseline trend forecasted by Capros et al, 2008. The forecasts pertain to assumptions prior to the deepening of financial crisis in September 2008 and hence PRIMES can be regarded as the pre-recession baseline estimate.

2. Expected long-term scarcity of allowances under EU-ETS

Indicator 2 provides an overview for the period 2005-2020 of the ETS allowance cap, the expected so-called 'baseline' emissions development, and as a result, the expected scarcity of emission allowances (i.e. difference between baseline and cap) under the scheme (see Figure 2).

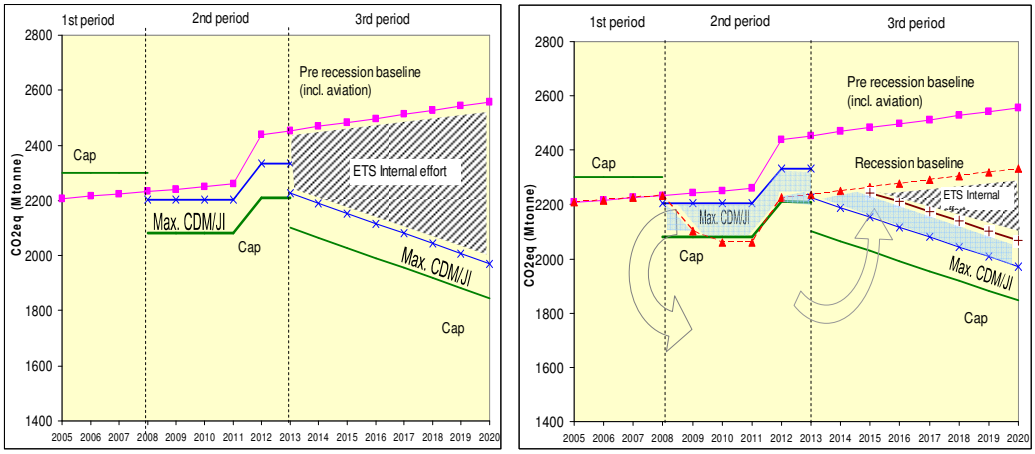

Figure 2 Envisaged baseline emissions and cap in a pre-recession (left) and recession (right) scenario. Note: Actual 2008 verified emissions are reported lower at 2118 Mtonne CO_2e (EC, 2009a), hence baseline curve for recession could be slightly lower.

Key message

In the recession baseline estimate (includes aviation after 2012), the average overall emission in the second trading period is close to meeting the cap, even without the use of CDM/JI-credits. In an economically efficient scenario, CDM/JI-credits imported in phase-2 are used for compliance in the same phase and an equivalent amount of EUAs are freed for banking to the next phase. As a result, the remaining EU-internal effort in phase-3 of the EU-ETS could reduce to 890 Mtonne CO_{2eq}, which is only 35% of the overall required abatement effort (~2500 Mtonne CO_{2eq}) under the recession baseline.

As a result of this latest development, there could be a structural change where the abatement efforts of the EU could inevitably shift focus to low-carbon offsets outside the EU as against the earlier envisaged focus on low-carbon technology within the EU.

3. Expected carbon price movements in the EU-ETS

Indicator 3 gives an analysis of price developments and dynamics under EU-ETS with long term price expectations until 2020 based on views from academic literature and other agencies. The latter forecasts were made after the deepening of banking crisis in September 2008. This is visualised in Figure 3.

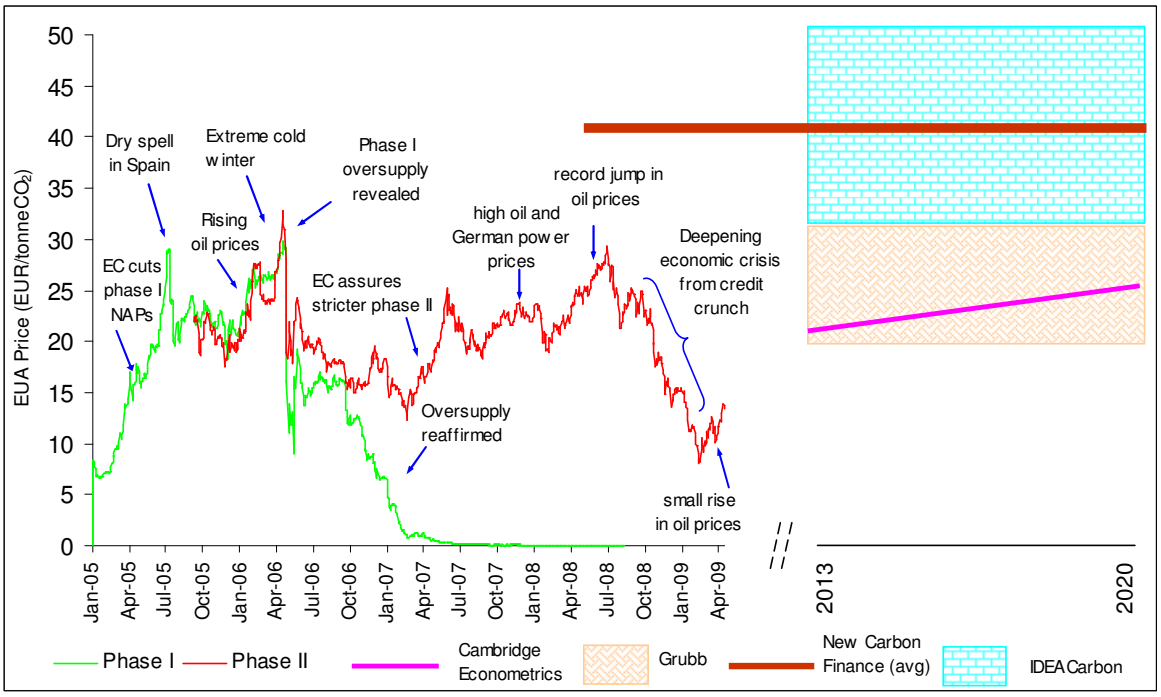

Figure 3 EUA price movement in phase 1 and 2, and forecasts for phase 3

Key messages

Due to the recent economic crisis, carbon prices have dropped from approximately 20 to 25 euro per tonne of CO_2 in summer 2008 (the former for CER credits, the latter for EUAs), to below 15 euro per tonne of CO_2 in recent times. Overall, we might expect that with the recent economic crisis lowering demand for permits in phase 2 and with the provision of banking EUAs to the next phase, CDM/JI credits could increasingly be used for cheaper compliance till 2012.

As a result, the remaining abatement effort in phase-3 of the EU-ETS could to a large extent (65%) be achieved through the use of CDM/JI-credits. Consequently, we may expect that price range in phase 3 may be more on the conservative side (around 20 €/t-CO_2), if the banking effect to phase 4 is ignored.

Overall concluding summary

Current recession could affect effectiveness of EU-ETS

Based on the emerging recession scenario, three observations could be made for scarcity volume of the third trading period (see right hand graph of Figure 2):

1. Medium term (2020) scarcity still remains.
2. To a much larger extent (65%), offsets could then be used for cheaper compliance, reducing EU-internal abatement efforts (striped area) to just 35% under the recession baseline.
3. As a result, the allowance price in the third period is expected to be in the lower range of price forecasts; €20, rather than earlier expectation of €40

The likely impact of an economic recession on long-term policy effectiveness could therefore be:

- A prolonged lower carbon price implies lower incentives for deploying technologies with higher abatement costs (example: CCS, off-shore wind).
- Governments will generate lower auction revenues. As a result, they may need to make additional expenditures for meeting the 2020 renewable energy targets.

Overall, for scaling-up investments in low-carbon technologies, a prolonged higher carbon price is essential. The current recession could weaken the contribution of emission trading scheme towards this objective.

Further research might therefore be required on new measures that need to be explored to maintain the scarcity volume. Alternatively, our analysis emphasises the need for dedicated EU renewable support policies as to some extent foreseen by the CCS directive (using 300 Mtonne of allowances for CCS and innovative renewables) and announced in the recent EU economic recovery plan.

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1 Introduction

The Netherlands Environmental Assessment Agency (Planbureau voor de Leefomgeving (or PBL) in Dutch) is the national institute for strategic policy analysis in the field of environment, nature and spatial planning. Every year, PBL publishes an Environmental Balance ('Milieubalans') about the status and trends of emissions and environmental quality in the Netherlands in the framework of current policy and societal developments.

PBL requested Ecofys to develop three climate policy indicators for the Environmental Balance 2009. The first indicator concerns ex-post and ex-ante greenhouse gas (GHG) policy impacts at European Union-level. The second and third indicators focus on the European Emission Trading Scheme (EU-ETS).

Indicator 1 will provide an overview of the ex-post (1990-2005) and ex-ante (2005-2020) impact of climate policies on the total greenhouse gas emissions in the European Union. Though not directly related to developments in the Netherlands, this indicator provides a concise picture of the European context of climate trends and policies for the Netherlands.

Indicator 2 and 3 will provide an overview for the period 2005-2020 of the ETS emission ceilings (caps), the expected so-called 'baseline' emissions development, and as a result the expected scarcity and price developments of emission allowances under the scheme. In summary, the indicators will provide insights on the expected impact and incentives from the EU-ETS. The EU-ETS can be regarded as the most important EU policy instrument that should assure that the EU's greenhouse gas emissions target of -20% in 2020 (compared to 1990) will be achieved. The majority of energy- and industrial installations in the Netherlands fall under the EU-ETS. Indicator 2 and 3 will therefore also provide insights to Dutch firms on the impact of EU-ETS.

2 Indicator 1: Ex-post and ex-ante GHG policy impact at EU level

The aim of indicator 1 is to show the environmental policy impacts on greenhouse gas emissions in EU-27 countries in the period from 1990 to 2005, and to illustrate to what extent future policies will be needed to reach the 20% greenhouse gas reduction target by 2020. The policy impacts are split-up in ex-post and ex-ante impacts.

The ex-post policy impacts have been published already by PBL (Wesselink et. al, 2008[2]). This publication was based on an underlying analysis carried out by Ecofys. The main message from the analysis was that without environmental policies in the EU, between 1990 and 2005, emissions of the six greenhouse gases under the Kyoto Protocol would have been approximately 7% higher in 2005 than they were actually. To meet the EU's 2020 climate target with reference to the PRIMES baseline (Capros et al, 2008), this impact must increase by a factor between three (all greenhouse gases) to five (CO_2) in the 2005-2020 period (see Figure 4).

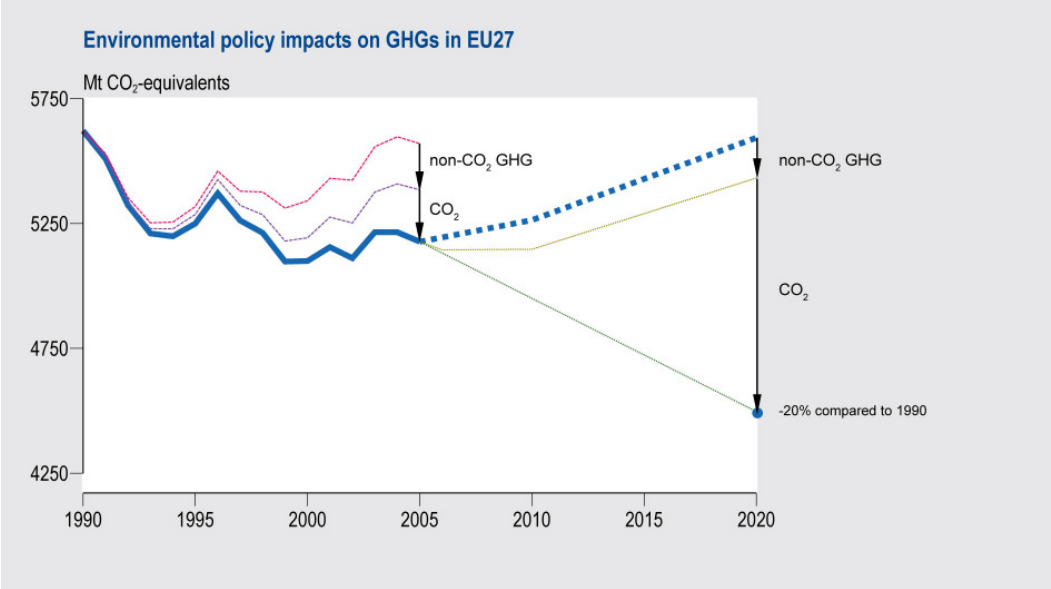

Figure 4 On the left, the ex-post estimated effects of environmental policies on GHGs in the EU-27 in the period 1990-2005. On the right, the ex-ante policy impact estimates

In the next section, we will provide indicator 1; to illustrate how the policies that are established under the European Commission's (EC's) Climate Package (European Commission, 2008b) are expected to contribute to the required 'factor three' (2005-2020) policy impact. For the ex-ante policy impacts we look at the expected effort

[2] Source: http://www.mnp.nl/en/publications/2008/EU2020climatetargetrequiresfive-foldincreaseinimpactofCO2policies.html

from energy and climate policies in the EU. Specifically, we assess the allowed use of flexible mechanism to comply to set targets.

In this Chapter we first give a description and quantification of existing policy frameworks and targets on EU level (2.1). This includes an assessment of the allowed use of flexible mechanisms. Section 2.2 gives a graphical representation of indicator 1 including a description of the methodology.

2.1 Policies and targets in EU

The EU has a range of targets and policies in place to tackle climate change or have significant climate change co-benefits. How these targets and policies relate to different sectors of the EU economy is summarised in Figure 5.

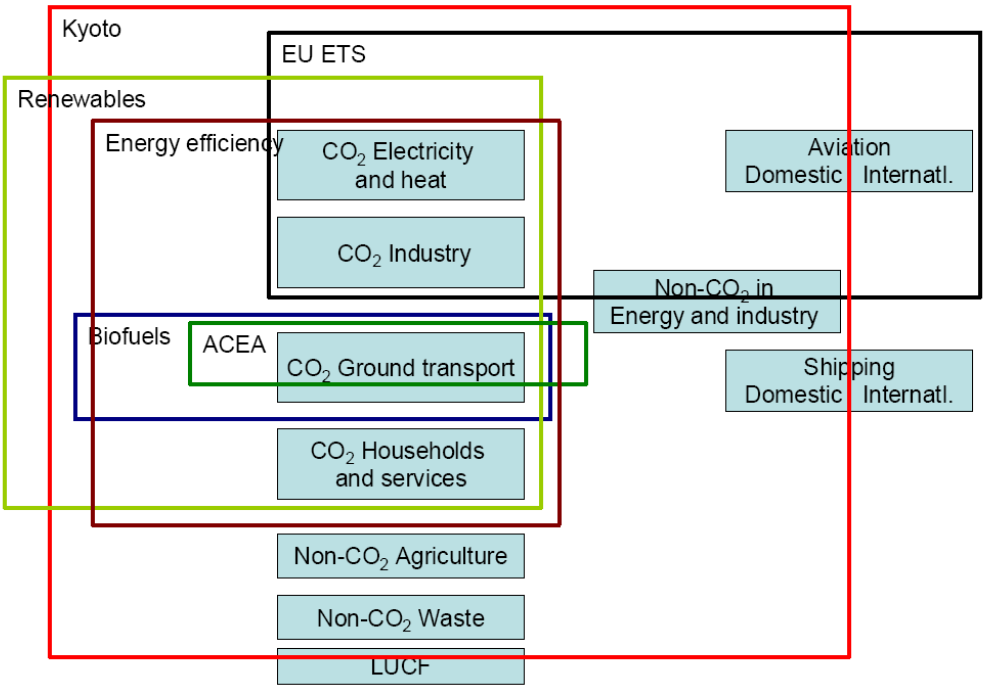

Figure 5 Overlap of EU targets and policies. The blue shaded boxes represent emissions sectors. The coloured squares encompass the sectors (or parts of sectors) which are included in the scope of a particular target (Ecofys, 2008)

The figure shows that there is a great deal of overlap among the targets with the emissions from some sectors being covered by a number of policies or targets. The most important targets and policies are briefly described below.

2.1.1 Overall EU target for reducing GHG emission

The European Council Conclusions in March 2007 agreed that the EU and its Member States should propose a 30% reduction in GHG emissions by developed countries by 2020 as part of a wider international agreement aimed at limiting global climate change to 2ºC above preindustrial levels. Until an international agreement is reached the EU should take on a firm independent commitment to achieve at least a 20% reduction of GHG emissions by 2020 compared to 1990[3].

In December 2008, EU leaders reached agreement over an energy and climate change 'package' to deliver the objectives of reducing greenhouse-gas emissions and increasing renewable energy use by 20% by 2020. Central to the strategy is a strengthening and expansion of the Emissions Trading Scheme (EU ETS). Emissions from the sectors covered by the system will be cut by 21% by 2020 compared with levels in 2005. Emissions from sectors not included in the EU ETS (such as transport, housing, agriculture and waste) will be cut by 10% from 2005 levels by 2020.

Summarizing, the overall target at the moment for EU27 is to reduce 20% of greenhouse gas emissions by 2020 in comparison to 1990. For the EU ETS sectors the target is to 21% of emissions by 2020 in comparison to 2005 and for non-ETS 10% of emissions by 2020 in comparison to 1990.

2.1.2 Targets for renewable energy and energy-efficiency

Policies in the field of renewable energy and energy-efficiency both can have an effect on the EU ETS sectors (by reduced fossil energy use) and on the non-ETS sectors. In the RES directive (2008/0016)[4], the target is to generate 20% of final energy demand by renewable energy sources by 2020 (in 2005, 8.6%[5] of final energy demand in the EU was supplied by renewable energy sources (EEA 2008a)). The 2006 Action Plan for energy efficiency outlines the EU ambition to reduce energy consumption by 20% compared to projections of primary energy use for 2020 on a cost-effective basis (specific measures include e.g. ecodesign, labeling, buildings directive, energy efficient products, cogeneration).

Based on Ecofys (2008) report, the joint target of renewable energy use and energy-efficiency improvement leads to an emission reduction of 26% in 2020 in comparison to 1990 and is therefore higher than the target of 20% reduction in 2020 in comparison to 1990.

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[3] Preamble 3 and 4 of the text of the package 'Shared effort to reduce GHG emissions' - http://www.europarl.europa.eu/sides/getDoc.do?type=TA&reference=20081217&secondRef=TOC&language=EN

[4] Promotion of the use of energy from renewable sources 2008/0016 (Proposal for a directive). Adopted on 17 December 2008. The Directive should be implemented by Member States by 2010.

[5] Eurostat introduced the indicator termed "share of renewables in Gross Final Energy Consumption", which is measured as a ratio of renewable energy consumed in all final demand sectors (including the part of electricity and heat generated by renewables) over final energy demand increased by distribution losses and self consumption of electricity and steam.

2.1.3 Use of flexible mechanisms

Flexible mechanisms can be used by both governments and companies. For both groups different amounts of allowances can be used.

Governments

For the 2008-2012 period, a maximum of 126.5 Mtonne CO_{2eq} of CDM/JI/ AAU credits are allowed annually (EEA 2008a). The EU "Shared Effort to reduce GHG emissions" in the "Climate action and renewable energy package"[6] adopted in December 2008 allows the maximum volume of flexible mechanisms (CDM/JI/AAUs) amounting to 98.5 Mtonne CO_{2eq} annually for the 2013-2020 period. This is based on the text, which states that the annual use of credits allowed is up to a quantity representing 3% of the greenhouse gas emissions of each Member State not covered under Directive 2003/87/EC in the year 2005 or in other Member States, until a future international agreement on climate change has been reached.[7]

A further 1% of verified emissions in 2005 is allowed from the Least Developed Countries (LDCs) and Small Island Developing Countries (SIDS). However, these are subject to certain conditions and given that LDCs/ SIDS have very limited potential to generate credits, the additional 1% is ignored in our indicator estimation.

EU-ETS

In case of an international agreement and 20% EU target[8], the maximum allowed use of CDM/JI credits in the entire 2008-2020 period within EU-ETS is 1584 Mtonne CO_{2eq} for sectors covered under phase 2. This is based on the text which states that "the measures shall ensure that the overall use of credits allowed does not exceed 50% of the EU-wide reductions of the existing sectors under the Community scheme over the period 2008 to 2020"[9] (European Commission, 2008b).

In the 2008-12 period, the maximum permissible carbon credit use is 1392 Mtonne CO_{2eq} (EEA 2008a). So the additional volume allowed in 2013-2020 is only 191 Mtonne CO_{2eq}. For the sake of simplified representation, however, the overall use of 1584 Mtonne CO_{2eq} of CDM/JI between 2008-2020 is spread equally over the entire period (13 years) thus representing 122 Mtonne CO_{2eq} as yearly average of credits allowed into EU ETS[10].

[6] http://ec.europa.eu/environment/climat/climate_action.htm
[7] Article 5 of the 'Shared Effort to Reduce GHG emissions' text of the package
[8] This refers to the scenario where EU's expectation of 'comparable efforts' from other developed country parties to reduce GHG emissions is not agreed upon. Please refer preambles 3, 4 and 5 'Greenhouse Gas Emission Allowance Trading system' text in the December 2008 package.
[9] Para 8 of Article 11a of the 'Greenhouse Gas Emission Allowance Trading system' text of the package. As per discussion of Ecofys with the Commission representative, the base level referred to here is the 2005 verified emissions. . This estimation is also in line with EC's figure of 1.6 billion credits for 2008 -2020, as mentioned in its website http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/08/796&format=HTML&aged=0&language=EN&guiLanguage=en
[10] Note that also a different division over the years can be used. Alternately if credits are not used, not all of them may be banked.

In case an international post 2012 climate agreement is not reached, the package so far allows credits, from 2013 onwards, only from LDCs or from third countries where a bilateral arrangement is made. Till date, the total GHG emissions from LDCs was only around 1085 Mtonne CO_{2eq}[11] as per year 2000 estimates. Further, the contribution of LDCs to the carbon credit generation under CDM is negligible so far[12]. Hence, for our simple estimation during this alternate scenario, we safely assume that a CDM/JI volume representing 10 Mtonne CO_{2e} would be imported annually into EU ETS from LDCs in the period 2008-2020.

For further discussion in this paper, we assume that an international agreement is reached and the EU target is 20%[13] reduction of 2005 levels by 2020. We however also present the impact on EU ETS from limit CDM/JI credits to LDCs alone in the results.

2.1.4 Summary of targets

Table 1 gives the amount of emissions in 2005, 2020 and the reductions per sector. The baseline emissions for the period 2005-2020 are based on Capros et al. (2008), also referred to as PRIMES baseline. This is the scenario underlying the 2008 climate package of the European Commission (European Commission, 2008b). The PRIMES baseline takes into account implemented policies up to 2006 and an average growth of GDP of 2.3% per year for the period 2005-2020. Overall, the PRIMES baseline predicts an increase of total greenhouse gas emissions in the EU27 of 5.5% between 2005 and 2020

The table shows that the needed relative reduction in EU ETS sectors is larger than the reduction in the non-ETS sectors. Without using flexible mechanisms, the EU ETS sectors should reduce direct emissions by 26% for sectors excluding aviation and 36% including aviation by 2020, in comparison to baseline emissions. For the non-ETS sectors this is only 12% of which 16% for CO_2 and 4% for non-CO_2 greenhouse gases.

Please note that emissions in EU ETS sectors are influenced by energy-efficiency policies, RES policies and implementation of Carbon Capture Storage (CCS).

[11] Source: CAIT data http://cait.wri.org/

[12] http://cdm.unfccc.int/Statistics/Issuance/CERsIssuedByHostPartyPieChart.html

[13] The reason for looking in this study at an EU target of 20% instead of a possible 30% target is that it is uncertain if a 30% target will be agreed upon, whereas the 20% target is firm. Also the specific details for the use of flexible mechanisms in case of a 30% target are unknown.

Table 1 Overview of baseline emissions (Capros et al., 2008) and reduction targets in 2020 compared to 2005, targets and reduction per sector (Mtonne CO2eq)

	Emissions in 2005	Baseline emissions in 2020	% Change in 2020 in comparison to 2005	Target in 2020 compared to 2005	Emissions 2020 when targets are met[14]	Reduction 2020 compared to baseline
EU ETS	**2340**	**2557**	**+9%**	**-20%**	**1872**	**27%**
ETS (phase 2 sectors) without aviation	2193	2339	+7%	-21%	1732[15]	26%
Aviation	147	218	+48%	97% in 2012 and 95% in 2013-2020	140	36%
Non-ETS	**2871**	**2940**	**+2%**	**-10%**	**2584**	**12%**
Non-ETS CO_2	1927	2054	+7%	-10%	1734	16%
Non-ETS Non-CO_2 GHG	944	886	-6%	-10%	850	4%
Total GHG	**5211[16]**	**5496**	**5%**	**-14.4%**	**4458[17]**	
Yearly max use of flexible mechanisms(CDM, JI, AAU) between 2008-2020 in EU ETS in case of international agreement[18]					***122***	
Yearly max use of flexible mechanisms (CDM, JI, AAU) between 2013-2020 by governments to comply with future international agreement					***98.5***	
Total GHG level in EU in 2020 taking into account max use of carbon credits					***4679***	

[14] Calculated from emissions in 2005 and targets in 2020.

[15] Revised figure from the December 2008 directive is 1720 $MTCO_2e$

[16] Taken from Capros et al. (2008). EEA (2009) gives 5157 Mtonne in 2005.

[17] 5572 Mtonne CO_{2eq} in 1990, which should reduce by 20% by 2020.

[18] Maximum use of flexible mechanism evenly spread over period.

2.2 Graphic representation of indicator 1

With the PRIMES baseline as a reference, we aim to estimate the impacts of individual climate policies. The previous sections described a range of new EU climate policies and targets for 2020. As illustrated in Figure 5, a number of these polices overlap, or better, reinforce each other. For example, renewables targets and policies should provide an important incentive for emissions reductions in the power supply sector, which is to a large extent part of the EU-ETS sector. Thus, the renewables target should help to achieve the EU-ETS cap, or vice versa. Similarly, CDM credits can be used by ETS participants as an offset for reductions that are too expensive to realise otherwise.

As a result of the overlap from various policies, ex-ante assessment of the impact of the individual policies or targets is complex and requires further research. Instead, we show the following impacts in this report:

ETS sectors (ETS, renewable energy policies, CCS subsidies, energy efficiency policies, use of flexible mechanisms):

- The EU-ETS (phase 2 installations, excluding aviation) has a legal maximum emissions level in 2020 (the cap), thus the impact of EU-ETS, and policies that reinforce it can be estimated straightforwardly from the emissions in the PRIMES baseline versus the cap.
- The EU-ETS aviation sector (included in the scheme from 2012 onwards) has a separate CAP, thus the effect of the scheme can be estimated in a similar way from the predicted baseline and the cap.
- Within the EU-ETS (phase 2 installations, excluding aviation) the legal maximum of CDM credits allowed, is shown.

Non-ETS sectors (renewable energy policies, transport policies, energy efficiency policies, use of flexible mechanisms):

- For non-ETS sectors, the overall policy target of -10% in 2020 (compared to 2005) is compared to the expected baseline emissions in 2020.
- More specifically, we estimated the impacts of the new legal standards including use of 10% biofuel on CO_2 emissions for passenger cars (see Appendix I).
- Finally, the maximum allowed use of flexible mechanisms (CDM/JI/AAU) by governments (to be used for offsetting emissions in non-ETS sectors) is shown.

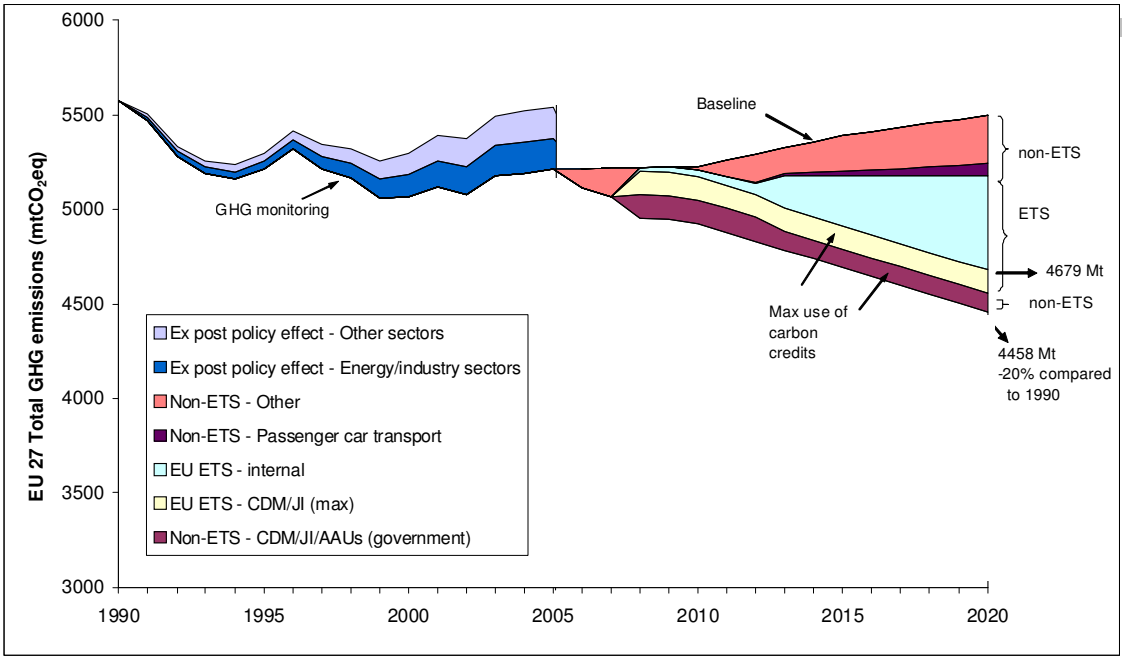


Figure 6 Indicator 1; 1990-2005 showing ex-post impact of environmental policies (split is CO_2 and non-CO_2 GHG emissions) and 2005-2020 ex-ante baseline and expected policy effect

Figure 6 illustrates the following policy messages:

- The required policy impact in the 2005-2020 period, to reach to overall 2020 EU target is -taking the PRIMES baseline (or the post-2005 baseline) as a reference- a factor of 2.6 higher[19] than the impact of environmental policies in the EU in the period 1990-2005.
- Total greenhouse gas emissions in the EU in the base year 2005 are equal to 5211 Mtonne CO2eq (5157 Mtonne CO2eq, as per EEA 2009) and are projected to grow to 5496 Mtonne by 2020 in the baseline (Capros et al., 2008). The target of 20% reduction of greenhouse gas emissions in comparison to 1990 level would lead to a reduction of emissions to 4458 Mtonne in 2020. When the maximum allowed volume of carbon credits from flexible mechanisms is used, emissions in EU would be 4679 Mtonne in 2020. This is a reduction of 16% in comparison to the 1990 level (where emissions were equal to 5572 Mtonne CO_{2eq}).
- Compared to the 1990-2005 period, policies up to 2020 focus stronger on the energy and industry sources, with the EU-ETS renewable energy and EU-ETS as the prime policy instruments.

[19] This factor had a value of 2.8 in the original study of Wesselink et al (2008). The current value is somewhat lower because it is based on final PRIMES baseline (Capros et al 2008) publication which was published afterwards.

- In the case no international agreement is reached and the use of CDM/JI credits within EU ETS is limited to LDCs, the entire effort shifts internally as the potential for LDCs to generate carbon credits is expected to be insignificant (see Appendix II).

Figure 7 shows the allowed use of flexible mechanisms in the total period 2005-2020 as cumulative figures.

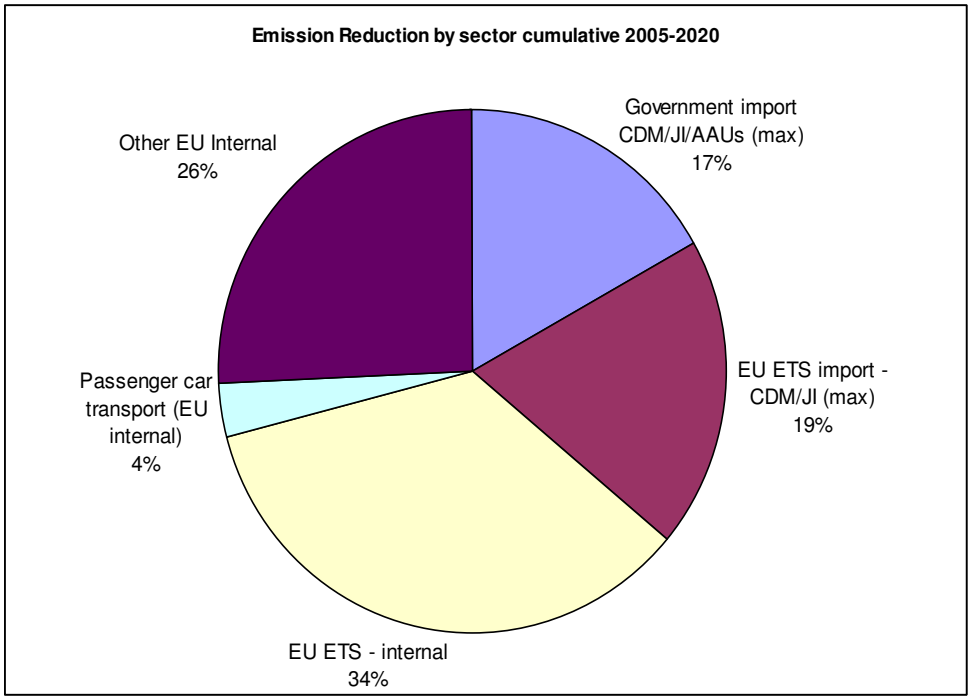


Figure 7 Contribution to reaching 20% target, cumulative all emissions in period 2005-2020[20]
Note: 1. With baseline data from PRIMES (Capros et al, 2008)
2. Aviation and new sectors not accounted in the EU ETS share.

This figure shows that the overall allowed use of flexible mechanisms in the period 2005-2020 is equal to 36% of the needed emission reduction (in comparison to the PRIMES baseline emissions in the period 2005-2020).
In case of no international agreement, the use of carbon credits within EU ETS is limited to LDCs. However, as their potential to generate the credits is limited, the total effort would shift entirely to EU internal.

The above analysis is valid for the pre-recession scenario with the PRIMES baseline as reference. However, in recent months, the EU economic outlook has changed drastically. Indicator 2 and 3 therefore analyse how the current recession could impact the effectiveness of the EU ETS policy instrument till 2020.

[20] The possibility of banking allowances from the second trading period to the third trading period is assumed.

3 Indicator 2 and 3: The EU Emissions Trading Scheme (EU-ETS)

As shown in the previous chapter, climate policies up to 2020 have a strong focus on the energy and industry sources, with the EU-ETS as the prime policy instrument. The second and third indicator therefore focuses on the European Emission Trading Scheme.

3.1 Expected long-term scarcity of allowances under the EU-ETS scheme

Due to the recent international economic crisis, carbon prices have dropped from approximately 20 to 25 euro per tonne of CO_2 in summer 2008 (the former for CER credits, the latter for EUAs), to below 10 to 15 euro per tonne of CO_2 in recent times (see Figure 10 below). The price drop could most likely affect future investments in abatement activities, and therefore the effectiveness EU-ETS mechanism to reduce CO_2 emissions has been questioned. As the cap-and-trade mechanism is seen as indispensable in order to reach 20% reduction of greenhouse gas emissions by 2020, it is worth investigating the possible effect of recent economic crisis on the forecasted emissions baseline. This baseline in-turn will have an effect on the EUA deficit till 2012. Going further, the new (lower) baseline will influence scarcity volume for 2013-2020 period, eventually altering the forecasted carbon price (see section 3.2).

The indicator to be discussed here after includes the monitored EU-ETS emissions, the cap(s) in different trading periods, the allowed CDM/JI volume under the scheme, the official PRIMES 2005-2020 emissions baseline projection, and a 'revised recession estimate' of that baseline. The indicator includes aviation, which will be part of ETS from 2012.

Revision of the European Emissions Trading Scheme Directive

In December 2008, the EU council reached final agreement on the revised Directive on EU Emissions Trading (European Commission, 2008b). The revised Directive will become effective from 2013 onwards. Major revisions in the Directive, compared to the original, include:

- Single EU emissions cap: a single emissions CAP for the overall scheme set at 21% below 2005 emissions level in 2020. This approach is different from phase-1 and -2 in which member states proposed national caps in their National Allocation Plans.
- The length of the trading period is extended from five (2008-2012) to 8 years (2013-2020); this decreases the policy uncertainty for participants in the scheme.
- Extension of the scope of the scheme, to include e.g. a large part of the chemical sector, the non-ferrous metal sector, selected non-CO2 emissions and Carbon Capture and Storage.
- Distribution of allowances:
  - The default allocation method is auctioning with exceptions for sector that are vulnerable to leakage due to outside competition (and some smaller exceptions for the Eastern European electricity sector) The share of auctioning will increase to more than half in phase 3.
  - Note, that power producers already forward the price of free allocated allowances (2005-2012) in the power price. Auctioning will thus not increase power prices, but will warrant that revenues flow to national governments rather than as 'windfall' profits to energy companies as was the case in phase-2.
  - Industrial sectors that compete on a global market and are at risk to so-called 'carbon leakage', will receive free allocation up to a 'benchmark' level. A benchmark is an emissions standard (t-CO2 per unit of production output). Dutch base-industry (e.g. refineries, steel production, base chemicals (including fertilizers) are all likely to fulfil the carbon leakage criteria Other industrial sectors will start at 80% free allowances in 2013, to be reduced to 30% in 2020, and intended zero in 2025.
  - Offsetting – please refer to section 2.1.3 above
- Compensation of increased electricity cost for industrial end-users: Member States may grant compensation to energy-intensive industries (e.g. aluminium producers) for EU-ETS induced increase of electricity prices
- Aviation: In a separate Directive the inclusion of aviation into EU-ETS has been defined. Aviation will be included from 2012 on and will increase the allowed emissions under the scheme with some 6-7%. Aviation has a separate emissions cap, its value in 2020 is set at 95% of 2004-2006 emissions.

Open ends in the EU-ETS Directive : A number of issues in the EU-Directive still have to decide on in 2009 and 2010, through the so-called Committology process. For EU and Dutch industry a most important issue is the precise rules of free allocation to industry. The free-allocation methodology of 'benchmarking' has been outlined in general principles (Ecofys and Fraunhofer-ISI, 2009), but the precise rules will have to be determined in the course of 2009 and 2010. It is expected that, in general, Dutch industry will – comparatively- profit from a benchmark approach, due to a relative high energy efficiency and gas dominated fuelling of industrial processes.

Figure 8 and Figure 9 show the CAP (green line) and baseline emissions for the three periods of the EU Emissions Trading Scheme (with and without aviation). The baseline of greenhouse gas emissions in the EU ETS sectors are based on Capros et al. (2008). In this scenario, the growth of greenhouse gas emissions is around 0.4% per year without aviation and 0.6% per year with aviation. Emissions from aviation alone grow by 3.4% per year till 2020.

Flexible mechanisms

As discussed in Chapter 2, for the period 2008-2020 the maximum allowed use of flexible mechanisms is 1584 Mtonne CO_{2eq} for phase 2 sectors in case an international agreement is reached[21]. The maximum allowed use for the period 2008-2012 is 1392 Mtonne CO_{2eq} (EEA, 2008a). So the additional volume in 2013-2020 is 191 Mtonne CO_{2eq}. However, for the sake of simplified representation, the overall use of 1584 Mtonne CO_{2eq} of carbon credits between 2008-2020 is spread over the entire period (13 years) thus representing 122 Mtonne CO_{2eq} as yearly average of CDM/JI credits allowed into EU ETS. In the case an international post 2012 climate agreement is not reached, we estimate that only 10 Mtonne CO_{2eq} could be imported annually into EU ETS from LDCs (or third countries) in the period 2008-2020.

Recession baseline

The red-dotted line in the figures is a so-called 'recession' baseline. This baseline is based on a reduction in GDP in EU27 in comparison to the baseline scenario. We assume that the recession will lower GDP growth rates for the period 2009-2010. Consequently, reduced energy demand will reduce CO_2 emissions in ETS sectors in this period and in the years thereafter. The European Commission spring forecast (2009b) expects a GDP decline of 4% in 2009, and further 0.1% in 2010. We then assume a growth of 1.8% in 2011, picking up to around 2.5% in 2012. We use these values for the recession baseline in EU27. After 2013 we assume that the economic growth rate is the same as in the baseline scenario, i.e. 2.3% per year.

In the baseline scenario, the growth of GDP equals 2.3% per year in the period 2005-2020. CO_2 emissions in this period increase by 0.6% per year for the ETS sectors (including aviation). This means that the CO_2 intensity decreases in the baseline scenario by 1.7% per year in the period 2005-2020 (this is also an average value we extract from 1990-2006 monitoring data, see Appendix III). In the case of a recession, the CO_2 intensity decrease might be different from the baseline situation. On the one hand energy demand falls, investments in new and more efficient technologies may be postponed, while on the other hand more efforts may be put in reducing costs by making cuts in energy usage. Because the size of the effects of

[21] In case no international agreement is reached, the allowed use of flexible mechanisms is limited to Least Developing Countries (based on text in European Commission (2008b))

these kinds of factors is complex, the calculated values between 2009 and 2012 should be regarded as indicative.

Nevertheless, we find proof for the predicted decline of emissions from

a. Carbon market outlooks[22]
b. Latest verified emissions data from CITL.

The former data set indicates that the emissions decline might be even higher in 2009 and 2010, recovering in 2011 and 2012.

However, after 2012, we assume that the GDP growth recovers, and hence the CO_2 intensity trend curve follows the same as baseline trend as PRIMES.

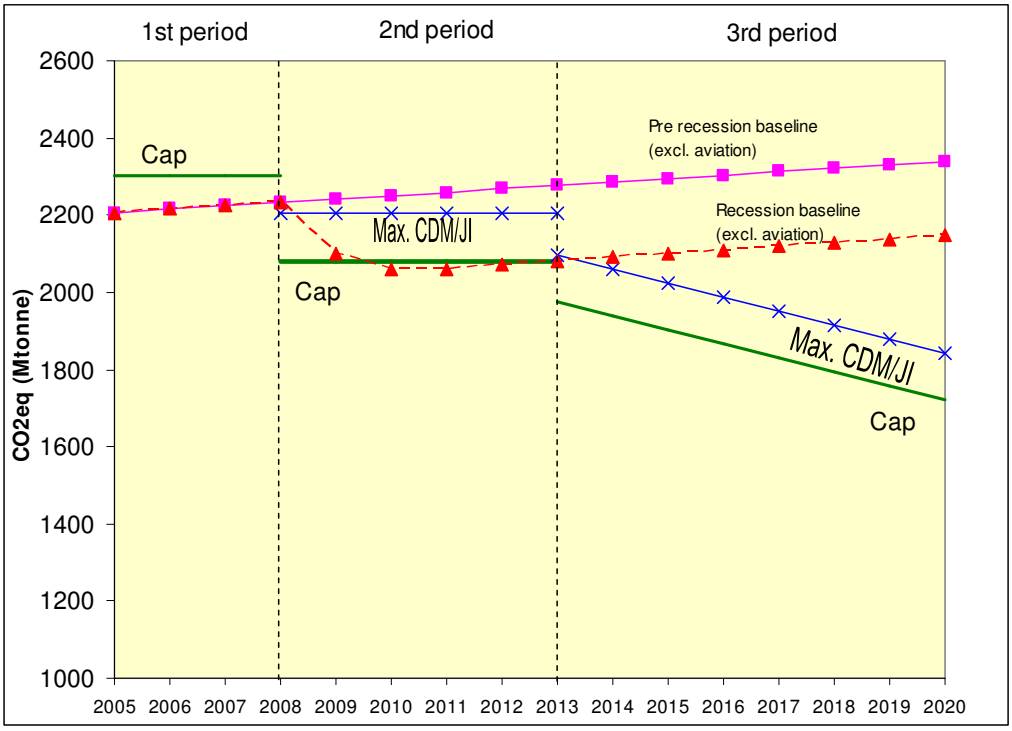


Figure 8 Indicator 2 for emissions of sectors in EU-ETS (excluding aviation from 2012 onwards) Note: Actual 2008 verified emissions are reported lower at 2118 Mtonne CO2e (EC, 2009a), hence recession baseline is likely to be further lower.

[22] See market outlooks by various agencies at http://uk.reuters.com/article/oilRpt/idUKLG61152420090218 and Point Carbon (2009)

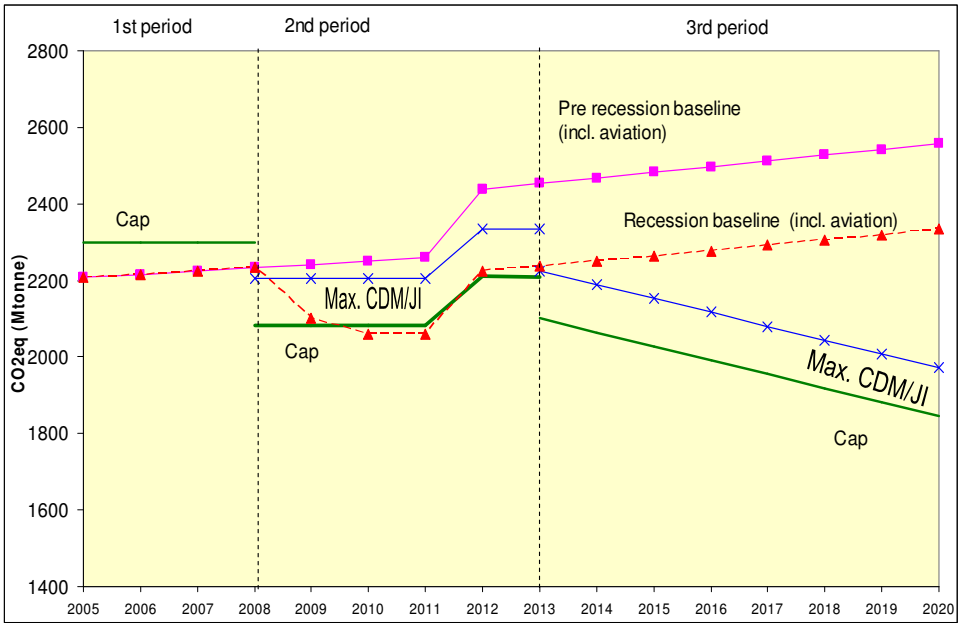


Figure 9 Indicator 2 for emissions of sectors in EU-ETS (including aviation from 2012 onwards) Note: Actual 2008 verified emissions are reported lower at 2118 Mtonne CO2e (EC, 2009a), hence recession baseline is likely to be further lower.

As seen from the above graph, in the recession baseline estimate, the average overall emission in the second trading period is close to meeting the cap, even without the use CDM/JI-credits (see Figure 8 and Figure 9).

Impact on the 3rd trading period.

Provision of banking of allowances (EUA's) from the second to the third trading could play an important role in determining the scarcity volume of allowances in the third trading period. This is because CDM/JI credits could increasingly be used for compliance as against EUAs, if the operators expect a higher EUA price in the future.Consequently, EUAs can thus be banked for the next phase.

In line with this trend, three scenarios could emerge as a result of the recession developments as indicated above:

1. The rate of CDM/JI-credits imported in the scheme declines to match the lower offsetting required. This could emerge if operators prefer to use their free allowances over purchasing credits.
2. All CDM/JI-credits imported in phase-2 are used for compliance in the same phase and an equivalent amount of EUAs are made available for banking to the next phase[23]. In this case, the maximum allowed CDM/JI-credit volume for phase-2 is 1392 million. However, due to the recent delayed pipeline of CDM/JI-process we may expect only around 60% access, which is equivalent to around 800 million credits. Now, for phase 2 and 3 combined,

[23] Some evidence of ETS operators using CERs for maximum allowed compliance has emerged from two German steel industries' compliance report for 2008 (Point Carbon, 2009).

the maximum allowed use is 1611 million credits [phase 2 sectors (1584) + aviation (27)[24]]. This implies that a remaining quantity of approximately 800 million EUAs are available for the phase-3 period (100 million allowances extra per year). In the context of overall abatement under EU-ETS, this implies the following:

a. Under the recession baseline, the total reduction effort required is ~ 2500 Mt-CO2 including aviation for the 8 year period of phase-3.
b. The overall CDM/JI credit volume that can be used in this phase –including the banking of 800 million allowances as discussed above- is a maximum of 1611 credits. As a result, the remaining EU-internal effort could reduce to 890 Mt CO2, which is only 35% of the overall abatement effort (under the recession baseline).
c. Overall, due to recession and the banking provision, the cumulative EU-internal effort would reduce to 35% in phase 3.

3. As a result of the reduced EU-internal efforts required in phase-3 (as discussed above), there may be a scenario emerging where the government would like to intervene to maintain the phase 3 scarcity volume by retiring EUAs equivalent to the CDM/JI-credit volume imported in phase-2 (see discussion under indicator 3). In that case, the EU-internal effort in phase-3 would likely be 68% under the recession baseline.

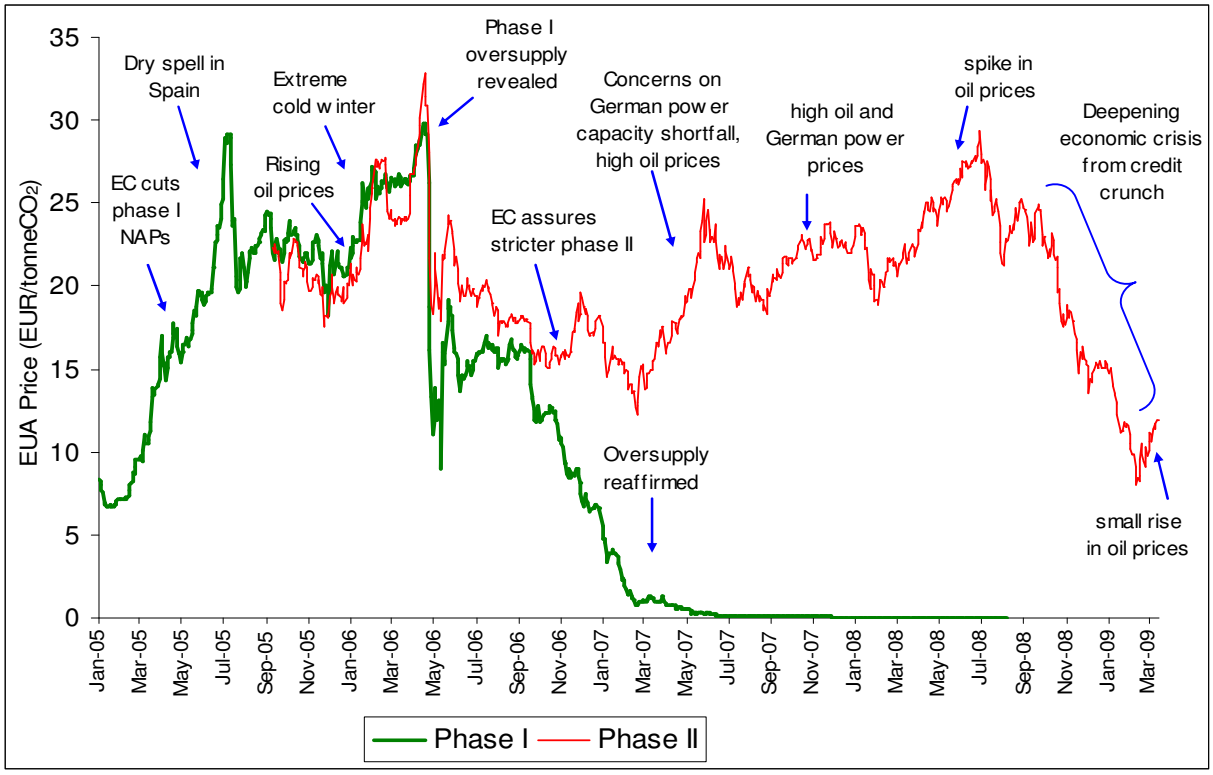
Overall conclusion considering the likely scenario 2

The current recession (declining production) could be a key factor in the reduction of emissions in phase-2 and even phase-3 of the EU-ETS. As a result of this latest development, there could be -in an economically efficient scenario- a structural change where the abatement efforts inside the EU could inevitably shift focus to low-carbon offsets outside the EU as against the earlier envisaged focus on low-carbon technology within the EU. This implies that new measures might need to be explored, to maintain the scarcity volume, as for example reserve price auctioning suggested by Grubb (2009) (see section 3.2).

[24] Note: As per calculations of Para 8 of Article 11a of the 'Greenhouse Gas Emission Allowance Trading system' text of the package, aviation can import a maximum of 27 million CERs between 2013-2020. Though this figure is used for aviation CDM in this report, the wordings on the allowed CDM volume under the Directive is still unclear. The above figure should therefore be considered as a conservative estimate.

3.2 Short- and long-term price movements in the EU-ETS

Also of relevance for PBL's Environmental Balance is the impact of EU-ETS for companies under EU-ETS. Current and expected trends of the carbon-price are important aspects of effectiveness. In this section we provide a concise analysis of current price developments and dynamics under EU-ETS in phase-II and lessons from the phase II market decline. The longer term price expectations until 2020 are projected based on academic literature and market players.



Price data source: Point Carbon(2009), European Climate Exchange (2009)

Figure 10 EUA over the counter price movements for EU ETS in phase I and II

The EU ETS carbon price developments were analysed under two phases – the trial/ phase I (2005-2007) and the Kyoto commitment phase II (2008 till date). The price movements for the two phases together with key empirical determinants are shown in Fig 1 above.

The trial/1st phase

While the objectives of first trading period of setting up institutional capacity and creating market awareness was broadly achieved in this phase (Ellerman et al. 2008; EEA, 2008b), a number of key observations can be drawn on the EU allowance (EUA) market price fluctuations:

In the first half of the phase I, EUA prices rose with positive signals coming from different variables. Firstly, the recurring message from European Commission (EC) on cuts from national allocation plans (NAPs) of few Member States during the start signaled the market of an apparent shortage of allowances (Rickels et al. 2007). Second, the rising natural gas prices in early 2006, driven largely from rising brent crude prices (Kanen 2006), in turn affected the EUA price signal needed for power generators to switch from coal to gas (Ellerman et al. 2008, Convery et al. 2007, Mansanet-Bataller et al. 2007). Thirdly, the extreme weather patterns like dry summer in 2005, and colder early 2006 winter across Europe, signaled increased demand from fossil fuel based power generation, thus pushing EUA prices higher during these periods (Alberola et al. 2007, Mansanet-Bataller 2007).

However, during the second half of phase I, the EUA price collapsed due to two major shortcomings in market design:

- ***Over allocation:*** With the 2005 verified emissions data released in April 2006, it became clear that there was no scarcity of allowances leading to a drastic fall in EUA prices (Ellerman et al. 2008). As per the latest EEA (2008b) analysis, total issuance from national allocation plans (NAPs) exceeded 4% in 2005 (around 83 million). Overall, a total of 151 million surplus allowances were issued in phase I.
- ***No banking permitted:*** Coupled to the over allocation issue, banking of first phase EUAs to the next phase was not permitted. This meant that the surplus allowances in phase I had to be retired in the same phase, implying no future market value for those EUAs (Ellerman et al, 2008).

The Kyoto commitment phase II

Although in this phase EC was able to rectify the inherent design defects of phase I, so far a broad movement of carbon price has been observed in phase II exemplifying its link with prevailing macroeconomic conditions.

The phase II EUA started trading much before 2008 through the futures contracts. EC's counsel of stricter phase II allocations and expected growth in power demand led to a steady increase of EUA price even before the trading period started. With the oil prices peaking later in summer 2008, the carbon price also followed suit leaping to 29€/tonne.

However, soon after with the sudden signal of global banking crisis in September 2008, the carbon price started falling steeply. As information on falling international oil prices and major European economies going into recession continued to emerge, carbon prices fell swiftly.

Other major related events which added to the fall of carbon price was the lack of demand for EUA and expected surplus allowances due to

1) *Industry sell off* : There were reports that industries sold EUAs to generate cash in the short term
2) *Government sell off*: Germany and Austria have recently offloaded significant amount of EUAs into the market[25]. Poland is also expected to sell its surplus allowances soon. (Point Carbon, 2009)
3) *Industrial low production*: With production declining, demand for fuel and electricity has fallen sharply, which implies less demand for allowances.
4) *Electricity low production*: This is resulting from low industry demand. Power generation utilities, the major buyers of allowances, hence expect lower demand.
5) Increased renewable power generation in winter 2008-09

This significant fall in carbon prices in January 2009 to below 10€/tonne demonstrated that EUA market movement depends on short-term market behaviour, even though scarcity of allowances in the entire second trading period was expected at that time. With the movement of carbon price strongly linked to its market fundamentals, the EC has so far refused to intervene for steadying the falling prices (Point Carbon, 2009).

Phase II verified emissions released

EEA (2009) has released the verified emissions data for 2008. For these installations, the aggregate emissions dropped by 3% in 2008 when compared to 2007 levels (EC, 2009a). Figure 11 shows the drop in verified emissions in different phase 2 sectors. Overall, total verified emissions for 2008 is 2118 MtCo2e vs a cap of 2080 million allowances[26].

[25] Likely source for government EUAs are reserves for new entrants and auctioning.

[26] Source: European Commission Press Release (IP/09/794) 15 May 2009 http://europa.eu/rapid/pressReleasesAction.do?reference=IP/09/794&format=HTML&aged=0&language=EN&guiLanguage=en

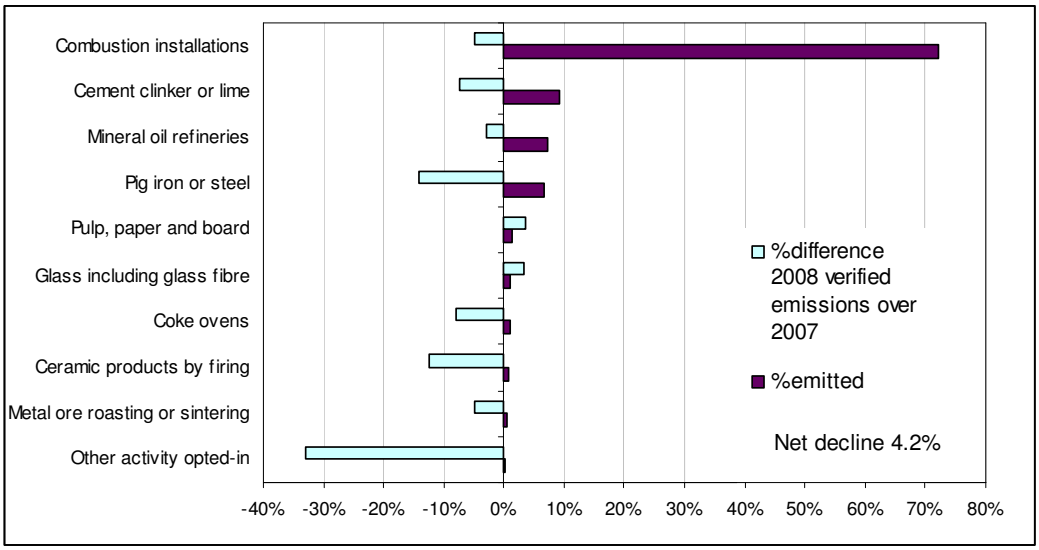


Figure 11 Comparison of 2008 over 2007 verified emissions

In its latest study, Cambridge Econometrics (April 2009) predicts the 2009-10 carbon price at €10-11/ tCO_2e. Further, it forecasts that as the economic growth recovers, the price could rise to €21 tCO_2e by 2012. However, the issue of operators/market players taking advantage of lower carbon prices to bank allowances into phase 3 is yet uncertain as per several studies.

Phase 3 price forecasts

In phase 3, a distinct feature will be auctioning of allowances mainly to power utilities in several member states[27]. Together with this new feature, a clearer picture has emerged over the primary drivers for phase 3 carbon price. While few of them are interrelated, broadly they are listed as follows[28].

- Allocation size (fixed in the package)
- Macroeconomic growth
- Oil prices
- Weather patterns
- Renewable energy contribution
- International trading regime after 2012
- Auction design

Particularly for the last determinant, Hepburn et al (2006), and Grubb (2009a) have proposed reserve price auctioning, where allowances below government fixed prices are retired, as a means to stabilize the market prices. Various studies indicate a

[27] Article 10 of the 'Greenhouse Gas Emission Allowance Trading system' package text.

[28] Other short term external factors include lack of demand for Green Investment Scheme linked AAUs and instead use of CERs for Kyoto compliance among Annex 1 parties (Grubb 2009).

number of other options need to be explored to steady the carbon market for phase 2 as well as phase-3[29].

In Jan 2008, EC's impact assessment had assumed carbon price range of €30/tCO_2e to €39/tCO_2e by 2020[30], the range depending on the import criterion of cheaper carbon credits. Capros et al (2008) also refers to price range of around €30/tCO_2e. After the emergence of full depth of credit crunch related economic crisis in the EU, very few academic model based studies have come forward with carbon price forecast for phase-3.

Grubb (October 2008) forecasts a price range of €20-€40/tCO_2e, the suggestion inclines towards the lower range due to continuing growth of CDM pipeline and more flexible amendments to the package. Cambridge Econometrics (April 2009) predicts the carbon price will touch €26/tCO_2e by 2020. The latter assumes the economic growth rate will fall to -3.2% in 2009 and resume at 2.5% post 2012.

On the other hand, New Carbon Finance (March 2009) expects a price of decline from average €55/tCO_2e to €40/tCO_2e for 13 years to 2020 due to the recent economic crisis[31]. Finally, IdeaCarbon (February 2009) has come out with a forecasted price range of €30-50/tCO_2e down from €35-60/tCO_2e expected earlier[32]. All these forecasts are presented in various price bands as shown in Figure 12 below.

[29] In addition, the issue of selling surplus allowances generated from renewable energy contribution to meet the separate renewable targets may need further investigation, as it further weakens the carbon market.

[30] http://ec.europa.eu/energy/climate_actions/doc/2008_res_ia_en.pdf

[31] www.newcarbonfinance.com/download.php?n=NCF_PressRelease_2009_20March_Costof_EU_ETS.pdf

[32] http://www.ideacarbon.com/IDEAcarbon_CARBONfirst_Market_Size_2020.doc

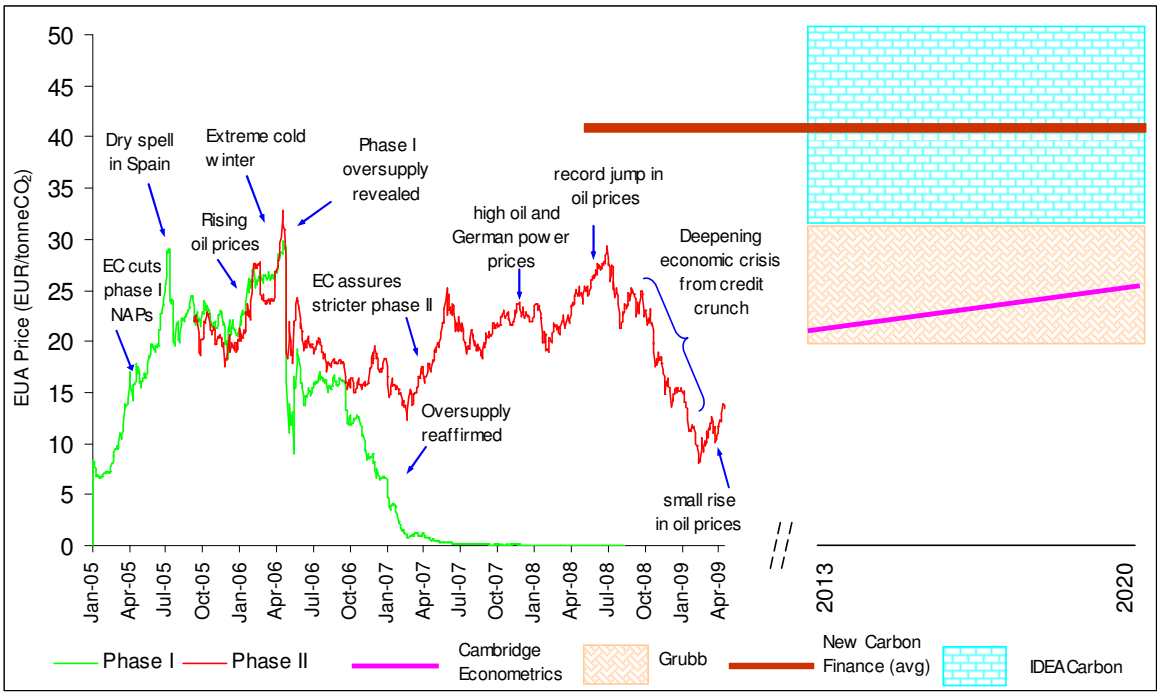


Figure 12 EUA price movement in phase 1 and 2, and forecasts for phase 3

Overall, we might expect that with the recent economic crisis lowering demand for permits in phase 2 and with the provision of banking EUAs to the next phase, CDM/JI credits could increasingly be used for cheaper compliance till 2012. The resulting surplus EUAs could then be banked. As a result, we may see a rise in carbon price at the end of phase 2. Going into the next phase with this surplus and as per our analysis from the new recession baseline, we expect that cheaper CDM-offsets could play a major role in compliance[33]. As a result, we expect that the price in phase 3 is close to the lower price forecasts presented above (20 €/t-CO_2) in a scenario where banking to phase 4 is ignored. The prolonged lower price in phase 3 may affect uptake of technologies with higher marginal abatement costs, thus upsetting long term abatement efforts.

[33] UNFCCC's latest forecast is 1.34 billion CERs before 2013 (Point Carbon, 2009). On the issue of how CER supply can be ensured after 2012, on one hand there are plans to move away from HFC, N2O credits which forms the bulk of supply in phase-2. On the other hand, there are discussions on new approaches like sectoral crediting post-2012. Overall, we assume that there would be no limitation of CER supply in all periods, as a conservative in approach to analyze the EU-ETS internal effort.

4 Conclusions

4.1 Energy and climate policy impacts until 2020 at EU level

The target of 20% reduction of greenhouse gas emissions in the EU in comparison to 1990 level would lead to 4458 Mtonne GHG emission in 2020. When the maximum allowed volume of carbon credits from flexible mechanisms is used, emissions in the EU would be 4679 Mtonne in 2020. This is a reduction of 16% in comparison to the 1990 level.

The required policy impact in the period 2005-2020, to reach the overall 2020 EU target is, taking the PRIMES baseline as a reference, a factor 2.6 higher than the impact of environmental policies in the EU in the period 1990-2005.

Compared to the 1990-2005 period, policies up to 2020 focus stronger on the energy and industry sectors, with the EU-ETS and renewable energy policies as the prime policy instruments.

Measured against the PRIMES baseline emissions, a maximum of 36% of the cumulative required EU-wide abatement between 2005 and 2020 could be fulfilled by the use of flexible mechanisms like CDM/JI/ AAUs, the rest of the efforts required would be EU-internal.

4.2 Emissions of EU ETS sectors until 2020

In the recession baseline estimate, the average overall emission in the second trading period are close to meeting the cap, even without the use of CDM/JI-credits. In an economically efficient scenario, all CDM/JI-credits imported in phase-2 are used for compliance in the same phase and the equivalent amount of EUAs is made available for banking to the next phase. As a result, the remaining EU-internal effort in phase-3 of the EU-ETS could reduce to 890 Mt CO_2 including aviation, which is only 35% of the overall abatement effort (approx. 2500 Mt CO_2) under the recession baseline.

As a result of this latest development, there could be a structural change where the abatement efforts inside the EU could inevitably shift focus to low-carbon offsets outside the EU as against the earlier envisaged focus on low-carbon technology within the EU. .

4.3 Expected price band of carbon prices until 2020

Due to the recent international economic crisis, carbon prices have dropped from approximately 20 to 25 euro per tonne of CO_2 in summer 2008 (the former for CER credits, the latter for EUAs), to below 15 euro per tonne of CO_2 in recent times. Overall, we might expect that with the recent economic crisis lowering demand for permits in phase 2 and with the provision of banking EUAs to the next phase, CDM/JI

credits could be increasingly be used for cheaper compliance till 2012. The resulting surplus EUAs could then be banked.

As a result, the remaining abatement effort in phase-3 of the EU-ETS could to a large extent (65%) be achieved through the use of CDM/JI-credits. Consequently, we may expect that the price range in phase 3 may be slightly close to the conservative forecast currently made (around 20 €/t-CO_2) in a scenario banking effect of subsequent phase is ignored.

4.4 Concluding summary: Current recession could affect effectiveness of EU emissions trading scheme

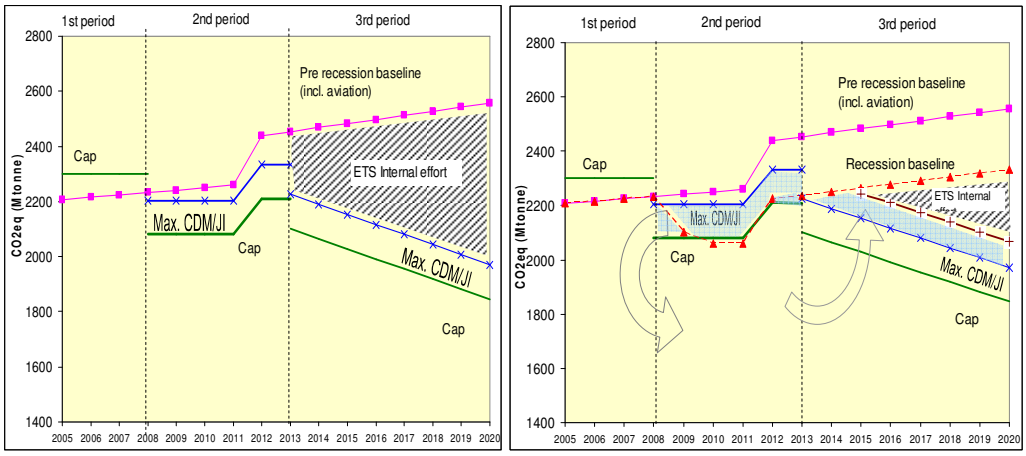


Figure 13 Envisaged baseline emissions and cap in a pre-recession (left) and recession (right) scenario. Note: Actual 2008 verified emissions are reported lower at 2118 Mtonne CO_2e (EC, 2009a), hence baseline curve for recession could be slightly lower.

Based on the emerging recession scenario, three observations could be made for the scarcity volume of the third trading period (see right hand graph in the above figure):

a. Medium term (2020) scarcity still remains.
b. To a much larger extent (65%), offsets could then be used for cheaper compliance, reducing EU-internal abatement efforts (striped area) to just 35% under the recession baseline.
c. As a result, the allowance price in the third period is expected to be in the lower range of price forecasts; €20, rather than earlier expectation of €40

Likely impact of recession on long-term policy effectiveness:

- A prolonged lower carbon price implies lower incentives for deploying technologies with higher abatement costs (example: CCS, off-shore wind).
- Governments will generate lower auction revenues. As a result, they may need to make additional expenditures for meeting the 2020 renewable energy targets.

Overall, for scaling-up investments in low-carbon technologies, a prolonged higher carbon price is essential. The current recession could weaken the contribution of emission trading scheme towards this objective. Further research might therefore be required on new measures that need to be explored to maintain the scarcity volume,

as for example reserve price auctioning suggested by Grubb (2009). Alternatively, our analysis emphasises the need for dedicated EU renewable support policies as to some extent foreseen by the CCS directive (using 300 Mtonne of allowances for CCS and innovative renewables) and announced in the recent EU economic recovery plan[34].

[34] http://www.europarl.europa.eu/news/expert/infopress_page/034-55118-124-05-19-905-20090505IPR55117-04-05-2009-2009-false/default_en.htm

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Appendix I: Details methodology indicator 1

Calculation of impact transport policies

In 1998 and 1999, the European Automobile Manufacturers Association (ACEA) and the Japanese Automobile Manufacturers Association (JAMA) together with the Korean Automobile Manufacturers Association (KAMA), adopted a commitment to reduce average emissions from new cars sold to 140 g CO_2/km by 2008 and 2009, respectively. In February 2007, the Commission adopted two parallel Communications. The Communications underlined that progress had been made towards the target of 140 g CO_2/km by 2008/2009, but that the Community objective of 120 g CO_2/km would not be met by 2012 in the absence of additional measures. The Communications therefore proposed an integrated approach with a view to reaching the Community target of 120 g CO_2/km by 2012.

The legislation sets a limit of 130 g-CO_2/km for new passenger cars to be reached by 2012, by improvements in vehicle motor technology. A further reduction of 10 g CO_2/km, will be delivered by other technological improvements and by an increased use of sustainable biofuels.

Policy impact of 130 g-CO2/km and 10% biofuel regulation

We calculated the policy impact of a 130 g/km performance standard for new passenger cars from 2012 on and of the 10% biofuels target for 2020. The reference for the calculations is the PRIMES baseline (European Commission, 2008a). In the PRIMES baseline, fuel efficiency of passenger cars improves with approximately 1% per year. CO_2-intensity is also assumed to improve with 1% per year. This compares well to the CO_2-intensity decrease for new cars that are reported for the 1998-2007 period, from 180 g/km in 1998 to 158 g/km in 2007 (RDW (2008) and European Commission (2008a)). The 1% per year baseline improvement is applied to the 160 g/km starting value in 2005. This gives a 153 g/km in 2010, which decreases to 138 g/klm in 2020. The policy variant assumes that all new cars have 130 g/km performance (on average) in 2012, decreasing by 1% per year to 120 g/km in 2020.

To arrive at an overall estimate of the 130 g/km policy on CO_2 emissions, we used (new) car volume scenario data from TREMOVE and PRIMES baseline pasenger kilomter data

The use of biofuels in the PRIMES baseline is 4%. The impact of the biofuels directive is calculated by increasing the use of biofuels in transport to 10%. The emissions factor of biofuels was assumed to be 50% lower than for conventional fuels.

The overall policy impact 130 g-CO2/km and 10% biofuel regulation was calculated at 67 Mtonne in 2020.

Appendix II: Case where use of flexible mechanisms in EU ETS is limited to LDCs

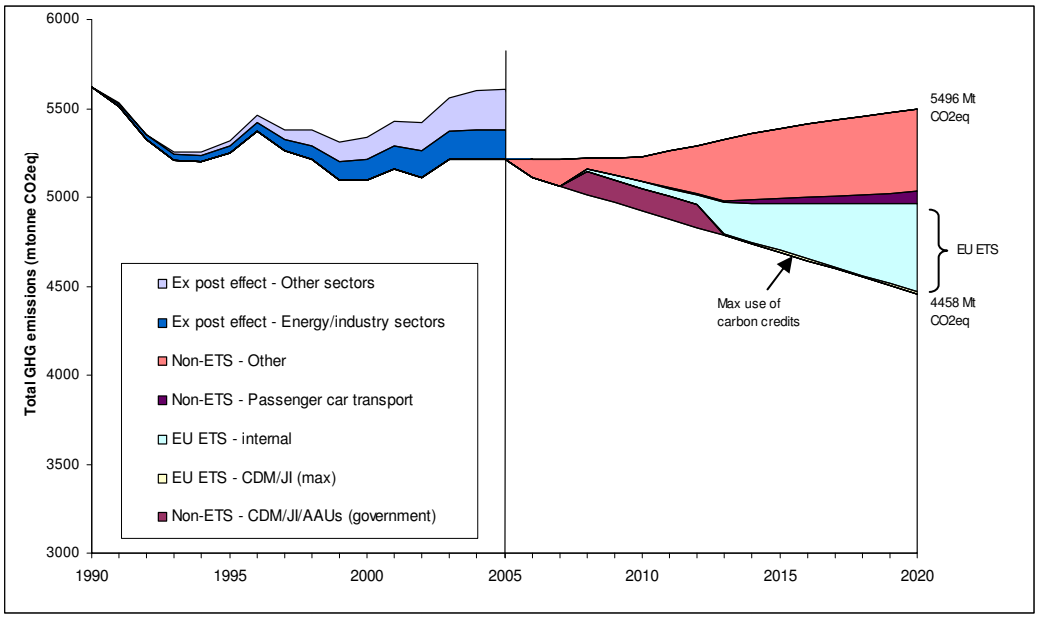

Figure 14 Indicator 1. 1990-2005 showing ex-post impact of environmental policies (split is CO_2 and non-CO_2 GHG emissions) and 2005-2020 ex-ante baseline and expected policy effect, assuming annual import of 10 million allowances from LDCs from 2013 to 2020.

Appendix III: Recession baseline – discussion on relationship CO_2 emissions and GDP

In the period 1970-2008 negative growth rates in EU27 are rare and occur only in 1975 (-0.4%) and 1993 (-0.2%).

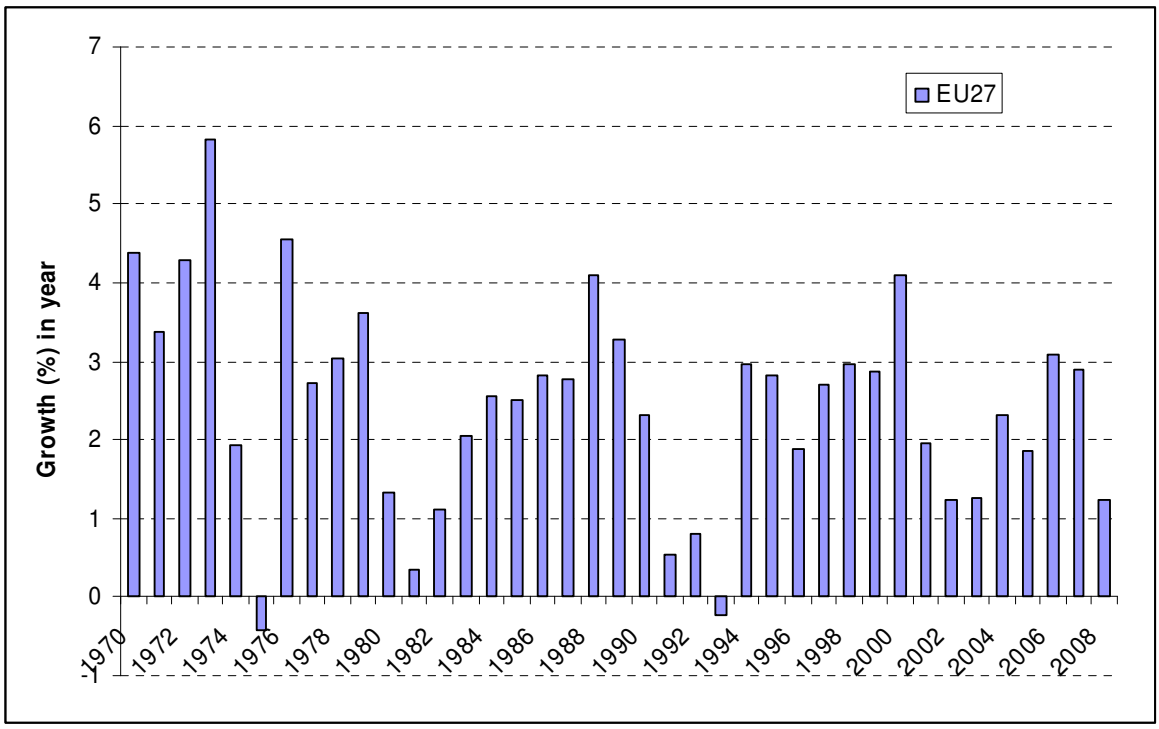

Figure 15 Growth in real GDP in EU27 in period 1970-2008 (Economic Research Service, 2009)

There were three recessions in this period, one in the early seventies, one in the early eighties and one in the early nineties. Also the years 2002-2004 show a decrease in growth of GDP. After a period of recession there is often a higher growth rate than average for a few years.
The average growth rate over the period 1970-2008 was 2.4% per year. Over the period 1990-2008 the average growth rate was 2.2% per year. Please note that in the reference scenario an average growth rate for the period 2005-2020 of 2.3% per year is assumed.

In the reference scenario the CO_2 intensity decreases by 1.7% per year for the EU ETS sectors; from 0.172 in 2005 to 0.134 kg CO_{2eq} per US$(2005) in 2020. We assume that the CO_2 intensity development in the recession baseline is the same as in the reference scenario. Please note that this assumption strongly influences results. The relation between GDP and CO_2 emissions, based on historic data, is week. This can be seen in Figure 16. This figure shows year to year fluctuations of GDP growth, growth in CO_2 emissions and CO_2 intensity.

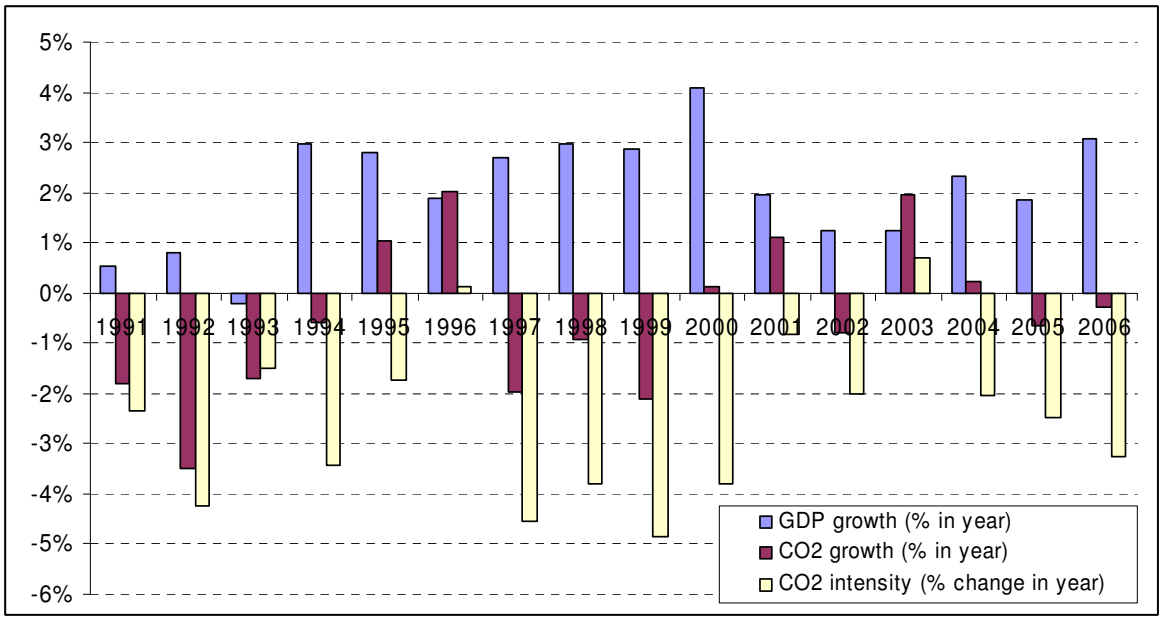

Figure 16 Growth in GDP, greenhouse gas emissions (CO2eq) and CO_2-intensity in EU27 in period 1990-2006

The figure shows that there is no clear relationship between growth of GDP and growth of CO_2 emissions. What is clear however is that CO_2 intensity nearly always decreases. Also in cases where GDP growth is low or negative, the CO_2-intensity decreases. We therefore think that it is safe to assume the same CO_2 intensity decrease in the recession baseline as in the reference scenario, of 1.7%.