

EUROPEAN CLIMATE CHANGE PROGRAMME

REPORT – JUNE 2001

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The European Climate Change Programme has been an ambitious force for change, initiated and led by the European Commission. Its mission has been to drive forward EU efforts to meet the targets set by the Kyoto Protocol for the reduction of greenhouse gas emissions. The programme has sought to engage the full range of stakeholders in the process of developing a strategy to cut greenhouse gas (GHG) emissions. It has also promoted the issue of horizontal integration of environmental policy across the Directorates General of the European Commission.

The ECCP is based on the May 1999 Communication “Preparing for implementation of the Kyoto Protocol”¹ and follows up proposals made by the Environment Council in June 1998 and October 1999. The Council urged the Commission to put forward a list of priority actions for common and co-ordinated policies and measures (CCPMs) as early as possible in 2000 and to prepare appropriate policy proposals.

On 8 March 2000, the Commission adopted the Communication on “EU policies and measures to reduce greenhouse gas emissions: Towards a European Climate Change Programme (ECCP)”². The Communication stressed, as on earlier occasions, that greater effort will be needed for the EU to meet its target set by the Kyoto Protocol of reducing greenhouse gas (GHG) emissions to 8% below the 1990 level by 2008-2012. According to the latest Member States inventory data this percentage accounts for 336 Mt CO₂ eq.³

This is the Final Report of the first phase of the European Climate Change Programme. It sets out a series of policies and measures to reduce the EU’s GHG emissions which will go to form the basis of a forthcoming Commission Communication. The report includes both the development of existing policies and new proposals which will form part of the EU’s strategy to combat climate change. Comprehensive information is given on the emission reduction potential, costs and timings of the measures proposed.

1. THE ECCP

1.1. Essential elements of the ECCP

The aim, over the last twelve months, has been to identify and develop within the ECCP the main elements of an EU strategy to implement the GHG emission reduction target set by the Kyoto Protocol. This preparatory work will help the Commission to make concrete policy proposals to Council and the European Parliament later this year.

One of the Programme’s most important features is the multi-stakeholder consultative process, in which relevant players, such as the Commission, national experts, industry and the NGO community have engaged in a co-operative effort. This broad consultative approach was initiated by the Commission to help it to design appropriate policy proposals for the reduction of GHG emissions in all the relevant sectors.

Another distinctive element is that the ECCP is not operating in isolation. Links to existing initiatives in the areas that have an impact on climate change have been made and need to be further developed with the purpose of producing programmes which are coherent, mutually compatible and reinforcing. Some of these measures, such as the commitment made by car manufacturers on the CO₂ reduction of passenger cars, have already been agreed. Others are in progress. The Commission has recently issued a number of proposals covering a range of issues directly related to climate change. These have included proposals for Directives on the Promotion of Renewable Energy Sources⁴, on further liberalisation of the natural gas market in the EU⁵ and a Directive on the Energy Performance of Buildings, an Action Plan for Improved Energy Efficiency in the Community⁶, a Green Paper on the Security of Energy Supply⁷, and

¹ Commission Communication to the Council and the Parliament “Preparing for implementation of the Kyoto Protocol” COM (1999)230

² COM(2000)88 final

³ Community GHG Emissions Inventory Data, Communication to the UNFCCC, April 2001

⁴ Directive on the promotion of electricity from renewable energy sources in the internal electricity market COM(2000)279 final

⁵ Commission Communication *Completing the Internal Energy Market*

⁶ Action plan for improving energy efficiency in the European Community, COM(2000)247 final

⁷ Green Paper *Towards a European strategy for the security of energy supply*, COM(2000)769 final

the revision of the guidelines on state aid for environmental protection⁸. Other initiatives such as the revision of the Common Transport Policy are in progress. Measures identified by the ECCP process have been developed in the context of these ongoing proposals and have been comprehensively integrated with them to produce a consistent programme of policies and measures.

Initiatives coming from the ECCP can be used in two ways. Firstly they will accelerate and give impetus to existing proposals, secondly they will push new ideas which should bear fruit in a somewhat longer time perspective. Therefore the ECCP is a unique opportunity to bring together the different elements of the EU's Climate Change Strategy in preparation for the first commitment period 2008-2012 under the Kyoto Protocol. This report establishes a clear set of priorities based on selection criteria including greenhouse gas emission reduction potential, cost effectiveness and timing.

1.2. Organisation of work

The operational stage of the ECCP focused on the energy, transport, industry, and research sectors, and on the issue of emissions trading in the framework of flexible mechanisms. Agriculture and Voluntary Agreements with industry were subsequently identified as further areas of interest and work in agriculture is ongoing.

Six technical Working Groups (WGs) were established under the co-ordination of the ECCP Steering Committee (SC) covering Flexible Mechanisms, Energy Supply, Energy Consumption, Transport, Industry and Research and these were active from June 2000. A number of WGs opted to establish specific sub-groups. In particular Working Group 5 on Industry, co-ordinates the work of four distinctive sub-groups: "Fluorinated Gases", "Renewable Raw Materials", "Voluntary Agreements" and, together with Working Group 3 on Energy Consumption, a Joint Sub Working Group (JSWG) on "Energy consumption in products and industrial processes". Working Group 1 Flexible Mechanisms co-ordinates two sub-groups "Emissions Trading" and "Joint Implementation/Clean Development Mechanisms - JI/CDM". Working Group 4 Transport co-ordinates five topic groups (TG1: Vehicle Technology and Fuel, TG2: Transport Infrastructure, Use and Charging, TG3: Freight Logistics and Intermodality, TG4: Awareness Raising and Behavioural Change, TG5: Data Validation). Working Group 6 Research established a sub-group on the scientific aspects of "Sinks".

A seventh Working Group Agriculture, was established only in March 2001. It is therefore expected to continue its work beyond the completion of the present ECCP Final Report and conclude its activities by September-October 2001.

The role of the Commission in the framework of the ECCP follows a complementary dual approach. On one hand the Commission is responsible, through the ECCP SC, for the general co-ordination of the Programme. On the other, the Commission is active as a facilitator in the different WGs. From the outset the ECCP has been a challenging integration exercise bringing together Commission services, industry, NGOs, and national experts, and driving forward implementation of the climate change agenda.

1.3. Response from Council and the European Parliament

On 10 October 2000 the Environment Council adopted Conclusions concerning Community policies and measures to limit emissions of greenhouse gases. The Conclusions confirm the choices made in the framework of the ECCP, but at the same time indicate some specific priorities in the transport, energy efficiency and industry sectors that should be developed taking into account the environmental and cost-effectiveness of the measures.⁹

The proposals in the field of transport policy include the following measures: reduction of CO₂ emissions from light utility vehicles; reduction of GHG emissions from air conditioning in vehicles; limitation of the increase of GHG emissions in air transportation; and limitation/reduction of CO₂ emissions from road transport by promoting the use of rail freight and passenger transportation, as well as intermodal and combined transport.

With regard to renewable sources of energy, power and heat production as well as energy use, the Council conclusions call for the promotion of the 12% objective for consumption of renewables; the promotion of the 18% objective for electricity production for combined heat and power (CHP); and the enhancement of energy efficiency in buildings through, amongst other measures, the revision of the Directive 93/76.

⁸ Community guidelines on state aid for environmental protection, COM(2000)

⁹ Common and Co-ordinated Policies and Measures in the European Union - Council Conclusions

The Council also supports the Commission's intention to include other sectors, in particular agriculture, in the second phase of the ECCP. Moreover special attention should be given to the guidelines on environment and state aids and to make proposals in order to reduce/remove fossil fuel subsidies which counteract an efficient use of energy.

The European Parliament Environment Committee adopted an Opinion on the ECCP on 9 October 2000 stressing that policies and measures, whether implemented at domestic or Community level, constitute the priority in the EU Climate Change strategy.

The ECCP Progress Report was presented at the special "Climate" Council on 7 November 2000. Despite the very short time available, the Programme already set out a first list of likely measures in all the relevant sectors taking fully into account the proposals made in the Parliament's Resolution and by the Council. This Final Report refines those results even more.

1.4. The emission reduction necessary by 2012

The most recent figures and projections, contained in the 2000 Monitoring Report,¹⁰ suggest that existing policies and measures ('business as usual') would at best reduce overall EU GHG emissions in 2010 to 1.4% below the 1990 level. According to a more pessimistic scenario policies and measures will merely stabilise GHG emissions at the 1990 level. This would result in a gap in the range of -6.6 % and -8% between the effects of existing policies and measures and the Kyoto target. However, due to considerable uncertainty related to the implementation of policies and methodologies used, concern about the accuracy of this figure must be expressed. In fact data at the European level suggest that the emission reduction to be achieved is - 9%, see section below.

In view of these uncertainties and the difficulties that the majority of Member States face in meeting their commitments under the burden sharing agreement, a reinforcement of policies and measures at EU level will be an important supplement to their national climate strategies.

2. AN ASSESSMENT OF THE GHG REDUCTION POTENTIAL OF POLICY OPTIONS

It has been **one of the main tasks** of the ECCP to assess the potential for GHG emission reductions associated with selected policy options based on environmental, cost and timing considerations. The major analytical work underpinning this part of the programme has been the Shared Analysis Project, the Commission Communication on Preparing for Implementation of the Kyoto Protocol and DG ENV's study on "Economic Evaluation of Sectoral Emissions Reduction Objectives for Climate Change". These elements have been supplemented by additional work undertaken by individual Working Groups.

2.1. Starting from the EU Energy Outlook to 2020

The study "EU Energy Outlook to 2020" published in 1999 in the context of the Shared Analysis Project aimed at presenting a consistent EU energy outlook for the period to 2020. With respect to the climate change issue the study showed that under reasonable assumptions for the period to 2010 (the baseline scenario), it is unlikely that the EU will meet its Kyoto commitments. Instead of the 8% reduction in GHG emissions by 2010, Energy Outlook 2020 projected that CO₂ emissions are to increase by 7%¹¹ while other GHG emissions will decrease. In the period to 2010 the sectors with the fastest increase in emissions are those where energy demand is expected to grow fastest, namely the tertiary and transport sectors.¹²

¹⁰ Report under Council Decision 1999/296/EC for a monitoring mechanism of Community greenhouse gas emissions

¹¹ The impact of the environment agreement with vehicle manufacturers, which is expected to reduce CO₂ emissions by about 80 Mt by 2020, was not included in the baseline of Energy Outlook 2020.

¹² European Union Energy Outlook to 2020, 1999, pp. 93-4. The development of Energy Outlooks is an on-going exercise. There will be an update of the baseline of the PRIMES model, which is used as the tool for producing EU energy outlooks. The revised baseline, expected to be finalised by mid-2002, will take into account a larger renewables penetration, to illustrate the effects of stronger measures in support of renewables

2.2. “Preparing for Implementation of KP” - COM (99) 230

In May 1999, the Commission presented a Communication to Council and Parliament, on ‘Preparing for Implementation of the Kyoto Protocol’ which outlined the necessary action within the EU to enable the full application of the Kyoto provisions.¹³ It stressed the primary importance of implementing policies and measures across all policy sectors.

2.3. The cost-effective approach

But the Communication also underlined the need to prioritise proposals taking into account the reduction potential and related abatement cost of a number of measures in the energy, transport, industry and agriculture sectors. This approach was based on modelling methods which since then have been developed further.

In 1999 DG ENV started the study “Economic Evaluation of Sectoral Emission Reduction Objectives for Climate Change”. The scope was to identify and assess in greater detail policies and measures which could contribute to meeting a Community wide target of greenhouse gas reduction of 8% in 2012 compared to the base year (1990 or 1995 depending on the gas), as specified in the Kyoto Protocol. The results of the study were published in May 2001. For energy related CO₂, the study updated the baseline used in Energy Outlook 2020 and added the most recent information on the other greenhouse gases to the analysis.

Table 1: Reduction potential of GHG under cost-effectiveness aspects for sectors in EU until 2010 (Including full implementation of the ACEA Agreement)¹⁴

Marginal cost €20/tCO ₂ eq	Emissions 1990 or 95 Mt CO ₂ equivalent	Baseline emissions for 2010 with existing measures	Cost-effective potential beyond baseline projection for 2010
Energy sector	1422	-6%	-13%
Industry	757	-9%	-12%
Transport	753	31%	-4%
Households	447	0%	-6%
Services	176	14%	-15%
Agriculture	417	-5%	-4%
Waste	166	-18%	-13%
Total	4138	1%	-9%

Table 1 summarises the key results in the main economic sectors of the study. Column (1) indicates the importance of the different sectors’ overall GHG emissions. Column (2) indicates that, particularly in the sectors of energy, industry and agriculture, existing measures will already generate an emission reduction by 2010 of respectively 6%, 9% and 5%. However the opposite is true for transport and commercial services where, without additional measures, emission increases are expected in the order of 31% and 14% respectively¹⁵.

¹³ COM(99)230

¹⁴ The base year for CO₂, methane and nitrous oxides is 1990. For fluorinated gases it is 1995. The emissions are not exactly comparable with the National Communications; The energy supply sector includes electricity generation, steam generation from co-generation, district heating and industrial boilers, refineries and energy branch consumption as well as methane emissions from coal mining and oil and gas exploration; Industry sector excludes steam production from industrial boilers; Transport baseline emissions take into account the 81 Mt of CO₂ reduction in road transport due to the ACEA/JAMA/KAMA agreement. This is about 10% of road transport emissions. Source: Data from the study “Economic evaluation of optimal sectoral emission reduction objectives for climate change” (May 2001)

¹⁵ There are indications that the growth of transport emissions may be higher than indicated here.

An important conclusion of column (3) is that a cost-effective potential beyond this baseline exists in all sectors, (indicating the availability of measures with a minimum average marginal abatement cost of maximum €20₁₉₉₉ per tonne of CO₂ equivalent). This potential is particularly important in the power sector, industry, commercial services and waste management.

The overall conclusion emerging from the analysis in Table 1, is that to minimise the overall cost of the EU Climate policy for society as a whole (consumers and producers) **every sector should contribute to the objective of the Kyoto Protocol** while the precise intensity of the emission reduction effort needs differentiation. Therefore it would not make sense from a least-cost perspective for each sector to undertake an emission reduction of 8%. Rather, this objective needs to be re-allocated over the different sectors through a cost-effective set of policies and measures. Moreover, the emissions reduction strategy should also take into account that there are policies and measures not primarily aimed at reducing GHG emissions but with beneficial effect.

With such differentiated reduction objectives, the compliance cost for the EU to meet the Kyoto target could be as low as €3.7 billion per annum in 2010. If uniform targets were set for each sector in the Member States, the annual costs could be €20,5 billion i.e. five times higher than with the least cost approach.

The Sectoral Emissions Reduction Objectives study proposed six key areas for work to allow the EU to reach the Kyoto target in the most cost-effective manner. These are identified as being:

- De-carbonisation of energy supply
- Improvement of energy efficiency, particularly in industry, households (retrofitting) and the services sector.
- Further reduction of nitrous oxide from the adipic acid industry and implementation of reduction options in the nitric acid industry.
- Reduction of methane emission in coal mining, the oil and natural gas system as well as waste and agriculture sectors.
- Reduction of fluorinated gases in specific applications, e.g. industrial processes, mobile air conditioning and commercial refrigeration.
- Energy efficiency improvement measures in the transport system

A number of the policy proposals made by the ECCP working groups correspond closely to these measures. However the proposals have now been developed in considerably greater detail with estimated emissions reduction potentials and time-scales for implementation. WG 2 has made a number of proposals relating to de-carbonisation of energy supply, for example, while other WGs propose measures to improve energy efficiency, reform industrial processes, and reduce emissions of fluorinated gases.

The working groups' proposals are set out in more detail in the next chapter, while the fourth chapter of the report draws together a strategy for the implementation of cost effective emissions reductions on the basis of the measures developed by the working groups.

3. OVERVIEW OF SECTORAL CONTRIBUTIONS

The following working group reports are drafted under the sole responsibility of the different chairpersons and of the WG members. The Working Group 7 “Agriculture” section is an interim report. The “Waste” section is not the outcome of an ECCP Working Group but is an assessment made by the Commission of on-going work.

3.1. ECCP WG 1 “Flexible Mechanisms”

3.1.1. *ECCP WG 1 “Flexible Mechanisms”: Emissions Trading*

3.1.1.1. MANDATE

The mandate of the Group was to examine how flexible mechanisms might be further developed within the EU in the context of climate change policy. The Working Group has concentrated on the design principles of an EC-wide emissions trading scheme and the necessary regulatory framework.

3.1.1.2. METHOD OF WORK

Rather than trying to identify and quantify measures that could be taken, the Group has concentrated on issues and choices that will have to be made in order to use such flexible mechanisms within the Community. The discussions that have taken place within the Group, and the Group’s Recommendations (see below) will be of assistance to the Commission. The Commission has also been able to benefit from the experience of members of the Group who are already involved in the development of flexible instruments.

A series of Background Documents have been prepared under the Chairman’s responsibility alone. The views expressed in these documents have been debated by the Group as a whole, and changes have been subsequently made to try to capture the spirit of the discussions. The Chairman’s Background Documents can be found on the Commission’s website at: <http://www.europa.eu.int/comm/environment/climat/eccp.htm>.

On some issues diverging views among the different stakeholders persist. Such differences of opinion include, in particular, whether participation in emissions trading should be mandatory or voluntary for certain “core” sectors. Equally, differences of opinion persisted on whether it is better to make allocations and measure emissions on a “direct” or “indirect” basis (particularly relevant for the emissions from electricity generation). However, in this context, all members agreed upon the need to avoid double counting or the under-reporting of emissions, and that Combined Heat and Power capacity should not be discouraged. Notwithstanding that the Group has concentrated on emissions trading at entity level, it remains the view of a small number of members that EC-wide emissions trading should start between Member States, with the involvement of entities engaged in greenhouse gas emission reductions. Some members believe that relative targets should only have a transitional role. It is also the opinion of some members that if the international rules on JI and CDM are not judged to be adequate from an environmental point of view, then additional rules at Community level on the eligibility of certain types of project, for example, would be warranted. Further consideration of these unresolved issues would be warranted.

3.1.1.3. CONCLUSIONS

An EU emissions trading system must be environmentally effective and economically efficient, simple and transparent.

Policies and measures to tackle climate change, including emissions trading, should endeavour to share effort equitably between all sectors of society and emitters. Preferential treatment of one sector will necessarily have a negative impact on all the others.

Emission trading creates on-going motivation for businesses to seek cost-effective reductions and strive for an optimal resource allocation.

Initial allocation is above all a prerequisite for getting trading started, and there are a number of ways of doing it. A mixture of allocation methods may be the most practical way forward. Furthermore, a progressive evolution towards auctioning is expected over the longer-term. The choice of baseline period for grandfathering allocations will have distributional effects.

It is not that one Member State might allocate allowances for free and another sell them through an auction that necessarily gives rise to distortions within the internal market. The two methods of allocation might be equally demanding in terms of environmental outcome.

Well designed emissions trading should level competition within the EU in a way that other instruments may not be able to do, because each and every company in the trading scheme faces the same carbon market price.

Emissions trading is likely to reduce the overall costs of compliance with the Kyoto Protocol commitments, both to Member States and to European businesses, compared to many alternative measures.

The rules and modalities of trading under the Kyoto Protocol will not be sufficiently complete to impose certain design choices made within individual schemes, such as whether schemes should be “upstream” (targeted at importers and producers of fossil fuels) or “downstream” (targeted at power and heat generators and energy consumers). Similarly, the choice between schemes calculating emissions on a “direct” or “indirect” basis would not be determined by the Kyoto rules, even if the Kyoto Protocol itself uses a “direct” emissions basis for Parties.

Monitoring, reporting, verification and compliance underpin emissions trading systems as the guarantors of environmental integrity and the economic value of permits. Without certainty in terms of what is being exchanged, what obligations there are, and what sanctions will be imposed in the case of non-respect of these obligations, no emissions trading system – individual or collective – will work.

3.1.1.4. RECOMMENDATIONS

GENERAL

Working Group 1 recommends that emissions trading start as soon as practicable. Implementation of emissions trading within the EC should not wait for the progress made in defining the Kyoto mechanisms, and should be developed in the context of, and with a view to influencing the design of, an international scheme from 2008. A pre-Kyoto EC system should be viewed as a “learning-by-doing” process.

An EC emissions trading system should seek to build upon the experience of existing emissions trading markets, while offering a European format to Member States that have not established their own schemes.

The Working Group recommends a Community framework on emissions trading such that a “level playing field” will be easier to ensure, as will the minimisation of economic costs.

Emissions trading should form part of a comprehensive and coherent package of policies and measures implemented at Member State and Community level. The interactions of the Kyoto mechanisms with the existing pool of instruments currently applied must be analysed carefully and negative impacts avoided.

In any future EC emissions trading scheme early actions should not be penalised.

The further development of emissions trading should involve business, environmental NGOs and other groups, in order to ensure maximum support for the schemes developed.

Emissions trading in the European Union should be designed with a view to avoid undue negative impact on competitiveness, in particular for those engaged in global competition.

TYPE & STRINGENCY OF TARGETS

Absolute targets must be at the core of any EC-wide emissions trading scheme. But with appropriate safeguards built in, there can also be a limited role for relative targets.

If relative targets in the form of performance standards are used, they must ensure that – when allowing for growth in output – Member States will still be able to deliver their overall absolute emissions reductions. The same caveat applies to all policies and measures that do not guarantee absolute emissions reductions.

ALLOCATION

Allocation methodologies and their practical implementation should not create systematic competitive distortions.

Member States should be allowed to choose their own initial method of allocation, subject to obtaining any appropriate State Aid approvals. The quantitative commitment required of any source engaged in emissions trading does not have to be the same as the Burden Sharing Agreement target set for the Member State in which the source is situated.

Allocation methodologies should be environmentally effective, which means that they should encourage early action and not reward past inaction.

COVERAGE (GASES & SECTORS)

It should be the objective to cover all greenhouse gases covered by the Kyoto Protocol. The Working group recommends that CO₂ is the “core” gas in the trading scheme, but that other greenhouse gases can be included on condition that monitoring capability is sufficiently robust.

A trading system should be designed with a view to extending it to as many sectors, entities and greenhouse gases as possible, while remaining environmentally effective, economically efficient, simple and transparent. In the initial phase of learning, the trading system should be designed with a limited but substantial number of entities, including in particular the power and heat sector, with a twofold objective: have a sufficiently simple system and obtain a sufficiently liquid market. A secondary emissions trading market could further increase efficiency and liquidity.

INTERNAL MARKET & COMPETITION ISSUES

Generally, in order for allowances allocated free of charge not to be defined as incompatible state aid, the allowances given to an individual entity or source should be no more than the amount of allowances that the entity or source is likely to need to cover its projected emissions in the absence of mitigation effort.

The application of state aid and competition rules to the initial allocation of allowances must recognise that in practice no allocation approach will be perfect, and that there will be some distributional impacts. However, trading allows for least cost compliance options to be used by all participants, and distortions are likely to be temporary.

It should be recognised that the use of the project mechanisms should not contravene the Community state aid, public procurement rules and any other international obligations.

RULES OF OPERATION OF EMISSIONS TRADING WITHIN THE EC

In respect of the denomination of what is to be exchanged (“currency of exchange”), the creation of a single currency is recommended by the Working Group. This should be metric tonnes of CO₂-equivalent, using IPCC conversion factors between different greenhouse gases.

Registries must be compatible with one another. The minimum information required to be kept should be harmonised. Retired permits must, of course, be definitively taken out of the registries of the combined trading systems. Guidelines should be established that ensure full transparency, accuracy and a high degree of reliability.

While banking permits should be permissible within an EC trading scheme, borrowing from future commitment periods should not be allowed for any participant.

LINKS WITH PROJECT MECHANISMS

To complement abatement action at home, use of Joint Implementation and the Clean Development Mechanism by companies should be encouraged. This can be done by recognising JI and CDM credits towards fulfilment of domestic obligations.

Member States and the Community should work together to provide clear and consistent guidance on project eligibility, additionality and baseline criteria under the CDM and JI.

The European Community may fund both JI and CDM projects. The suitability of doing this should be decided with the Member States.

Consideration should be given to the establishment of domestic greenhouse gas reduction projects to generate credits that could be used towards the fulfilment of domestic obligations, including those arising under any possible Community emissions trading system. Such project mechanisms can bring emissions reductions to new areas, provided they are carefully defined to ensure that genuine emissions reductions are delivered. However, care must be taken not to delay the commencement of emissions trading within the Community.

MONITORING, REPORTING, VERIFICATION & COMPLIANCE

High standards of monitoring, verification, reporting and compliance are crucial for guaranteeing the environmental and financial credibility of emissions trading and should be comparable both throughout an EC-wide scheme and between linked national schemes.

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The Working Group recommends co-ordination to guarantee a minimum level of sanctions in an EC-scheme in order to achieve the environmental outcome.

The Working Group underlines the importance of speedy and automatic sanctions in the case of breaches in compliance – given the speed at which markets work. It is of central importance for environmental integrity that financial penalties are substantially higher than the cost of allowances or credits.

Calculation probably offers the most feasible and comparable means of monitoring CO₂ emissions in most cases. The Working Group recommends that existing protocols for measurement, calculation and reporting should be used as far as possible.

The Final Report, of which this is a shortened version, was agreed by members of Working Group 1 at its meeting of 2 May 2001.

3.1.2. ECCP WG 1 “Flexible Mechanisms”: JI/CDM Sub-group

3.1.2.1. INTERACTIONS BETWEEN PROJECT-BASED ACTIVITIES AND A POSSIBLE COMMUNITY SCHEME FOR EMISSIONS TRADING:

Allowing legal entities participating in any emissions trading scheme to use credits from project-based activities would lower compliance costs while promoting the development of clean technologies.

Serious consideration should be given to the establishment of domestic greenhouse gas mitigation projects both within the EU and with third countries to generate credits that could be used towards the fulfilment of domestic obligations, including those arising under any possible Community emissions trading system. Basing these project-based activities as much as possible on the emerging Kyoto rules would give some reassurances about their possible eligibility under JI or the CDM and maximise “learning-by-doing”.

3.1.2.2. REGISTRY ISSUES:

Different project credit serial number should be given to credits from domestic projects approved at national level as opposed to credits from projects registered by the Executive Board of the CDM. Such identification should not prejudice the compatibility of national registries with international emissions trading and UN provisions on registries.

3.1.2.3. COMMUNITY-WIDE EXCHANGE OF INFORMATION ON PROJECTS:

The Community may have a role to play as a clearinghouse for the collection and dissemination of information on JI and CDM projects (opportunities, pipeline, on-going activities, potential projects).

3.1.2.4 MONITORING JI/CDM IMPLEMENTATION AT COMMUNITY LEVEL:

Member States should report on their JI/CDM activities (total of emission reductions achieved, national measures taken or envisaged for the promotion of JI/CDM projects) through the Monitoring Mechanism in accordance with the Council Decision 99/296/EC.

3.1.2.5 MARKET ISSUES:

Competition:

State Aid rules may apply to JI and CDM projects benefiting from Member States’ resources located inside or outside the Community. State Aid supporting JI and CDM projects may be compatible with Treaty competition rules in accordance with State Aid Guidelines for Environmental Protection (2001/C–37/03, OJ C37, 3 February 2001, p. 3).

Transparency:

Adherence to national and Community public procurement rules will help to avoid incompatible state aid or any preferential treatment being granted to national entities that may endanger fair competition or the smooth functioning of the Internal Market.

3.1.2.6 RELATIONSHIP WITH EXISTING POLICIES:

Member States and Candidate Countries shall take existing national and EC requirements into consideration when they adopt national measures for the implementation of JI.

Where available and applicable with regard to energy efficiency and greenhouse gas emission reductions, BAT Reference Documents (BREFs) established for the implementation of the IPPC Directive 96/61/EC should be referred to, amongst other parameters, for the establishment of the baseline scenario for a JI project. Such references should take account of the economic and specific characteristics of the project concerned as set out in the BREF methodology.

3.1.2.7 RULES AT COMMUNITY LEVEL FOR MAKING JI/CDM OPERATIONAL:

With regard to JI:

The Community could play a facilitative role through the establishment of:

Guidelines on baseline setting, taking into account existing experience gained through initiatives developed by Member States and multilateral organisations.

Recommendations on verification or accreditation requirements (for Independent Entities) if these are not dealt with at UNFCCC level.

With regard to the CDM:

There would be no added value in the Community adding further rules to the operation of the CDM over and above those rules that are required to respect the Protocol and its implementing provisions if those are deemed by the Community and its Member States to be sufficient to guarantee environmental integrity.

With regard to both JI and the CDM:

The establishment of a Community voluntary carbon labelling scheme (technology list, sound baseline methods, additionality component, EIA and public participation, fast track procedure) for an early implementation of the project-based mechanisms could reduce transaction costs while giving credibility to JI and the CDM in the long term. The scheme should be opened to environmentally sound technologies only.

3.1.2.8 THE ROLE OF COMMUNITY FUNDING IN THE IMPLEMENTATION OF JI/CDM.

Public funds including Community Funds will have a critical role to play in the implementation of some JI and CDM projects. In this context, Community funds must follow strict rules in accordance with prevailing state aid and competition legislation in order to avoid any crowding out of private capital.

EC public support to JI/CDM investment must be distinct from and not result in a diversion of Official Development Aid (ODA) and Official Aid (OA) and should be separately accounted for in an open and transparent manner in the OECD/DAC statistical reporting system.

Ji and the CDM should be mainstreamed into Community programmes. EC public funds could be employed for the following activities related to JI/CDM:

Capacity building: Support to setting up of appropriate enabling environment including supportive policies and legal frameworks in host countries.

Specific capacity building activities in Candidate Countries: Support through PHARE for the implementation of the Council Decision 93/389 as amended by Council Decision 99/296, to building up monitoring systems required in Article 5 and 7 of the Kyoto Protocol.

Temporary financial support during the design stages of JI/CDM (e.g. private sector promotion programmes).

Complementary or 'gap' funding for JI/CDM investments for projects that have other ancillary benefits (e.g. health, poverty reduction).

Ji/CDM project investments in areas of public or semi-public competence.

One effective way of reducing risk is for the public sector to pro-actively create markets for credits as in the case of the Prototype Carbon Fund or the Dutch ERU-PT programme. ***Setting up a Community Fund for the acquisition of credits would provide economic incentives for private sector to invest in JI/CDM projects*** in addition to those incentives provided for by different EU Member States and other organisations. However, such a Community-wide initiative would have to be decided with Member States and Parliament.

3.2. ECCP WG 2 "Energy Supply"

3.2.1. *Working Procedures and items discussed*

The objective of Working Group 2 is to identify and propose **Policies and Measures (PAMs)** in the area of **energy production and conversion** for the EU's implementation of its Kyoto Protocol commitments. The discussions of the Group followed the scope of issues previously identified in the mandate received from the ECCP Steering Committee.

Working Group 2 has progressed its work through three sectoral meetings and five plenary sessions.

Detailed descriptions of the mandate, the participants in the group and the very valuable information supplied by the "stakeholders" are included in the annexes and will be available on

http://europa.eu.int/comm/energy_transport/en/etf_en.html (*This address may be subject to change*)

3.2.2. *Overview of the energy supply sector on the EU₁₅*

Working Group 2 notes that climate change objectives for energy supply should be **consistent** with other Community policies, particularly the security of energy supply, other environmental policies and the completion of the internal energy market.

After the analysis of the EU₁₅ energy supply, the group concludes that the simultaneous achievement of energy supply and climate change objectives can be best reached by a wide, globally oriented and technology-gear approach, including all energy sources. Two priority orientations are: the reduction of the carbon content per unit of energy supply and increasing the conversion efficiency of fuels to final energy.

Meeting GHG emissions reduction targets in the energy supply sector will have a price - both for the EU industry and the citizen. It can also have benefits, including reduction of pollutants, increasing security of European energy supply and employment creation. The implementation of PAMs should ensure that the emission reduction objectives are met at the least cost and that the efforts are equally distributed, giving attention to the use of market orientated instruments. Moreover, the impact of the currently identified PAMs should affect positively long-term sustainable development.

3.2.3. *Likely policies and measures*

Working Group 2 has formulated **General Principles** for the implementation of PAMs, which are of paramount importance for the cost-effective allocation of sectoral emission reduction objectives for climate change. In particular, WG 2 considers that Community institutions should set up a coherent and coordinated framework of policy instruments, avoiding double or multiple regulation, and providing security for long-term investment in cleaner technologies.

Seven broad areas have been identified. These can be differentiated between those measures to provide emission-reductions in the short-medium term (2001-2010) and those mainly for the longer term (post 2010).

2000-2010 period

- Combined Heat and Power
- Electricity generation from fossil fuels
- Improving efficiency of the energy supply system
- Renewable Sources of Energy
- The exploration, production and transport of fossil fuels

Post 2010 period

- CO₂ capture and sequestration
- R & D for Climate technologies

As a result of the analysis of these areas, WG-2 requests giving preference to the following policies and measures in addition to the implementation of emission trading instruments¹⁶:

The launch of an EU **co-generation initiative**, followed by the adoption of a **co-generation directive (CHP-E)**¹⁷. Support to CHP should focus on efficient CHP systems, which must produce a quantifiable reduction in GHG emissions. The co-generation directive could be launched in 2002¹⁸.

The early implementation of the amended Directive 96/92/EC and 98/30/EC concerning common rules for the internal market in electricity and natural gas.

The Commission's proposal is under procedure in the European Parliament and the Council. The rules should give room for entry to the markets safe climate mitigation technologies in supply and demand.

To support the implementation of **efficiency-increasing measures**, including clean and efficient coal technologies.

To invite the European industry to establish **negotiated** agreements in the form of long-term commitments for a European Energy efficiency and Best practise initiative on conversion of fuels to electricity and/or heat.

The early implementation of the Directive on the promotion of electricity from renewable energy sources in the internal electricity market (RES-E).

The Commission's proposal is under procedure in the European Parliament and in the Council.

To launch an EU initiative aiming at increased environmental benign utilisation of **liquid and gaseous bio-fuels**, followed by a **Directive promoting the penetration of bio-fuels for transport**. The Directive could be launched by end 2001/ beginning 2002.

To launch an EU initiative to promote **heat** production from RES¹⁹. This initiative can be launched in 2002²⁰.

To encourage the energy production industry to continue the efforts on **reduction of emissions of CH₄** from pipeline infrastructure and to promote methane capture from closed coal mines

Ongoing initiatives are being undertaken by the industry on a voluntary basis.

To promote further technological efforts of **capture and sequestration of CO₂** from fossil fuels conversion, that contributes to the future objective of zero-emissions of electricity production from fossil fuels. Should be the subject of Community RTD in the 2001/2010 period.

To create **European space** for R&D on climate, safe and clean energy technologies in the context of the 6th FPRTD.

The European Commission has adopted rules and policy documents, which outline possible future initiatives to promote climate-friendly energy systems, and in particular:

The Community guidelines on State aid for environmental protection (December 2000)

The Action Plan to improve Energy Efficiency in the European Community (April 2000).

Member States and the European industry should take advantage of the framework offered by such initiatives in order to promote RES and energy efficiency in the conversion of fuels.

3.2.4. Cost allocation of GHG abatement

WG-2 has identified a cost-effective (under €20/tCO₂ eq.) potential for additional reductions of 13% in the period 1998-2010, totalling 18% in the Kyoto period. The following shows the details of this potential

¹⁶ The principles and technical aspects of emissions trading have been dealt with by WG 1

¹⁷ Not all participants were equally convinced of the justification for a Directive

¹⁸ On this point see also the outcome of WG3 "Energy Consumption" in section 4 in this chapter

¹⁹ The Environmental NGOs request for a Directive on this issue

²⁰ On this point see also the outcome of WG3 "Energy Consumption" in section 4 in this chapter

Emissions in Mt of CO ₂ eq, (Marginal cost: €20 per tonne of CO ₂)	Emissions in 1990 (1995 for SF ₆)	Baseline emissions in 2010	Kyoto Least-cost reduction Objective In 2010	Kyoto Least –cost reduction objective vs. 1990	Kyoto Least-cost reduction objective vs. 2010
Energy related CO ₂	1269	1233	1072	-15,5%	-13,0%
Energy related CH ₄ , N ₂ O and SF ₆	58	45	42	-27,1%	-5,7%
CH ₄ from fossil fuel extraction, transport and distribution	95	61	51	-46,1%	-15,8%
Total	1422	1338	1166	-18,0%	-12,9%

Source: Table 3 of the long report. *Note:* CO₂ emissions from industrial boilers included in energy supply.

The following CO₂ reduction potential and cost allocations have been identified from the "Economic Evaluation of Sectoral Emission Reduction Objectives for Climate Change" and contributions from some stakeholders.

Potential for CO₂ abatement in MtCO₂ according to cost ranges

Specific abatement costs €/ton CO ₂	<0	0-20	20-50	50-100	100-200	>200
CHP		1	17	47		
Fuels switching in electricity generation		88	25			
Increasing efficiency of fuels conversion			100			
Renewable sources of energy and waste	25	101	18	20	2	34
Reduction of CH ₄ emissions from fossil fuels production	20	14				
CO ₂ capture and sequestration			50			
Other GHG (SF ₆ N ₂ O)		3				
Total	45	207	210	67	2	34

In a "bottom-up" approach, the analysis of the cost allocation of CO₂ reduction identifies a potential of 412 Mt CO₂ eq. (excluding CO₂ capture and sequestration) at a cost below €50 per ton CO₂ eq. and a potential of 252 Mt CO₂ eq. at a cost below €20 per ton CO₂. These results are consistent with the result of the top-down analysis.

3.2.5. The way forward

Current PAMs already adopted or proposed is making the European energy supply system one of the "greenest" power systems of the world.

The following issues still need to be addressed in a future phase of the ECCP:

To get further modelling underway for various subsequent policies analyses, including latest trends on implementation of PAMs. To include one model of a strong renewable penetration, which should bring the EU close to the 12% target for 2010.

As the enlargement of the EU may bring along shifts in the energy supply system of the EU their implications on greenhouse gas emissions should be investigated.

International dimension in the EU's energy supply system is of particular importance. Therefore, links with Clean Development Mechanisms and Joint Implementation should be elaborated carefully.

Links with agricultural and forest policies (biomass) and waste policy (energy recovery from non-recyclable material) should be highlighted. Much more work is necessary to identify coherent policies and measures in this inter-linked area.

Further analysis is necessary on the convenience to give a relative advantage to technologies aiming to reduce the carbon emission per unit of energy supply, either through price or technological incentives.

Members of the working group on energy supply highlighted the importance of holding future meetings, at least annually, in order to take profit of the large consultation process opened up by the ECCP.

3.3. ECCP WG 3 "Energy Consumption"

3.3.0. Procedure Used, Objective and Potential

The **Working Group on Energy Consumption (WG 3)** was mandated by the ECCP Steering Committee to identify, analyse and propose cost-effective and politically and technically feasible policies and measures for the reduction of CO₂ emissions, based on the rational consumption of energy. The buildings sector accounts for over 40% of all energy consumption in the EU and has therefore been given special emphasis in the work of WG 3. Installed equipment and renewables in buildings are also included.

WG 3 participants have included a large number of branch organisations, NGOs and independent experts. Eight Member State National Experts took part, as well as representatives from five Directorates-General. Members of WG 3 have prepared, presented and discussed over 50 written reports on issues, policies and measures at 13 meetings. These documents and discussions have formed the basis for this report.

The ultimate objective of WG 3 has been to facilitate the realisation of the **CO₂ reduction potential** that exists for the buildings sector up to the year 2010. This potential is estimated to be between **220 Mt CO₂ and 247 Mt CO₂**, depending on allowed costs. Around **150 Mt** of this potential can be realised at negative or zero life-time costs by 2010, while an additional **70 Mt** is estimated to cost up to 20 €/tonne. An additional 27 Mt can be realised for a cost of between 20€/tonne and 100€/tonne.²¹

An energy savings potential of between 22% and 40% of energy consumption in the sector has also been identified. An indicative target of one percentage point/year in improved energy efficiency was adopted by the Council in 1998. Realising this target, which is now considered by many to be modest, would realise 18 percentage points of the potential²².

Below, WG 3 proposes an integrated package of **legislative and non-legislative policies and supporting measures**. Potential savings for measures are indicative.

3.3.1. Proposals

3.3.1.1 SCOPE OF PROPOSALS

To counteract and eventually reverse the trend toward increasing energy consumption, it is necessary to implement a number of actions, which include prescribing frameworks such as minimum standards and guidelines while, at the same time, providing information and incentives for consumers, producers, builders, installers, architects and retailers, among others. It is also important to aggregate and focus fragmented consumer demand on energy-efficient technology and best practices and to sanction and empower this demand in networks and consortia. **Behavioural aspects**, such as, e.g., changing concepts of comfort seen in the transition from passive heating and cooling to artificial means and learning effects are also addressed here. Because of rapid technological development, it is important to ensure that all policies and measures have a **dynamic dimension** to ensure that they do not "lock-in" obsolete energy-efficient technology and practices. Rules for frequent revisions of building codes, labelling categories, minimum efficiency standards, procurement guidelines, etc. are therefore necessary to eliminate technological drag and other negative side-effects and to prepare the producers of energy equipment for changes.

²¹Numerous studies have been undertaken to estimate potential savings and CO₂ reduction possibilities in the buildings sector. Results of these vary, depending on the assumptions made regarding economic development, the rate of diffusion of technology, and the shapes of cost, price and learning curves. Options in the entire buildings sector with negative or zero costs represent over 50 % of the identified reduction potential for the sector, using a 4% rate of return. Zero and negative cost options are defined as investments which generate savings that pay back capital costs and cover maintenance, operating and interest costs within the normal, accepted technical life of the technology in question. Source: "Economic Evaluation of Sectoral Emission Reduction Objectives for Climate Change". ECOFYS Study 2001

²² Council Resolution of 7 December 1998. (OJ 98/C 394/01)

3.3.1.2 LEGISLATIVE PROPOSALS

It is generally accepted that legislative measures can be effective and very cost-effective instruments to increase energy efficiency. But legislation cannot effectively act alone, and must be accompanied by adequate implementing measures, reliable information on available technologies, by incentives and market-based measures. An understanding of lead times and learning curves for new technology is also critical to policy outcome. These factors have been reflected in the following proposals.

Proposal for a Directive on the Energy Performance of Buildings

The objective of this proposal is to promote the energy performance of buildings in all Member States by introducing *i.a.*: (1) a framework for an integrated methodology for measuring energy performance; (2) application of minimum standards to new buildings and certain renovated buildings, and regular updating of these; (3) energy certification and advice for new and existing buildings and public display of certificates in certain cases; and (4) inspection and assessment of boilers and heating/cooling systems. The Commission in April 2001 adopted this Directive proposal. Compliance is foreseen by 2004. Also, an initiative for best practices in EU Institution buildings is to precede it. This measure can realise **35-45 Mt CO₂/year by 2010**.

Proposal for an Amended Directive (93/76/EEC)

Directive 93/76/EEC (the "SAVE Directive") has had only limited impact on energy efficiency due to its unusually large degree of flexibility and subsidiarity. An amended Directive 93/76/EEC is expected to strengthen and clarify the Directive's own implementing and reporting requirements, with emphasis on metering of consumption, auditing, third-party financing, and possibly building energy management systems, while mainly **supporting** the above proposal on buildings. It will also cover wider aspects of the metering, monitoring, evaluation and reporting of energy efficiency initiatives. With compliance by 2005, savings of **15-20 Mt CO₂/year by 2010** are predicted.

Energy-Efficient Public Procurement Initiative and Proposed Directive

The objective of this initiative is to aggregate the very large and important demand for energy-efficient technology that exists within the public sector in order to procure, demonstrate, learn about and thus promote increased production volumes and lower costs and prices for new, energy-efficient technology in all end-use sectors. Purchasing routines are of great importance and should be based on Life-Cycle Cost (LCC) when possible²³. Initially, this will be a strengthening of existing voluntary formations of networks of buyers (cities, government agencies, etc.), where *i.a.*, energy-efficient refurbishment of building fabrics and installed systems are addressed. Community support for development of EU procurement and energy management guidelines, information and databases will be provided. The envisaged Directive could consolidate the progress made by voluntary agreements by establishing public procurement principles in conformity with existing Community public procurement legislation. With compliance by 2005, savings of **25-40 Mt CO₂/year by 2010** are possible.

Energy Services Directive Proposal

The objective of this proposal is to complete the internal market for energy by developing and encouraging energy efficiency on the demand side, especially as it is provided by utilities and service companies in the form of energy services. It is envisaged that Member States will set targets to promote and support energy efficiency services, (e.g., third party financing) and programmes, especially for smaller energy consumers such as households and SMEs. This includes a supportive framework for implementation and financing of energy services, adapted to each Member States' liberalised market. A minimum energy efficiency target to be reached through energy services each year is proposed for Member States that corresponds to 1% of the total electricity and gas sales. This proposal is in lieu of additional public service obligations in the Amended Internal Market Directives and the Commission's Amended Rational Planning Techniques Directive proposal from March 1997. With compliance by 2006, this measure may save between **40 and 55 Mt CO₂/year by 2010**.

Combined Heat and Power (CHP) Directive Proposal

Since CHP is generally an energy-efficient supply option which reduces energy consumption, it has been discussed both in WG 2 (Energy Supply) and WG 3. For practical reasons it has been decided that CHP will mainly be covered in the section relating to energy supply, but WG 3 recommends that a proposal for a Directive on CHP be put forward. The aim of the Directive is to complement and strengthen existing measures to promote CHP in line with the Community

²³ See www.lcc-guidelines.com, which is a SAVE project

target of doubling the share of CHP in EU electricity generation from 9% in 1994 to 18% by 2010. See WG 2, regarding possible savings of **65 Mt CO₂/year by 2010**. Modelled to some extent on the Renewables Electricity Directive, the CHP Directive will cover technologies ranging from small-scale CHP in the residential and tertiary sectors to industrial CHP and CHP with district heating, with special provisions to promote small-scale CHP and renewables CHP. In addition, the Directive will address, *i.a.*, (i) the definition and certification of good quality CHP; (ii) national CHP targets; and (iii) grid-connection issues, procedures and permits on a local, national and regional basis.

3.3.1.3 NON-LEGISLATIVE PROPOSALS

*Audit Schemes, Best Practice Initiative and Voluntary Agreements (LTAs)*²⁴

The use of energy and eco-audit schemes enable the most cost effective measures to be identified while best practice and benchmarking illustrate what can be achieved with BATT and BATT+²⁵. Voluntary agreements are then suitably built on these and on labelled products and processes. Agreements are of particular importance for manufacturers, SMEs and even households if financial incentives are offered by Member States to those who invest in energy-efficient equipment and plants. The obvious EU role is to provide harmonised methods, indicators, certification, labelling, networks and support for these. Pilot actions on audit schemes and best practice are ongoing and a new Commission Communication on Agreements is planned, all with a view to strengthen these instruments. **Savings of 20-35 Mt CO₂/year by 2010 are possible.**

Technology Procurement Initiative

The aim is to introduce technology with the energy efficiency dimension specified by bringing together interested buyers and developers of this technology (BATT+). Development support and financial incentives will be encouraged at Member State level with EU support and co-ordination where appropriate. Both common and co-ordinated procurements will be promoted. The ongoing *Energy+*²⁶ project on energy-efficient refrigerators is an example of a current pilot action. Other areas include windows, heating equipment, CHP, heat pumps, solar, etc. **Savings of 15-25 Mt CO₂/year** are considered possible.

3.3.1.4 ORGANISATIONAL AND SUPPORTING MEASURES

European Sustainable Energy Agency (ESEA)

The increasing need for rapid and co-ordinated implementation of Community policies and measures to meet the EU Kyoto commitment lies behind this proposal. The proposal will establish an EU agency for renewable energy sources and energy efficiency. The European Parliament has also identified the need for such an agency²⁷. Working under the Commission with a fair degree of autonomy, ESEA will manage Community energy efficiency and renewable energy programmes such as the continuation programmes for SAVE, Altener, Synergy and parts of the RTD Framework Programme. It will assume responsibility for the SAVE agencies and for the OPET network, using these for the dissemination of results from projects, best practices and new technology. ESEA shall provide the basis for revision of ongoing policies and measures by means of regular progress reports (see 3.3.1.5). It will also have a large international dimension. ESEA's role should be agreed in 2001, with budgetary approval by 2002. The agency should be operative by 2003.

Framework Support for National, Regional and Local Energy Networks

The role of existing energy advisory networks such as Fedarene, EnR and Energie-Cités should be enhanced with more formalised structures in order to contribute more effectively at the local and regional levels to the climate change activities described in this report. This should include targeted awareness campaigns, education and training, the

²⁴ While voluntary agreements usually cover processes and technology used by enterprises, negotiated agreements refer to minimum efficiency standards of energy-using equipment produced by enterprises

²⁵ Best Available Technology and Techniques and recently enhanced versions of these

²⁶ A SAVE-funded project

²⁷ Call for an Energy Intelligent Europe. European Parliament Committee on Industry, Trade, Research and Energy, 2001

monitoring of legislation and an active role in the Campaign for Take-off (see below). Also, more emphasis will be placed on transport systems, especially high performance combined systems, and preparation for a Community initiative in clean renewable heating (RES-H). Consideration is to be given to partial funding of these activities from eco-taxes or climate change levies by Member States. Considerable contact with and support from ESEA is foreseen. Ongoing projects will be accelerated and expanded.

3.3.1.5 MONITORING/INFORMATIVE/EDUCATIONAL AND TRAINING

Monitoring Progress, Public Awareness Campaign and Campaign for Take-off

Monitoring progress and providing benchmarks to do so are integral parts of improving energy efficiency. Reporting this progress on a regular basis is of equal importance and will be the task of ESEA (see above). To focus attention and help measure progress, a Public Awareness Campaign (PAC) and a parallel Campaign for Take-off (CTO) will start in 2002. Their purpose will be to show that energy conservation by means of energy efficiency provides substantial results and that it is an important basis and integral part of all sound, comprehensive Community and Member State energy strategies. In addition, other positive effects, such as improvements in security of supply, the local environment, employment, and competitiveness, will be clearly demonstrated. The CTO will provide indicative targets to measure progress, serve as benchmarks for decision-makers and planners and reinforce the existing campaign for renewable energy sources²⁸

Education and training

Education and training enable citizens, installers, manufacturers, retailers and others to consider more sustainable lifestyles and to choose products and equipment with the lowest environmental costs. Targeted training ensures that appropriate products are selected, correctly installed and maintained. Community programmes will increase public access to EU-wide product information systems, develop university-level educational and self-training modules, and harmonise accreditation schemes for technicians, installers, etc. Ongoing projects to be expanded and legislation to be considered.

3.3.1.6 OTHER CROSS-CUTTING MEASURES

Labelling, Minimum Standards and Certification

A co-ordinated EU- Member State initiative will be undertaken to improve the impact of labelling and certification. The creation of an EU-wide market for certified products will increase the diffusion of and demand for energy-efficient technology. The scheme will also build on a new framework for minimum efficiency standards and be made dynamic to use and drive technological development. Important elements will be (i) revision and extension of the EU labelling scheme to cover installed equipment and processes; (ii) support for internet-based labelling information, including databases; (iii) promotion of labelling in incentive schemes, including home financing, property taxation, green certification, voluntary agreements, etc.; (iv) measures to increase compliance in Member States and (v) rules to ensure regular updates. For further developments see the work developed by the JSWG in the following section.

Institutional, Financial and Other Measures

A range of incentives is required to encourage the purchase of energy-efficient products by moving the time horizon of both the consumer and investor closer to the economic lifetime of buildings, which can be long. EU measures will include: (i) Promotion of VAT differentiation and accelerated depreciation to promote energy-efficient products and practices; (ii) promotion of energy services with low interest loans and third-party financing; (iii) increased consumer information on pay-back periods and real costs; (iv) studies on Member State tax (incl. VAT) levels for efficient technology; and (v) further harmonisation of areas such as State Aid and Structural Fund rules, etc.

²⁸ In addition to a possible revision of the overall Community target of 1%/ year, the following detailed targets for 2010 are given as examples: *reduction in average energy demand by 25% when buildings are refurbished; 1000 large low energy-efficient office building with at least 50% of energy supplied by renewable energy sources; one 'A' labelled appliance and at least two CFLs per household*

3.3.2. Further Work of WG 3

The success of WG 3 has led to the recommendation that the group be asked to continue as an advisory board in the implementation of proposals.

3.4. ECCP JSWG on Energy Efficiency in End-Use Equipment and Industrial Processes

The ECCP Joint Sub Working Group (JSWG) was mandated by the ECCP Steering Committee to identify cost-effective CO₂ reduction potential by the rational use of energy and energy efficiency in end-use equipment and industrial processes, and by the introduction of active energy services particularly to SMEs. The JSWG gathered industry representatives of the end-use equipment (CECED, EACEM, EICTA, CEMEP, CELMA, EUROPUMP, PNEUROPE, ELC) and energy intensive industry (metal industry: EUROFER, EUROMETAUX; non-metallic mineral products: CEMBUREAU, CERAME-UNIE, CPIV; paper & pulp industry: CEPI; chemical industry: CEFIC; electricity industry: EURELECTRIC, and SMEs UEAPME), Member States representatives (UK, D, FI, SP, I), independent experts and NGO's. The JSWG held alternative meetings for end-use equipment and for industrial processes.

The JSWG recommends to establish an EU Products and Processes Information Forum on Energy Efficiency by continuing the JSWG multi-stakeholders dialogue. The Forum shall contribute to policy monitoring and review and to inform the EU strategy on energy efficiency. In this context the JSWG considers market transformation for end-use equipment, consumer behaviour and training of high importance. For industrial processes energy management, training and benchmarking best practices of energy efficiency are of outstanding importance.

3.4.1. End-use Equipment:

The JSWG estimated the consumption of major end-use equipment for the residential, tertiary and industry sectors if no new policies were introduced (Business as Usual (BaU) scenario). Then the JSWG identified the Community (Common) level and other priority policy (Co-ordinated) actions which would be required to deliver the provisional policy scenario and achieve cost-effective energy savings.

A potential of about 170 TWh energy savings was identified. The assumption is that the existing stock of appliances would be gradually replaced by more efficient appliances that are close to the least life cycle product cost for the consumer.

These policy measures include enhanced consumer/end-user information, the fostering of gradual phasing out of less efficient equipment and accelerated replacement of old less-efficient appliances in use and in some cases also change in consumer behaviour. Moreover, the outcome would depend on building and maintaining that consensus view and on a commitment by all the stakeholders to continue to work together to refine and deliver an integrated programme of policy measures at both Community and national levels.

The current policy analysis indicates that most of the identified policy actions would be cost-effective for the Community according to cost and benefit calculations. The reduction in the life cycle cost for end-users would largely offset the additional costs of investments by industry. However, the reduction in the life cycle cost for end-users implies additional costs of investments by industry and, in some cases, reduced revenues with possible social impacts. Balance has to be found to overcome any single sided share of burden.

The analysis of energy saving potential indicates energy savings in the following equipment sectors:

- electric motor systems, by addressing the efficiency and design of the entire motor system and in particular through the accelerated introduction of Variable Speed Drives (VSD), and actions on compress air systems [saving potential 38,80 MtCO₂];
- office equipment in both the domestic and tertiary sectors [saving potential 33.75 MtCO₂];
- lighting in both the domestic and tertiary sectors [saving potential 24 MtCO₂];
- consumer electronics (reduction of stand by losses, especially for STB, and on-mode of TV) [saving potential 14 MtCO₂];
- electric heating equipment: e.g. substitution of electric heating with heat pumps [saving potential 11,25 MtCO₂]²⁹;

²⁹ It should be noted that the emergence of radical new technologies such as fuel cells and micro-CHP and national policy on fuel switching could quickly change priorities for heating systems

- commercial HVAC systems [saving potential 8,28 MtCO₂];
- Domestic refrigeration appliances [saving potential 6,90 Mt CO₂].
- domestic appliances, through early replacement programmes [saving potential at least 5 MtCO₂]
- training and education programmes for consumers/end-users targeting consumer behaviour [saving potential at least 10 MtCO₂]

Recommended Priority Policy Actions for End-Use Equipment:

Based on its consideration of the analysis and on the ongoing activities in labelling and energy efficiency, the JSWG has acknowledged the Commission priorities for Community level policy action.

- The adoption of a new *Framework Directive for Efficiency Requirement of Electrical and Electronic End-use Equipment* to facilitate and accelerate the achievement of ambitious energy efficiency targets to be implemented through minimum efficiency requirements and/or voluntary agreements [adoption by 2003 – effective on the market by 2005 - saving potential to be assessed].
- The adoption of an Directive on the *Environmental impact of Electrical and Electronic Equipment* [adoption by 2003 – effective on the market by 2008 -saving potential to be assessed];
- The *revision of the Energy Labelling Directive 92/75/EC* to provide for additional and effective consumer information [adoption by 2003 saving potential 10 MtCO₂]

The JSWG suggests to launch new policy initiatives or to continue the momentum of current initiatives such as:

- The introduction of the *Motor Challenge Programme* to achieve system optimisation in motor driven processes and accelerate the penetration of Variable Speed Drives [adoption by 2002 - saving potential 30 MtCO₂];
- The conclusion of an *agreement with the lamp manufacturers* to substantially increase the sales of CFLs by 2005 and 2010 [adoption by 2003 saving potential 7 MtCO₂] and the promotion of the *GreenLight Programme* and its expansion into the *GreenBuilding Programme* ;
- The effective implementation of the *Energy Star Programme and of the Code of Conduct for Digital TV Services* [adoption already started - saving potential 13 MtCO₂];

To ensure the maximum benefits from these Community level measures, Member States should be invited to deliver complementary and supportive actions, consistent with the common policy programme and EU projections and scenarios. To this end is the JSW recommends to adopt a EU Recommendation³⁰ or, at least, Guidelines to co-ordinate the Member States efforts:

- to increase the *speed of replacement* of old and inefficient equipment by new and best available technology [saving potential at least 15 MtCO₂];
- to introduce *accelerated depreciation rules* for commercial and industrial equipment;
- to *introduce low or zero-rate VAT* for the most efficiency equipment [class A or above], this measure could be fiscally neutral by an increase of VAT on the low energy efficiency equipment.
- to develop initiatives of research, training and education on changing the consumer/end-user behaviour towards correct and efficient use of equipment [saving potential at least 10 MtCO₂].

³⁰ This might include the revision of existing EU legislation concerning VAT

3.4.2. Industrial Processes:

The reference study for industrial processes was the “Economic Evaluation of Sectorial Emission Reduction Objectives for Climate Change” (ECOFYS study). In particular the JSWG considered the energy intensive sectors of industry (iron and steel, non-ferrous metals, building material, pulp and paper, and chemicals), which covers two thirds of total industry energy consumption. In addition, the less energy intensive sectors such as SMEs have been analysed and in particular the provision of active energy service and schemes to foster the development of energy management. In the course of discussions it became clear that some stakeholders were uncomfortable with the results of the ECOFYS study and that further, more detailed information would be needed to achieve a firm consensus on energy efficiency priorities and measures. The JSWG also noted that energy efficiency contributes to enhance industrial competitiveness and contribute to the industry sustainable development.

There is a strong interrelation among all the measures and programmes identified; moreover the contribution and feasibility of individual actions are strictly linked to other policies not discussed in the JSWG (e.g. Energy tax, tradable permits, environmental permits, etc). The JSWG has identified the need for a *comprehensive energy audit and management scheme* in all sectors of less energy intensive industries and in SMEs. SMEs will also require improved provision of active *energy services*.³¹

Recommended Priority Policy Actions for Industrial Processes:

The working group on process concluded that the following policy actions essential to recover the CO₂ emission reduction potentials in industrial processes.

- The implementation of **comprehensive energy audit and management scheme** (provisionally called **E2MAS³² as an energy section for the EMAS directive**) is the most important measure to foster energy efficiency in industry, in particular in non-energy intensive sector and SMEs. Therefore the establishment of an energy audit and management scheme is highly recommended as a priority. The scheme should particular focus on the non-core processes, which represent about half of energy consumption of industry. This programme shall also foster **training and education of energy managers and maintenance personnel**.
- **Long term agreements (LTAs)** are one of the most efficient instruments in energy intensive industry to improve energy efficiency and to reduce emissions. LTAs have been so far concluded at national level. However, it should be explored if European agreements could be concluded in order to avoid internal market distortions. If this would not be feasible, it is desirable that the Commission develops guidance on target setting, monitoring and reporting, etc. LTAs should aim at achieving the economic CO₂ saving potentials in core processes of energy intensive sectors. LTAs shall also target at establishing energy management schemes in less energy intensive sectors and non core processes of process industries as well as at the application of energy-efficient equipment like motors, pumps, VSDs, furnaces, burners, etc.
- **Making better use of the existing IPPC Directive.** The Directive was not perceived originally for climate change. The Directive foresees already in Article 3 the obligation to use energy efficiently. BREFs should be improved on energy efficiency requirements for individual sectors. National authorities granting the permits shall ensure that energy efficiency requirements **are implemented**.
- Actions to establish support structures (institutional networks) for SMEs for energy efficiency and energy services. The support structures shall help SMEs to implement actions resulting from audits and the proposed E2MAS programme, profit from training actions and foster the implementation of best practices gained from Europe-wide benchmarking.
- The establishment of measures for motor systems, such as the Motor Challenge Programme, which was already described in the equipment section.

³¹ The JSWG did not discuss the potential of CHP, however there is a large contribution of CHP to industrial energy efficiency. In particular the saving potential associated with LTAs includes the introduction of CHP whenever it is cost effective

³² Based on a proposal suggested by EURELECTRIC

3.5. ECCP WG 4 "Transport"

3.5.1. Working procedures

The ECCP-Working Group Transport has considered all modes of transport with respect to measures, which in addition to a reduction of greenhouse gas emissions also could have other beneficial effects, e.g. increase in transport efficiency and reduction of environmental impact in other areas. The working method as set out by the mandate followed a bottom-up approach with the aim of identifying cost-effective packages of the most promising measures resulting in greenhouse gas emission reductions with a time horizon of the Kyoto Protocol (2010) and an appreciable effect already within a few years. The Working Group Transport has elaborated the concrete work with experts in five Topic Groups (TGs):

TG1: Vehicle Technology and Fuel

TG2: Transport Infrastructure, Use and Charging

TG3: Freight Logistics and Intermodality

TG4: Awareness Raising and Behavioural Change

TG5: Data Validation

Other already existing expert groups also have contributed:

An **Aviation Subgroup** evaluated studies from various institutions including ICAO and IPCC. Technical, traffic management and market based measures with a potential for greenhouse gas emission reductions have been identified.

A **Joint Expert Group on Transport and Environment** co-ordinated by DGs ENV and TREN, in their report of 9/2000, have listed a large number of policies and instruments/measures which can reduce greenhouse gas emissions.

A **Joint Expert Group on fiscal measures** is studying the possibilities of establishing a fiscal framework in order to achieve the emission strategy target of 120g CO₂/km for new passenger cars.

Enhanced Environmentally friendly Vehicles (EEV) are under investigation in a specific group co-ordinated by DG ENV and DG ENTR. A possible basic concept has been developed.

3.5.2. Likely measures and orders of magnitude

The policies, measures and instruments proposed have been evaluated to the extent possible on the basis of existing data, using the harmonised criteria:

Potential for reduction of greenhouse gas emissions

Time scale of realisation

Mitigation costs

Impact on other EU policies

The aggregated list of measures identified by the Working Group offers a potential in greenhouse gas reductions largely exceeding the **least-cost share of the transport sector of 38 Mt CO₂ eq.** as identified in the EU Study on the "Economic Evaluation of Sectoral Emission Reduction Objectives for Climate Change" of March 2001. The numbers for expected CO₂ savings given in this report, however, present simplified estimates for the potential and are not fully additive. The uncertainty of the effect of these measures will remain high until careful monitoring can reveal the benefits.

Environmental Agreement with car industry on reductions of CO₂ emissions from Light Commercial Vehicles, with a potential for CO₂ saving of possibly **5 - 10 Mt/y**. Improvements of Light Duty Vehicles are particularly important in view of their expected strong increase in number over the next years due to a rapid expansion of e-commerce.

Technological improvements in passenger cars and fuels not covered by car industry commitments, with a potential for CO₂ saving of order up to **40 Mt/y** through the introduction of EEV concepts, improved mobile air conditioning, low-sulphur automotive fuels, conversion of conventional vehicles to alternative fuels (LPG, NG, biofuels) and introduction of advanced combustion engines, fuel cell and hydrogen technologies with a view of 20% market share for alternative fuels in 2020 as set out by the Green Paper on the Security of Energy Supply.

Improvements in transport infrastructure use and charging, with a potential for CO₂ saving of possibly **40 – 60 Mt/y**. The use of Intelligent Transport Systems (ITS) with a wide range of telematics applications may allow overall reductions of 3-5% of total transport related CO₂ emissions. Maintenance of the infrastructure and improvements in vehicle loading capacities contribute to transport efficiency, thereby reducing the emissions per journey.

Fiscal measures have been estimated by experts of TG2 to offer a potential for of **17 Mt/y**. The underlying price elasticities in this area should be re-assessed on the basis of growing experience with eco-taxes on fuels in several Member States.

Freight intermodal/multimodal transport and logistics efficiency improvements offer a large potential for CO₂ saving of up to **50% in certain sectors**. Several proposals have been developed by rail, road and infrastructure companies to facilitate and encourage multimodal/combined transport, ports, and inland terminals measures as well as to facilitate road/sea transport. Considerable savings already have been achieved in local or company based schemes. Extrapolations to EU wide application are difficult to quantify due to large uncertainties in the total transport volume which can be targeted, and due to regional specificities. Benchmarking and dissemination of information on best practice should be used to provide fast market penetration of the schemes outlined in the detailed report of the Working Group Transport (see Annex).

Awareness raising and behavioural change in car usage offers a potential for CO₂ saving of at least **50 Mt/y**. An EU wide awareness programme should point out the economic benefits of attention to fuel consumption. A lasting affect has to be assured through a sustained impetus to the action. While a bundle of incentives and regulations can rapidly lead to short-term results, the long-term effectiveness will come only from successful eco-driving education.

Data for assessment and monitoring of the proposed measures should be provided with better quality for all modes of transport according to the recommendations from the **data validation group**. Emphasis should be placed on **road transport**, the largest contributor to greenhouse gas emissions from transport and **aviation**, the fastest growing source of greenhouse gas emissions. **Transport models** should further be developed and updated for regular assessment of the effectiveness of policies in force and new policies proposed for implementation.

3.5.3. Further work

Consistent studies on the agglomerate potential and full cost-efficiency comparisons should still be carried out. Options in setting priorities therefore are left for the implementation process and will also depend on other strategic objectives of the Common Transport Policy.

3.6. ECCP – WG 5 “Industry”

3.6.1. ECCP - WG 5 "Industry": Fluorinated Gases

3.6.1.1 MANDATE AND SCOPE

The objective of the Working Group on fluorinated gases under the ECCP was to develop the basis for a framework of an EU-policy to reduce emissions of the fluorinated greenhouse gases addressed by the Kyoto Protocol (HFCs, PFCs and SF₆) in a cost-effective way.

The group of experts involved in the ECCP Working Group on fluorinated gases comprised participants from Industry, Environmental NGOs, Academia, Consultancy, Member States and the Commission. Under the work programme of the group, all major sectors accountable for emissions of fluorinated gases have been covered in 9 full-day meetings between June 2000 and April 2001.

Emissions of fluorinated gases emanate from a wide range of sources in markets with very different characteristics. Among the sources examined³³ in this working group were refrigeration and stationary air conditioning, mobile air conditioning, HCFC 22 production, technical aerosols, foams, semiconductor production, SF₆ in tyres and windows, metered dosed inhalers, solvents, fire fighting, aluminium production, magnesium production and casting and gas insulated switchgear.

³³ A number of recommendations have been made for each sector. These sector specific recommendations are addressed in the long version of the ECCP final report

3.6.1.2 POTENTIAL EMISSIONS REDUCTION AND GENERAL CONCLUSIONS

Participants broadly agreed with the consultants' estimates that fluorinated gases contributed about 2% (65 MT CO₂ eq.) of overall EC greenhouse gas emissions in 1995. Views on the likely future evolution of these emissions levels varied but fell into the range of 2-4% of total emissions by 2010. The group agreed that this potential growth warrants specific action from regulators and industry to limit emissions of fluorinated gases. It was clearly established that there is significant potential for the reduction of emissions of fluorinated gases in most markets segments.

The estimated cost effectiveness of individual emission reduction measures varies considerably. The following general findings were made:

Very few of the measures for an emission reduction of fluorinated gases have the excellent cost effectiveness exhibited by certain energy related CO₂ reductions (i.e. emission reduction combined with cost savings).

Many measures have good or reasonable cost effectiveness in the range of €1 to €50 per tonne CO₂ saved. It is estimated that some 30 MT CO₂ equivalent per year (of projected 98 MT CO₂ eq. per year total business as usual emissions in 2010) can be reduced at less than €20 per tonne CO₂ eq. and another 20 MT CO₂ eq. per year at less than €50 per tonne of CO₂ eq.

Some measures are much more costly, in the range of €100 to €500 per ton, and would not necessarily be the best use of resources.

3.6.1.3 MAIN RECOMMENDATIONS

Recommendation 1: Make a clear political statement on the importance of reducing fluorinated gas emissions

Recommendation 2: Establish a regulatory framework in a "Community Directive on Fluorinated Gases"

The key objectives of such a Directive would be:

- Improved monitoring and verification of emissions of fluorinated gases.
- Improved containment of fluorinated gases.
- Marketing and use restrictions in certain applications, such as SF₆ in tyres and windows.

Recommendation 3: Use existing or planned EU legislation³⁴ to the extent possible for the reduction of fluorinated gases

Recommendation 4: Examine the appropriateness of selected voluntary agreements primarily in the semi-conductor, switchgear and foam sector

Recommendation 5: Carry out integrated, independent assessments of relevant technologies in order to facilitate a comparison between the use of fluorinated gases and alternatives

Recommendation 6: Promote the development and appropriate use of alternative Fluids and not in kind (NIK) technologies

³⁴ The working group noted that policies should not undermine the phase out of ozone depleting substances under the EC Regulation 2037/2000. Integrated Pollution Prevention and Control Directive (IPPC), Waste Electric and Electronic Equipment Directive (WEEE) and End of Life Vehicle Directive are other examples for important potential links

3.6.2 ECCP WG 5: Renewable Raw Materials

3.6.2.1 MANDATE AND SCOPE

In this report we focus on the relatively recent use of renewable raw materials (RRM) in the chemical industry sector, where in past decades products were manufactured almost exclusively from fossil materials (crude oil and natural gas). Potential benefits of using RRM as feedstock are a reduction in the use of fossil resources, reduced CO₂ emissions and waste problems, as well as reduced general emission. There are potentially new business opportunities for European enterprises and the creation of new employment opportunities.

3.6.2.2 WORKING PROCEDURES

Meetings with industry/supplier representatives and external experts' consultation were made in order to gather the information and reflect the industrial applications. The work focused on four product areas: on polymers (plastics), lubricants, solvents and surfactants.

In order to assess the total energy and CO₂ reduction potential, it is necessary to take a systems approach covering all steps from the raw material supply to manufacturing of the end product its use and waste phase (cradle-to-grave approach). The figures on CO₂ savings presented in this report are therefore based as far as possible on life cycle assessment studies (LCA).

3.6.2.3 PROPOSED MEASURES

General policy measures to facilitate a wider introduction of renewable raw materials in European manufacturing industry are listed in Table 1. This includes a modified common agricultural policy (CAP) creating new opportunities for European non-food agriculture.

Table 1: Suggested general policy measures to promote a wider use of renewable raw materials.

Objective	Suggested policy measures
Secure sufficient and stable supply	Innovative inclusion of RRM requirements in future development of CAP (Common Agricultural Policy), with particular attention to enlargement and WTO
Improve scope for application as well as technical and economic performance	Promote basic research on RRM Provide for the possibility to apply bio-technology Support applied research, demonstration projects , support for market development
Fiscal incentives	Tax incentives for RRM based products
Remove barriers inherent in the chemical registration (EINECS/ELINCS) system	Adapt EINECS / ELINCS system to account for RRM specifics, adapt new chemical policy to the same effect
Facilitating commercialisation and creating economies of scale for renewable products.	European or International Standards Public procurement favouring products partly or fully based on renewable raw materials. Venture capital for emerging industries based on RRM

Stimulating demand and consumer awareness (also on environmental benefits) for products based on RRM	Adapt EU ECO-labelling scheme to RRM based products in case of proven environmental benefits. Information campaigns
Provide for coherent approach and political attention for the short, medium and long term	Create European Commission inter-service task force on RRM White Paper on RRM Technology roadmap for RRM Develop monitoring and benchmarking of progress
Making bio-degradability and non-toxicity relevant to the consumers.	Improve infrastructure for separate collection and treatment of biodegradable materials (especially polymers) Adapt waste legislation
Favouring use of biodegradable and non-toxic lubricants in applications where there is a high risk for leakage to the environment.	Legal requirements for biodegradable lubricants in sensitive areas with the intention to promote RRM Enforcement of legislation in place Incentives for outdoor machinery using biodegradable lubricants.
Inclusion of RRM in GHG emission trading	CO ₂ credits for manufacturers/users of RRM

3.6.2.4 POTENTIAL CO₂ SAVINGS

Estimates for the greenhouse gas (GHG) reduction potential have been made by taking into account projections of **the market development** until 2010, either in the absence or in the presence of policies and measures (P&M) that would promote a wider use of RRM.

Table 2: Primary GHG savings due to the use of RRM as a chemical feedstock (expressed as CO₂) equivalents) secondary savings are not taken into account, see table 3. (N/A = not available)

Application area	Savings of GHG emissions in 1990 (compared to no use of RRM) (kt CO ₂ eq.)	Savings of GHG emissions in 1998 (compared to no use of RRM) (kt CO ₂ eq.)	Estimated GHG emission reduction by RRM in 2010 relative to 1998, without P&Ms (kt CO ₂ eq.)	Estimated GHG emission reduction by RRM in 2010 relative to 1998, with P&Ms (kt CO ₂ eq.)
Polymers	N/A	< 50	2 000	4000*
Lubricants	N/A	200	800	3500
Solvents	N/A	N/A	1 000	N/A
Surfactants	~1200	1 500	0	660
Total savings	N/A	~ 1700	3800	~8200

* Reports on “life cycle assessment of Mater-Bi and ERS Loose Fills” Composto, Olten/Switzerland, July 2000; and “life cycle assessment of Mater-Bi bags for the collection of compostable waste, Olten/Switzerland, September 1998

Table 3: Examples of **secondary GHG savings** related to the performance of RRM based products (expressed as CO₂ equivalents). Secondary savings can be considerably larger than primary savings.

Application	Replacement	Specific Assumptions	Total European potential GHG savings (kt/year)
Bio-fillers for tyres	50% of traditional fillers (carbon black and silica)	Reduction potential –9.52g CO ₂ /Km/Car 10000km/Car 150M cars	~15000
Motor & Gear Oils	Mineral Oils Chemical additives	Reduction of fuel consumption by 3 to 5 %	>10000

3.6.2.5 OPEN ISSUES

In contrast to secondary savings, the primary GHG saving potential is rather modest. For the sake of “Kyoto relevance” total emissions would need to be assessed, too. However, in the long run and making use of biotechnology large reductions of CO₂ emissions could be achieved by producing bulk chemicals from bio-mass feedstocks.

No detailed assessment of costs in relation to the wider use of RRM could be made. Estimates indicated that the changeover to more use of RRM can result in actual financial savings for the end users of these products or in higher extra costs caused for instance by necessary changes in production processes and increased raw material prices. For large market volumes, however, costs compare well with those encountered with “conventional” products. However, specific political measures will have to be taken to mitigate any additional costs related to the implementation phase in industry.

3.6.3 ECCP WG 5: Voluntary Agreements

3.6.3.1 AIM

The sub-working group explored the role of Voluntary Agreements (VAs) in contributing to addressing the issue of climate change.

3.6.3.2 ITEMS COVERED

The sub-working group explored a number of key themes:

National and EU experience with VAs and lessons from their application as well as needs for supporting initiatives;

Lessons on “technical” aspects of VAs for EU and national practice, including: emissions reference year and baseline development; target setting; monitoring, reporting and verification; and measures for non-compliance;

Interactions between VAs and emissions trading (ET) and other instruments (e.g. taxes; regulation, permitting and the Kyoto mechanisms – Joint Implementation (JI) and Clean Development Mechanism (CDM)).

3.6.3.3 BACKGROUND

VAs can include a variety of types of agreements, ranging from self-commitments by industry, (de-facto) recognised by public authorities or not, to contractual agreements between industry and public authorities. The conclusions and recommendations of this report exclude pure self-commitments that are not recognised by public authorities.

Apart from the legal status, a large variation exists in the practice of VAs for climate change. Some VAs are concluded by associations, others by companies; some VAs focus on greenhouse gas emissions, others on energy use; some VAs contain absolute targets, others relative targets, and yet others are more VAs on process; some VAs are launched with explicit linkage to other policy instruments, whilst others are more stand-alone.

Industry tends to be positive towards VAs, as they offer the flexibility industry needs to build effectively on its knowledge of abatement options. Since VAs are undertaken voluntarily, industry argue they have the extra element of motivation for delivery. NGOs, on the other hand, tend to prefer other instruments over VAs given concerns that VAs will not credibly offer reductions in greenhouse gas emissions that are substantially more than those achievable under “business as usual”.

3.6.3.4 CONCLUSIONS

Extensive stakeholder consultation across Member States Ministries, European Commission DGs, industry associations, NGOs and independent experts, have led to the following conclusions:

A distinction must be made between Climate Change VAs that are process emissions based and those that are product emissions based. A distinction should also be made between direct emissions and indirect emissions.

Reasoned arguments and experience to date suggest that in most cases national level VAs are more appropriate for process related emissions. For internal market reasons, agreements related to products may be more efficient at EU level, provided environmental effectiveness is not compromised.

All agreements need to have targets, monitoring and reporting mechanisms and a system of verification, but it is not possible to require a particular format for all agreements. The final form needs to be assessed on a case by case basis, taking into account good practice.

VAs do not tend to be stand-alone instruments, but linked explicitly or implicitly to other policy instruments. The effectiveness of VAs may increase when part of a “package” of instruments.

VAs can be seen as a long term instrument for addressing climate change, and have a potential role both in parallel to ET and the Kyoto mechanisms, and with a direct linkage to ET and JI/CDM.

VAs that can link to ET are likely to be those that deal with process emissions and for companies and sectors that are eligible under ET. VAs could form a basis for subsequent trading or VAs could be explicitly linked to trading, eg. with trading being an instrument to meet VA targets, or for VAs to facilitate trading.

3.6.3.5 RECOMMENDATIONS

The members of the sub-working group agree on the following:

VAs could be used to address climate change as part of an appropriate mix of policy instruments. An EU level agreement would only be appropriate if it has added value to a VA at national level. The decision to enter into an EU level agreement should be taken on a case by case basis, depending on, inter alia, the problem to be addressed, the likely environmental effectiveness, the type of sector, the number of players involved, and internal market concerns.

For a VA to be successful, it should: be carefully designed and monitored; be negotiated in the presence of credible alternative instruments; be implemented with recourse to appropriate sanctions and incentives; adopt transparent and open reporting that does not impinge on concerns of commercial confidence; include independent verification; and be launched where the government has appropriate technical capacity to negotiate and monitor the agreement. Furthermore, the quality of target setting is a key success feature, and for longer agreements there should be a mechanism for reviewing and renegotiating the targets.

Lessons from existing EU and Member States’ practice could usefully be summarised and developed into EU Framework Guidelines for good practice. Such guidelines could include recommendations for minimum considerations that *national VAs* should follow and items that have to be addressed by all agreements (monitoring, target setting, compliance systems, verification etc). This would help ensure minimum quality agreements while at the same time addressing internal market concerns related to separate approaches by the Member States, and help ensure that national level agreements are consistent with EU climate change objectives and competition rules. This should build on the 1996 Commission Communication on VAs and could take the form of guidelines, best practice examples and a toolbox (e.g. of emissions inventories, evaluation and monitoring techniques, including benchmarking).

It is recommended that a framework for *VAs at EU-level* be developed. This framework should provide a transparent procedure and contain a number of core principles, such as target setting, measures for ensuring compliance, independent verification and monitoring. The framework should build on the guidelines of the 1996 Commission Communication on Environmental Agreements.

There is a need for early consideration of the implications of a potential future linkage to Emissions Trading (ET). If a future linkage is envisaged, the VA must be designed to ensure an efficient instrument and smooth linkage to ET. This would require that targets, monitoring schemes and compliance systems are compatible with those of ET schemes.

3.7. ECCP WG 6 "Research"

3.7.1. *Working procedures*

The Working Group Research met four times in Brussels during regular intervals from 27 June 2000 -26 April 2001. A working sub-group on the scientific aspects of sinks was set up at a later stage in order to examine this particular issue. The sub-group met twice.

There was a broad consensus on the proposals included in this report. However, some stakeholders expressed some concern about the policy consequences of some of the issues, in particular on sinks -where some important results and suggestions had only been forwarded very recently- and on the technology related research needs which also were put on the agenda at a late stage when it turned out that no other Working Group was dealing systematically with them. The stakeholders suggested that the dialogue should continue on those issues.

3.7.2. *The mandate the scope and the policy context*

On the basis of the mandate (see annex VI for objectives and participants) the Working Group worked around the following four tasks:

- a) Collect information and synthesis of RTD results related to Kyoto implementation.
- b) Assess future RTD needs for understanding and mitigating climate change.
- c) Analyse the scientific aspects of carbon sinks, other gases, global observation.
- d) Mobilise European RTD resources on climate change and propose practical initiatives.

As to the scope, it was stressed that the research community should expand its vision beyond the Kyoto targets and timetables because, even if the Parties meet the Kyoto targets, the human disturbance of the climate system will remain a long lasting problem.

The **policy context** is well defined by both the UN Convention on Climate Change and the Kyoto Protocol which include research among the policies and measures for emission limitation and reduction and sustainable development. **The two instruments explicitly encourage the signatories to promote and co-operate in scientific, technological, technical, socio-economic and other research as well as systematic observations.**

3.7.3. *Valorisation of existing results; carbon sinks*

The Working Group requested the Commission to launch a process for the collection of finalised RTD projects carried out at European level related directly or indirectly to Climate Change and make a synthesis of the most policy relevant results.

It was recognised as an indisputable element that European research, either directly or indirectly through the IPCC process has contributed considerably to the present state of knowledge about climate change as well on mitigation and adaptation technologies and strategies.

Due to its urgency and importance, the Sub-Group on Sinks compiled existing research results on carbon sinks and measurement and pinpointed uncertainties and gaps in knowledge and in methodology, as well as priority research needs, such as those listed in the annex of the final report of the WG 6.

It was confirmed by the most recognised European scientists that strategies, observational and modelling techniques have been developed by various European research groups that can be used to detect land based carbon stock changes in Europe. They can also verify in the atmosphere the carbon sink strength of the terrestrial biosphere and its changes. A combination of methods and approaches should be used to narrow down uncertainties that are associated with the estimates of carbon stocks. These methods could also serve as the basis for reporting, accounting and verification requirements under the Kyoto Protocol.

The methods available should be developed further in order to ensure the sound implementation of all the folds of the Kyoto Protocol. There is a need to better quantify carbon stock changes and to minimise uncertainties, standardise carbon ecosystem inventories and harmonise data collection. Consequently, further research is needed to improve our understanding of the natural process and elaborate on very basic elements in carbon inventories.

3.7.4. *The emerging proposals*

Climate research and the stimulation, through the appropriate policies, of technological development and innovation should become a structural element of the ECCP in parallel to good management and to efficient regulatory and economic instruments. More steps are required to define further, with accuracy and certainty the evolution of the phenomenon of climate change and its potential impact on the ecosystems, the society and the economy. More research is certainly needed for the development of cost-effective energy technologies and related actions and methodologies which mitigate the climate change. For safeguarding environment it is important to invest in research and to developing new methodologies and technologies for making climate change mitigation more cost effective and socially acceptable.

In this context, the Working Group made 9 proposals along the following lines with a view to mobilising European research for the ECCP. These proposals can be group in four categories.

- To deepen scientific and technological research relevant to climate change, improve current knowledge and infrastructure.
- To increase the efficiency of scientific and technological research in Europe by bringing together and networking the best institutes and national programmes.
- To bring closer researchers to policy making with the view to provide scientifically sound support to policy making.
- To reinforce the participation of European researchers in the international scientific structures and in particular in IPCC.

More specifically, it is proposed to:

- 1) Continue and further develop research for climate change in the new Framework Programme.
- 2) Provide support to research infrastructure
- 3) Materialise the Global Monitoring for Environment and Security (GMES)
- 4) Network the European efforts in climate and energy research. Co-operation with MS national programmes and international co-operation.
- 5) Establish a Reference system for greenhouse gases emissions measurement in Europe.
- 6) Establish a Forum on economic, energy and environment modelling (E3)
- 7) Promote open and sound scientific data management and exploitation.
- 8) Establish of a scientific "Help Desk" for climate negotiations
- 9) Encourage European participation in IPCC

Implementation can start gradually as early as 2002 and continue, at least, throughout the life of the new Framework Programme till 2007.

3.7.5. *The means*

The recent Commission initiative for establishing the **European Research Area** and the **new Framework Programme** provide the means for the implementation of the above proposals.

The Commission's proposal for the new Framework Programme offers, indeed, climate related research a prominent place among its priorities with two pillars; one on better understanding the phenomenon and its impacts and second on mitigating it through new technologies and strategies. **Integrated Research projects, networking of national efforts as well as networking the excellence** are some of the new instruments.

In addition, it envisages support for **innovation and start-ups in SMEs**, for research **infrastructure**, for development of **human potential** as well as for bringing closer **research and society** through, for example, actions for **policy support**.

3.7.6. Open questions for the next phase of the ECCP.

Bearing in mind the request of stakeholders for more dialogue as well as the dynamic character of the ECCP we suggest continuing the dialogue between the scientist and stakeholders in the context of the debate on the ECCP final report and final conference. The DG RTD (Energy Programme) will hold a workshop before July with the participation of experts and stakeholders to deepen dialogue on technology research related to climate change.

Also, without prejudging the outcome of the next Kyoto Protocol meeting in Bonn, we suggest that the sub-group on sinks continue its work in the next phase of ECCP by focusing always on the very fundamental remaining scientific aspects and by strengthening the dialogue with the stakeholders.

3.8. ECCP WG 7 "Agriculture" (interim report)

3.8.1. Introduction

The objective of WG Agriculture is to identify and develop the most important elements in the area of agricultural policy that are necessary for the implementation of the Kyoto protocol. This preparatory work, achieved with the co-operative work of all stakeholders, will enable the ECCP to propose in due course, if appropriate, concrete proposals to Commission. The analysis of relevant greenhouse gas emissions from the agricultural sector and their reduction potential is based on a review of literature and already existing studies and on the expert knowledge of the members of the working group.

In the European Union the three main sources of emissions of greenhouse gases from agriculture are N₂O emissions from soils, CH₄ emissions from enteric fermentation and CH₄ and N₂O emissions from manure management

Methane emissions from agriculture were 41% of all CH₄ emissions while nitrous oxide emissions reached 51% of N₂O emissions in 1990. Together with carbon dioxide emissions agricultural greenhouse gas emissions were about 11% of all greenhouse gas emissions of the EU in 1990.

Therefore the WG 7 has tackled the following issues in 2 Subgroups:

- First Subgroup (21/22.03.01):
- Mitigation potential of Methane emissions from enteric fermentation and
- Mitigation potential of Methane and Nitrous Oxide emissions from manure management
- Second Subgroup (16/17.05.01):
- Mitigation potential of Nitrous Oxide emissions from agricultural soils
- Sequestration potential from agricultural soils including agricultural related sinks.
- Mitigation potential of Carbon Dioxide by providing of renewable raw materials for the energy/industrial sector

3.8.2. Mitigation potential of CH₄ from enteric fermentation and CH₄ and N₂O from manure management

At first glance the more intensive forms of animal production tend to have lower GHG emissions per unit of output than the more extensive systems. But they might not be compatible (unless very well regulated) with the environmental situation for water, soil, bio-diversity and eventually landscape or animal welfare. And looking at life-time methane production, an unproductive phase of dairy cows by approximately 2.5 years (plus +- 6 months drying off periods) has to be considered. From this point it follows that increasing the number of lactation periods can result in less methane production per kg milk. Final conclusions can be drawn only from a complete data set. However, it is obvious that the practice of slaughtering cows, which do not show the expected performance in the first lactation period will result in an unnecessarily high methane production per kg milk. Increasing the age at slaughter may affect beef quality. This aspect and the consequences of an increased number of lactation periods for the economy of milk production have to be examined carefully.

Changing or improving diet composition and diet quality or feeding additives etc. may only result in a reduction of GHG, if there are strong nutrition deficits in different regions and countries of the EU. But generally within the countries of the EU cattle is fed to their current nutritional optimum such that there is limited chance of improvement in the foreseeable future. Furthermore many of the improved dietary options are still based in the laboratory or at the very

small field scale. Further development in terms of practicality and applicability would be required to fully implement these options. There has also been little research carried out into the risks to animal health/welfare and farm economics associated with feeding high energy diets, and this surely has to be done before implementation of diets to improve rumen efficiency and control methane emissions. There are doubts whether this research will lead to practical conclusions in the near future. Among the aspects, which need to be examined are the following: a higher milk yield increases the risk of udder health problems. Furthermore, the productive period may be reduced as a consequence of the "burning-out" phenomenon observed with high-yielding cows.

Following outbreaks of BSE there are a number of issues related to animal welfare and consumer confidence in meat products suggesting that cattle will be fed more forage based diets, and less emphasis would be put on concentrates and some "non-natural" additives.

Anaerobic digestion, as an alternative energy source, has been a topic of research from the end of the seventies. The last 20 years tremendous progress has been made on anaerobic digestion of industrial waste and sewage sludge. In spite of the successful industrial introduction, agricultural applications dropped behind. By now (after 2000) there is a new interest for AD from CO₂-emission point of view. Stimulating programs from the EU and its member states increased the interest in AD. But for having an impact on GHG emissions there are a number of technical and policy developments required, e.g. a sure market for energy from AD, promotion and support in distribution.

3.8.3. Reduction of N₂O emissions from Agricultural soils

Fertilisation of crops significantly contributes to the emission of greenhouse gases, especially through the emission of nitrous oxide (N₂O) from soils. This is a result of incomplete transformation of ammonia to nitrate (nitrification) and/or the incomplete turnover of nitrate to nitrogen gas (denitrification). In general, incomplete denitrification is considered to be the most important of the two processes. Reduction options for N₂O generally rely on the reduction of nitrogen inputs to soils through enhanced fertiliser use efficiency and a better integration and accounting for N in manures applied to soil. The measures aim at reducing nitrogen surpluses at the field, farm and regional scale. The biological potential for greenhouse gas reduction could reach up to 50 Mt CO₂-equ. a⁻¹, out of which 10 Mt CO₂-equ. a⁻¹ seem to be economically feasible at negative or low cost until the first commitment period. The effect of the measures is highly site-specific, so a significant uncertainty is associated with these estimates.

Many of the proposed measures go in line with actions taken under the nitrate and possible future ammonia legislation, which should ease the implementation and adoption of the measures. In addition, if a link between the reduction rate of greenhouse gas emissions and of ammonia and nitrate can be established on a scientific basis, there should be major synergy effects for the monitoring of the efficiency of the measures.

3.8.4. Carbon sequestration in agricultural soils

The working group concluded that carbon sequestration does not represent a real mitigation option because of the high risks associated with carbon sinks since the sink in soil which is non-permanent. It will hence only allow to buy time in order to develop other long-term mitigation measures. As the sink will saturate when a new equilibrium of soil organic matter is reached, carbon sequestration measures are only applicable for a limited time span of at maximum 50 to 100 years. The biological potential for carbon sequestration in agricultural soils through optimised land management could be as high as 100 Mt CO₂-equ. a⁻¹. Only a small fraction of that, however, will be feasible until the first commitment period (Kyoto Protocol) since carbon sequestration in agricultural soils requires a major change in crop rotations, land management and the dedication of the set-aside areas. The actual rate of carbon sequestration is highly uncertain and still, there are no tools available to measure and monitor stock changes in soil carbon at a time scale as short as the first commitment period. Furthermore, it is unclear how much of the potential carbon sink will be accountable to fulfil the commitments under the Kyoto Protocol as long as no political decisions on the scope and accounting system of Article 3.4 (land use/additional measures) have been taken.

3.8.5. Bio-energy for carbon substitution

Biomass for energy could lead to significant reductions in emissions from the energy sectors³⁵ and, possibly, transport sector, while being possibly beneficial to the agricultural sector in terms of CO₂ and other economic and environmental benefits. The use of biomass could also be combined with a small portion of carbon sequestration. The total technical

³⁵ Beside the energy sector renewable raw materials can be used as well for the industrial sector.

potential for bioenergy from forests, agriculture and other residues could achieve 200 to 800 Mt CO₂-equ. a⁻¹ (5-22% of CO₂ emissions from fossil energy in 1995).

All measures rely on a strong component of energy crops, which could be produced on set-aside land. The experiences since 1992, however, have shown that the supply of set-aside land for non-food production has not yet lead to lasting increases for cultures of renewable raw materials. Measures of demand policy (such as for increased uses of renewable energy in the energy sector) should hence be envisaged. A major portion of the technical potential might be feasible at low cost until the first commitment period.

But not all biomass fuel chains will provide the same level of CO₂ benefits, based on the relative energy intensity of the biomass production and processing into any intermediate fuel and avoided emissions from alternative means of providing the same energy service. This also applies to environmental and economic benefits to the agricultural sector.

Most of the biomass fuel cycles investigated in the so-called Biocosts-Study³⁶ have a clear advantage over fossil fuels regarding their contribution to global warming.

The uncertainty in the measures is relatively low because the efficiency can be easily monitored by a reduction of emissions from fossil fuel consumption

³⁶ TOTAL COSTS AND BENEFITS OF BIOMASS IN SELECTED REGIONS OF THE EUROPEAN UNION- BIOCOSTS - Final Report, p. 108 (Public Version - September 1998) Research funded in part by THE EUROPEAN COMMISSION in the framework of the Non Nuclear Energy Programme JOULE III

3.8.6. *General comments - Outlook*

The Working Group Agriculture discussed around 60 potential measures and has ranked them regarding specific costs, effects on farm income and labour, the emission reduction potential, environmental side effects and technical feasibility (see examples with a positive ranking in cost effectiveness, environmental side effects and technical feasibility in the annex):

Regarding the forecasts for the reduction potential in the agricultural sector the information is still unsure. WG 7 has a general doubt to lay down average figures for the reduction potential and the reduction costs for most tackled measures for Europe at this stage. Further information (number and type of animals, animal performance, diet composition, animal and manure management, farm and feeding practices etc.) are needed for more realistic calculations.

This applies as well for the projections for baseline emissions for N₂O and CH₄ based on forecast changes in fertiliser consumption and livestock numbers. These projections take into account the reform of the Common Agricultural Policy adopted in the framework of Agenda 2000. These trends were extrapolated to 2010 to provide an estimate of the change in the market for products between 1998 and 2010, at the EU level. The Working group agriculture may not give exact forecasts for the baseline emissions and further cost effective reduction potential beyond baseline projection for 2010 at this stage. But as a first result it can be assumed that the Cost effective reduction potential of 4 % beyond the baseline emission (-5%) mentioned in the Study “Economic Evaluation of Sectoral Emission Reduction Objectives for climate Change” under 2.3 in this report is probably overestimated. Beside all the measures, which could have small effects on methane and nitrous dioxide reduction, the scientists underline the fact that a significant reduction is possible due to a reduction of animal stocks by changing consumer behaviour (less meat and milk, milk products). Agricultural policy can't change the consumer behaviour but there are some elements within CAP, which promote a higher consumption of meat and milk products (subsidies of butter for bakery and ice-cream industry). These elements should be considered in the context of the midterm review. The implementation of measures to mitigate greenhouse gas emissions from agriculture relies on information and (financial) incentives. A good integration with other environmental policies (N₂O reduction) and climate change policies in other sectors (bioenergy) is essential. The climate aspect should be integrated more in CAP³⁷, especially in the rural Development Policy.

Finally it should not be forgotten that according to assessment report of potential effects and adaptations for climate change in Europe, agriculture could become one of the main victims of climate change.

³⁷ When discussing milk quotas, methane production may be one of several aspects which should be taken into consideration.

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Annex: Potential measures ranked by cost effectiveness, environmental side effects and technical feasibility

Ranking (Ra.): 1= negative 3= neutral 5= positive

Measure	Specific costs		Effects on farm income/Labour	Emission Reduction pot. EU15		Environmental side effects ³⁸	Technical Feasibility
	Euro/tCO ₂ -eq.	Ra.		Ranking	KtCO ₂ -eq.		
Enteric fermentation: change composition concentrates by NSC - dairy - non-dairy	Neutral	4	3/3	?	4	3	4-5
Lifetime -c younger slaughter of animals	Will be estimated for the final report	5	3/3	?	4	3	5
Manure: anaerobic digestion (farm scale or centralised (with or without heat & power) -	Will be estimated for the final report	4-5	3-4/2-3	+ - 7000	5	4-5	4
N₂O from Soils: A1:Enhanced spreader maintenance	Will be estimated for the final report	5	4/3	2000	5	5	5
A2:Fertiliser-free zones	Will be estimated for the final report	5	?/3	100	3	4	3
A3:Optimising distribution geometry ³⁹	Will be estimated for the final report	5	4/2	110	3	5	4-5
A4:Improvements in fertiliser efficiency through precision farming ⁴⁰	Will be estimated for the final report	5	?/1	370	4	5	4
A5:Optimising N application by allowing for manure N and residual N	Will be estimated for the final report	4	?	262 (under-estimated)	5	5	5
A6:Continuation of set-aside ⁴¹	Will be estimated for the final report	5	4/5	6196	?	5	?
A7:Soil/plant testing	> 0	2	2/1	?	4	5	5
A8:Minimise fallow periods (catch crops)	Will be estimated for the final report	?	?/2	?	?	4	4
A9:Synchronise N supply with crop demand	>0	2-3	2-3/2	2700	5	5	4
Carbon sequestration in agricultural soils: Measures are discussed and results are described – see text							
Bioenergy for carbon substitution: Measures are discussed and results are described – see text							

³⁸ Animal welfare and consumer confidence are included

³⁹ 2 and 3 cannot be done together

⁴⁰ but only for bigger farms or contractors

⁴¹ Assumption for figure given is a reduction of 50 kg N/ha for the 10% of land that is set aside, this recognises that not all set aside will be fertiliser free so that for some land there will be a greater reduction and for some less or none at all.

3.9. Waste policy aspects relevant to ECCP

Waste management operations account for 4% of total GHG emissions.

The field of waste management practices is undergoing evolution with waste increasingly being diverted throughout the EU from landfills to various waste treatment techniques. This trend is being accelerated as a result of EU initiatives namely the Landfill Directive 1999/31/EC and the Directives on end of life vehicles (ELVs), waste packaging and waste electric and electronic equipment (WEEE). Certain waste Directives include specific provisions which target capturing/treating the GHG generated (CFCs, HCFCs and HFCs in WEEE; fluids in ELVs, methane in landfills) and recovering energy as far as possible in the landfill and incineration processes.

The emerging waste management practices will have a significant reduction potential of the GHG impact of the sector. Thus, appropriate care must be given to steering the practices in order to achieve the optimal reduction potential of the sector.

Although to date little information is available on the precise reduction potentials of various waste management scenarios and on their costs, recent and ongoing studies give an indication of possible areas of intervention:

- Year 2000 MSW management practices are considered to contribute yearly by 50 kg CO₂ eq/t generated
- Recycling is for several materials the best GHG reduction option and shows very favourable GHG impacts with – 260 kg CO₂ eq/t for glass, -500 for plastics, -1500 for ferrous metals, -1800 for PET, -3200 for textiles, -9100 for aluminium.
- In the case of paper, recycling is the best GHG reduction option equalised by incineration only on very favourable energy scenarios such as low humidity content and combined heat and power (CHP)
- In the case of putrescible waste, diversion from landfill has strong advantages in terms of reduction of GHG emissions. Organic treatment always is advantageous whereas thermal treatment is advantageous in cases where energy efficiency is high and the energy displaced is not of the most benign types (renewable energy). Thus, it is important that putrescible waste to energy does not compete with renewable energy sources (e.g. through allocation of economic incentives) as the overall balance would then generate a positive figure for the emissions of GHG instead of the wanted negative figure.

Gross assessment can be made of a reasonable diversion scenario of municipal solid waste (MSW) from landfills in favour of recycling, organic treatment (composting, anaerobic digestion and mechanical/biological stabilisation) and/or energy recovery. The assessment shows possible GHG impact reductions of up to –400 or –500 kg CO₂ eq/t, which represents a total net reduction of GHG emissions of some 100 Mt CO₂ eq per year.

In considering these figures one must be aware that in the models the positive contribution of energy to waste is very sensitive to assumptions concerning the energy technologies displaced and the energy efficiency of the thermal processes.

Further developments of the EU waste policy will thus imply possibilities of significant positive net contribution in the reduction of GHG impact. Further studies are needed in order to evaluate more precisely the GHG reduction potentials, their costs and the time spans required for their achievement.

Short-term measures that will contribute to reaching potential GHG emission benefits in the waste sector are:

- Implementation of the ELV Directive, with resulting increased recycling and recovery of used cars and better treatment of fluids including greenhouse gases
- Adoption of the WEEE Directive which will dramatically change the management pattern of such waste by both diverting significant amounts of recoverable waste (+/- one third of WEEE generated) from landfills to recycling and recovery and imposing the extraction and treatment of GHG prior to shedding
- Significant increase of the recycling targets of the packaging Directive which will entail additional recycling of some 10 Mt packaging waste.

In the medium and long term, implementation of the Landfill Directive will guarantee significant reduction of methane emissions through both the capture and treatment of landfill gasses (2007) and gradually diverting of 65% of the putrescible waste landfilled in 1995 (increasing targets from 2006 to 2016). Maximum benefits would result from the

biological treatment of biodegradable waste (composting, anaerobic digestion and mechanical/biological treatment) and the use of compost on soils.

The Thematic Recycling Strategy announced in the 6th Community Environment Programme (6th EAP) will give the framework for increasing recycling in the medium and long term.

Additionally, one should not overlook that besides measures on end-of-pipe waste management processes prevention of waste generation and optimal use of resources can largely contribute to reducing GHG emissions as well as other environmental impacts. The Thematic Strategy on the Sustainable Use of Resources announced in the 6th EAP will be the framework for reaching such benefits. Integrated Product Policy will be an important instrument for implementation of resource efficiency and waste prevention objectives.

4. THE WAY FORWARD: TOWARDS THE EU CLIMATE CHANGE STRATEGY

The ECCP has produced recommendations and proposals for a large number of policies and measures over the full range of areas covered by the programme. This stretches from giving further impetus to existing proposals to the development of completely new measures ranging from conventional legislation through voluntary actions and best practice to the proposed EU emissions trading scheme. A full table of all the measures, including emission reduction potential, costs and timings can be found in Annex 1.

Table: Summary of ECCP measures and estimated cost effective savings

Estimates of cost-effective measures – as far as they were the subject of an explicit analysis – are indicated in 2 columns, one below and one above €20/tonne CO₂. The emission reduction potentials are estimates; they cannot always be added up as the real gains depend on the interplay of the various measures. It is also important to note that it has not been possible to assess the cost-effectiveness of the measures proposed by the RRM subgroup of WG 5 and some of the measures proposed by the JSWG and WG 4.

	Proposed measures	Estimated reduction potential (Mt CO ₂ eq) Cost effective < € 20/tonne	Estimated reduction potential (Mt CO ₂ eq) > €20/tonne
WG 1	Emissions Trading EU Framework for Emissions Trading	N/a	N/a
	JI/CDM Establishment of a Community Voluntary Carbon labelling scheme. Capacity building as part of existing Community programmes, in particular in Candidate Countries and during design stages of JI/CDM. Complementary funding for JI/CDM projects that have other benefits (e.g. health, poverty reduction). JI/CDM project investments in areas of public or semi-public competence.	N/a	N/a
WG 2	CHP (cogeneration initiative and Directive)	1-12	53-64
	Fuel switching and increased efficiency in generation (liberalisation Directive and negotiated agreements)	88 ⁴²	125
	Renewables (Directives on RES-E and biofuels, heat production initiative)	126	74
	Reduce methane emissions	34	-
	CO ₂ capture and sequestration	-	50
	Other GHG	3	-

⁴² Including 63 Mt CO₂ based on the assumption that new power capacity uses NGCC rather than clean coal.

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	TOTAL	252-263	302-313
WG 3	Directive on energy performance of buildings	35-45	6
	Amended 93/76/EEC (SAVE) Directive	15-20	2
	Directive on energy-efficient public procurement	25-40	5
	Energy Services Directive	40-55	7
	CHP/RES Directive	Covered by WG 2	
	Audit Schemes, Best Practice and Voluntary Agreements	20-35	4
	Technology Procurement	15-25	3
	Campaign for take-off, European Sustainable Energy Agency, Supporting Measures	Included in the above	
	TOTAL	150-220	27
JSWG	End-use equipment		
	Framework Directive for minimum efficiency standards		
	EU Recommendation or Guidelines for Member States supporting action	25	
	Revision of Energy Labelling Directive	10	
	Motor Challenge Programme	30	
	Agreement with lamp manufacturers	7	
	Energy Star Programme and Code of Conduct for Digital TV Services	13	
adoption of planned EEE Directive			
	Industrial processes⁴³	40	60
	Long term agreements with energy intensive industries		
	E2MAS (comprehensive energy audit and management scheme)		
	adapting IPPC Directive		
	active energy services for SMEs		
	TOTAL	125	60
WG 4 ⁴⁴	Environmental Agreement with car industry on Light Commercial Vehicles		5-10
	Technological improvements in passenger cars and fuels		40
	Infrastructure, use and charging	40-60	
	Awareness raising action	50	

⁴³ No costs have been agreed for the estimates given in the right-hand column.

⁴⁴ It was not possible to calculate with any precision the costs of the measures proposed by WG 4. However it is assumed that those savings in the cost effective column will be achieved at low cost, net gain or be fiscally neutral.

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	Fiscal measures	17	
	Multimodal freight		
	TOTAL	107-127	45-50
WG 5	Fluorinated Gases	30	20
	Framework Directive links to other EU Legislation (IPPC, WEEE, End of Life Vehicles) voluntary agreements development of alternatives sector specific recommendations		
	Renewable raw materials Secure supplies through inclusion of RRM in future development of CAP Promote research and fiscal incentives, remove administrative barriers Help commercialisation through EU Standards and public procurement policy Include RRM in EU ECO-labelling scheme to boost consumer awareness Develop political strategy with White Paper and benchmarking scheme Include RRM in emissions trading (CO ₂ credits for manufacturers/users of RRM)	It was not possible to calculate with any precision the costs of the measures proposed by the RRM subgroup (3.8 Mt without PAMs; 8.2 with PAMs)	
	Voluntary Agreements VAs should form part of an appropriate mix of policy instruments VAs should be carefully designed and monitored; include sanctions and incentives; adopt transparent and open reporting; include independent verification EU framework guidelines are needed for good practice of national VAs Linkages should be developed with emissions trading		N/a
	TOTAL	30	20

WG 6	Develop climate change research in new FP Provide support to research infrastructure Establish Global Monitoring for Environment and Security (GMES) Network European efforts in climate and energy research Establish a reference system for greenhouse gas emissions measurement in Europe. Establish a forum on economic, energy and environment modelling (E3) Promote open and sound scientific data management and exploitation. Establish a scientific "Help Desk" for climate negotiations Encourage European participation in IPCC		N/a
	TOTAL	664-765	454-469

4.1. ECCP as an integration exercise and a stakeholders forum

The EU has consistently regarded the GHG emission reduction target set by Kyoto as a key priority. The aim of the ECCP from the outset has been to develop a comprehensive EU strategy to achieve the emission reduction target, and the programme has thus formed an essential part of the EU Sustainable Development Strategy. Climate change is also described as one of the most serious challenges facing the EU in the Communication on the Sixth Environment Action Programme.

The only efficient way to address such global issues is to develop a comprehensive strategic approach that “will require improvements in the **implementation** of existing legislation, **integrating** environmental concerns into other policies, encouraging the **market** to work for the environment, and empowering citizens and **changing behaviour**.” The ECCP, after these first twelve months, has indeed sought to work with a clear cross-cutting approach, through different sectors (energy, transport, industry, etc.) but also at different levels, the European, the national, in some cases also the regional perspective, have been taken into consideration.

The ECCP has been working with stakeholders and with national experts in order to identify the building blocks for possible European-wide initiatives to implement the Kyoto commitment. There is a need to **develop common solutions to common problems that at the same time are able to find support among the different stakeholders**. The common element of the policies that will emerge from the ECCP will be the need to build strong links with all major relevant existing initiatives at EU level with strong climate change implications, particularly in the field of energy.

The European Climate Change Programme has proved over the course of the last 12 months to be a forum capable of bringing together all the important stakeholders (such as different Commission services, the national experts, Industry and NGO representatives) in order to evaluate and assess concrete policy proposals in the areas of energy, transport and industry. The result of this process will now be passed on to the Commission to draw up the necessary policy proposals to submit to Council and Parliament.

Therefore the ECCP has to be seen as a **launch-pad** for the overall strategy and not as the final destination. The overall impression is certainly positive. Stakeholders quickly developed a constructive attitude bringing valuable information and expertise into the discussion. So far more than 200 experts have participated in this challenging integration exercise.

At the end of the consultative process that will follow the publication of this report by summer this year, the ECCP will have given impetus to and accelerated existing proposals, while at the same time pushing forward new ideas.

4.2. The range of instruments

The ECCP working groups have examined and made proposals across the full range of policy instruments. The final package of the programme is truly integrated, drawing together **legislation** (existing, new and planned), organisational and institutional initiatives, **voluntary actions**, supporting measures, and **awareness and best practice** initiatives, using **market instruments** and research and technology development, and covering all the policy areas which formed part of the scope of the ECCP working groups. Importantly, these instruments should be used for implementation of cost-effective measures to reduce GHG emissions, for instance by promoting technological development.

Environmental legislation is and will remain an important pillar of the Community's approach to comply with the Kyoto Protocol. On this point the ECCP has produced a number of proposals which refer to **existing legislation**. Such is the case with the IPPC Directive where it is proposed to upgrade the energy efficiency requirements of the Directive. The Directive was not originally conceived for climate change, but already sets out a requirement in Article 3 to use energy efficiently. Technical reference documents, the BREFs, should be improved to take into account energy efficiency requirements for individual sectors. Other examples of relevant existing legislation that need to be amended are the SAVE 93/76/EEC Directive; the Energy Labelling Directive 92/75.

Some proposals are very advanced and the discussion in the ECCP working groups has been used to establish greater clarity on: the potential for CO₂ emission reduction; the economic cost; the state of technological development. Last but not least the WGs have been used to develop consensus among the stakeholders. A practical example is the finalisation of a Directive on energy efficiency in buildings. Other proposals are linked to speeding-up legislation already in the pipeline such as the early implementation of the amended Directive 96/92/EC and 98/30/EC concerning common rules for the internal market in electricity and natural gas. Another example is also the early implementation of the Directive for promotion of renewable energy in the internal electricity market (RES-E) with a target for 22% of electricity to be produced from RES by 2010.

Some proposals are new and the discussion in the working groups has helped again to cover all the relevant technical and political issues. This is the case for a proposed Directive on the handling of fluorinated gases discussed and proposed by the Industry WG 5. In the case of the new proposal to launch a Directive on Combined Heat and Power (CHP) the ECCP framework **has also been used to bring renewed political and technical impetus to ongoing proposals**. In 1997 an Action Plan was adopted on promotion of CHP with indicative objectives of doubling the existing share of 8% of energy consumption. Since then little progress has been made and only now through the ECCP the Working Groups on Energy Supply and Consumption are developing a proposal on a Directive for the promotion of CHP. Other relevant examples of new proposals are: Framework Directive on Minimum Efficiency Standards for electrical equipment; a Directive promoting the penetration of bio-fuels for transport; a Directive for Energy-Efficient Public Procurement; an Energy Services Directive which will establish national targets for energy services investments and monitoring procedures; the Environmental Impact of Electrical and Electronic Equipment Directive (EEE) and finally a Framework Directive for the establishment of a Community Emissions Trading Scheme. Standard setting will play a role also in the transport sector with technological improvements in passenger cars and fuels.

In the field of **voluntary instruments** several proposals were made: Long Term Agreements with the process industry on energy efficiency; an agreement with the lamp manufacturers to substantially increase the sales of CFLs by 2005; the effective implementation of the *Energy Star Programme*; Environmental Agreement with car industry on reductions of CO₂ emissions from Light Commercial Vehicles. Some of the fluorinated gases sectors such as semi-conductor, switchgear and foam have presented proposals for voluntary actions in the form of self-commitments. One common element that emerged from the discussion in several working groups related to voluntary actions is that these do not tend to be stand alone instruments but should be part of a package. Community guidelines for national environment agreements in the field of climate could be developed as well as part of the EU Climate Change Strategy. Technology procurement as a market transformation instrument is being applied at EU level after successful Member States programmes.

Innovation and Technology promotion initiatives, best practice and awareness campaigns are underlined by several groups. In particular, there are concrete proposals with regard to initiatives in the field of: promotion of CHP and heat production from renewables; demand side management for energy services; use of Renewable Raw Materials in European manufacturing industry; Motor Challenge Programme; improvements in transport infrastructure use and charging.

The exchange of experience and **best-practice initiatives** have been equally mentioned by almost all the Working Groups in order to activate a useful complementary range of measures. The reduction of methane emissions from pipeline infrastructure and methane capture from closed coalmines are elements that fit into this category. Moreover other possible best practices have been taken into account by the following actions: promotion of the Green-Light Programme; the E2MAS programme to promote energy efficiency in industry; support for energy services for SMEs;

freight intermodal/multimodal transport and logistics efficiency improvements. Specific initiatives of partnership with large and small business could be activated.

Awareness campaigns can play a relevant role in reaching the final European citizen in order to activate behavioural changes. The Campaign for Take Off for energy efficiency and the awareness raising in car usage offer a potential for diffusing the objectives of the EU Climate Change Strategy.

The need to develop and strengthen the EU's position in **research** has also been identified as a priority, both to improve our understanding of the science of climate change and to develop technology to reduce our GHG emissions. Proposals include the networking of European institutes in climate and energy research; development of climate change research in the context of the new Framework Programme and support to research infrastructure.

Climate research and the stimulation, through the appropriate policies, of technological development and innovation should become a structural element of the ECCP in parallel to good management and to efficient regulatory and economic instruments. It is important to invest in research and to developing new methodologies and technologies for making further climate change mitigation more cost effective and socially acceptable.

Encouraging **market mechanisms to work for the environment** can be activated mainly through the launch of a Community Emissions Trading Scheme. The system has its main justification in the development of least cost options to achieve effective emissions reduction. It will be built with strong links to existing measures such as the IPPC Directive. Some of the working groups made some additional proposals with regard to fiscal measures (WG 4, Topic Group 2) or with respect to promotion of VAT differentiation and accelerated depreciation to promote energy-efficient products and practices (WG 3) or to introduce low or zero-rate VAT for the most efficiency equipment. These proposals are intended to be preliminary. More work is needed in order to clarify some possible follow-up.

4.3. Follow-up of the ECCP: start of the implementation process

Conclusions from the ECCP Report highlight some of the key points and indicate how they are strategically linked.

The first important step is of course to meet by 2008-2012 in a sustainable way the objective of an emission level that is 8% below emissions in 1990 as defined at Kyoto. The discussion that took place in the ECCP indicates that even this modest target requires an effort across the different economic sectors responsible for the emissions.

The overall approach will develop integrating different elements of action:

developing **specific measures** to enhance energy-efficiency, energy saving, more use of renewable energies, and the reduction of greenhouse gases other than CO₂. This can be through specific legislation, industry voluntary agreements, diffusion of best practices, promotion of initiatives.

integrating further the **climate change objectives** into the Community's sectoral policies such as transport, energy, industry, and agriculture based on specific targets, identifying concrete actions to be taken and developing relevant indicators. This will build strongly on the Cardiff Process and take forward principles set out in the EU Sustainable Development Strategy.

developing **cross-sectoral approaches**, including the establishment of an EU-wide emissions trading scheme that will enter into force by 2003-5 and the revision of the IPPC Directive with the strengthening of its energy efficiency criteria and of its implementation at national level. The notion of integration is in fact essential to the exercise and horizontal instruments such as the IPPC Directive will have a particularly strong role to play in view of their ability to cover a wide range of activities coherently.

enhancing **research** especially in the context of the new Framework Programme;

improving **information to citizens and business** about climate change, the implications it may have for them at the local level, and showing them how they can contribute to addressing the climate change challenge.

Following the ECCP Report the Commission will prepare the Community Implementation Strategy. This will establish the framework and set-up the Commission's priorities with regard to policy action at EU level. It will focus on a selected number of measures with an important impact in terms of emissions reduction, the possibility to be launched and implemented within the next two to three years time-frame and with consideration concerning the competitiveness of the European industry. However, a great responsibility for agreeing, implementing and enforcing any proposed reduction measures will lie with the Member States and regional and local authorities. This is particularly the case for transport policy, land-use planning and awareness initiatives.

Of the measures proposed by the ECCP a large proportion have undergone a cost-effectiveness assessment. It is important to distinguish between proposed measures that 1) are at an advanced stage of preparation, "mature"; 2) those

which are in a less mature state, “in the pipeline”, and 3) those where more detailed work is needed. To this extent a first identification of these three categories is presented below. The distinctions established by the categories 2 and 3 are not clear-cut and the allocation of the measures to them is not final. Of course this will not be the only guiding principle in the future selection process since it has to be ensured that the measures selected comply with the principle of sustainability.

1) Mature:

- Framework Directive for a Community Greenhouse Gases Emissions Trading Scheme
- Bio-fuel Directive
- Directive for Promotion of Renewable Energies, RES-E
- Directive on the Energy Performance of Buildings
- Directive on Energy Efficient Public Procurement
- Amended SAVE Directive 93/76/EEC
- Campaign for take off and Public Awareness Campaign for energy efficiency
- Framework Directive on Fluorinated Gases

2) In the Pipe-line:

- Adaptation/revision of the IPPC Directive
- CHP Directive
- Voluntary measures to reduce methane emissions
- Directive on Energy Services
- European Sustainable Energy Agency
- Technology Procurement Initiative
- EEE Directive
- Framework Directive for Minimum Efficiency Standards for Electrical Equipment
- The Motor Challenge Programme Initiative
- Continue and further develop research and technology for climate change in the new Framework Programme. Provide support to research infrastructure and network research within the European Research Area
- Establish the Global Monitoring for Environment and Security (GMES)

3) More work needed:

- Technological improvements in passenger cars and fuels
- Environmental agreement with car industry on Light Commercial Vehicles
- Fiscal measures for passenger cars
- Car usage awareness campaign

- Initiative on the promotion of heat production from RES
- Promote CO₂ capture and sequestration from fossil fuels conversion
- Negotiated agreements with industry for energy efficiency and best practices initiatives on conversions of fuels to electricity and/or heat
- Long Term Agreements with energy intensive industries
- The E2MAS energy audit and management scheme
- Framework support for national, regional and local energy networks
- Development of alternatives to F-gases
- Promotion of voluntary initiatives by some fluorinated gases industry sectors
- Community guidelines for “climate” agreements at national level
- Promotion of the use of Renewable Raw Materials by the manufacturing industry
- Establish a reference system for greenhouse gas emissions measurement in Europe.
- Establish a Forum on Economic, Energy And Environment Modelling (E3)
- Promote open and sound scientific data management and exploitation.
- Establishment of a Community Voluntary Carbon labelling scheme for JI/CDM
- Legal framework for building project based mechanisms to emission trading
- Specific capacity building activities in Candidate Countries for monitoring systems required by Kyoto Protocol
- Temporary financial support during design stages of JI/CDM
- Complementary funding for JI/CDM projects that have other external benefits (e.g. health, poverty reduction)
- JI/CDM project investments in areas of public or semi-public competence

The basic principles of the ECCP, the integration approach and the open consultation process, allowed the suggested measures to be broadly discussed and in most of the cases these are now supported by a broad coalition of stakeholders. This is a necessary step in getting a political support for action at Community level as requested by Council and Parliament.

In this context the Commission will hold a major Conference on 2-3 July 2001 to consider “The next steps for the ECCP”. Its main objectives are to broaden awareness of the ECCP amongst stakeholders, to identify ways of taking the ECCP forward, and to provide input into the forthcoming Commission Communication on the implementation of the Climate Change Strategy.

ANNEX 1 - SUMMARY ECCP MEASURES: ESTIMATED SAVINGS, TIMING, COSTS

	Proposed measures	Estimated CO ₂ reduction potential (Mt)	Time-scale for implementation ⁴⁵	Costs
WG 1	<p>EU Framework for Emissions Trading</p> <p>Recommendations are setting the grounds for the forthcoming Directive on a Community CO₂ Emissions Trading Scheme</p> <p>Quick implementation of a pre-Kyoto EU Emissions Trading scheme</p> <p>Emissions Trading as part of a comprehensive PAMs package at national and EU level</p> <p>EU Emissions Trading will ensure common level playing field</p> <p>EU Emissions Trading has to be environmentally effective, economically efficient, simple and transparent</p>	WG did not aim to quantify measures	2001	WG did not aim to quantify measures

⁴⁵ Dates for Directives refer to estimated date of adoption by Commission

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	<p>JI/CDM</p> <p>Establishment of a Community Voluntary Carbon labelling scheme</p> <p>Legal framework for building project based mechanisms to emission trading</p> <p>Specific capacity building activities in Candidate Countries for monitoring systems required by Kyoto Protocol</p> <p>Temporary financial support during design stages of JI/CDM</p> <p>Complementary funding for JI/CDM projects that have other external benefits (e.g. health, poverty reduction)</p> <p>JI/CDM project investments in areas of public or semi-public competence</p>		<p>2002</p> <p>2002 design study</p> <p>2002 financing proposal</p> <p>2002 financing proposal</p> <p>2002 existing financial instruments on demand of beneficiary countries</p> <p>2005 pilot projects</p>	
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	Proposed measures	Estimated CO₂ reduction potential (Mt)	Time-scale for implementation	Costs
WG 2	<p>CHP</p> <ul style="list-style-type: none"> - EU Cogeneration initiative (new) - EU Cogeneration Directive (CHP-E) (new) 	Up to 65 Mt/year (includes small-scale CHP covered by WG 3)	<p>Launch in 2002</p> <p>EU target to double electricity from CHP from 9% to 18% by 2010.</p>	<p><€20/t: 1-12Mt CO₂eq</p> <p>€20-50/t: 6-17Mt CO₂eq</p>
	<p>Electricity generation from fossil fuels</p> <ul style="list-style-type: none"> - Directive on full liberalisation of electricity and gas markets by 2005 	80-120Mt/year (WG 2) (includes 63Mt CO ₂ that should be avoided in case that new power capacity were based on NGCC instead of clean coal)	Proposal adopted by Commission Mar 2001	<p><€20/t: 88Mt CO₂eq</p> <p>€20-50/t: 25Mt CO₂eq</p>
	<p>More efficient energy conversion</p> <ul style="list-style-type: none"> - Speedy gas and electricity liberalisation (see fuel switch above) - Negotiated agreements with industry on basis of IPPC and LCP Directives 	100 Mt/year	None	<p>€20-50/t: 100 Mt CO₂eq</p> <p>(includes improved efficiency in power generation)</p>

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	<p>Renewables</p> <p>-Directive for promotion of renewable energies RES-E (ongoing)</p> <p>- Directive on the promotion of Biofuels</p> <p>- Initiative on the promotion of heat production from RES</p>	<p>229 (Bottom-up/Ecofys)-330 Mt/year if 12% target reached.</p>	<p>RES-E Directive in pipeline</p> <p>Launch end 2001 – 02</p> <p>Launch 2002</p>	<p><€20/t: 126Mt CO₂eq</p> <p>€20-50/t: 18Mt CO₂eq</p>
	<p>Reduce methane emissions</p> <p>- Voluntary measures by mining and oil and gas industries</p>	<p>34Mt/year already achieved by 1998</p> <p>Further reduction of 34Mt/year possible</p>	<p>Ongoing initiatives</p>	<p><€20/t: 34Mt CO₂eq</p>
	<p>CO₂ capture and sequestration</p>	<p>Costly but up to 50Mt/year</p>	<p>2001-2010</p>	<p>€20-50/t: 50 Mt CO₂eq</p>
	<p>TOTAL</p> <p>7% reduction (1990-1998)</p> <p>Cost-effective potential 13% (98-2010)</p> <p>18% reduction in the “Kyoto period”</p>	<p>TOTAL:</p> <p>Top-down: 173 Mt CO₂eq</p> <p>Bottom-up: 228-268 Mt CO₂eq</p>		<p>TOTAL:</p> <p><€20/t: up to 263 Mt CO₂eq</p> <p>€20-50/t: up to 210 Mt CO₂eq</p>

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	Proposed measures	Estimated CO₂ reduction potential (Mt)	Time-scale for implementation		Costs
WG 3	Legislation and non legislative initiatives	220 -247 Mt CO ₂ including direct and indirect emissions.	Com.	Member States	Around 150 Mt. CO ₂ abatement costs are zero or less. An additional 70 Mt. CO ₂ have a cost of between zero and €20/tonne. That is to say, all costs for the first 220 Mt. CO ₂ are lower than €20/tCO ₂ . An additional 27 Mt can be realised for a cost of between €20 /tonne and €100/tonne. (Based on effective costs i.e.– investments costs plus operating, maintenance and interests costs minus discounted savings over the accepted technical life, using discount rates of 4%.) Ecofys
	Buildings Directive Amended 93/76/EEC	(65 Mt CO ₂ , see WG 2)	2001	2004	
	Energy-Efficient Public procurement Dir. Energy Services Dir.		2002	2005	
Energy Audit Schemes, Best Practice and Voluntary Agreements (Non-leg.) Technology procurement initiative (non-leg.) CHP Dir.	2002		2006		
			2001	2001	
			2001	2001	
			2002	2004	
			2002	2003	
			2001	2002	
			2002	2002	
			2001	2001	
			2001	2001	
			2001- 2005		
	Co-ordination & support - European Energy Agency - Framework support for National, Regional and Local Energy Networks	Necessary supporting and implementation measures for legislative actions.	2002	2003	Included in costs for implementation of legislative measures.
	Information & Promotion - Monitoring, Campaign for Take-off and Public Awareness Campaign -Education and Training -Labelling, Minimum Standards and Certification -Institutional, Financial and Other Measures	Necessary supporting and implementation measures for legislative actions.	2002	2002	Included in costs for implementation of legislative measures.
			2001	2001	
			2001	2001	
			2001- 2005		

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	Proposed measures	Estimated CO₂ reduction potential (Mt)	Time-scale for implementation	Costs
WG 4	- Environmental Agreement with car industry on Light Commercial Vehicles (new)	5-10Mt/year	Final proposal aimed for 2001	It was not possible to calculate with any precision the costs of the measures proposed by WG 4. However it is assumed that those savings in Infrastructure, use and charging; Awareness raising action and Fiscal Measures will be achieved at low cost, net gain or be fiscally neutral
	- Technological improvements in passenger cars and fuels (number of projects ongoing)	40Mt	-	
	- Infrastructure, use and charging	40-60Mt/year (ITS)	Within 5 years	
	- Awareness raising action (new)	50Mt/year	-	
	- Fiscal measures (ongoing)	17Mt/year	-	
	- Multimodal freight	No savings estimate	-	

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	Proposed measures	Estimated CO₂ reduction potential (Mt)	Time-scale for implementation	Costs
WG 5	Fluorinated Gases - Framework Directive for improved containment of F-gases - Links to other EU Legislation (IPPC, WEEE, End of Life Vehicles) - Voluntary Agreements - Development of Alternative Fluids and Not in Kind (NIK) technologies - Sector specific recommendations	29.8 Mt/year cost-effectively	Launch 2002 2001-02 2002 2002	<€20/t: 29.8Mt CO ₂ eq €20-50/t: 18.4Mt CO ₂ eq >€50/t: 20.6Mt CO ₂ eq
	RRM - Secure supplies through inclusion of RRM in future development of CAP - Promote research and fiscal incentives, remove administrative barriers - Help commercialisation through EU Standards and public procurement policy - Include RRM in EU ECO-labelling scheme to boost consumer awareness - Develop political strategy with White Paper and benchmarking scheme - Include RRM in emissions trading (CO ₂ credits for manufacturers/users of RRM)	Total savings 3.8 Mt/year without PAMs (8.2 Mt/year with PAMs) Of which: (figs in brackets are with PAMs) Polymers 2Mt (4Mt) Lubricants 0.8Mt (3.5Mt) Solvents 1Mt (-) Surfactants 0Mt (0.6Mt) Secondary savings: 25Mt/year		It was not possible to calculate with any precision the costs of the measures proposed by the RRM subgroup.

	<p>Voluntary Agreements (VAs)</p> <p>VAs as part of an appropriate mix of policy instruments.</p> <p>VAs should be carefully designed and monitored; sanctions and incentives; adopt transparent and open reporting; include independent verification;</p> <p>EU framework guidelines for good practise of national VAs;</p> <p>Linkages with ET</p>		<p>EU framework:</p> <p>Communication on EAs: 2001, Directive possibly 2003</p> <p>EU guidelines: 2002</p>	
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	Proposed measures	Estimated CO₂ reduction potential (Mt)	Time-scale for implementation	Costs
WG 6	<p>Develop climate change research in new FP</p> <p>Provide support to research infrastructure</p> <p>Establish Global Monitoring for Environment and Security (GMES)</p> <p>Network European efforts in climate and energy research</p> <p>Establish a reference system for greenhouse gas emissions measurement in Europe.</p> <p>Establish a forum on economic, energy and environment modelling (E3)</p> <p>Promote open and sound scientific data management and exploitation.</p> <p>Establish a scientific "Help Desk" for climate negotiations</p> <p>Encourage European participation in IPCC</p>		2002 – 2007 for all proposed measures	