Is there a case for the EU to move beyond 20% GHG emissions reduction by 2020?

Consistency of policy instruments

How the EU could move to a -30% GHG target

-Confidential-

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This report provides options on how to achieve a 30% reduction in greenhouse gas emissions in the EU from 1990 to 2020. The EU has agreed a set of goals (objectives) and related instruments for 2020: the most prominent objectives are the 20% or 30% reduction of greenhouse gases (all emissions, including in and outside of the Emissions Trading System), the 20% improvement of energy efficiency and the 20% of renewable energy use by 2020. The stringency of the instruments to reach these goals needs to be set carefully to ensure overall consistency. Particularly after the economic crisis 2008/2009, the system has to be “tuned” again to be fully consistent: e.g. fast take up of renewable energy and fewer emissions due to the recession may cause an over-allocation in the EU-ETS in the extreme event.

The EU has a range of targets and policies in place that either directly 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 1.

---

1 Some sectors (boxes) are only treated in part by a target or policy. In such cases the lines go through a box.

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The figure shows that there is an overlap among the targets with the emissions from some sectors being covered by a number of targets. For example, some emissions from industry are covered by the EU ETS, renewables, energy efficiency and Kyoto Protocol targets. The targets are briefly described in the following sections (see also Wesselink et al. 2010).

1.1 The greenhouse gas target

The European Council Conclusions in March 2007 (European Commission 2007c) 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 pre-industrial levels. Until an international agreement is concluded the EU should take on a firm independent commitment to achieve at least a 20% reduction of GHG emissions by 2020 compared to 1990.

This position still holds. The 20% target is agreed, the option to move to more ambitious 30% is conditional on a global and comprehensive agreement post-2012 provided other developed countries commit to comparable reductions and developing countries contribute according to their capabilities.

Several Directives support the implementation of the greenhouse gas target: the EU Emissions Trading System covers roughly half of the GHG emissions of the Union. The “effort sharing” Decision (European Commission 2009) defines targets for Member States for the remaining emissions.

1.2 The renewable energy target

The EU aims to reach a renewable energy target of 20% of renewable energy sources in gross inland consumption by 2020 (European Commission 2006c, European Commission 2007b). Within the Climate and Energy Package of 2008 (CEP), the effort in reaching this target was shared between Member States, assigning individual targets for the share of renewable energy per Member State. In addition, there is also a binding target for each Member State to achieve a 10% share by energy content of biofuels in petrol and diesel by 2020 subject to certain sustainability criteria.

The targets can be achieved by different combinations of renewable deployment in the electricity, heat and transport sectors. It is left to the Member State how they achieve them with the policy instruments of their choice (Held et al. 2010).

1.3 The energy efficiency target

The 2005 Green Paper on energy efficiency (European Commission 2005) outlines the EU’s ambition to reduce energy consumption by 20% compared to Business as Usual (BAU) projections for 2020 on a cost-effective basis. The projections for the EU at that time were 1900 million tonne of oil equivalent (Mtoe) gross inland consumption in 2020 compared with 1725 Mtoe energy consumption in 2005.
The 2006 Action Plan for energy efficiency (European Commission 2006a) is more concrete in that it outlines a framework of policies and measures for realising the energy savings potential, estimated at over 20% of EU annual primary energy consumption by 2020. While the green paper includes gross energy consumption or total consumption, the Action Plan is based on primary energy consumption. Thus, the major difference is that gross energy consumption covers only all final energy consumed, i.e. does not cover potential energy efficiency improvements in conversion of primary energy to final energy (e.g. electricity generation), while primary energy consumption includes all primary energy.

The Action Plan was endorsed at the Spring Council of 2007, reconfirmed as part of the EU’s Climate and Energy package in 2008/2009 and was finally adopted by the European Heads of State and Government (the European Council) on 17 June 2010 as part of the new ‘Europe 2020’ strategy.

Although the baseline of energy consumption has changed due to the recession, we assume for the purpose of this study that the target is to keep energy consumption below 1600 Mtoe in 2020.

The energy efficiency target is not binding and is not specified per sector so far. According to a Communication from the European Commission in November 2010 will the “…. Energy Efficiency Plan to be presented in early 2011”... “be followed by concrete regulatory proposals in the course of that year. It will also address the issue of financing in terms of access to finance, the availability of innovative financing products, incentives to induce energy-efficiency investments as well as the role of EU funding, in particular the structural funds, further building on existing successful examples” ((European Commission)).

The energy efficiency target is not directly linked to the EU’s current legislative policy package. Still, the combined directives described below aim to contribute to increasing the EU’s energy efficiency.

### 1.3.1 The Energy Services Directive

The Directive on energy end-use and energy services (Directive 2006/32/EC, hereafter Energy Services Directive) applies to energy providers and final energy consumers, excluding final energy consumers that participate in the EU-ETS (industry). Thus, the Directive covers the fuel, district heat and electricity consumption in sectors such as the built environment, transport and smaller industrial installations.

The Directive aims to promote the efficient endues of energy. It has a target defined as a volume of energy savings equal to 9% of the final energy use of a reference period 2000 to 2005 for 2016. EU Member States have to present National Energy Efficiency Action Plans (NEEAPs) to monitor progress,
1.3.2 The Energy Performance in Buildings Directive

The Energy Performance and Buildings Directive (hereafter called EPBD) has recently been recast (Directive 2010/31/EU). Energy performance standards for buildings are the key element of the Directive. Member States shall ensure that minimum energy performance requirements for buildings are set at cost-optimal levels. From 2019 onwards, public authorities that occupy and own a new building shall ensure that the building is a ‘nearly zero energy’ building. By 2021, all new buildings, including those privately owned, will have to be ‘nearly zero energy’ buildings. (European Parliament and European Council 2010).

1.3.3 Agreement on emissions from passenger cars

The EU’s strategy to improve fuel economy and reduce CO2 emissions from passenger cars has evolved over the years. First, negotiated self-commitments were concluded with the European (European Automobile Manufacturers’ Association - ACEA), the Japanese (Japan Automobile Manufacturers’ Association - JAMA) and Korean (Korean Automobile Manufacturers’ Association - KAMA) automobile industries in 1999/2000. The three commitments contained the same quantified CO2 emission objective for the average of new passenger cars sold in the European Union, i.e. 140 grams carbon dioxide per kilometre (gCO2/km) (to be achieved by 2009 by JAMA and KAMA and by 2008 by ACEA). At that time, the EU’s strategy to reduce CO2 emissions from passenger cars aimed for a longer-term target with a figure for passenger cars newly registered from 1 January 2012 in the Community of 120 g CO2/km.

As the targets set in the voluntary agreement were missed, the regulation setting CO2 standards for passenger cars (Regulation No 443/2009) was introduced. The regulation prescribes 130 g-CO2/km for the new passenger car fleet entering the market, by means of improving vehicle motor technology, to be reached by 2015. In addition to improved motor technology, complementary measures such as low carbon fuels, co-driving and improved tyres, should contribute to achieving the Community objective of 120 g-CO2/km. A review of the Regulation (to be completed by 2013) will define ‘the modalities for reaching, by the year 2020, a long-term target of 95 g-CO2/km in a cost-effective manner; and the aspects of the implementation of that target…’. This indicates that the contribution of improved motor technology versus complementary measures in achieving the 95 g-CO2/km target is still undecided.

Despite these improvements, the voluntary ‘ACEA’ (European Automobile Manufacturers’ Association) target of 140 g-CO2/km in 2008 was not met. In addition, a strong increase in the volume of vehicles over the same time period has outweighed the improved car performance, resulting in a 30% increase of CO2 emissions from road transport over the past 2 decades (EEA 2009). Whereas the recent regulatory target of 130 g-CO2/km target (2015) is fairly close to the long term industry trend, the implementation of a 95 g-CO2/km standard can be regarded as more ambitious.
1.3.4 Other directives related to energy efficiency

The **Eco-design Directive** revised in 2009 (Directive 2009/125/EC) requires producers to make reductions in energy use and other environmental impacts an integral part of the design process of electrical appliances. Key aspect of the directive are the energy efficiency requirements for product groups, which are set through ‘implementing measures’. Among the product groups involved are typical household or service appliances that use electricity or fuel, like boilers, fridges and computers, as well as industrial appliances like electric motors and fans.

The **Energy Labelling Directive** (Council Directive 92/75/EEC) is the framework for implementation of Directives for seven household appliance groups: refrigerators, freezers and combinations, washing machines, dryers, dishwashing machines, electrical ovens, lighting, and air-conditioning units. All appliances should be provided with an energy label and an information pack when offered for sale or hire, to provide the consumer with proper information on the energy demand of the appliance.

The Directive ‘on the promotion of cogeneration based on a useful heat demand’ (2004/8/EC, hereafter **CHP Directive**) aims to stimulate energy savings and the improvement of energy security. The Directive sets definitions for high-efficiency CHP (HECHP) and obliges Member States to, i) identify their HE-CHP potentials, ii) ensure that support for CHP is based on the demand for useful heat, iii) to reduce the barriers for CHP regarding grid access, tariffs and administrative procedures, and iv) to set up a system for guarantees of origin for HE-CHP. Many of the CHP installations addressed by the Directive are covered by the EU-ETS. The CHP Directive is different from most of the Directives discussed here, as it is a technology-specific Directive.
Method

This chapter describes the method of the analysis. We first created a common dataset of activity data, energy and emissions for the EU 27 from 1990 to 2020 and then calculated several illustrative cases on how to reach the 30% goal.

As a first step we developed one complete dataset of activity data, energy use and emissions (historic and BAU projections) for the EU 27 from 1990 to 2020 (see Figure 2 and Figure 3). The sources of this data include the following:

- Historic and future energy data from PRIMES which form the basis for energy related projections of emissions (2010, post recession)
- GHG emissions inventories of EU Member States (latest 2010 CRF submissions (UNFCCC))
- Projections of non-energy GHG emissions from the 5th National Communication (UNFCCC)

Taking into account latest policies and the effect of the recession, BAU emissions excluding LULUCF and international transport (Kyoto emissions) in 2020 are 12% below the 1990 level (Figure 2) and BAU emissions across all sectors are 3% below 1990 (Figure 3). 2008 emissions are 10.6% below 1990. Not yet considered in this report is the newest estimate of the European Environment Agency that emissions in 2009 were 17.3% below 1990 (EEA 2010).

Figure 2  Emissions per sector in the EU 27 (all sectors)
Depending on the underlying rationales, there could be different ways to reach the 30% reduction target. Different objectives include:

- **Short- to mid-term cost minimization**: The focus would be on those areas, where emissions can be reduced at the least cost, e.g. energy efficiency or through offsets from outside of the EU.

- **Long-term cost minimization / technological learning**: Under a long-term perspective activities would be encouraged in sectors, where the emission reduction costs is high today, so that mitigation options become available in the long run.

- **Improve energy security**: The focus would be on reducing the dependence on insecure energy sources, e.g. gas imports from only a low number of suppliers.

- **Promote low carbon growth**: The focus would be on areas where reducing GHG emissions could have the best benefits for economic growth by stimulating innovation and new business areas for domestic and export markets, e.g. photovoltaics. The focus would also to avoid leakage.

- **Equity considerations**: The focus would be on avoiding severe impacts on some Member States different groups in society.
Having these objectives in mind, we analysed five illustrative options that result in different sectoral splits to reach a 30% and/or 20% reduction. The first two options are based on EU legislation, the later three are cases based on our own calculation:

- **Climate and Energy Package:** The CEP includes an EU wide 20% emission reduction target, split among the ETS (-21% below 2005) and non-ETS (-10% below 2005) sectors.

- **EU Communication:** The EU Commission provides two estimates on possible distributions of reduction efforts under a more stringent 30% reduction target by 2020: 30% reduction with flexibility – policy target scenario with 25% domestic reduction and 5% credit-use and 30% domestic reduction - all additional reduction efforts are reached domestically.

- **Least cost reductions:** In this approach, emission reductions across the EU are shared so that the most costs effective measures are chosen first. Using a Marginal Abatement Cost Curve (MACC) it is assumed that reduction measures are implemented in the order of their costs, starting from the least cost options, until a 30% emission reduction is reached across all countries. The approach represents the most cost-effective (short to mid term) emission reductions in 2020 for the EU.

- **EE and RES targets first:** In this case the renewable energy target would be implemented first, then the energy efficiency target. In addition realistic emission reductions are assumed for the remaining sectors that are not covered by these two targets. Since the approach looks at the currently existing EU targets it represents a politically viable way for implementation of the EU.

- **Offsets and LULUCF:** For illustrative purposes we will include a case where first LULUCF accounting and maximum use of offsets would require less reduction efforts on the other EU sectors. If possible this case will include no change to the current ETS cap. The goal of this approach is to minimize the domestic emission reduction efforts in achieving the 30% target.

The main rationale of these illustrative cases is different. The focus of the ‘least cost approach’ is to minimize short term costs for society, the EE and RE targets aim primarily at energy security and long-term cost reductions (technological learning).

Table 1 provides an overview of the options to share emissions in relation to the options with or without offsets. In total we consider 8 cases.
The current energy and climate package has a specific goal to reach 20% reductions, but allows for some offsets. The EU Commission Communication includes two cases, one with and one without offsets. The “least cost approach” will be calculated for this 20% case and also for reaching the 30% target with and without offsets and LULUCF. The “EE and RES targets first” case is only calculated for reaching the target “without LULUCF and offsets”, because implementation of the renewable energy and energy efficiency targets would already reduce domestic emissions by more than 20%. The “Offsets and LULUCF” case will be calculated for the “30% target with offsets” case only.

For all cases we discuss, whether the resulting development of domestic emissions is consistent with what would be necessary for achieving an 80% to 95% reduction by 2050.
Climate and Energy Package (CEP) for 20% emission reduction target

In 2008 the EU adopted its Climate and Energy Package (CEP). This provides reduction targets for emissions and targets to increase energy efficiency and renewables by 2020. These targets shall be the basis to realise an overall emission reduction of about 20% below 1990 in 2020.

The overall 20% emission reduction target is split among the ETS and non-ETS sectors as follows:

- 21% below 2005 verified emissions for ETS sectors
- 10% below 2005 emissions for non-ETS sectors

Resulting sectoral reductions are provided in Figure 12 and Figure 13.
4 EU Commission Communication on 30% emission reduction

The EU Commission provides two estimates on possible distributions of reduction efforts under a more stringent 30% reduction target by 2020 (European Commission 2010a, see also Table 2):

30% reduction with flexibility – policy target scenario with 25% domestic reduction and 5% credit-use

- 30% domestic reduction - all additional reduction efforts are reached domestically; Scenario to identify the economically optimal distribution of efforts between ETS and non-ETS

<table>
<thead>
<tr>
<th>2020 emission reductions [% reduction below 2005]</th>
<th>~ 20% target (reference)</th>
<th>30% with flexibility (25% domestic)</th>
<th>30% domestic</th>
</tr>
</thead>
<tbody>
<tr>
<td>% GHG reduction compared to 2005</td>
<td>-14%</td>
<td>-19%</td>
<td>-24%</td>
</tr>
<tr>
<td>% reduction ETS compared to 2005</td>
<td>-19%</td>
<td>-26%</td>
<td>-34%</td>
</tr>
<tr>
<td>% reduction non-ETS compared to 2005</td>
<td>-9.5%</td>
<td>-13%</td>
<td>-16%</td>
</tr>
</tbody>
</table>

Table 2 Emission reductions in 2020 compared to 2005 under different assumptions as given in the EU communication (European Comissions 2010a)

The split is based on a model study, assuming least cost reductions across all sectors. Both, ETS and non-ETS, should contribute considerably. However, the cost-effective potential remains lower in the non-ETS sectors according to the models used (see also Figure 12 and Figure 13).

While the 20% target is decided on the political level, the EU Commission considers the 30% with flexibility scenario to be the closest to a 2°C compatible trajectory.
5 Reaching 30% at the least costs

The 30% target could also be reached by using a least cost approach across Europe. Under such an approach it is assumed that the overall costs to society are minimized. Such an approach reflects an optimal short to midterm outcome, but neglects long term issues such as the learning of RE technologies and a necessary system switch. Furthermore it neglects any non-financial barriers not reflected in the cost curve and does not address potential difficulties in obtaining up front financing for the implementation of the options.

Technically, an approximation of this can be done through ranking abatement options by their marginal abatement costs from low to high. Such marginal abatement cost curves (MACC) can then be used to determine the cost of reducing a given amount of emissions as well as the order of measures executed. Starting from the left side of the curve and moving right, all measures are assumed to be taken until the given amount of emission reductions is achieved. An illustration of such a MACC for Europe is given in Figure 4.

![Abatement cost curve for 650 technologies in the EU27 in 2030, aggregated into clusters.](image)

Figure 4 Abatement cost curve for 650 technologies in the EU27 in 2030, aggregated into clusters. The abatement potential (X-axis) is relative to a Frozen 2005 technology pathway. Y-axis shows specific societal costs of abatement.

We used the SERPEC MACC (Figure 4) that we updated for this project with a post-recession baseline\(^2\). We determined the total amount of emission reductions achieved per sector (Figure 6). We assumed that all measures will be taken until the domestic target

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\(^2\) For a detailed description of how we updated the MACC please see the Appendix

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of 30% reductions below 1990 is reached\(^3\). All emission reductions were then aggregated at the sectoral level, including the EU-ETS and non EU ETS.

![Graph showing emission levels under the “30% at least cost” scenario for all sectors and gases covered under the Kyoto Protocol](image)

**Figure 5**  Emission levels under the "30% at least cost" scenario for all sectors and gases covered under the Kyoto Protocol (i.e. excl. LULUCF, excl. international transport). \(^4\)

![Graph showing emission levels in the ETS sectors for the three least cost cases and split of emission reduction below the Frozen Technology Reference Line (FTRL)](image)

**Figure 6**  Emission level in the ETS sectors for the three least cost cases and split of emission reduction below the Frozen Technology Reference Line (FTRL)

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\(^3\) In fact, only a target of 28% emission reductions was achieved. For a detailed description see the Appendix.

\(^4\) With the scaling of the MACC as described in the Appendix only a 28% domestic emission reduction can be reached until 2020.
One interesting observation that can be made from this analysis is the effect emission reductions achieved through reductions of electricity consumption in the demand sectors as well as the renewable energy target on the overall ETS cap. Figure 6 shows emission reductions split in the ETS sector for each of the least cost scenario cases (left to right). Under the -30% domestic reduction case only 38% of the emission reductions have to be achieved in the ETS sector directly. 26% will be achieved in other sectors (electricity demand reduction) and 36% through the renewable energy (RE) target, which are incentivised through other support mechanisms. This shows that although, as will be shown later, the cap on the ETS will need to be stringent, it does not mean that the ETS sectors have to undertake relatively more effort than the non-ETS sector.
6 Reaching 30% consistent with renewable and efficiency targets

This section includes the methodology and results on how to reach a 30% emission reduction target through the implementation of the EU’s energy efficiency and renewable targets. We find that after the recession, the full implementation of the energy efficiency target and the renewable target would lead to an emission reduction in the order of 30% domestically.

For this approach it is important to stress the difference between the target as set at the EU level (regarded in this chapter) and the means and policies set on an EU but especially Member State level (not regarded in this chapter). If an appropriate framework including binding targets and a policy framework is put in place to reach these targets, the EU can reach its 30% target domestically. Our results do not imply that sufficient action is already taken to reach the 20% energy efficiency target and respectively the 30% GHG reduction target.

Methodology

As mentioned in the introduction, the EU has not only set a target for GHG emissions but also targets for renewable energy production (RE target) as well as energy efficiency (EE target)\(^5\) (see Section Error! Reference source not found.). While these targets are set independently, they are directly connected to the achievement of the GHG target (see Figure 1).

In an earlier analysis Ecofys evaluated the interrelation of these three targets (Höhne et al. 2008). The result was that “for the EU 27 the combined renewable and energy efficiency target base-case leads to a GHG emission reduction of 26% on 1990 levels by 2020”. This analysis was done before the financial crisis and hence needs to be updated.

We updated this earlier analysis using a post-recession baseline. For this we used the newest PRIMES data available as of 2010 for projections of energy use and respective emissions (European Commission, 2009 4306 /id). For non-energy emissions we used the newest emission projections as provided by the EU members states to the UNFCCC (UNFCCC 2010a). On top of that we also updated the historical emissions with the newest country submissions to the UNFCCC (UNFCCC 2010b).

The update changed the projected BAU paths, while the historical numbers for 1990 and 2005 remained largely unchanged. Under the new BAU scenario emissions are already reduced by -12% until the year 2020, under the old scenario this was only -2% (Höhne et al. 2008).

In a first step we determined the resulting emission level in 2020 under the assumption that only the renewable energy (RE) target will be met. We applied the country specific targets as provided in Directive 2009/28/EC in % of total final energy consumption. To

\(^5\) While the renewable energy target is part of Climate and Energy Package of the EU (CEP) the energy efficiency target is currently not.
split these targets across sectors we assumed that countries would implement a least cost approach.

As sensitivity tests we added two cases. In the first one we assumed that the renewable targets are shared among Member States based on a least cost approach. This could be the resulting situation if Member States make extensive use of the provision to jointly implement their targets. A second case assumes an equal percentage increase of the share of renewables in all sectors and countries.

In a next step we added the energy efficiency (EE) target on top of the RE target (RE + EE). The energy efficiency target sets a 20% reduction in Gross Inland Consumption of Energy compared to the BAU. In the calculation of the target we use a fixed number for the EU27 BAU projection of 1900 Mtoe. Despite the fact that post-recession BAU projections are lower (PRIMES: app. 1800 Mtoe), we use this number as it is explicitly mentioned in the Green Paper6. We count the difference between these two numbers of 100 Mtoe toward achieving the 20% target.

We assumed here that the EE target is fully achieved. However, recent analysis shows that the current policy instruments are not sufficient to achieve this target. Wesselink et al. 2010

For sharing the 20% reduction across sectors and countries we used the following assumptions: We assume an equal percentage reduction of energy use across all EU Member States as default. We added sensitivities as error bars in Figure 7 by using an alternate approach of sectoral energy efficiency convergence.

Together with the two EE cases we have a total of 6 cases, of which one, as described above, is selected as the default.

In a last step we added emission reductions in those other sectors that are not covered by the two previous targets, that is the non-energy emissions. We assumed the emissions changes in the sectors as provided in Table 3. We also added sensitivities to this approach by using the same 5 cases as under the EE + RE case, while adding the assumption to each that reductions in the other sectors will also be achieved.

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### Non-energy sectors and Efficiency indicators

<table>
<thead>
<tr>
<th>Non-energy in industry:</th>
<th>Reduce emissions from 2005 by at least</th>
<th>20%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other energy industries (fugitive emissions):</td>
<td>Reduce emissions from 2005 by at least</td>
<td>50%</td>
</tr>
<tr>
<td>Non-CO₂ Agriculture:</td>
<td>Reduction below BAU in 2020</td>
<td>10%</td>
</tr>
<tr>
<td>LUCF: At least do not increase emissions / decrease removals from 2005</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>Waste: Converge emissions per capita to [2005 average: 0.31 tCO₂eq/cap]</td>
<td>0.2 tCO₂eq/cap</td>
<td></td>
</tr>
<tr>
<td>International transport:</td>
<td>Reduction below BAU in 2020 (only relevant where these emissions are included)</td>
<td>30%</td>
</tr>
</tbody>
</table>

Table 3 Assumptions made for non-energy sectors under the “consistency with EE and RE target” scenario

### Results

Figure 7 provides a summary of the reductions achieved in the different cases. Our BAU scenario is already 12% below 1990 in 2020. Achieving only the energy efficiency target results in a reduction of around 25% below 1990 in 2020 (excl. LULUCF, excl. international transport). Achieving the energy efficiency and the renewables targets combined will result in about 30% GHG reduction in 2020. If we assume on top of that an additional reduction in the other sectors not covered by these two targets, the reductions will go beyond the 30% mark.

In our old analysis before the recession, we calculated that reductions from the energy efficiency target and the renewables target already result in a 26% reduction below 1990 in 2020. One could say that the recession added the missing four percentage points for the 30% target.

![Figure 7](image-url)

Figure 7 Emission levels under the “consistency with EE and RE target” scenario for all sectors and gases covered under the Kyoto Protocol (i.e. excl. LULUCF, excl. international transport). Error bars show the range from possible alternatives to reach the energy efficiency and renewables targets.
An interesting observation is also that on an EU wide level the way the targets are shared among the countries does not seem to make a large difference with respect to the emission reductions achieved. For the RE targets this means that potential trading amongst countries will not have a significant effect on the resulting EU 27 emissions level although renewables might be replacing very different emissions. For the individual Member States this is quite different.

The split of the emission level by sector as well as the sectoral reduction wedge split show a clear dominance of the emission reductions in the energy industry and industry sector (Figure 8). This is due to the effect that energy efficiency measures for electrical appliances reduce the electricity demand and therefore the emissions covered in the ETS (see also Section 6). This has implication for the EU ETS cap for the year 2020. Figure 9 shows that the cap has to be set at 38% below 2005 emission (41% below 1990) for this sector in order to be consistent with this scenario.

![Figure 8](image_url)  
Figure 8  Sectoral emission and reduction split under the “consistency with EE and RE target”
Figure 9  Sectoral emission and reduction split in the Energy industry and industry sectors (ETS) under the "consistency with EE and RE target"
Reaching nominal 30% with offsets and LULUCF

Instead of meeting the 30% target completely with domestic emission reductions the share of domestic reductions could be reduced by using offsets and by applying LULUCF accounting rules.

In this section we will analyse the influence of offsets and LULUCF accounting on the amount of remaining necessary domestic mitigation action in the EU. After evaluating the possible influence of offsets (Chapter 7.1) and LULUCF accounting (Chapter 7.2) we give an estimate on the remaining domestic action (Chapter 7.3).

7.1 Influence of offsets

The EU set limits on the amount of offsets to fulfil its emission reduction targets. Offsets are credits generated by emission reductions outside the EU. With the use of offsets the national emission reduction effort is reduced, instead emissions are reduced internationally. In an ideal scenario, i.e. if the emission reductions achieved through offsets are purely additional, the international emission level thereby remains unchanged.

Different rules exist for the ETS sectors and the non-ETS sectors on how much credits may be used.

The EU decisions for the period from 2008 to 2012 include:

- in non-ETS sectors: no limit regarding offsets
- in ETS sectors: countries had to indicate their planned offsets, which had to be approved by the Commission

To reach its proposed emission reductions of 20% below 1990 levels the EU decided on the Climate and Energy Package (CEP) in 2008. With respect to credits, the CEP provides the following rules for 2013 to 2020:

- In non-ETS sectors: quantity of credits up to 3% of 2005 non-ETS emissions. This can be increased by 1 percentage point in special cases.
- In ETS: installations may use up to 50% offsets, considering their 2008-2020 cap if they are already included in the ETS, considering their 2005 level for new entrants.

These rules, given in the climate package, leave a high degree of uncertainty as to the actual volume of offsets that will be used. They only describe the potential access to credits, not the actual use. They therefore provide only a maximum limit, countries or companies may even chose to not use offsets at all. The economic downturn during the financial crisis might have reduced the demand of offsets even more pronounced (see Appendix III). In addition, even the maximum limit cannot be predetermined as there are too many uncertain variables (e.g. the number of new entrants in the ETS, definition of special cases in the non ETS sector).

For this study we compared different sources which analyse the amount of offsets available in the EU by 2020 under different reduction targets (see Appendix III). We
applied the split of ETS and non-ETS values to the figures we used as basis for the calculations in the report.

The CEP includes a maximum amount of offsets allowed as described above (see Appendix III). The remaining domestic action would be about 17% below 1990 emission levels. This includes the reduction of the 20% target plus offsets related to this target of about 3 percentage points. When moving to a more ambitious 30% target a larger amount of offsets would be allowed. Moving from a total 20% to a total 30% target would therefore only require domestic action of about 7%, not 10%. Domestic emissions would therefore be at 24% below 1990 in 2020.

![Figure 10: Effect of offsets on the 30% reduction target (excluding aviation)](image)

One main uncertainty when estimating the additional credits needed to move from the 20% to the 30% target is the distribution of the additional effort between ETS and non-ETS. In both sectors different shares of usable credits are allowed, which directly affects the total amount of allowed offsets. The assumptions for this study include the mix of assumptions made in the considered sources.

### 7.2 Influence of changing LULUCF accounting rules

LULUCF is not explicitly included in the CEP. However, LULUCF plays an important role in the international climate change architecture under the Kyoto Protocol. Different options for LULUCF accounting are discussed for the period after 2012. These would affect the calculation of emissions in the base year and would allow alteration of the final emissions level of the reduction target in 2020.

In an ideal case LULUCF accounting systems provide lead to proven CO\(_2\) removals from new or enhanced sinks as a result of further policy intervention and contribute therefore to real emission reductions. However, depending on the strictness of the rules some CO\(_2\) removals by sinks could be accounted for that are expected to occur anyway in the...
absence of additional policy. Such ‘lenient LULUCF rules’ would not contribute to real emission reductions (UNEP 2010 p.37).

The accounting options assessed here are based on different proposals discussed in the international negotiations under the Kyoto Protocol. The European Commission discusses several of the options in their staff working paper (European Commission 2010a). These are:

- **Option 0**: no changes to accounting rules after 2012. The large removals from forest management were capped at an individual level per country for the period 2008 to 2012. It is assumed to be set at the same level also after 2012. Countries could choose to account for other subcategories and are assumed here to not change their current choice.

- **Option 1**: no changes to accounting rules except an evolution by 2020 towards mandatory accounting for all subcategories. For the forest management sector three discounts rates are applied to all countries instead of the country specific cap for 2008 to 2012.

- **Option 2**: option based on the current regime but accounting emissions/removals from forest management in the target year and in a base period. There would also be an evolution towards mandatory accounting for all subcategories by 2020.

- **Option 3**: option based on the current regime but the emission flux of the forest management sector would be compared to a forward looking baseline for forest management.

- **Option 4**: Accounting of emissions and removals of all subcategories in the base year and in the target year.

Apart from the net/net accounting approach, considering reference emissions in a single year, the EU is also interested in reference levels with a band. The table below includes an assessment of the options 1, 2 and 4 (European Commission 2010a). All options apply different accounting rules to physically the same forest in 2020. The results show the impact of the different options for accounting rules of LULUCF on the amount of emissions or absorptions accounted for, compared to 1990 emissions (excluding LULUCF). A negative value of around -1.9 for the EU means that under these accounting rules forests represent a carbon uptake and that around 2% of the required 30% reductions can be achieved through LULUCF accounting.

We also considered an independent assessment of the accounting rules for LULUCF (PIK as for www.climateactiontracker.org). These estimates are in the same order of magnitude as those shown in Table 4.

From all of the options, a reasonable average rate is 2% of 1990 emissions. The extreme case of 8.7 or 8.8% is not very likely to be the outcome of the international negotiations, because it would allow 100% the accounting for the removals from forest management.

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7 Instead of reference emission level from a base year an interval, also called band or bar, is added to the reference emission level. Only emission changes exceeding this interval are accounted for ((UNFCCC)).
This option is unacceptable to most countries. For our further assumptions we assume a discount factor for forest management of 85%, which is analogous to the current rules under the Kyoto Protocol. However, changes in this discounting rate would lead to substantially different results.
7.3 Remaining need for domestic action after application of LULUCF accounting rules and using offsets

To identify the remaining domestic reduction effort when moving from a 20% target to a 30% target we have to consider both, offsets and LULUCF accounting.

Reductions from the energy and climate package would lead to a reduction in emissions of about 20% below 1990. Under a potential 30% reduction target the average available amount of offsets would add 3%. Assuming 85% discounting on forest management, LULUCF would add another 2%.

Thus, the remaining domestic emissions reduction effort would be about 5% below 1990 when assuming a likely outcome of the negotiations on LULUCF accounting rules. However, other accounting rules have the potential to be sufficient to cover the remaining 5%.

![Figure 11 Effect of offsets and changes in LULUCF accounting rules on the 30% reduction target (excluding aviation)](image)

Figure 11 Effect of offsets and changes in LULUCF accounting rules on the 30% reduction target (excluding aviation)
Comparison

This chapter compares the results of the 8 cases analysed in the previous chapters.

Figure 12 provides an overview of the allowed emissions per sector under the eight cases. Figure 13 provides an overview of the cap level of the EU ETS under the seven cases. Shown are the domestic emissions per sector (first bar) and the offsets and forestry that can be used (second bar).

![Figure 12 Resulting domestic emissions split per sector (first bars) and reductions through offsets and forestry (second bars).](image-url)

![Figure 13 Resulting domestic emissions in the ETS sectors in 2020 (first bars) and reductions through offsets and forestry (second bars).](image-url)
We make the following observations from the two figures:

- **Energy and Climate Package 20%**: In the current energy and climate package, a nominal 20% target is reached. Domestic emissions can be higher, because offsets are allowed (equivalent to around 3% of 1990 emissions).

- **Least cost approach incl. offsets 20% (15% internal)**: Also after the recession, the reductions would be spread similarly compared to what has been agreed in the Energy and Climate Package. Our least cost results show a little more reductions in the ETS sectors.

- **EU commission proposal**: the illustrative calculations by the Commission for a cost efficient spread of 25% and 30% domestic reductions are in line with our calculations.

- **The LULUCF option allows the maximum amount of offsets.**

### 8.1 Comparison to what would be required in the long term

The following figures compare resulting domestic emissions to an imaginary path from the 2010 level to an 80% to 95% reduction in 2050. While such a straight line might not be the optimal reduction path, it is still an indication, whether the resulting emissions are in line with long term goals. If one sector is required to reduce less than the imaginary straight path (e.g. transport), then another sector may have to reduce more.

![Figure 14 Long term comparison - emissions of the sectors covered under the ETS](image-url)
Figure 15 Long term comparison – emissions of the sectors not covered by the ETS

Figure 16 Long term comparison - total domestic emissions (excl. LULUCF)\(^8\)

\(^8\) For all scenarios except the least cost scenarios international transport is also excluded. Under the least cost scenario the PRIMES 2009 data used did not distinguish sufficiently between international aviation and national aviation. International shipping is excluded though.

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Options to change policy instruments to move to a 30% target

The EU has several options to change current policy instruments to move towards the 30% target. Some of the options are discussed in the recent Commission Communication (COM(2010) 265 final).

A main and most cost-effective option is to spur energy efficiency measures. (Wesselink at al. 2010) show that these can cover most cheaply as much as half of the abatement effort required for deep greenhouse gas reductions. Several instruments can contribute to increased energy savings:

- Most ambitious energy or CO₂ standards for appliances and cars
- Develop more ambitious and tailored national energy efficiency policies based on binding national targets and
- Create required energy efficiency investment funds, financed by private as well as public money:
  - on a national level via recycled ETS-revenues
  - on the EU level via redirecting financing under the structural and cohesion funds

Focus on energy savings will assure that the ETS cap can be adjusted downwards at the lowest costs.

The policies for renewable energy could also be strengthened. While the targets are ambitious and binding, further policies could be implemented to achieve the targets. Recent reports suggest, that the implementation of policy instruments to reach the renewable targets is quite advanced but also needs to be strengthened (Held et al. 2010).

The ETS is regarded as the main tool to drive emission reductions. Its cap would need to be adjusted if changes occur in the policy instruments mentioned above. The cap could be adjusted or a share of the allowances planned for auction could be set aside. It is likely that although fewer allowances are auctioned the revenues from auctioning are increased due to increasing prices.

The EU could also adjust the effort sharing decision for the sectors not covered under the EU ETS. This would require however a detailed discussion on the emission levels of each Member State.

The Commission Communication also mentions a carbon tax, without any further specification. Such a new instrument would have an impact overlapping with all other policies.

The Commission Communication also suggests directing a greater volume of cohesion policy funding towards green investments.

Land use, land use change and forestry (LULUCF) activities were not included in the 2008 Climate and Energy Package and so could contribute to achieving an enhanced target. These and offsets from emission reductions projects outside of the EU are discussed in chapter 5.
The EU’s position in international negotiations is to create new market mechanisms that create new international carbon credits. Under such a mechanism, developing countries could set a sectoral baseline and reductions below this baseline could generate new credits. The EU could decide to allow such new credits for compliance with its emission reduction targets. More stringent targets would create demand for such credits.
Conclusions

The work shows that there is a need to carefully reconsider the balance of the different 2020 targets and objectives. These changes are necessary due to the recession and recent policy developments.

The full implementation of the energy efficiency and the renewables target would lead to emissions significantly lower in 2020 than 20% below 1990. Our results suggest a reduction of around 30%. Assuming additional reductions in non-energy sectors even a 32% reduction domestically is possible.

The Emissions Trading System may be ineffective if energy efficiency and renewables targets are met. If the energy efficiency target and the renewables target were met, significantly fewer emissions would occur in the sectors that are covered under the Emissions Trading System than the current target. According to our calculations, a reduction of 38% below 2005 in the emissions covered by the ETS is a result of the energy efficiency and renewables target. This compares to the current cap of 21% below 2005.

The 30% target could also be met by maximizing the allowed use of offsets and allowances from land use, land-use change and forestry (LULUCF). Offsets can contribute to around 3% of 1990 emissions for the 20% target and around 6% for the 30% target. Allowances from land use, land-use change and forestry could contribute 1% to 9% (most likely 2%) of 1990 for reaching the 30% target. The value depends on the accounting rule chosen. Allowing offsets and LULUCF together, domestic emissions could be only 17% to 22% below 1990, while still nominally meeting the 30% target. Allowing the use of new international offsets (e.g. from a new sectoral crediting mechanism) would further reduce the requirements on domestic emissions.

A 25% to 30% reduction of domestic emissions in the EU in 2020 compared to 1990 would be consistent with the long-term goal of reducing emissions by 80 to 95% by 2050. This can be achieved through enhancing energy efficiency measures and starting the transformation process in the sectors not covered by the ETS.

For individual policy areas we draw the following conclusions:

- **Energy efficiency**: Current policy efforts on energy efficiency are not sufficient to meet the energy efficiency target by the EU. Efforts can be increased using the existing directives (energy services, energy performance in buildings, eco design, road transport) or by implementing new energy efficiency targets. Significant cost effective mitigation potential exists.

- **ETS**: The emissions originating from the sectors covered by the ETS are dependant on the policies aimed at saving electricity use. The cap of the EU ETS would need to be set at (percentage below 2005 in 2020):
  - [34% to 36%] for a total domestic reduction of 30% to ensure a least cost approach across all sectors
- 29% to 43% to be consistent with EE and RES targets also leading to a total reduction of 30%

**Renewables:** The policies for renewable energy could also be strengthened. While the targets are ambitious and binding, further policies could be implemented to achieve the targets. Policy instruments to reach the renewable targets are quite advanced but also needs to be strengthened.
Appendix I: SERPEC update

For this project we updated the SERPEC MACC curve. We briefly describe here how this was done.

Under the original SERPEC MACC the total emission reductions potential was sufficient to reach a 30% emission reduction in 2020 below 1990. Through this update the emission reduction potential was reduced to only -28% below 1990. This can be explained in the method used to adapt the MACC curve. There are three important implications this method has for the -30% target (below 1990)

- A decrease in the baseline leads to a decrease in absolute emissions
- A decrease in the baseline also leads to a decrease in the reduction potential
- Furthermore the delay of action and the passing of time lead to a decrease in the available reduction potential

While bullet point number 1 has a positive effect on reaching the reduction target, the other two others have a negative effect. Within our analysis the overall effect is negative, as there is only enough reduction potential to reach a -28% emission below 1990. This can be reasoned by the way we implemented the factor ‘passage of time’ or new base year.

Correction FTRL for the recession (2005-2020)

A key-question in updating the baseline is, to what extent the change in emission is due to reduced (recession caused) activities or due to increased policies. For each sector we analysed the available Primis data and estimated the share of each of the two. We then adjusted the downward scaling accordingly.

Correction for new base year (2010)

In SERPEC we assumed for all options maximum feasible annual implementation rates of new clean technologies and fuels. Between 2005 and 2020 the annual rates were constant. Obviously, the maximum possible implementation rates under SERPEC have not been achieved in the 2005-2010 period. We therefore now assume that these maximum feasible implementation rates start from 2010 on. Reductions start from the 2010 emissions provided by the PRIMES 2009 model. This means that for all options on the cost-curve a correction factor of 10/15 (0.66) is applied, to correct for a 10 year rather than 15 year implementation period.

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9 Emission reductions caused by policies are not included in the FTRL baseline
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Appendix II: Additional figures for long term reduction path

Figure 17  Long term comparison – emissions in the energy supply sectors

Figure 18  Long term comparison - results for industry
Figure 19 Long term comparison - results for buildings

Figure 20 Long term comparison - emissions in the transport sector
A SUSTAINABLE ENERGY SUPPLY FOR EVERYONE

Figure 21 Long term comparison - results for agriculture

Figure 22 Long term comparison - results for waste

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Appendix II: Use of offsets

Detailed description of the impact of the recession on the availability offsets in the EU

The emission cap is set for the second period (green line). It is allowed to achieve some of the reductions via offsets with CDM or JI credits (yellow). In addition, unused allowances from the second trading period can be banked and used in the third period. Because the recession led to unexpected emission reductions most of the allowed credits (yellow) in the second period will not be used. It is likely that the cap in the second period can be achieved without additional reduction effort. For the third period an amount of the reduction effort is allowed to be covered by offsets (yellow). In addition banked credits from the second period can be used (brown). The remaining domestic reduction effort is thus much smaller than it would have been without the recession.

![Emission caps and offsets in the EU ETS](image)

Figure 23 Emission caps and offsets in the EU ETS

Estimating the resulting use of offset credits - Overview of studies

The rules on how much credits can be used can be interpreted in different ways. The table below includes results of different studies on emissions, the amount of usable offsets and remaining emissions in 2020 for a 20% and a 30% emission reduction target of the EU.
Galharret 2010 assumes an even distribution of the additional 10% among ETS and non-ETS. Phylipsen and Wesselink 2010 split the additional effort among ETS and non-ETS sectors according to their share in 2005 emissions, which would be a bit more than 50% for non-ETS. This split has a considerable influence on the overall amount of offsets and could be discussed further. Other options, such as least cost distribution, would be possible.

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Table 5  Reference emissions and offsets under a 20% and 30% target by 2020 in the EU

10 (Graus) and (Galharret) partly consider the possibility of banking EU Allowances (EUAs) under the Emission Trading Scheme. (Höhne and Ellermann) do not consider banking of EUAs. (Phylipsen and Wesselink) indirectly consider the possibility of transferring offsets into EUAs but not the implications of banking "original" EUAs. In this case, additional banking of EUAs could decrease absolute amount of emissions that actually need to be reduced in 2020.

9-Mar-11
Reference sources


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**IS THERE A CASE FOR THE EU MOVING BEYOND 20% GHG EMISSIONS REDUCTION TARGET BY 2020?**

led by **Emmanuel Guérin** of the Institute for Sustainable Development and International Relations (IDDRI)

Other papers prepared in the project:

CIRED: Short-Term / Long-Term Coherence of Emissions Reduction Pathway
ICE: Employment Impact of Climate Policy. What Challenges while Moving the EU Targets beyond 20% GHG Reduction by 2020?
FIIA: Climate Mitigation and Energy Security in Central and Eastern Europe: Case Studies of the Impact of a 30% Target on Energy Security in three CEE Member States
ECN: Considering the Implications for Low-Carbon Technology Innovations and Policies
ECOFYS: Quantifying the Impacts of a 30% Target on Energy Security
E3G: Global Low Carbon Technology Race and International Cooperation
ECOFYS: Consistency of Policy Instruments: How the EU could move to a -30% GHG target?
CIRED: Is there a case for the EU to move beyond 20% GHG emissions reduction by 2020? Addressing leakage concerns
IDDRI: Technology and policy option to ensure the time-consistency of the power sector low-carbon transition

All papers are available from: [http://www.climatestrategies.org/research/our-reports/category/57.html](http://www.climatestrategies.org/research/our-reports/category/57.html)