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A report for DG Climate Action

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Executive Summary

This report is the final deliverable under the contract "Next phase of the European Climate Change Programme: Analysis of Member States actions to implement the Effort Sharing Decision and options for further community-wide measures". It has been prepared by AEA, in collaboration with Alterra, Ecofys and Fraunhofer ISI.

The project has run for a period of two years. The main activities performed in the delivery of the study objectives are summarised below. A more detailed description of these activities and the associated results can be found in the individual reports that have been prepared during the course of the study. These reports are attached as separate appendices to this main report, and are referred to throughout.

Emission projections, ESD target and policy gap analysis

The first and most significant work activity involved an analysis of the greenhouse gas emissions, at both an EU and Member State level, which fall within the scope of the ESD – and the projected change in these emissions in the future. These projections were then compared with the emissions limits agreed as part of the Decision. The specific activities included:

- A detailed analysis of the emissions in sectors covered by the ESD in each country specifying the contributions of all greenhouse gases, sources and sub-sectors.
- A detailed analysis of Member State projections until 2020 and 2030 and a comparison with other available projections.
- An assessment of the baseline scenario per Member State for emissions from sectors covered by the ESD up to 2030.
- An assessment of existing community-wide policies and measures in sectors covered by the ESD and their expected effects in terms of quantitative emissions reductions in each Member State by 2020 and 2030.
- An analysis of the expected gaps within each Member State for meeting their commitments under the ESD.

A detailed description of the activities performed, and the associated results, can be found in the report on Greenhouse gas emissions projections, emissions limits and abatement potential in ESD sectors. This is attached in Appendix A of this report. A more extensive summary of the work can also be found in Chapter 2.

Cost-effective abatement potential

Alongside the analysis of the emissions projections, an initial assessment was carried out of the potential abatement measures that could be used to deliver additional emissions reductions in the ESD sectors by 2020. The specific work involved:

- An assessment of the cost-effective abatement potentials in the various sectors and sub-sectors covered by the ESD.

These activities, and the associated results, are also described in the report on Greenhouse gas emissions projections, emissions limits and abatement potential in ESD sectors. A more detailed summary of the work can also be found in Chapter 3.

Preparedness and capacity of Member States for meeting the requirements of the ESD

Understanding Member States' preparedness, capacity and performance is important for the European Commission so that any need for additional assistance by Member States in meeting their requirements under the ESD can be effectively assessed. The following activities were carried out in relation to this activity:

- A first analysis of Member States preparedness and capacity to implement necessary measures for meeting their commitments under the ESD.

- An assessment of the actions and activities, including good practice examples, that Member States may need to carry out in order to be well prepared for meeting the ESD requirements.

The results of this analysis are presented in the report Greenhouse gas emissions projections, emissions limits and abatement potential in ESD sectors. In addition, a separate report has been prepared on setting out an Action Plan for Member States preparing for the Effort Sharing Decision. This is attached in Appendix B of this report. A more detailed summary of the work can also be found in Chapter 4.

Best practice policy examples

To support the development of new policies at a national and EU wide level, a review of existing and proposed policies targeting greenhouse gas emission reductions in EU Member States was carried out for the main ESD sectors. This work included the following activities:

- An identification of best practices for mitigating GHG emissions in sectors covered by the ESD at national level in Member States.
- An analysis of possible options that could be introduced in 2013-2020 to deliver further emission reductions in Member States
- An assessment the health an environmental related health effects of different measures to reduce GHG emissions
- An assessment of the interaction of policies and the indirect effect of measures in one sector on another sector

Separate case study reports for policies in the agriculture, buildings, industry, transport and waste management sectors are attached in Appendix 3. A summary of the work to prepare the case studies can also be found in Chapter 5.

Communication and outreach

The exchange of information delivered by the project and other related information on policy development in the ESD sectors was a key objective of the project. The activities that have been carried out in support of this objective are as follows:

- Establishment of a website for information dissemination of material developed as part of the study;
- Organisation of two international workshops for Member States and other stakeholders to exchange information on activities relating to the implementation of the ESD.

Further information on the activities can be found on the project website, with a summary of the work to prepare the website and conferences found in Chapter 6.

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1 Introduction

This report is the final deliverable under the contract "*Next phase of the European Climate Change Programme: Analysis of Member States actions to implement the Effort Sharing Decision and options for further community-wide measures*". It has been prepared by AEA, in collaboration with Alterra, Ecofys and Fraunhofer ISI.

1.1 Aims and objectives

The overarching aim of the project is to assist the European Commission and Member States in preparing and implementing successful policies and measures in order to fulfil their national commitments under the Effort Sharing Decision (ESD).

The specific objectives of the project are to:

1. Examine and assess Member States' preparedness, capacity and performance in implementing emission reduction policies and measures in the ESD sectors in order to achieve their national targets under the ESD;
2. Support the European Commission in preparing for further community-wide policies and measures to support Member States in achieving their national targets under the ESD;
3. Facilitate an exchange of information between the European Commission and relevant authorities in the Member States in order to ensure that they define and implement timely and adequate measures to comply with their national emission limits in the ESD.

This report contributes directly to each of these objectives.

1.2 Policy context

The Effort Sharing Decision (ESD) was agreed by the EU as part of the Climate and Energy package in December 2008. It sets national emission limits for greenhouse gas (GHG) emissions in the ESD sectors in the 27 EU Member States in 2020. The ESD covers emissions from all sources outside the EU's Emissions Trading Scheme (ETS), except for international maritime emissions and emissions and removals from land use, land-use change and forestry (LULUCF). The ESD covers a number of sectors and sources. In order of importance, the three largest sectors are:

- Energy use in road transport,
- Energy use in the built environment and
- Emissions from agriculture.

Other sources include emissions from less energy intensive businesses in the industry sector; methane emissions from waste; industrial process emissions (including F-gases) and fugitive emissions from the energy sectors (leakage of gas pipelines, coal mining).

Table 1-1: Total GHG emissions within the scope of the ESD, by sector, in 2005

Sector	Mt CO_2 eq.
Energy supply sector	101.8
Energy use in industry	167.4
Energy use in households	498.6
Energy use in services and other	262.2
Energy use in transport	924.4
Industrial processes	122.6
Waste	146.6
Agriculture	471.0
Total emissions	**2,688**

Source: PRIMES (Capros et al, 2010) and GAINS supported by CAPRI (Höglund-Isaksson et al, 2010)

The Decision defines linear legally binding emissions trajectories in Member States for the period 2013-2020 with annual monitoring and compliance checks. It also provides flexibility for Member States in reaching their targets by allowing transfers of annual emissions allocations between years, between Member States and the use of external credits through the Clean Development Mechanism. From a national perspective, the ESD can be regarded as a (flexible) emissions ceiling, which can be achieved via multiple sectors, comprising both national and Community wide instruments.

Under the ESD, all Member States have individual 2020 emissions targets, which, based on the original estimates, average out at -10% for the EU as a whole compared to 2005. In Member States where GDP/capita exceeds the EU average, a deeper emissions reduction than the EU average is required, up to -20% below 2005. Countries with a low GDP per capita will be allowed to increase their emissions in ESD sectors by up to 20% above 2005 levels. This approach reflects projections that their relatively higher economic growth in the next decade will be accompanied by increased emissions in, for instance, the transportation sector. Nevertheless, these targets still represent a limit on their total emissions and will require a reduction effort also in these Member States.

Delivery of these targets will be challenging, and will require additional policy interventions. Typically, in the early phase of a policy development cycle, 'getting the data right' is a key issue. This will involve important analytical work such as agreeing emissions baselines, quantifying future impacts of policies, improving monitoring of emission sources and clarifying unclear sector definition. Furthermore, in order to deliver cost-effective policies, evidence is required on the technical and behavioural measures and the policies options that can be used to implement the abatement activities. Finally, the multiple-sector character of the ESD will require Member States to build upon and bring together sectoral governance structures. This is also likely to require greater engagement with regional and local delivery agencies.

1.3 Main activities and outputs

The project has run for a period of two years. The main activities performed in the delivery of the study objectives are summarised below, and in subsequent chapters. A more detailed description of these activities and the associated results can be found in the interim reports that have been prepared during the course of the study. These reports are attached as separate appendices to this main report, and are referred to throughout.

1.3.1 Main activities

The following activities have been performed in accordance with the terms of reference for the study.

Emission projections, ESD target and policy gap analysis

The first and most significant work activity involved an analysis of the greenhouse gas emissions, at both an EU and Member State level, which fall within the scope of the ESD – and the projected change in these emissions in the future. These projections were then compared with the emissions limits agreed as part of the Decision. The specific activities included:

- A detailed analysis of the emissions in sectors covered by the ESD in each country specifying the contributions of all greenhouse gases, sources and sub-sectors.
- A detailed analysis of Member State projections until 2020 and 2030 and a comparison with other available projections.
- An assessment of the baseline scenario per Member State for emissions from sectors covered by the ESD up to 2030.
- An assessment of existing community-wide policies and measures in sectors covered by the ESD and their expected effects in terms of quantitative emissions reductions in each Member State by 2020 and 2030.
- An analysis of the expected gaps within each Member State for meeting their commitments under the ESD.

A detailed description of the activities performed, and the associated results, can be found in the report on *Greenhouse gas emissions projections, emissions limits and abatement potential in ESD*

sectors[1]. This is attached in Appendix 1 of this report. A more extensive summary of the work can also be found in Chapter 2.

Cost-effective abatement potential

Alongside the analysis of the emissions projections, an assessment was carried out of the potential abatement measures that could be used to deliver additional emissions reductions in the ESD sectors by 2020. The specific work involved:

- An assessment of the cost-effective abatement potentials in the various sectors and sub-sectors covered by the ESD.

These activities, and the associated results, are also described in the report on *Greenhouse gas emissions projections, emissions limits and abatement potential in ESD sectors*. A more detailed summary of the work can also be found in Chapter 3.

Preparedness and capacity of Member States for meeting the requirements of the ESD

Understanding Member States' preparedness, capacity and performance is important for the European Commission so that any need for additional assistance by Member States in meeting their requirements under the ESD can be effectively assessed. The following activities were carried out in relation to this activity:

- An analysis of Member States preparedness and capacity to implement necessary measures for meeting their commitments under the ESD.
- An assessment of the actions and activities, including good practice examples, that Member States may need to carry out in order to be well prepared for meeting the ESD requirements.

The results of this analysis are presented in the report *Greenhouse gas emissions projections, emissions limits and abatement potential in ESD sectors*. In addition, a separate report has been prepared setting out an *Action Plan for Member States preparing for the Effort Sharing Decision*. This is attached in Appendix 2 of this report. A more detailed summary of the work can also be found in Chapter 4.

Best practice policy examples

To support the development of new policies at a national and EU wide level, a review of existing and proposed policies targeting greenhouse gas emission reductions in EU Member States was carried out for the main ESD sectors. This work included the following activities:

- An identification of best practices for mitigating GHG emissions in sectors covered by the ESD at national level in Member States.
- An analysis of possible options that could be introduced in 2013-2020 to deliver further emission reductions in Member States
- An assessment the health an environmental related health effects of different measures to reduce GHG emissions
- An assessment of the interaction of policies and the indirect effect of measures in one sector on another sector

Separate *case study reports for policies in the agriculture, buildings, industry, transport and waste management sectors* are attached in Appendix 3. A summary of the work to prepare the case studies can also be found in Chapter 5.

Communication and outreach

The exchange of information delivered by the project and other related information on policy development in the ESD sectors was a key objective of the project. The activities that have been carried out in support of this objective are as follows:

[1] This was formally titled "1st Interim report"

- Establishment of a website for information dissemination of material developed as part of the study.
- Organisation of two international workshops for Member States and other stakeholders to exchange information on activities relating to the implementation of the ESD.

Further information on the activities can be found on the project website[2], with a summary of the work to prepare the website and conferences found in Chapter 6.

1.3.1 This report

This report synthesises the work that has been carried out as part of the project. It is organised into the following sections, in addition to this introduction:

- Chapter 2 - Emissions projections, ESD targets and policy gap analysis
- Chapter 3 - Abatement potential
- Chapter 4 - Member States preparedness and capacity
- Chapter 5 - Policy case studies
- Chapter 6 - Communication and outreach

Most of the material reported here is described in more detail in the reports attached in the appendices, and readers are referred here for further information:

- Appendix 1 – Greenhouse gas emissions projections, emissions limits and abatement potential in ESD sectors
- Appendix 2 – Action Plan for Member States preparing for the Effort Sharing Decision
- Appendix 3 - Case study reports for policies in the agriculture, buildings, industry, transport and waste management sectors

The one exception is the information that is reported on the future activities. The ESD is still in its infancy, and whilst the work carried out in the current project has addressed a number of issues relating to the initial phases of the ESD implementation, new issues and challenges will arise as the policy develops. For each of the main activities a brief commentary is provided in the relevant chapter on the future activities that might need to be undertaken by the Commission and Member States in the next phase of implementation of the Decision.

[2] www.ghgeffortsharing.eu

2 Emissions projections, ESD targets and policy gap analysis

An important part of the analysis was concerned with providing an improved understanding, based on current projections, of the likely performance of Member States, and of the European Union as a whole, in meeting the limits set out in the Effort Sharing Decision.

2.1 Work carried out

The starting point for the analysis was an assessment of the scope and scale of emissions that are captured by the Effort Sharing Decision. From this it was possible to project the trend in these emissions in the future, and then compare this trend with the emissions limits that have been agreed by each of the individual Member States under the Decision. This information was then used identify those countries that are expected to meet their targets, and those that have an apparent 'policy gap'. Each of these steps are summarised below.

It is important to note that this assessment was based upon the most up-to-date projections that were available at the time of the analysis. In practice, these projections are updated on a regular basis, and therefore the results presented below may not necessarily represent the most recent projections. The results should be viewed with this caveat in mind.

2.1.1 Assessment of the emissions within the scope of the ESD, and Member States' emissions limits

Under the Decision, the 2020 level of effort that has been agreed by Member States has been determined in relation to the level of its 2005 greenhouse gas emissions covered by the Decision. For each Member State, the 2005 emissions within the scope of the Decision have been estimated based upon the emissions data reported by Member States in their National Inventory Report (NIR). In most cases, the latest NIR reports submitted by Member States did not specifically differentiate between the emissions that are within the scope of the Decision and those outside. It was therefore necessary to approximate the extent of emissions covered by the Decision using additional data sources. These data sources, and the approach taken to analyse the data, are described in the main report.

2.1.2 Assessment of the projected emissions in 2020

For each individual Member State, an estimate was made of the extent to which emissions within the scope of the ESD are likely to change in future years. This provides an indication, based on current expectations, of the likelihood of each individual Member States meeting its emissions limit.

Two sources of projections were used to assess the emissions in 2020:

- EU wide modelling using model runs from the PRIMES (Capros et al, 2010) and GAINS supported by CAPRI (Höglund-Isaksson et al, 2010) models. These models provide multi-sectoral projections for GHG emissions to 2030 across the EU 27 Member States, based upon a consistent set of assumptions (e.g. on the effects of the economic crisis).

- Submissions of the Member States (under Article 3.1 of the Council Decision 280/2004/EC on a Mechanism for Monitoring Community Greenhouse Gas Emissions and for implementing the Kyoto Protocol, henceforth 'Monitoring Mechanism Decision') provide Member States own projections on the expected evolution of their greenhouse gas emissions to 2020.

These projections are not fully comparable, but taken together provide alternative estimates of the projected evolution of emissions in the individual Member States and for the EU 27 as a whole.

For both sets of projections an estimation was required of the split of future emissions falling within the scope of the ESD. The approach used to estimate this emission split is described in the main report.

2.2 Main results

2.2.1 Overall results

The analysis of the emissions projections suggests that with measures in place mid 2009 the EU-27 will not meet its target reduction in emissions from the ESD sectors of about 10% by 2020 compared to 2005. This is the outcome from both the PRIMES/GAINS EU wide modeling, and Member States' own projections.

The PRIMES/GAINS analysis suggests a 'policy gap' equivalent to 5.8% of the 2005 emissions levels, with Member State projections suggesting a gap of 1.6% to 10.0% depending on the assumed take up of additional measures. This 'policy gap' represents the additional reduction in emissions required to meet the ESD target, across all of the relevant emissions sources.

Projected performance against target has also been assessed for those Member States with an emissions growth limit, as a group, and those Member States with an emissions reduction target, as a separate group. The projections suggest that the 'growth limit' group is on track to meet its overall target. The 'reduction target' group is projected to fall short of its target by between 2 and 11 percent.

It is important to note that these projections represent a snap shot of the policy gap at a given point in time. Additional greenhouse gas mitigation policies, introduced subsequently to the latest emissions modelling, will reduce the extent of the policy gap. Likewise, changes in expectation about future economic activity will influence projected emissions. The most recent projections from Member States suggest further closure of the policy gap[3].

A number of uncertainties surround the estimated performance of the EU, with respect to the ESD target. These include uncertainties associated with the estimation of emissions within the scope of the Decision, and uncertainties associated within the modeling of the future projections (including economic growth rates, energy prices, policy impacts etc). Future work to reduce these uncertainties would be beneficial.

2.2.2 Policy impacts

A number of existing and planned EU wide policies and measures will deliver emissions reductions in the ESD sectors over the target period. The policies therefore have an important role in helping Member States meet their national targets.

The EU wide projections that have been made using the PRIMES and GAINS models already include the most important policies in the 2009 baseline projections, such as the CO2 and cars regulation and EU waste legislation. Therefore the estimated 'policy gap' (described above) already includes the effects of these policies.

However, a few key policies have been (or are planned to be) implemented subsequent to the PRIMES/GAINS baseline, which will act to reduce emissions (and the extent of the policy gap) further. In particular, the recast of the Energy Performance of Building Directive will deliver further emissions reductions in the buildings sector and the Renewable Energy Directive will deliver additional saving in the transport and heat sectors. Finally, the regulations on CO2 emissions from vans, once implemented, is likely to deliver additional emissions reductions from road transport.

In general, little work has been carried out to reconcile the Commission's ex-ante estimates of EU wide policies with estimates made at Member State level. Further work to understand the main differences between these alternative estimates of the policy impacts would be useful, and would provide greater reassurances on the expected emissions reductions from EU policies.

[3] Eleven Member States are expected to meet their targets with existing policies and measures. A further seven Member States would meet their targets with planned additional policies and measures. Finally, nine Member States are unlikely to deliver on their commitments even with the additional measures foreseen for now. As regards EU-27, the estimates show that the overall non-ETS target would be delivered. (European Commission, Progress report toward meeting Kyoto Objectives, 2011).

2.3 Future activities

The analysis of Member States projections and the comparison of the emissions with the limits under the ESD revealed a number of areas where future work would be beneficial. Some of these issues are being addressed by current DG CLIMA activities, for example as part of the working groups under the EU Climate Change Committee, and as part of existing service contract funded by DG CLIMA. However, some research gaps may remain. These may include:

- An improved understanding of the scope and scale of emissions from industrial activities that fall within the scope of the ESD would be beneficial. Inconsistencies between the reporting of emissions under the EU ETS and within national inventories make estimates of emissions from this sector more uncertain than for others. This also makes estimates of the projected evolution of emissions from this sector more uncertain.

- An increasing number of Member States are providing estimates of emissions within (and outside) the scope of the ESD. However, without a complete coverage of projections from all Member States, the Commission will need to rely on EU wide modelling. Effort should continue to encourage and support Member States in preparing projections, with particular emphasis of projecting emission within the scope of the ESD. This may involve better alignment of modelling tools within the data in national inventories. Further activities to harmonise methodologies would also be beneficial.

- Few comparisons have been made between estimates of policy impacts made at an EU level with estimates prepared at a Member State level. However, it is clear that EU wide policies will have an important role in helping Member States to meet the emissions limits set out in the ESD. Further work to understand, assess and compare the impacts of EU wide polices at a Member State level would help Member States to understand the additional effort that is required from national policies. At the same time this work would also help the Commission to improve the accuracy of EU policy appraisals. This would also allow EU policy assessment to be updated to reflect national implementation aspects.

- Increasing the accuracy of short term emission forecasting may become important as Member States enter the ESD compliance period. Short term annual fluctuations in emissions will have an important bearing on the need for flexibility provisions. Building upon the work of the European Environment Agency to develop proxy greenhouse gas inventories, the Commission can have an important role in raising capacity and sharing best practice amongst Member States in short term forecasting techniques.

3 Abatement potential

Delivery of the emission limits set under the ESD is likely to require the take up of measures or behaviours to mitigate greenhouse gas emissions. Drawing upon previous research, an estimate was made of the abatement potential that may be available within the ESD sectors to deliver additional emissions reductions in 2020. This work was led by Ecofys.

3.1 Work carried out

The analysis of abatement potential drew upon the results of the Sectoral Emission Reduction Potentials and Economic Costs for Climate Change (SERPEC 2009a) project. The SERPEC analysis was used because it provides the most comprehensive and complete dataset available, covering each of the main ESD sectors in a consistent and comparable basis. However due to some differences in the scope of the current project the SERPEC data had to be adapted.

A three step approach was used, as described in the sub-sections below. Full details on the approach that was applied, and the results from the analysis can be found in the report *Greenhouse gas emissions projections, emissions limits and abatement potential in ESD sectors,* which is attached in Appendix 1

3.1.1 Use the original SERPEC data to assess of the cost effective potential for each Member State, in each ESD sector

In the SERPEC project the abatement potential of the individual abatement measures were assessed 'bottom up' relative to the performance of current (2005) technologies and with 2007 projections for GDP, population and fuel prices. The original SERPEC results were disaggregated at a Member State and sector level, to provide a first indication of the abatement potential in the ESD sectors. For certain measures this required an estimation of the proportion of the emission savings falling within and outside the scope of the ESD (e.g. savings from reducing electricity consumption are outside the scope of the ESD).

3.1.2 Update the SERPEC analysis of the cost effective potential, where appropriate

The original SERPEC estimates were updated to ensure consistency with the most recent (2009) emissions projections. Adjustments were made to take into account:

- The impact of the recession in the period between 2005 and 2010.
- The change in reference year, and assessment period (2010-2020 instead of 2005-2020)
- The impact of policies introduced subsequent to the original projections

In making the adjustments a judgement was made as to how each of the groups of abatement measures would be influenced by the factors described above. The approach used is described further in the report *Greenhouse gas emissions projections, emissions limits and abatement potential in ESD sectors.*

3.1.3 Cross check results with Member State specific estimates of the cost effective potential where possible

The abatement potential estimates were cross checked with Member State data, where available. Due to differences in methodologies and assumptions (base year, policies included), this comparison was made at a more general level i.e. the order of magnitude and distribution over sectors.

3.2 Main results

In combination, the ESD sectors of agriculture, road transport, built environment, small industry and waste have an estimated technical abatement potential in 2020, that can be considered additional to any emission savings captured within the PRIMES/GAINS baseline, of 470 million tonnes of carbon dioxide equivalents ($MtCO_2$ eq), at an EU level.

Additional mitigation policies, introduced subsequently to the PRIMES/GAINS baseline will take up a proportion of the cost-effective abatement potential, reducing the remaining potential in 2020. After accounting for the impacts of the most important EU wide policies, the remaining abatement potential in 2020 is estimated to be 397 $MtCO_2$ eq.

Of the 397 $MtCO_2$ eq. of abatement potential remaining in 2020, an estimated 156 $MtCO_2$ eq is considered to be cost effective (i.e. below zero cost, using social discount rate), without the need for any further policy support e.g. a carbon price. In other words, the efficiency savings (e.g. reducing energy consumption) delivered by the measures over their lifetimes, is more than sufficient to offset the overall cost of their implementation and maintenance. These measures therefore offer a win-win option, by delivering both emissions reductions and financial savings.

The total cost effective abatement potential remaining in 2020 is estimated to be in excess of the policy gap in 2020. This suggests that the ESD target can be met, at an EU level, at no net cost to the European economy. In fact, delivery of the ESD targets using the cost-effective abatement potential will deliver net benefits to the economy through the efficiency savings.

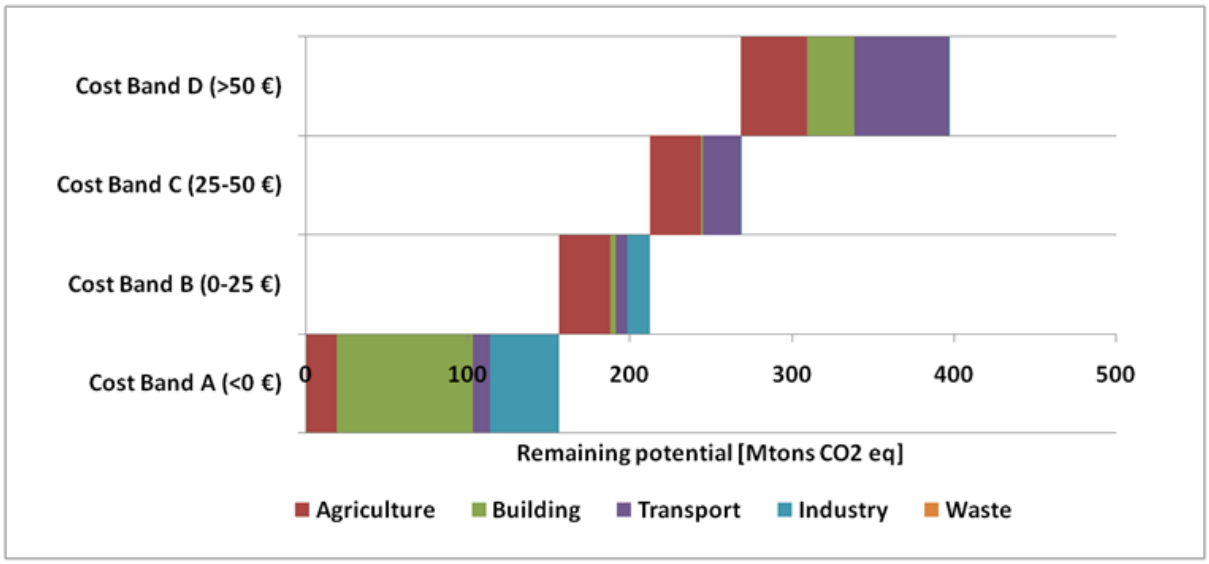
A further 56 $MtCO_2$ eq. of annual emissions reductions in 2020 is available at a cost less than €25/tCO_2 eq. Thus over 212 $MtCO_2$ eq. of abatement potential could be considered 'cost-effective' at a carbon price of €25/tCO_2 eq (see Table below). The take up of this cost-effective potential would represent an additional 8.5% reduction in the 2020 emission level, and a total reduction of 14% on the emission level in 2005.

Table 2: **Abatement potential in the EU per sector and per cost band**

	EU 27	Agriculture	Building	Transport	Industry	Waste
Cost Band A (<0 €)	156	19	84	11	43	0
Cost Band B (0-25 €)	56	31	4	7	14	0
Cost Band C (25-50 €)	56	31	2	23	0	0
Cost Band D (>50 €)	129	41	29	58	0	0
EU wide per sector	397	122	118	100	57	0

Most of the abatement potential from the buildings and industry sectors can be realised at a negative cost. The majority of the abatement potential in the agriculture sector can be realised at a cost band <€25/tCO_2 eq. The remaining abatement potential in the transport sector is mostly at a cost >€25/tCO_2 eq. Thus each of these sectors might be expected to make a differential contribution to the overall target. Abatement potential remaining in the waste sector in 2020 is much more limited, largely as a result of the assumed effectiveness of existing policies in exhausting the current potential.

Figure 1: **Abatement potential distributed over cost bands on EU level by sector**



There are uncertainties in the abatement cost analysis. The analysis, whilst based on bottom up technology estimates, has not been updated in detail to reflect new or emerging technologies, or account taken for changes in fuel prices. Furthermore, the cost estimates do not take into account certain hidden costs (e.g. time cost of installing measures) which may increase the cost estimates, or direct rebound effects (e.g. taking more heating comfort), which may reduce the emissions savings.

The estimated abatement potential is based, in most cases, upon technical measures. Therefore the potential savings do not take into account most behavioural measures (e.g. turning down the heating), which have the potential to delivery additional savings. On this basis the level of savings can be considered conservative.

Finally, the abatement potential estimates are largely based on EU wide assumptions, so may not reflect variations in technical potential or the cost of measures at a national level. Further work is required to provide a more detailed assessment of the abatement potential within specific Member States.

These issues are not unique to the sectors falling within the scope of the ESD. However, the ESD by its very nature requires a consideration of the options and opportunities across a range of source and sectors, which presents particular challenges in terms of the comparability of opportunities.

3.3 Future activities

The assessment of the abatement potential was one of the most challenging elements of the project. While emissions data and emissions projections are readily available and reported by Member States, information on abatement measures and abatement potential is much scarcer. Furthermore, the information that is available is often specific to the particular assumptions that have been applied, and is less transferable to other areas.

The European Commission can potentially have a role in building capacity within Member States in certain aspects of abatement cost analysis, as well as in the harmonisation of methodologies and assumptions. This will increase the accuracy and consistency of estimates. At the same time the Commission may wish to make the results and data from EU assessments publically available, where not done already, to aid understanding within Member States of the potential measures and their cost-effectiveness.

Further work to understand the barriers and “hidden costs” associated with energy efficiency measures would be beneficial. A number of studies have highlighted the large cost effective abatement potential that relates to energy efficiency measures. However, these estimates may not reflect fully these hidden and missing costs, as well as the barriers to take up. Some of these factors

may reflect country-specific circumstances, such as ownership arrangements and social/cultural influences.

4 Member States preparedness and capacity to meet the requirements of the ESD

In addition to understanding the policy gap for each Member State and the cost-effective abatement potentials in ESD sectors, this project has also looked at the preparedness and capacity of Member States to implement necessary measures for meeting their commitments under the ESD. A high level of preparedness is important for all Member States irrespective of whether they are projected to meet their ESD targets.

4.1 Work carried out

Whilst the value in assessing preparedness and capacity is clear, performing the assessment was more challenging. There are no standard criteria that define each of the characteristics, and whilst there are potentially a wide number of criteria that could be used, all require a degree of subjective judgement.

On this basis a pragmatic approach was adopted. A desk based review was used, drawing upon existing data and reports. This allowed a high-level assessment to be carried out of all Member States using a consistent and comparable approach. However, it required certain simplifying assumptions to hold true. In particular, it assumed that the selected criteria were suitable indicators of the overall preparedness and capacity of the respective Member State.

Following this high level assessment, the specific actions and activities that might be associated with a 'good' level of preparedness were further explored as part of a project conference for ESD stakeholders. This led to the development of a specific report that summarised the main actions, and drawing upon practical experience from Member States, provided examples of good practice in each of the areas. This report *Action Plan for Member States preparing for the Effort Sharing Decision* is attached in Appendix 2.

4.2 Main results

4.2.1 Preparedness and capacity

Out of the 27 Member States reviewed, 10 (37%) were assessed to be well prepared, 6 (22%) were assessed to have average preparation and 11 (41%) were assessed to have poor preparation and capacity to address their ESD targets.

Of the 10 Member States that are assessed to be well prepared, the majority are northern European countries with the exception of 2 southern European Member States. All of the 11 Member States assessed to be poorly prepared are either southern European or eastern European. Of the 6 Member States assessed as having average preparation, 3 are northern European and 2 are eastern European.

An assessment that a country is well prepared is not necessarily an indication that they will meet their ESD targets, more it is an indication that the government is aware that there is a gap and they are engaging in relevant policies and practices to try and close the gap. Likewise poor preparedness does not necessarily indicate that a country will not meet its targets.

Poor preparedness is more an indication of one of the following things: That the country is expected to meet its targets easily and does not recognise the potential value of transfers, that the country is expected not to meet it targets and is either not aware that further action is needed and/or there is little evidence that the country is actively preparing itself to meet the targets.

Table 3: Number of Member States that are expected to meet/not meet their ESD targets and how well prepared they are to address any gaps.

Assessment	Number of Member States	%
Expected to meet ESD targets, good preparedness and capacity	2	7
Expected to meet ESD targets, average preparedness and capacity	2	7
Expected to meet ESD targets, poor preparedness and capacity	6	22
Not expected to meet ESD targets, good preparedness and capacity	8	30
Not expected to meet ESD targets, average preparedness and capacity	4	15
Not expected to meet ESD targets, poor preparedness and capacity	5	19
Total number of Member States assessed	**27**	**100**

The results presented above can be compared with the results from a questionnaire sent to Member States prior to the stakeholder conference that was held as part of the project in November 2010. Of the 9 Member States that returned the completed questionnaire 6 of these agreed with our initial analysis in terms of their overall level of preparedness. Of the 3 that did not agree 2 of these reported themselves as good but were as assessed on the basis of our methodology as poor. This difference might be explained by the fact that certain activities may be underway, but not captured by our simple indicators. Our results therefore represent the worst case scenario in most cases. In the one remaining case our scoring suggested a more favorable level of preparedness than the Member States own scoring.

4.2.2 Action plan

The aim of the action plan is to summarise key actions that Member States may need to take as part of their preparation, and to share examples of actions already taken by others. The action plan includes:

1. A summary of the types of activities that Member States might carry out in order to be well prepared for meeting the requirements of the ESD;
2. Information on when and how these activities could be undertaken, and;
3. Useful examples of good practice with respect to each of the activities.

The different elements within the action plan have been grouped under three headings: analytical framework, operational and legal framework, and strategic framework. A summary of the actions is provided below.

Analytical Framework

1. Understand the future evolution of emissions within the scope of the ESD and the extent of any emissions gap
2. Quantify the impacts of the policies and measures on emissions in ESD sectors
3. Understand the abatement potential and the cost of abatement in ESD sectors

Operational and legal framework

4. Develop an overarching legal framework
5. Co-ordinate responsibilities for ensuring the delivery of the ESD targets
6. Raise awareness of ESD requirements within relevant stakeholder groups
7. Implement measures

Strategic framework

8. Identify the structural and market barriers at country level that need to be overcome to deliver ESD aspirations
9. Develop a strategy for the use of flexibility provisions

10. Analyse the co-benefits of action to deliver the ESD targets
11. Assess the ESD policies and measures in the context of long-term emissions reduction pathways

The action plan provides a high level summary of actions already taken in certain Member States in response to the ESD, as well as actions likely to be required in the future. The action plan is not meant to be exhaustive, nor is it expected that all activities should be applied directly in all Member States. Some Member States may choose to focus more on some activities than on others.

4.3 Future activities

Understanding how well prepared Member States are for meeting the requirements of the ESD is important for targeting EU activities to support implementation. The analysis carried out in this project are therefore useful for informing both approaches to assess preparedness and capacity, and also approaches to help raise capacity.

The assessment methodology includes a number of metrics that have been developed to assess preparedness and capacity. These metrics were expanded upon in the development of the action plan. The Commission may consider repeating this assessment at regular intervals in order to assess the relative progress made by Member States. Some of this monitoring is carried out already, for example by the European Environment Agency, which could easily be built upon.

The analysis also identified a number of areas where additional capacity building would be beneficial. It is notable that the action plan was an output that was developed in response to discussion with Member States at the workshop and was not planned at the project outset. This suggests that Member States have a demand for this type of information, and a desire to learn and share practical experience on the implementation issues (as well the policy issues). The Commission is well placed to provide this co-ordination and facilitation of this process, particularly in relation to ESD implementation issues.

5 Policy case studies

Delivery of the ESD targets it likely to require, at least for some Member states, the implementation of additional policies at a national level. For the main sectors with emissions falling within the scope of the ESD (agriculture, buildings energy use, industry energy use, road transport and waste management) an analysis has been made of selected cases study policies. These are summarised in separate sectoral case study reports.

5.1 Work carried out

The first task was the identification of the case studies. For each of the sectors, the selection of case studies has taken into account the analysis carried out elsewhere in the project. Therefore, the selected case studies aim to demonstrate examples of policies that could deliver the abatement potential, and aim to build upon existing and planned EU wide initiatives.

In the case of building and industry, the focus of the case studies is on policies that can help to realise the energy efficiency potential, by overcoming the existing barriers and market failures. In agriculture the case study policies address emissions both from manure management and from soils. Existing EU wide policies are likely to take up a large proportion of the low cost technology measures in the road transport sector, so the transport case studies focus on emerging technologies and behavioural measures. In the waste sector the Landfill Directive will drive emissions reductions within Member States, but national policies will be required to deliver the targets set out in the Directive. The waste case studies therefore focus on national polices that can be used to help meet these targets.

The table below summarised the case study policies that have been examined for each of the sectors.

Sector	Policies
Agriculture	• Financial support for anaerobic digestion • Mitigation of N_2O emission from soils
Buildings	• White Certificate Schemes • Capacity building programmes • Financial incentives
Industry	• Financial support and incentive programmes • Financial instruments for SMEs • Voluntary/negotiated agreements • Learning Energy Efficiency Networks
Transport	• Financial incentive schemes to stimulate uptake of electric vehicles; • Electric vehicle recharging infrastructure development schemes; • Speed management measures; and • Eco-driving programmes.
Waste management	• Landfill tax • Landfill bans and restrictions

For each of the case studies an assessment was made of the objective of the measure, the main features of the measure, and the example applications of the measure in EU Member States.

The environmental, economic and social impacts were assessed, along with cross-cutting issues such as how the measures may interact with emissions in other sectors. Finally, an assessment was made of how the positive impacts could be maximised to ensure the policy delivers its full potential. Lessons learned were compiled from schemes that have already been introduced, as well as using evidence from the broader literature to suggest how implementation could be improved.

5.2 Main results

The case studies are the main outputs. They provide a reference source for policy makers who are considering developing new policies in the respective policy areas.

5.3 Future activities

Sharing practical experiences on policy implementation is a useful activity for building capacity of policy makers, and the continuation of activities to share these practical experiences would be beneficial. However, it is worth considering what is special about the requirements of the effort sharing decision, and the how this may influence future activities. This may mean that certain sectors that are well targeted by other initiatives (e.g. energy use in buildings) are given less attention, and further efforts are targeted on those sectors where policy development is less well advanced at a national level (e.g. agriculture). However, at the same time it is important to recognise the results of the abatement cost analysis where a large amount of the cost effective potential relates to energy efficiency measures.

6 Communication and outreach

A number of communication and outreach activities have been performed during the course of the project. The aim of these activities has been to: facilitate the sharing of good practices among Member State policy makers and experts; increase the awareness among stakeholders in the EU of the ESD and Member States on their obligations; stimulate discussion of possible options for policies and measures that can be implemented to help meet the requirements of the ESD.

6.1 Work carried out

The communication and outreach activities have focussed on two main elements: stakeholder conferences, and a project website. These are described in turn below. The focus of the activities, the target audience and the communication channels were agreed as part of the project's overall communication strategy.

6.1.1 Stakeholder conferences

Two stakeholder conferences were held in Brussels. The first conference was held in November 2010 and the second in November 2011. The conferences were used to disseminate the results from the project, and to allow further discussion on issues relating to the implementation of the ESD within Member States. Specifically, the conferences provided a forum to discuss policies and measures at Member State level, as well as the actions that need to be taken at Member State level in order to be well prepared for meeting the requirements of the ESD.

The conferences focused on specific sectors that are responsible for the majority of emissions under the ESD. The first conference focused on the transport, buildings and agriculture sectors, with the second conference revisiting transport and agriculture, whilst also capturing the industry sector.

The target audience for the conference were:

- Member State policy makers responsible for the ESD implementation;
- National experts in the main ESD sectors (e.g. transport, buildings, agriculture, industry);
- Sector/branch organisations (e.g. trade associations);
- Environmental Non-Governmental Organisations (NGOs) dealing with climate issues.

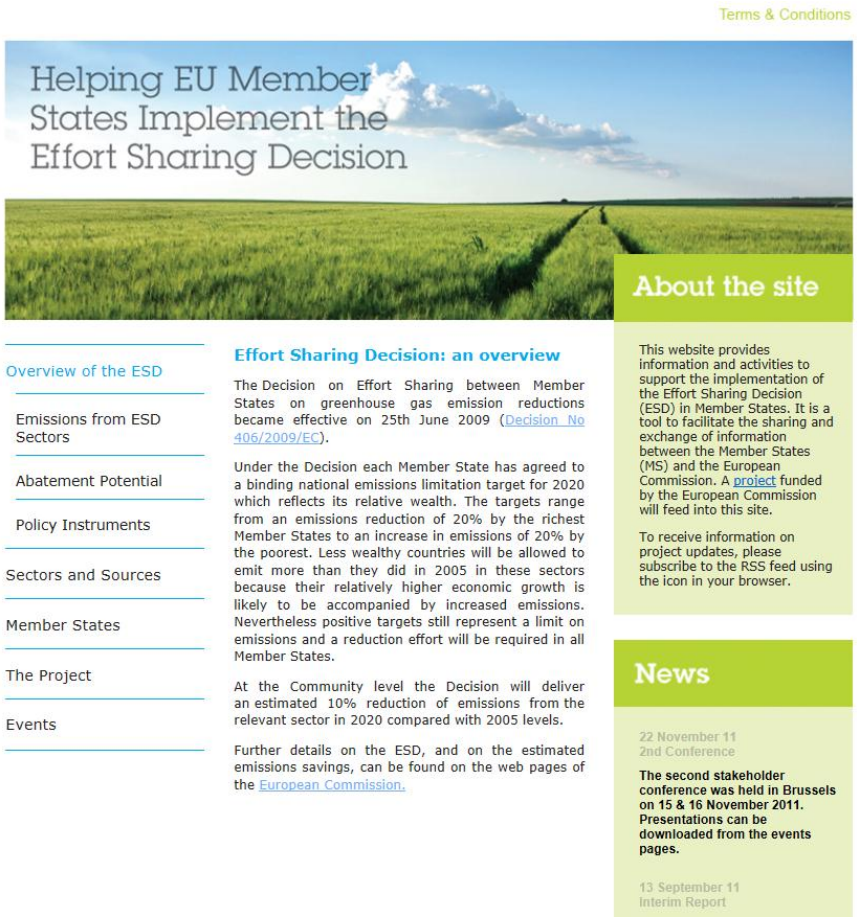
In addition to the two scheduled workshops, a third ad-hoc workshop was held for Member State policy makers on the results from the abatement cost analysis. This workshop provided more detail on methodology that was used to assess the cost of the abatement measures, as well as allowing further discussion on the results.

6.1.2 Website

A project website was designed, built and hosted by AEA as a vehicle for disseminating the outputs from the project. The website including certain background material on the Effort Sharing Decision, but was primarily designed to facilitate the sharing of material prepared during the project. This included the project reports, but also the presentations delivered at the stakeholder conferences.

In order to capture relevant research from outside the project that was relevant to ESD implementation a newsletter was piloted on the website. This document provided a short summary of, and links to, recently published research relevant to the ESD sectors. The newsletter was received well by stakeholders, but was not repeated.

A screenshot of the website home page is provided below. The URL for the website is www.ghgeffortsharing.eu



6.2 Main results

6.2.1 Stakeholder conference

The first stakeholder conference was attended by over 60 delegates, with the majority Member State policy makers.

The conference agenda included the following items:

- Presentations from the project team on the draft results from the project;
- Presentations from invited speakers from Denmark, Finland, France, Germany, Ireland and Sweden on national policies and measures;
- Presentations from the European Commission Directorate Generals for Mobility & Transport, Energy and Agriculture & Rural Development, on EU policies in the transport, buildings and agriculture sectors, respectively;
- An interactive group session on activities required in order to be well prepared for implementing the requirements of the ESD.

The overall feedback from the conference was positive, with 100% of the respondents who provided feedback indicating that the workshop met their objectives. The feedback on the presentations was largely positive, with most delegates scoring the sessions as good. The feedback on the interactive group session was mixed, with some delegates expressing a desire for more time to discuss and share experiences as part of interactive sessions.

The second stakeholder conference was attended by over 70 delegates. Once again the audience was largely made up of Member State policy makers, with selected industry associations and NGOs.

The conference agenda included the following items:

- Presentations from the project team on the results from the project

- Presentations from the European Commission Directorate Generals for Mobility & Transport, Energy and Agriculture & Rural Development, on EU policies in the transport, industry and agriculture sectors, respectively
- Presentations from invited speakers from Austria, Finland, Germany, the Netherlands, United Kingdom on national and regional policies and measures targeting emissions in the ESD sectors
- An interactive group session on the strengths and weaknesses of different policy options
- An interactive group session on engaging with stakeholders in the policy making process

The feedback on the conference was positive, with 96% of the respondents who provided feedback indicating that the workshop met their objectives. Once again the presentations scored well, and the interactive sessions received a more mixed response.

The conference presentations were published on the project website.

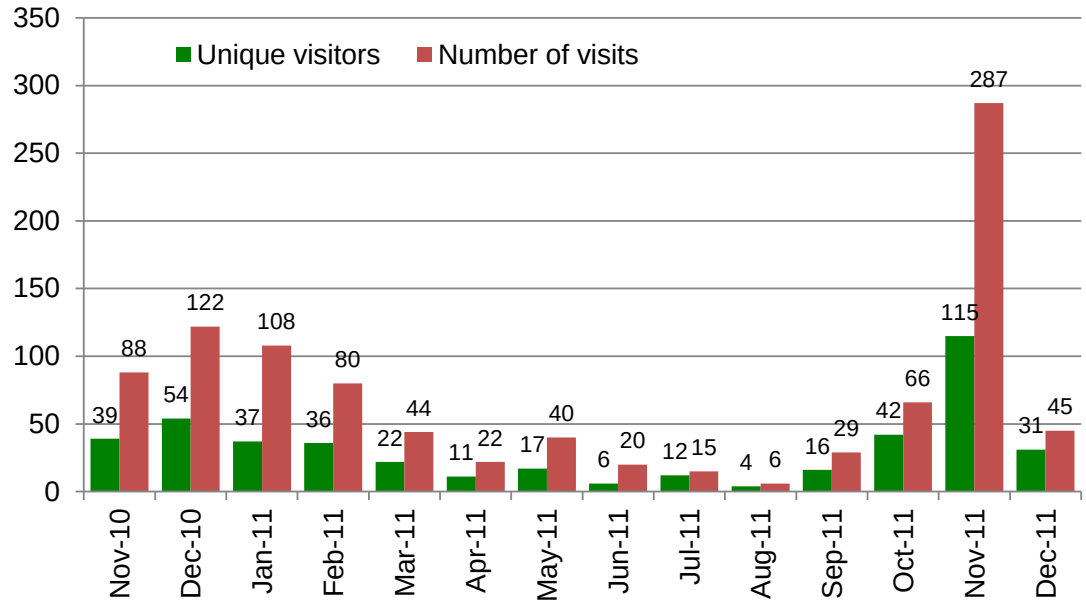
6.2.2 Website

The project website was published in November 2010. A summary of the key statistics for the site are summarised below for the 14 months the web site has been operational.

In total there have been 442 unique visitors to the site[4], and 972 site visits. This suggests a relatively moderate interest in the site (c. 30 visitors per month), but this is perhaps not surprising given the specialist nature of the information.

It is also notable that the site visits are strongly correlated to the project events – for example, the high interest in December 2010 and November 2011 correlate to when the presentations from the conferences were uploaded to the website.

Figure 2: Visitors to the project website



It is also worth noting that over 94% of the site visitors used the direct URL, rather than being directed to the site from a search engine, or linked from another site. This suggests that most visitors to the site had some prior knowledge of the existence of the site.

In terms of the pages on the site that generated most interest, almost half of the visits to the site were on pages relating to the conference, and the associated presentations. A similar number of visits to the site were on pages providing an overview of the ESD, or on pages providing an overview of the project.

[4] This may not be truly unique visitors as the numbers are assessed monthly, so the visits by the same person on different months will be recorded as different visitors.

Interestingly, only a small number of site visitors (27) downloaded the interim report from the project website. This may be explained by the fact that the interim report was circulated to Member State policy makers separately as an email attachment (but the presentations could only be accessed via the website). Slightly more visitors (50) accessed the project newsletter (with links to other ESD relevant material).

6.3 Future activities

The communication and outreach activities were an important part of the project work programme, and this was reinforced by the large interest in the conference material, and to a lesser extent the website. The Commission should therefore consider continuing certain related activities.

6.3.1 Stakeholder conference

The conferences were well attended and on the whole received positive feedback. Delegates appreciated the opportunity to share experience and learn from other Member States. Continuation of these activities, under the coordination of the European Commission, is likely to be of continued interest.

Where activities are continued it is recommended that these focus on aspects related to the Effort Sharing Decision, and the issues associated with its implementation. Whilst Member State delegates at the conference appreciated the presentations on general policy experiences, these experiences are also shared at numerous other events. However, what was unique about the conferences held under the current project was the focus on issues relevant to the ESD. Since these issues are not discussed within any other fora the conferences provided a rare opportunity for Member States to share practical experiences.

The interactive sessions received mixed feedback from delegates, but were effective in stimulating discussions around specific issues, and sharing experiences. Few other opportunities exist for this kind of interaction, so the continuation of some facilitated and interactive sessions is encouraged. However, critical to the success of these sessions is the selection of issues that all delegates are able to engage with on an equal basis.

The conferences highlighted a clear discrepancy between those Member State that were advanced in their preparations for the implementation of the ESD (and for climate change mitigation policies generally) and those that were less well prepared. Future conferences might reflect this directly, by designing sessions aimed at different level of experience. However, at the same time it is important not losing sight of the value of allowing those delegates with less experience to learn from those with more.

In the future it is recommended that any new conferences in this area focus more narrowly on those policy officers involved in the implementation of the required of the ESD in Member States. It should focus on the sharing of experience and best practice relating to the day-to-day activities, and the upcoming challenges related to ESD implementation, of this audience.

6.3.2 Website

The contents from the project website have been moved to the European Commission’s website where the contents can be actively managed in the future.

Appendices

Appendix 1:	Greenhouse gas emissions projections, emissions limits and abatement potential in ESD sectors
Appendix 2:	Action Plan for Member States preparing for the Effort Sharing Decision
Appendix 3:	Case study reports for policies in the agriculture, buildings, industry and transport sectors

Appendix 1

Greenhouse gas emissions projections, emissions limits and abatement potential in ESD sectors

Appendix 2

Action Plan for Member States preparing for the Effort Sharing Decision

Appendix 3

Case study reports for policies in the agriculture, buildings, industry, transport and waste management sectors

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