Report of the project

Deriving Optimal Promotion Strategies for Increasing the Share of RES-E in a Dynamic European Electricity Market

Green-X

INTEGRATED POLICY ANALYSIS OF DEMAND SIDE ENERGY EFFICIENCY & CHP, GHG AND RES-E SCHEMES IN EU-15 COUNTRIES

Work Package 3

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The report “Integrated cross-policy analysis of demand side energy efficiency & CHP, GHG and RES-E schemes in EU-15 countries (D8 Report)” has been carried out by CSIC (Pablo del Río[1], Félix Hernández, Miguel Gual and Andrés Tacsir).

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LIST OF ABBREVIATIONS.

-BAT: Best Available Technologies.
-BSA: Burden Sharing Agreement.
-CCL : Climate Change Levy
-CDM: Clean Development Mechanism.
-CER: Certified Emissions Reductions (emissions reduction unit in CDM projects)
-CHP: Combined Heat and Power.
-CO2 Directive: Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC.
-DSM: Demand Side Management.
-ECCP: European Climate Change Programme.
-ERU: Emissions Reduction Unit (emissions reduction unit in JI projects).
-EU ETS: European Union Emissions Trading Scheme.
-GHG: Greenhouse Gas.
-GOs: Guarantees of Origin.
-IPPC Directive: Integrated Pollution Prevention and Control Directive (Directive 96/61/EC).
-JI: Joint Implementation.
-KP: Kyoto Protocol.
-LULUCF: Land use, land use change and Forestry activities.
-MIID. MURE II Database.
-MS: Member States.
-MSWR: Municipal Solid Waste Residues (*biodegradable fraction of waste*).
-NA: Negotiated agreements.
-NAP: National Allocation Plan.
-NTPA: Negotiated Third Party Agreement.
-P&M: Policies & Measures.
-RES: Renewable energy sources.
-RES-E: Electricity from renewable energy sources.
-RES-E Directive: Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal energy market.
-RTPA: Regulated Third Party Access.
-SB: Single buyer system.
-TGCs: Tradable Green Certificates.
-TNC: Third National Communications of the countries to the UNFCCC.
-TPA: Third Party Access
-UNFCCC: United Nations Framework Convention on Climate Change.
-VA: VOLUNTARY AGREEMENTs.
-WMS: Without measures scenario (in TNCs).
-WAMS: With additional measures scenario (in TNCs).

1.- INTRODUCTION.

The environment and energy contexts have traditionally been two major focus of attention of EU and Member State (MS) policy. This attention has intensified in recent years, as a response to both internal and external events and strategies (i.e., the Kyoto Protocol).

In this context, the EU and its MS have set ambitious goals in the environmental and energy policy realms. Both policies interact. Although there might be conflicts between both, there are also interesting sinergistic and reinforcing effects with significant policy implications. Actually, as stated in the Amsterdam Treaty, environmental protection is one of the major goals of energy policy (together with "security of supply" and "competitive energy systems"). On the other hand, the energy sector is instrumental in the success of environmental policy.

The EU and its MS have a wide array of instruments at their disposal to achieve these goals. Particularly, Demand Side Management (DSM) activities, promotion of electricity from renewable energy sources (RES-E) and measures aimed at the mitigation of Greenhouse Gas (GHG) emissions are arguably three of the main instruments which have the potential to contribute to energy and environmental goals.

However, the achievement of those goals and the implementation of these instruments are major challenges for both the EU and the MS, as shown by the trends in energy efficiency, RES-E deployment and GHG emissions.

The aim of this report is to provide an overview of major trends, policies, goals and instruments in the energy and environment realm at both the EU and MS levels.

Accordingly, the report is structured as follows. The next section will provide an overview of major EU energy-related environmental trends. It also analyses the EU implementation of policies and measures concerning DSM, RES-E and GHG mitigation. Section 3 analyses energy efficiency, RES-E and GHG emissions trends at the MS level and provides an overview of the relevant domestic policies and measures being taken. The report closes with some concluding remarks.

2.- EU POLICY

2.1.- Institutional framework

After the Amsterdam Treaty of 1997, EU energy policy has three main elements (Wohlgemuth 2003):

-*Security of supply*, aiming at minimisation risks and impacts of possible supply disruption on the EU.
-*Competitive energy systems* to ensure low-cost energy for producers and consumers to contribute to industrial competitiveness and wider social policy objectives.
-*Environmental protection*, which is integrated in both energy production and energy use. Specially relevant in the EU is the mitigation of GHG emissions, linked to compliance with the Kyoto Protocol targets.

Environmental protection has, then, become a key criterion by which to judge the long-term success of the EU´s energy policy (op.cit). More specifically, EU policy concerning Energy and Environment has several goals: to reduce the emissions of Greenhouse Gases (GHG) to comply with EU commitments in the Kyoto Protocol, to increase the share of renewable energy in the consumption of electricity in the context of increasingly liberalised electricity markets and to stimulate energy efficiency investments in the context of demand side management.

These goals are interrelated and have reinforcing effects. For example, a CO2 quota may be beneficial for the deployment of renewable electricity (see Morthorst et al 2004). Simultaneously, the development of RES-E allows the reduction of CO2 emissions, facilitating the compliance with CO2 quotas and, particularly with the Kyoto Protocol targets.

At the EU level, there have been policy proposals to achieve these goals. These policy proposals have to follow the normal EU legislative procedure. As outlined in the Amsterdam Treaty, Directives follow the so-called “conciliation procedure”, according to which the European Commission initiates the legislative process by making legislative proposals. The Council of Ministers and the Parliament have two opportunities to approve or amend the proposals. A conciliation committee is created in case the two do not agree. This committee aims to reach an agreement acceptable to both institutions. Their joint proposal must then be approved by the Council of Ministers (through Qualified Majority Voting) and the European Parliament (through a majority of votes, Rowlands 2004, p.2). If the conciliation committee does not reach an agreement, the legislative process ends.

Within the European Commission, there is a distribution of issues between different Departments (D.G.). For example, D.G. Environment has been responsible for proposals for the implementation of an emissions trading scheme, while legislative proposals concerning renewable energy and energy efficiency are the responsibility of DG TREN (DG Transport and Energy).

2.2.- Demand Side Energy Efficiency Policy & CHP

2.2.1.- Review of main indicators

The analysis of demand side energy efficiency is based on the ODYSSÉE database (SAVE-ODYSSEE, 2000), which provides energy efficiency figures for different sectors in all EU-15 Member States. The following four tables show, respectively, the country's final total energy intensity, the country's final energy intensity in industry, the country's unit consumption per dwelling (adjusted to EU average climate) and the MS' energy intensity in the service sector in relation to the EU in the 1990-1999 period. The calculated intensities are related to the EU average energy intensity (i.e. EU=100).

Table 2-1. MS' final total energy intensity in relation to the EU (EU=100).

	90	93	96	99
Austria	86,3	85,3	88,4	89,1
Belgium	118,1	116,9	124,3	122,2
Denmark	76,6	79,0	76,7	73,1
Spain	101,0	100,0	104,1	109,2
Finland	121,9	133,1	123,7	n.a.
France	85,3	87,0	87,5	89,9
United Kingdom	126,0	128,4	124,8	121,4
Greece	123,6	123,1	129,7	n.a.
Ireland	124,6	117,6	108,8	102,8
Italy	96,8	97,0	95,8	n.a.
Luxembourg	209,7	199,3	164,7	n.a.
Netherlands	113,4	118,4	116,2	103,1
Portugal	95,3	95,9	101,8	n.a.
Germany	104,3	84,6	85,8	82,6
Sweden	125,5	129,9	127,9	121,2

Source: Own elaboration from SAVE-ODYSSEE (2000).

Table 2-2. MS's final energy intensity in industry in relation with EU (EU=100).

	90	93	96	99
Austria	97,1	89,8	92,7	85,7
Belgium	167,8	168,8	158,3	155,4
Denmark	69,5	83,7	74,8	70,0
Spain	107,4	110,2	103,7	95,1
Finland	226,6	247,3	215,9	175,3
France	117,0	124,8	122,3	124,5
United Kingdom	103,8	121,6	95,5	93,3
Greece	147,8	148,3	168,6	n.a
Ireland	104,1	95,8	75,4	59,5
Italy	116,5	120,5	114,0	113,2
Luxembourg	421,0	432,1	260,4	n.a
Netherlands	130,3	154,8	136,1	123,8
Portugal	140,4	138,3	115,9	n.a
Germany	87,7	84,7	81,4	78,4
Sweden	210,8	242,6	209,0	188,2

Source: Own elaboration from SAVE-ODYSSEE (2000).

Table 2-3. MS's unit consumption per dwelling with climatic corrections in relation with EU (EU=100).

	90	93	96	99
Austria	106,3	112,6	107,4	110,5
Belgium	139,9	144,1	150,5	157,2
Denmark	100,7	104,7	100,7	103,9
Spain	43,1	43,8	49,7	49,9
Finland	105,7	116,2	118,4	n.a.
France	102,8	108,6	106,6	n.a.
United Kingdom	116,8	115,3	116,2	n.a.
Greece	54,8	49,5	63,9	n.a.
Ireland	131,7	112,7	119,6	132,5
Italy	77,8	78,6	80,0	n.a.
Luxembourg	223,0	237,6	254,3	n.a.
Netherlands	100,6	101,1	103,1	98,4
Portugal	28,9	29,7	40,6	n.a.
Germany	104,4	108,8	106,8	107,6
Sweden	118,7	118,0	120,3	121,5

Source: Own elaboration from SAVE-ODYSSEE (2000).

Table 2-4. MS's energy intensity in service sector in relation with EU (EU=100).

	90	93	96	99
Austria	88,8	95,3	95,9	86,9
Belgium	87,9	94,2	104,8	104,4
Denmark	91,8	93,1	88,4	84,3
Spain	64,3	67,2	71,1	80,3
Finland	132,9	146,7	n.a.	n.a.
France	79,0	90,3	93,5	100,4
United Kingdom	295,8	321,3	279,0	250,8
Greece	88,0	85,0	62,9	n.a.
Ireland	169,3	171,9	160,4	162,3
Italy	72,9	73,5	71,8	78,2
Luxembourg	30,4	31,8	16,7	17,5
Netherlands	116,9	124,2	109,8	107,7
Portugal	59,7	66,7	92,1	82,2
Germany	130,3	97,4	101,9	93,1
Sweden	209,4	203,2	187,1	184,7

Source: Own elaboration from SAVE-ODYSSEE (2000).

The analysis of the above tables can be undertaken in terms of a cross-country comparison in 1999 (static analysis) and as a time series comparison (dynamic). We start with the static comparison.

Concerning table 2-1, final energy intensity in 1999 was relatively high compared to the EU average in Luxembourg (1996 data), Greece (1996 data), Belgium, U.K. and Sweden and it was relatively low in Denmark, Germany, Austria and France.

Table 2-2 shows that final energy intensity in industry in 1999 was relatively high in Sweden, Finland and Greece (1996 data) and relatively low in Ireland, Denmark and Germany.

Concerning table 2-3 energy consumption per dwelling in 1999 was relatively high compared to the EU average in Belgium, Ireland and Sweden and it was relatively low in Portugal (1996 data), Spain and Greece (1996 data).

Table 2-4 shows that final energy intensity in service in 1999 was relatively high in U.K., Sweden and Ireland and relatively low in Luxembourg, Greece (1996 data) and Italy.

Trends in MS with respect to the EU indicator can be of two types: Convergent or divergent. Convergence means that the MS indicator approaches the EU indicator. Convergence and divergence can be considered "positive" or "negative". Positive convergence means the MS indicator is above the EU indicator at the beginning of the period (1990) but it approaches the EU indicator during the period. Negative convergence means that the MS indicator, which is below the EU indicator in 1990, comes closer to the EU indicator towards 1999. Positive divergence means the MS indicator, which is below the EU indicator at the beginning of the period becomes even lower than the EU indicator during the period, while negative divergence means that the relative higher energy intensity in the MS in 1990 even increases relative to the EU indicator during the period.

The following table summarises these trends regarding the above mentioned four indicators for all countries, taking into account that a reduction in energy intensity represents an improvement of energy efficiency and, conversely, a higher energy intensity represents a lower energy efficiency.

Table 2-5. Trends in energy efficiency indicators (1990-1999 period).

	Final energy intensity (total)	**Final energy intensity (industry)**	**Residential energy consumption**	**Energy intensity (services)**
Austria	(-) conv.	(+) div. †	(stable above the EU indicator)	(+) div. †
Belgium	(-) div.	(+) conv. †	(-) div.	(-) conv.
Denmark	(+) div. †	(+) div. †	(stable around the EU indicator)	(+) div. †
Spain	(-) div.	(+) conv. †	(-) conv.	(-) conv.
Finland	(+) conv. †	(+) conv. †	(-) div.	(-) div
France	(-) conv.	(-) div.	(stable above EU indicator)	(-) conv.
United Kingdom	(+) conv. †	(+) div. †	(stable above EU indicator)	(+) conv. †
Greece	(-) div.	(-) div.	(-) conv.	(+) div. †
Ireland	(+) conv. †	(+) div. †	(-) div.	(+) conv. †
Italy	(+) div. †	(+) conv. †	(-) conv.	(-) conv.
Luxembourg	(+) conv. †	(+) conv. †	(-) div.	(+) div. †
Netherlands	(+) conv. †	(+) conv. †	(stable around EU indicator)	(-) conv.

Portugal	(-) conv.	(+) conv. †	(-) conv.	(-) conv.
Germany	(+) div. †	(+) div. †	(stable above EU indicator)	(+) div (unstable) †
Sweden	(+) conv. †	(+) conv. †	(stable above EU indicator, tending to (-) div.)	(+) conv. †

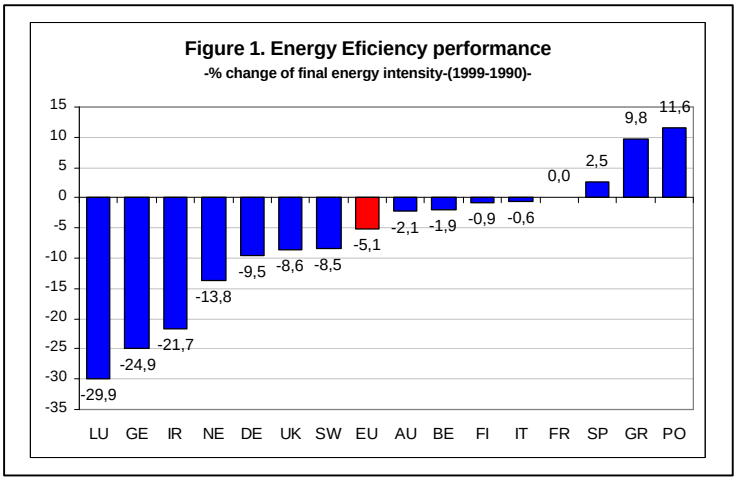
Source: Own elaboration.

Note: Positive trends in the MS compared to the EU (i.e., positive convergence and positive divergence) are indicated with a † sign.

Trends in the MS compared to the EU can be considered positive when there is either positive convergence or positive divergence († sign in the above table). If a comparison of the trends in the four indicators per MS is undertaken, we can observe that energy efficiency is improving in some countries (Denmark, U.K., Ireland, Luxembourg, Germany and Sweden). Four countries experience an improvement in two of the indicators (Austria, Finland, Italy and the Netherlands) while in Belgium, Spain, Greece and Portugal only one energy efficiency indicator improves. France is the only country showing negative convergence or negative divergence in all the indicators.

Figures 2-1 to 2-4 show energy efficiency trends for all MS in the 1990-1999 period in the different sectors compared to the EU weighed average (percentage annual average growth rates)[2].

Figure 2-1. Energy efficiency performance.



[2] Figure 4 does not include Finland to the the unavailability of data for the years 1996 and 1999.

Figure 2-2. Energy efficiency performance in industry.

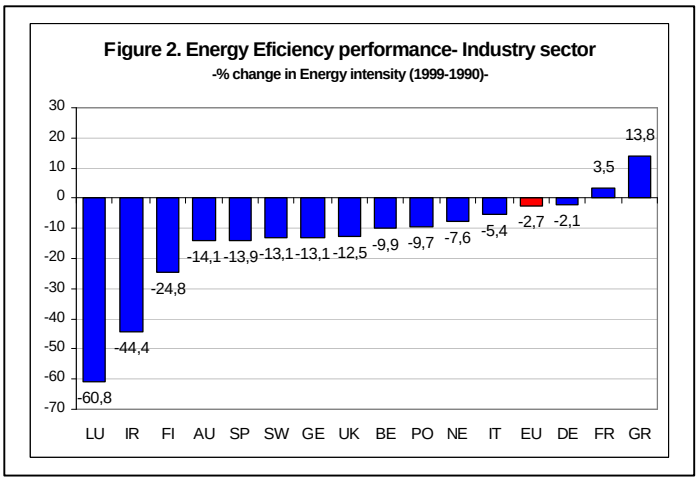


Figure 2-3. Energy efficiency performance: Household sector.

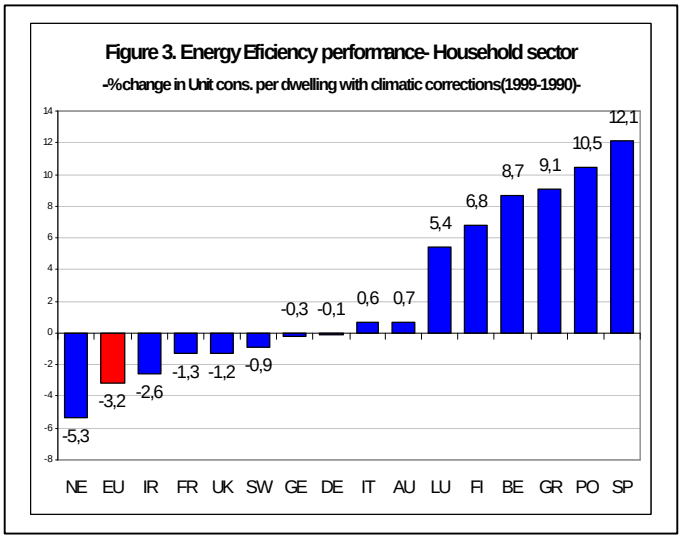
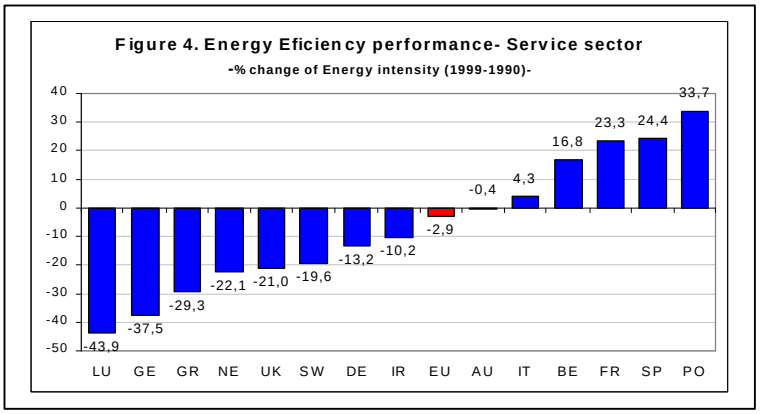


Figure 2-4. Energy efficiency performance: Service sector.



2.2.2.- Legislation and main programmes/incentives.

In a context of growing global energy demand, energy efficiency plays a crucial role in the transition towards sustainable development. Efficiency does not only depend on the quantity of energy being supplied by the product but, also, on the effectiveness of the service which is being demanded (through a process which transforms the fuel into heat or electricity)[3]. Therefore, fuel demand depends on the final use of energy, which finally determines the degree of substitution between factors of production. Thereby, the concept of energy service allows us to link energy demand and supply. This link is essential to reach a sustainable consumption.

Therefore, it is necessary to improve the energy efficiency not only in relation to the quantity of energy being provided by the product but, also, according to the energy demanded. Taking into account the first criteria, we should use the energy intensity indicator (energy input/economic output). If the second criterion is considered, several policies and measures already applied can improve substantially the energy efficiency. We refer to measures such as: standards, information campaigns, labels, voluntary programmes, fiscal and financial incentives, etc.... They have a greater influence on final energy consumers (economic sectors and individual energy users) than on energy suppliers and distributors.

In this section we carry out an analysis of the state and evolution of the energy input/economic output for each MS, and also the measures and standards applied to improve the energy efficiency (table 2-6).

[3] For the purposes of this report, the term “effectiveness” indicates the energy performance which takes into account the process of transformation and distribution of energy, independently of the technological level achieved. Effectiveness depends on the type of final energy being demanded. On the other hand, “efficiency” is an abstract term indicating the technological level reached in the transformation of energy.

Table 2-6. Energy efficiency measures considered in this section.

Climate Change • **Directive 3/76** • **Decision April 25th 2002** • **Directive 2003/87/EC**
Energy efficiency • **COM 1998** • **Decisión 647/2000** (further at the back in the text) • **COM 2000 (247?)** • **Directive 2000/55/CE** • **Decision 2001/469**
Energy performance • **Directive 92/42** • **Directive 96/57** • **Directive 2003/66**
CHP • **COM 2002 (415)**

EC legislation leading to increased energy efficiency.

-Directive 3/76/CEE on the control of CO_2 emissions through energy efficiency improvements (SAVE).

The goal is to limit CO_2 emissions in the most energy consuming sectors (domestic and tertiary sectors).

The Directive invites Member States to implement programmes in the following areas:

- Energy certification of buildings.
- Invoicing of heating, air conditioning and sanitary water heating expenses according to real consumption.
- Funding of investments leading to improvements in the energy efficiency of the public sector by third parties.
- Thermal insulation of new buildings.
- Periodic inspection of boilers with a power capacity above 15 kW.

Energy audits in high consumption industries.

-Decision on the EC signature of the Protocol to the United Nations Framework Convention on Climate Change and on the implementation of the associated commitments (April 25th 2002).

This Decision indicates that the first Commitment period will run from 2008 to 2012. Member States must jointly reduce their GHG emissions by 8% compared to 1990 levels. In order to reach this objective, the following measures are proposed:

- To reinforce or set national policy measures aimed at emissions reduction (higher energy efficiency, promotion of sustainable agriculture, promotion of renewable energy sources etc..).
- To cooperate with the rest of countries (Parties)(exchanging experiences and data, coordination of national policies to take advantage of the Kyoto Mechanisms: International Emissions Trading, Joint Implementation and the Clean Development Mechanisms).

-Directive 2003/87/EC (CO2 Emissions Trading Directive). This Directive will be extensively described in a later section (see 2.4.3.2).

-COM 1998 (April 29th 1998). Towards a strategy on the rational use of energy aimed at energy efficiency improvement**.**

Objectives:

- To emphasise the current economic potential concerning effectiveness.
- To analyse the policies implemented so far.
- To highlight the interventions already carried out at community, national and regional levels.
- To set up a detailed action plan.
- To prepare the adoption of common policies and actions in conformity with the Kyoto commitments.

There are economic, institutional and legal obstacles to the investment in energy efficiency. To avoid economic barriers, it is necessary that the real costs of generation and distribution are taken into account. This can be done through:

- the internalisation of external costs through taxes and charges.
- the liberalisation of the electricity and gas markets. This is crucial to improve the energy performance and to reduce prices.

Institutional and legal barriers, which may delay improvements in energy performance, are.

- the selling (as it is usual practice) of the energy according to each kWh consumed and not according to the services associated to heating, lighting etc..
- the usual practice on the part of several home owner and builders which install cheap domestic appliances whose high energy consumption falls on the buyer or on the tenant.

Concerning the rational use of energy, we propose the following priority areas:

- High energy efficiency buildings.
- Assessment of the Directive 93/76/CEE aimed at reducing CO2 emissions[4].
- Domestic appliances and other high final energy consumption equipment

[4] This Directive aims at the limitation of CO2 emissions through the implementation of energy efficiency improvements (SAVE)(see below).

- Implementation of negotiated agreements with manufacturers to set minimum performance standards.
- Information dissemination..
- Funding of third parties, guarantees on performance and other innovative funding schemes.
- Energy efficiency in the electricity, gas and CHP sectors.
- Energy management and cooperative acquisition of technology.

-Decision 647/2000/CE on the approval of a energy efficiency promotion programme (SAVE 1998-2002), which abolishes decision 96/737/CEE.

The aim is to implement a programme promoting the rational and efficient use of energy. The programme is linked to the achievement of the Kyoto Protocol GHG target, because energy efficiency is a cornerstone in this regard.

The following activities are funded under this programme:

- Studies which consider the energy costs linked to Community measures.
- Pilot activities leading to the faster implementation of energy efficient investments and to the improvement of energy-use habits.
- Promotion of the exchange of experiences
- Monitoring advancements in energy efficiency and assessment of activities adopted in the framework of the programme.
- Improving the management at the regional and urban levels, favouring the cohesion between Member States and regions.

-COM 2000/247: action plan to improve energy efficiency.

Objective: to reduce energy consumption by 1% until 2010.
There are several barriers, such as the inefficient use of energy in the industrial sector and commercial barriers, which we can include in the following categories:

- Sale of the energy according to its consumption per kWh rather than according to the services it provides.
- Lack of internalisation of externalities leading to a lack of inclusion of all energy costs in final prices.
- Institutional and legal barriers.
- Incomplete information which hinders the use of profitable and effective techniques.

The measures considered can be grouped in three categories:

1) Measures aimed at the integration of the energy efficiency objective into other community policies.
2) Measures aimed at strengthening and extension of existing actions.
3) New measures.

The former (integration measures) affect six main areas:

- Transport (promotion of modal shifts through the building of new infrastructures).

- Business firms (promotion of sustainable development, particularly in the industrial sector, especially through voluntary agreements).
- Regional and Urban policy (Allocation of Structural and Cohesion Funds, etc.).
- R & D (through the framework programmes).
- Fiscal measures and price policy (fiscal exemptions for investments in energy efficiency and the proposal for a tax framework of energy products).
- International cooperation and activities aimed at the harmonisation of national legislation and liberalisation).

The measures of strengthening and extension of existing actions affect five main areas:

- Transport (voluntary agreements with the car manufacturers with the aim to reduce CO2 emissions by one third in 2005-2010 compared to 1995 levels and proposals for draft legislation).
- Domestic appliances, commercial equipment and other equipment (labels- including ecological labels- and minimum standards for energy efficiency–voluntary agreements with, video recorders, washing machines, water heaters, dishwashers and television manufacturers).
- Industry, including electricity and gas sectors (long-term agreements with the industry on minimum performance standards of processes; increase of CHP plants in order to control emissions of large combustion plants and increased energy efficiency of energy services through voluntary agreements).
- Construction (reform of the Directive 93/76/CEE on energy certification of buildings, complementary proposal on the performance of buildings, boilers and building materials and adoption of Directive on efficiency of lighting systems.
- Horizontal, cross-cutting measures (decentralisation of energy management, reinforcement of third-party financing, diffusion of training and information actions, improvement of monitoring, better harmonisation of monitoring programmes and definition of indicators).

The new actions and measures affect four main areas:

- Promotion of energy efficiency in public contracts (analysis of public programmes to make recommendations and to undertake pilot projects).
- Cooperation in the context of public contracts for technology (linking needs and requirements of the public contracts on high-performance technologies).
- Audits in the industry and tertiary sectors (disseminating information to increase energy savings).
- Better practices (according to the SAVE programme, which provides information and advice to users).

<u>-Directive 2000/55/CE, concerning energy efficiency requirements of the sleepers of fluorescent lamps.</u>

The objective is to save energy in lightning, with the use of fluorescent lamps whose sleepers account for a significant part of consumption.

The proposal aims at removing barriers to the exchanges between Member States through the elaboration of norms relative to the sleepers of fluorescent lamps. This allows harmonisation at EU level.

-Decision 2001/469/CE on the agreement between the EC and the government of the United States of America regarding the coordination of the energy efficiency labelling programmes for office computer equipment.

The aim is to coordinate the labelling of highly efficient office computer equipment with the ENERGY STAR logo.

The coordinated labelling programme ENERGY STAR is voluntary and allows identification of those OFIMATIC equipment with high energy performance. The implementation of the programme in the UE is managed by BESCE.

-Directive 92/42/CEE, concerning energy performance requirements of water heating boilers with power capacities between 4kW and 400 kW and which use liquid or gaseous fuels. This is modified by Directive 93/68/CEE.

The aim is to guarantee the free trade of these devices by harmonising its performance requirements.

Assessment on the conformity with the EC trademark is undertaken by the pertinent agencies of Member States and by the manufacturers themselves.

-Directive 96/57/CE, concerning the energy performance requirements of refrigerators, freezer and domestic electric appliances.

-Directive 2003/66/CE, concerning the energy labelling of refrigerators, freezers and domestic electric appliances, which modifies Directive 92/75/CEE.

The aim is to set minimum energy performance standards for these home appliances. Those complying with such standards will be able to use the “EC” trademark. Each Member State will be responsible for granting such authorisation.

-COM 2002/415 on the promotion of CHP (increase of CHP in heat demand in the energy internal market).

The goal is to promote CHP leading to energy savings and compliance with the Kyoto Protocol targets. In the short term the aim is to strengthen existing installations while in the medium and long terms the goal is to reduce CO_2 emissions and to contribute to Sustainable Development.

The legislative framework concerning CHP has to face the following barriers:

- Insufficient monitoring of old monopolies.
- Insufficient support by regional and local governments.

- Incomplete liberalisation.
- Unfavourable legislation.
- Lack of EU legislation on grid connection.

There are already rules and regulations on CHP in Germany, Belgium and Spain.

The regime of public support for CHP promotion focuses on small installations, i.e., those with a capacity of 50 MW, while the large installations only receive support for the first 50 MW of electricity.

2.3.- Renewable Energy Policy

2.3.1. Review of main indicators (EU average & EU15).

In the EU, renewable energy accounted for 2.7% of electricity generation in 2001 (excluding hydro) and 15.5% if hydro was included. MS have different shares, however.

Virtually all Member States in Europe recognise the socioeconomic and environmental benefits of renewable electricity and have been promoting this energy source for years. The following table shows the trends in RES-E deployment in the 1995-2001 period. It is important to note that both the contribution of RES-E and the trends in the considered period are not only a result of promotion schemes. They are also the consequence of different geographic conditions as well and the existence of non-technical barriers (administrative procedures, lead times etc...).

Table 2-7. Trends in RES-E generation in the 1995-2001 period (exc. hydro).

Country	RES-E 1995 (%) *	RES-E 2001 (%)*	RES-E 1995 (TWh)**	RES-E 2001 (TWh)**	Average annual percent change 1995-2001***
Austria	3.3	3.1	1.821	1.934	1.0
Belgium	0.8	0.8	0.588	0.628	1.1
Denmark	5.4	16.3	1.981	6.145	20.8
Finland	10.5	11.4	3.412	12.143	23.5
France	0.6	0.8	2.945	4.368	7.0
Germany	1.0	2.7	5.326	15.654	20.0
Greece	0.1	1.6	0.041	0.849	65.0
Ireland	0.1	1.7	0.017	0.418	69.0
Italy	1.6	2.9	3.798	7.885	13.0
Luxembourg	10.9	17.3	0.054	0.086	8.0
Netherlands	1.5	3.3	1.215	2.998	16.2
Portugal	3.2	4.2	1.062	1.940	10.6
Spain	0.9	4.4	1.490	10.326	38.0
Sweden	1.7	2.4	2.521	3.880	7.5
UK	0.6	1.4	1.995	5.369	17.9
EU	1.4	2.7			

Source: Own elaboration from IEA/OECD (2003).
*Share of electricity production from renewable sources excluding hydro (%), by country.
**Absolute electricity generation from renewables, excluding hydro (data in TWh).
*** Average annual percent change 1995-2001 in absolute generation from renewables (two preceding columns).

The data (excluding hydro) shows that, in several countries, RES-E already had a relatively high contribution to electricity production in 1995. These were the cases of Luxembourg and Finland and, to a lesser extent, Denmark, Austria and Portugal. In Sweden, Italy and the Netherlands the RES-E contribution was around 1.5%, while in the rest of MS it was below 1% and in some cases was negligible.

But in the following years, the deployment of RES-E experienced fast growth rates in some European countries. These were the cases of Greece and Ireland, which had very small contribution in 1995. Spain, Finland, Denmark and Germany experienced average annual percentage growth rates above 20% followed by U.K. (18%), the Netherlands (16.2%) and Italy (13%). Intermediate growth rates (between 7% and 10%) can be discerned in Portugal, Luxembourg, Sweden and France. Very slow growth is observed in Austria and Belgium.

These trends have caused that the contribution of RES-E to electricity production be significant in some countries in 2001, while in others this contribution has not changed (or have even declined) compared to the 1995 contribution. The case of Denmark, where in 2001 already 16% of its electricity production came from renewables is worth mentioning. Luxembourg and Spain are other cases in point, where this contribution has increased considerably. On the other side of the picture we can find MS where the 2001 (and 1995) contributions are very low and the growth in the 1995-2001 period has been slow. These are the cases of Belgium and France.

If hydro is included, and data for the 1990-2001 period is considered, the above picture changes a bit concerning the contribution of renewables to electricity production, although not much regarding the growth trends (table 2-8).

Table 2-8. Share of electricity production from RES (%), by country*.

	1990	**1995**	**1998**	**2000**	**2001**	**Average annual percent change 90-2001**
Austria	66.2	70.5	69.4	72.3	70.1	0.5
Belgium	1.1	1.3	1.3	1.2	1.4	2.1
Denmark	3.2	5.5	10.1	16.3	16.4	16.0
Finland	28.6	30.9	34.8	33.3	29.1	0.2
France	13.3	15.4	12.9	13.3	14.4	0.7
Germany	3.7	5.1	4.8	6.3	6.2	4.7
Greece	5.1	8.6	8.2	7.8	5.5	0.7
Ireland	4.9	4.1	5.6	5.0	4.2	-1.5
Italy	16.4	17.5	18.4	18.9	20.1	1.9
Luxembourg	16.7	29.0	46.7	46.9	44.0	9.2
Netherlands	1.1	1.6	2.5	3.2	3.5	10.6
Portugal	34.7	28.3	36.4	30.3	34.6	-0.0
Spain	17.2	14.9	19.3	16.3	21.9	2.2
Sweden	51.0	47.6	49.2	57.2	51.3	0.1
UK	1.8	2.1	2.4	2.6	2.5	2.9
EU	13.1	14.0	14.3	14.9	15.5	1.5

Source: IEA (2003).

**Renewable sources include hydro, geothermal, solar thermal, solar PV, tide, wind, renewable municipal solid waste, solid biomass and biogas..*

Note: Numbers for hydro power are not “normal water” corrected; Hence, a (high) annual deviation occurs (see e.g. Ireland).

Concerning the electricity production mix, the main energy source for electricity generation is nuclear energy (35%), followed by coal (26%), natural gas (17%) and hydro (12%). Table2-9 provides an overview of the contribution of the different generation technologies.

In most countries, electricity generation is dominated by fossil fuels. This occurs in Denmark (coal and natural gas), Germany (coal), Greece (coal), Ireland (coal, oil and natural gas in equal shares), Italy (oil and natural gas), Luxembourg (natural gas), The Netherlands (natural gas and coal to a lesser extent), Portugal (coal and oil and natural gas to a lesser extent), Spain (coal) and U.K.(Natural gas and coal).

In 5 countries non-GHG emitting energy sources predominate in the electricity generation mix: Austria (hydro), Belgium (nuclear), Finland (nuclear, hydro and other renewables), France (nuclear) and Sweden (nuclear and hydro).

Several countries, where GHG energy sources predominate, have also a significant share of other energy sources: Germany (nuclear), Italy (hydro), Luxembourg (hydro and other renewables), Portugal (hydro), Spain (nuclear).

Table 2-9. Electricity production mix.

	Electricity generation (TWh)	**Coal (% share)**	**Oil (% share)**	**Natural gas (% share)**	**Nuclear (% share)**	**Hydro (% share)**	**Others (% share)**
Austria	59	9	5	15	0	68	3
Belgium	83	15	1	23	59	0	1
Denmark	39	52	13	24	0	0	12
Finland	69	14	1	14	33	18	20
France	520	6	2	1	76	14	1
Germany	551	52	1	10	31	4	3
Greece	49	66	17	8	0	9	1
Ireland	22	27	28	32	0	4	9
Italy	259	11	35	34	0	18	3
Luxembourg	0.4	0	0	57	0	24	19
Netherlands	87	26	8	57	4	0	6
Portugal	43	35	26	19	0	17	3
Spain	206	37	12	9	29	11	3
Sweden	155	2	2	0	47	46	2
UK	364	29	2	39	27	2	2
EU	2,508	26	7	17	35	12	3

Source: IEA (2001).

The following table shows the contribution of individual RES-E technologies to total RES-E generation. Hydro still accounts for a high share of total renewable electricity generation but the growth in wind deployment is responsible for most of the increase in RES-E in the 1995-2001 period. Certain non-hydro RES-E technologies play a very relevant role in several countries such as geothermal (Italy), wind (Denmark), MSWR (The Netherlands), solid biomass (Finland) and biogas (U.K.).

Table 2-10. Contribution of different technologies to RES-E total generation (% share over total RES-E generation).

	Hydro	Geoth.*	Solar PV	Tide*	Wind	MSWR*	Solid Biomass	Biogas
Austria	95,6	0,0	0,0	0,0	0,4	0,1	3,5	0,4
Belgium	41,0	0,0	0,0	0,0	3,4	27,6	16,1	11,8
Denmark	0,5	0,0	0,0	0,0	69,5	17,3	9,2	3,6
Finland	60,9	0,0	0,0	0,0	0,3	0,9	37,8	0,1
France	94,6	0,0	0,0	0,7	0,2	1,9	1,9	0,8
Germany	56,9	0,0	0,4	0,0	29,7	5,7	1,8	5,5
Greece	71,5	0,0	0,0	0,0	25,8	0,0	0,0	2,7
Ireland	58,0	0,0	0,0	0,0	32,5	0,0	0,0	9,4
Italy	85,5	8,2	0,0	0,0	2,2	2,3	0,5	1,2
Luxembourg	60,7	0,0	0,5	0,0	11,9	23,3	0,0	3,7
Netherlands	3,6	0,0	0,4	0,0	25,4	40,7	20,6	9,3
Portugal	87,7	0,7	0,0	0,0	1,6	3,2	6,8	0,0
Spain	80,0	0,0	0,0	0,0	13,6	1,2	4,5	0,6
Sweden	95,4	0,0	0,0	0,0	0,6	0,3	3,7	0,0
UK	42,2	0,0	0,0	0,0	10,0	9,9	8,0	29,9
EU	82,7	1,1	0,1	0,1	6,6	2,5	5,1	1,8

Source: Own elaboration from IEA/OECD (2003).
**Geoth. = Geothermal; *Tide = tide/wave/ocean; *MSWR = Municipal solid waste residues (only biodegradable fraction of waste).*
Note: Renewables do not include industrial waste, non-renewable municipal solid waste and pumped storage production

2.3.2. Legislation.

The aim of EU energy policy in the medium term is to promote investments in installations producing renewable electricity in general provided that renewable electricity competes on an unequal playing field with conventional electricity. Although, in general, private generation costs are higher for renewable than for conventional electricity, the former provides certain benefits which are not internalised by the market. RES-E pollutes much less and therefore, avoids the negative externalities of conventional electricity production. Employment and investment opportunities are created through renewable electricity and, by having renewable potential in its territory, Europe can also reduce risks relative to the security of supply, which is certainly a major policy concern nowadays. This all translates into a generally lower social cost (inclusive of private costs plus external costs) for renewable energy. The well-known problem is that market operators (investors, generators, suppliers, and consumers) are guided by the incentives provided by the market where decisions are taken on the basis of private and not social costs. The justification for providing financial support to renewables is to level the playing field with respect to conventional electricity, to internalise the positive externalities of renewables in the decisions taken by economic actors and to allow renewables to penetrate the market.

Initial legislative steps.

Although the European Commission released a Green Paper on renewable energy sources (RES) in 1996, initially the most relevant document of renewable energy policy was the White Paper on RES, which set a target for the deployment of renewable electricity

(European Commission 1997a). By 2010, 12% of gross inland consumption of energy would have to come from renewable energy sources (RES). In turn, this percentage translates into a percentage share of electricity consumption being provided by electricity from renewable energy sources (RES-E): 22% (12.5% if large hydro is excluded). The White Paper proposed that a Directive on RES would be published shortly.

The RES-E Directive (Directive 2001/77/EC).

RES-E requires significant public support in order to penetrate the electricity market. This has been recognised at the EU level and by the individual MS. The latter have been promoting RES-E for years.

Renewable electricity (RES-E) has a strategic role in renewable energy promotion. On the one hand, electricity, which accounts for 40% of gross inland consumption in the EU-15, represents by itself the most relevant energy subsector. On the other hand, several European studies (i.e. TERES) consider electricity generation as the easiest way to get renewable energy into the market.

The Renewable Electricity Directive sets targets for the deployment of renewable electricity by 2010. Its main lines are briefly summarised below[5].

Indicative targets for RES-E.

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The 1997 White Paper target of 12% of gross inland consumption of energy coming from renewable energy sources (RES) was translated into a percentage share of electricity consumption in Europe being provided by electricity from renewable energy sources (RES-E): 22.1 %[6]. This indicative target for the deployment of RES-E in Europe is specified in the Renewable Electricity Directive (European Commission 2001a), which also sets indicative targets per MS (see table below). Although the targets are indicative they could be made mandatory in the future, after the review process in which the Commission assesses the extent to which MS' targets are compatible with the achievement of the 22.1% objective by 2010. As stressed by Rowlands (2004, p.5), if the Commission finds that the national targets are likely to be inconsistent with this target, then the Commission shall "present proposals to the European Parliament and to the Council with respect to individual and mandatory national targets" (European Commission 2001a).

Table 2-11. RES-E indicative targets (2010) per MS.

	RES-E 1997 (TWh)	RES-E 1997 (%)	TARGET 2010 (%)	RES-E 1997 (exc. large hydro)(%)	TARGET 2010 (exc. large hydro)(%)
Austria	39.05	70	78.1	10.7	21.1
Belgium	0.86	1.1	6	0.9	5.8
Denmark	3.21	8.7	29	8.7	29
Finland	19.03	24.7	31.5	10.4	18
France	66.0	15	21	2.2	8.9
Germany	24.91	4.5	12.5	2.4	10.3
Greece	3.94	8.6	20.1	0.4	14.5
Ireland	0.84	3.6	13.2	1.1	11.7

[5] The design and final approval of the RES-E Directive was the result of significant negotiations and discussions. See Rowlands (2004) in this regard.

[6] After three countries reduced their targets from those that the Commission had introduced in its first draft of the Directive (Finland from 35% to 31%, the Netherlands from 12% to 9% and Portugal from 45.6% to 39%), Rowlands (2004, p.5) has calculated that the actual figure is estimated to be 21.7%.

Italy	46.46	16	25	4.5	14.9
Luxembourg	0.14	2.1	5.7	2.1	5.7
Netherlands	3.45	3.5	9	3.5	9
Portugal	14.3	38.5	39	4.8	14,9
Spain	37.15	19.9	29.4	3.6	17.5
Sweden	72.03	49.1	60	5.1	15.7
UK	7.04	1.7	10	0.9	9.3
EU	338.41	13.9	22.1	3.2	12.5

Source: CEC (2001a).

The RES-E Directive. Main issues and deadlines.

1) *Definition of renewables*.

According to article 2 of the Directive, renewable energy sources "shall mean renewable non-fossil energy sources (wind, solar, geothermal, wave, tidal, hydro-power, biomass, landfill gas, sewage treatment plant gas and biogases)". Biomass "shall mean the biodegradable fraction of products, waste and residues from agriculture (including vegetal and animal substances), forestry and related industries, as well as the biodegradable fraction of industrial and municipal waste".

2) *National support schemes and EU community framework.*

Taking account of the wide diversity of promotion schemes between Member States, the Directive states that it is too early to set a Community-wide framework regarding support schemes. By 10/27/2005 the Commission should present a report on the experience gained with the application and coexistence of different support schemes in the Member States. The report may be accompanied by a proposal for a Community framework for RES support schemes (art.4.2). However, the directive also stipulates that such a proposal for a harmonised support framework should allow a transition period of at least 7 years (thereafter) in order to maintain investors' confidence and avoid stranded costs.

Thereby, the EU RES-E Directive has initiated a transition period concerning support schemes having an influence on renewable electricity deployment in the future. The Directive sets a minimum framework for RES-E policy but it does not prejudge what RES-E policy scheme should be used in the future. Not even if a common RES-E promotion scheme should be implemented. In line with the Principle of Subsidiarity, it allows each MS to choose the support scheme which "corresponds best to its particular situation". Therefore, at least in the short/medium term, national support schemes will continue to be used by MS to promote RES-E. In the future, some sort of combination of a community framework (harmonisation) and continuation of MS policies for new and existing capacity can be expected.

3) Mandatory guarantees of origin (GOs).

By 10/27/2003 at latest MSs shall ensure that the origin of RES-E can be guaranteed as such according to objective, transparent and non-discriminatory criteria laid down by each MS. They will issue a GO containing data about the energy source from which the electricity was

produced (including dates and places of production). The explicit aim is to enable producers of RES-E to demonstrate that the electricity they sell is produced from RES. GOs will be mutually recognised by MS.

4) *Ensure grid access.*

MS shall take the necessary measures to ensure that transmission system operators and distribution system operators in their territory guarantee the transmission and distribution of RES-E.

5) Reporting obligations.

On the one hand, the Directive sets reporting obligations for the Commission and for MS on success in meeting the national indicative targets, issuing of guarantees of origin for RES-E, etc... The following reporting obligations apply to the European Commission:

1) Publication of a report assessing if MS have made progress towards achieving their national indicative targets (10/27/2004 and then every two years).

2) Presentation of a report on the implementation of the Directive (12/31/2005 and then every five years).

On the other hand, MS will also have reporting obligations:

1) Publication of reports setting national indicative targets for the future consumption of RES-E for the next 10 years (10/27/2002 and then ever five years).

2) Publication of national reports on success in meeting the national indicative targets (10/27/2003 and then every two years).

3) Issuing a guarantee of origin of RES-E (10/27/2003). 4) Publication of a report evaluating the authorisation procedures for RES-E plants (10/27/2003).

2.4.- GHG Policy

2.4.1.- The Burden Sharing Agreement (BSA) and the Kyoto Protocol (KP).

The EC has committed itself to reduce its GHG emissions by 8% from base year level in the first commitment period 2008–2012 of the Kyoto Protocol, with differentiated commitments per MS.

The Kyoto Protocol (KP) was ratified by the EU and its Member States on 31 May 2002. The EU made use of art. 4 of the KP, which allows countries form ”bubbles”, i.e., to club together and to share their joint commitments differently from the common target. Accordingly, under the Burden Sharing Agreement (BSA), which became legally binding for the Member States when the EU ratified the KP (Council Decision 2002/358/EC of 25 April 2002), the 8% target was shared between the 15 Member States, allowing some countries to increase their emissions and obliging others to reduce (table 2-12)

Table 2-12. Member States commitments under the BSA.

	2008-2012 = 100
Austria	87
Belgium	92.5
Denmark	79
Finland	100
France	100
Germany	79
Greece	125
Ireland	113
Italy	93.5
Luxembourg	72
The Netherlands	94
Portugal	127
Spain	115
Sweden	104
U.K.	87.5
EU	92

All the Member States are jointly liable if some of them cause the EU to miss its overall Kyoto target. In other words, the BSA serves as basis for reaching their commitments individually for every MS in case the EC as a whole would fail to reach its commitment in the period 2008-2012.

2.4.2.- GHG emissions trends in the 1990-2001 period.

Analysis by gas.

The EU GHG emissions decreased by 2.3 % from base year level in 2001 and reached a level of 4108 Million tonnes Co2-equivalent. The reduction is not much more than one quarter of the EC's Kyoto target of an 8 % reduction from base year level to 2010.

-CO2 emissions

CO2 is the most important GHG in the EU, accounting for 82% of total GHG emissions in 2001. These emissions have increased by 1.6% between 1990 and 2001. The transport sector and the "other sectors" are contributing most to this increase (a 20% and a 3% increase, respectively, compared to 1990 levels).

-Methane (CH4) emissions.

Methane emissions account for 8% of total EU GHG emissions, which have been reduced by a 21% between 1990 and 2001. According to European Commission (2003b), the reasons for this reduction are: the decline of coal mining, reductions in solid waste disposal on land and technical measures to reduce these emissions and decreasing numbers of cattle.

-Nitrous oxide (NO2) emissions

They are responsible for 8% of total GHG emissions and have decreased by 16% between 1990 and 2001. Main reasons for this reduction are: the decline in emissions in the production of adipic acid due to technical measures and the reduction in the use of fertilisers (op.cit.).

-Fluorinated-gas emissions

Their importance is limited, since they account for only 1% of total GHG emissions in 2001. HFC emissions increased by 11% between 1995 (which is taken as the base year for all the fluorinated gases) and 2001, while PFC emissions decreased by 28% and SF6 emissions by 25% in the same period.

Analysis by sector.

CO2 emissions from energy industries, transport, other sectors (mainly combustion processes in households, public buildings and agriculture) and manufacturing industries and construction account for more than 75% of total GHG emissions in the EC and all result from fuel consumption. These sectors have seen different trends in the period, as the following tables show.

2-13. GHG emissions share and trends of selected sectors.

Sector	**Share in EU GHG emissions (2001)**	**Trend in the 1990-2001 period.**
Energy industries	27%	2% reduction
Transport	20%	20% increase
Other sectors	16%	3% increase
Manufacturing industries and construction	14%	9% reduction

Source: own elaboration from European Commission (2003b).

2-13. GHG emissions share and trends of selected sectors (disaggregated)

Sector	**Share in EU GHG emissions (2001)**	**Trend in the 1990-2001 period.**
Other (non-energy)	0%	-6%
Waste	2%	-24%
Agriculture	10%	-8%
Transport	21%	21%
Other (Energy)	17%	1%
Industry (Processes)	6%	-20%
Industry (Energy)	14%	-9%
Fugitive Emissions	2%	-37%
Energy Industries	28%	-2%

Source: EEA (2003).

The main reasons for these trends are provided in the following table. The large increase in emissions from the transport sector are especially worrying.

Table 2-14. Reasons behind GHG emissions trends.

Sector	Main reasons for the trend
Energy industries (electricity heat and steam production)	Fuel shifts from coal to gas and improved efficiency. Increase in the use of CHP and RES-E.
Transport	Increase in road transport volumes and associated fuel combustion
Manufacturing industries and construction	Economic restructing following the German reunification and continuing efficiency improvements.

Source: own elaboration from European Commission (2003b).

Analysis by Member State.

Table 2-15 shows the trends of GHG emissions in EU-15. The distance-to-target indicator, which measures the progress of each MS in emission control compared to the theoretical linear Kyoto target path of the MS under the BSA, shows that several countries are far from their target path.

In this context, countries can be grouped into four categories. U.K., Germany, Sweden and Luxembourg are complying with their targets. Minor uncompliance can be observed in Finland and France. Belgium, Denmark, Greece, Italy and the Netherlands show intermediate uncompliance, while major non-compliance can be observed in Austria, Ireland, Portugal and Spain. The trend in the Spanish emissions from this later country are specially worrying, since it is the fifth largest emitter in the EU, behind Germany, U.K., Italy and France, all controlling their emission levels.

Table 2-15. GHG emissions in CO2e and KP targets for 2008-2012 in EU-15.

	Base year (Mt CO2)*	Kyoto target (according to the BSA)	GHG emissions 2001 (Mt CO2).	Change 2001 (in % of base year emissions)	Change 2001 (in % of 2000 emissions)	Distance-to target indicator (index points)
Austria	78.3	-13.0%	89.5	+9.6%	+4.8%	**+16.8%**
Belgium	141.2	-7.5%	150.2	+6.3%	+0.2%	**+10.5%**
Denmark**	69.5	-21.0%	69.4	-0.2% (-9.0%)	+1.8%	**+11.4% (+2.6%)**
Finland	77.2	0.0%	80.9	+4.7%	+7.3%	**+4.7%**
France	540.8	0.0%	560.8	+0.4%	+0.5%	**+0.4%**
Germany	1216.2	-21.0%	993.5	-18.3%	+1.2%	**-6.8%**
Greece	107.0	+25%	132.2	+23.5%	+1.9%	**+9.8%**
Ireland	53.4	+13%	70.0	+31.1%	+2.7%	**+23.9%**
Italy	509.3	-6.5%	545.4	+7.1%	+0.3%	**+10.7%**
Luxembourg	10.9	-28%	6.1	-44.2%	+1.3%	**-28.8%**
Netherlands	211.1	-6%	219.7	+4.1%	+1.3%	**+7.4%**
Portugal	61.4	+27%	83.8	+36.4%	+1.9%	**+21.6%**
Spain	289.9	+15%	382.8	+32.1%	-1.1%	**+23.8%**
Sweden	72.9	+4%	70.5	-3.3%	+2.2%	**-5.5%**
UK	747.2	-12.5%	657.2	-12.0%	+1.3%	**-5.2%**
EU	4204.0	-8%	4108.3	-2.3%	+1.0%	**+2.1%**

Source: European Commission (2003b)

*Base year for CO2, CH4 and N2O is 1990; for the fluorinated gases most Member States have indicated to select 1995 as base year, as allowed for under the Protocol. Therefore, 1995 is used as the base year for fluorinated gases for all Member States.

**For Denmark, data that reflect adjustments for variations in electricity trade in 1990 are given in brackets.

***The data does not include LULUCF emissions and removals.

Finally, two relevant indicators (emissions per capita and per unit of GDP) have been reduced since 1990. Emissions per capita have remained more or less constant since 1995. Emissions per unit of GDP drop by around 10% since 1995.

Table 2-16. Emissions per capita and per unit of GDP in UE-15.

	1990	**1995**	**1997**	**1999**	**2000**
Per capita emissions (tCO2/inhabitant).	9.2	8.8	8.8	8.8	8.8
Emissions per unit of GDP (tCO2/GDP).	629	576	554	529	514

Source: Own elaboration.

2.4.3.- Legislation and main programmes/incentives (targets).

The control of GHG emissions in the EU has been based on different programmes and incentive schemes targeting different sectors (industry, energy, residential, transport...).

The first steps towards emission trading in the EU. The Green Paper and the European Climate Change Programme.

Apart from other Policies and Measures (i.e., energy efficiency, renewable energy promotion), GHG mitigation at the EU level has relied on the use of emission trading. An initial proposal to implement a CO2 tax scheme in the EU was not approved. A first indication of the Community´s interest in the use of market-based mechanisms can be found in its 5th environmental action programme, although emission trading was not specifically mentioned. However, the specific interest in emissions trading developed quickly after the adoption of the Kyoto Protocol in December 1997. A first reference to an "EC-wide approach to emissions trading" can be found in the Commission´s Communication on the EU´s post-Kyoto strategy from 3 June 1998[7]. In this Communication the Commission suggested the implementation of an EU-wide emissions trading scheme by 2005. In a following Communication[8], the Commission suggested the adoption of a Green Paper on EU GHG emissions trading (Lefevere 2002, p.24).

The publication by the Commission of the Green Paper on Emission Trading in March 2000 (see European Commission 2000b), initiated the process towards the implementation of an emissions trading scheme in the EU culminated by the Directive establishing a European Union CO2 emission Trading Scheme (EU ETS) to reach the KP commitments. The Green Paper launched a discussion on GHG trading within the EU, including issues related to the design features of an EU ETS and to the relationship between emissions trading and other policies and measures to address climate change. Several sectors were considered as candidates for inclusion in the EU ETS. All except the chemical sector have finally been included[9]. There was also a commitment to present legislative proposals on emission trading by the end of 2001 at the latest.

[7] Communication from the Commission to the Council and the European Parliament, "Climate Change, towards a EU Post-Kyoto Strategy, COM(1998)353, 3 June 1998.

[8] Communication from the Commission to the Council and the European Parliament, "Preparing for Implementation of the Kyoto Protocol", COM(1999)230, 19 May 1999.

[9] More on the ECCP, see European Commission (2003a) and Convery (2001). A complete overview of the development of emissions trading in the EU is provided by Lefevere (2002).

In parallel, the Commission established the European Climate Change Programme (ECCP) in June 2000. The ECCP set up as a multi-stakeholder consultative process and helped identify the most environmentally beneficial and cost effective measures to achieve the KP target.

In March 2001 the Commission released the results of a two-year project designed to identify a least-cost approach to meeting the EU target (the Sectoral Objectives Study) which included both a ”top down” and a ”bottom-up” approach to cost estimation. The study identified the individual sectoral emissions levels that would result in least-cost means of achieving the EU target, contrasting the least-cost result to an uniform reduction requirement that would achieve the overall target. This project also provided information on the potential cost savings from emission trading. The study reported that emissions trading among selected sectors in all MS could reduce costs by up to half of total compliance costs in those sectors (Harrison and Radov 2002).

The CO2 Directive.

Major legislative steps have been taken to implement an emissions trading system in the European Union. Actually, a Directive creating a CO2 emissions trading scheme in Europe was proposed in 2001. After going through the usual legislative procedure (Commission, Council and Parliament), the EU emissions trading Directive was formally adopted by the Council on 22 July 2003 (European Directive 2003/87/EC). On October 13, 2003 the Directive was published in the Official Journal of the EU making it EU law. Member States are now expected to implement the provisions necessary to comply with the new emissions trading scheme. The European Emission Trading Scheme (EU ETS) covers carbon dioxide emissions from large stationary sources including power and heat generators, oil refineries, ferrous metals, cement, lime, glass and ceramic materials, and pulp and paper. It is estimated that these sources will emit 46% of the Community’s carbon dioxide emissions in 2010.

National authorities will issue site-specific greenhouse gas emission permits to installations setting requirements for monitoring and reporting emissions of greenhouse gases. Member States will allocate EU emission allowances to installations, based on a national allocation plan developed in accordance with common criteria. Holdings of allowances will be recorded in a registry in each Member State, and four months after the end of each year, operators will be required to hand over allowances equivalent to the installation’s emissions during the preceding year to the national authority. Operators of installations will be free, if they so wish, to buy or sell their allowances. If an operator can reduce emissions, the excess allowances can be traded for a profit. The operator of an installation that increases its emissions beyond its allocation can acquire additional allowances in respect of those emissions from the market, thereby ensuring that the overall reduction target will be met. If an operator does not hold sufficient allowances, harmonised non-compliance penalties will apply. In this way, emissions reductions can occur where it is most economically efficient for them to take place right across the EU. An overview of the main features of the EU ETS, as envisaged in the Directive is provided in the following table.

Table 2-17. Main features of the EU ETS.

Issue	**Content**	**Article in the Directive**
Type of system	Entity-based domestic cap and trade allowance scheme. Modified downstream approach (target group are basically emitters, although fuel producers are also included)[10].	
Timing	Start on January 1st 2005. First phase: 2005-2007. Second phase: 2008-2012	**Art. 4, art.11**

[10] The difference between a “downstream” and an “upstream” approach is clearly explained in Gagelmann and Hansjürgens (2002).

Permits and allowances	In the wording of the CO2 Directive, "allowances" are the papers that state the authorisation to emit a certain amount of CO2 (i.e. one ton), while the permit is the general authorisation to take part in trading allowances. The conditions concerning permits are regulated in art. 5 and 6.	**Art.3 (a and d)**
Sector coverage	Emissions from large stationary sources including power and heat generators, oil refineries, ferrous metals, cement, lime, glass and ceramic materials, and pulp and paper (thresholds)(Annex I). Procedures for unilateral inclusion of additional activities envisaged in art. 24 and art.30.	**Art.2** **Annex I** **Art.24** **Art.30**
Emissions coverage	First period (2005-2007): CO2 only (46% of the Community's CO2 emissions in 2010). Second period (2008-2012): all six GHG. Approximately 12.000 installations in EU25 will be covered. Procedures for unilateral inclusion of additional gases envisaged in art. 24 and art.30.	**Annex I and II.** **Art.24** **Art.30**
Allocation	– Free allocation, but MS may auction up to 5% for 2005 to 2007 and up to 10% for 2008 to 2012 -Each Member State should set up an ex- ante national allocation plan (NAP) before March 31st 2004 (first period), and before 31st July 2006 (second period). However, concerning the first period, MS may decide on the total quantity of allowances to be allocated and on its allocation to the installations "at least 3 months before the start of the period" (art. 11). -The NAP will determine the total quantity of allowances that the MS will allocate in each period and, also, the allocation method. -The NAP will be based on objective and transparent criteria. Observations from the public have to be taken into account. – Member States must observe some common allocation criteria (Annex III of the Directive). -The CO2 cap per country translates into a CO2 cap per installation/firm. -The Commission may reject NAPs on the basis of article 10 or Annex I.	**Art.9, Art. 10, Art. 11, Art. 12, Annex IV. See also European Commission (2004a)**
Recipients	Installations in covered sectors.	
Metric	In principle, allowances can be allocated using an emissions, a production or an input metric. In practice, historical emissions and benchmarking are being used.	
Targets	The emissions reduction targets for the initial phase depend upon the allocation each Member State makes for this period, taking into account the commitments under the Burden Sharing Agreement (IETA 2003).	
Surrendering allowances	Four months after the end of each year. These allowances will be cancelled.	**Art.12** **Art.13**
Sanctions	–For every tonne of emissions that is not covered by an allowance, a company will have to pay a penalty of 40 € in 2005 to 2007 and 100 € thereafter. -Payment of the penalty for excess emissions will not release the operator from the obligation to surrender an amount of allowances equal to those excess emissions in the subsequent year	**Art.16**
Banking and borrowing	-"Intraperiod banking": allowed since "allowances shall be valid for emissions during the period referred to in Article 11(1) or (2) for which they are issued" (art.13). The proposal allows for unrestricted banking within the three-year initial phase (2005-2007). -"Interperiod banking": allowed if the MS decides so (i.e., Member States are free to decide whether or not to allow banking of allowances from the initial phase into the 2008-2012 period) -Borrowing: not allowed.	**Art.13**
Opt-out ("temporary exclusion of installations").	MS may apply to the Commission for installations to be temporarily excluded until 31 December 2007 at the latest from the Community scheme.	**Art. 27**
Pooling	Member States may allow operators of installations carrying out one of the activities listed in Annex I to form a pool of installations from the same	**Art. 28**

	activity.	
Force majeure	During the first period, MS may apply to the Commission for certain installations to be issued with additional allowances in cases of force majeure. The Commission shall determine whether force majeure is demonstrated, in which case it shall authorise the issue of additional and non-transferable allowances by that Member State to the operators of those installations.	**Art. 29**
Review and further development	On the basis of progress achieved in the monitoring of emissions of greenhouse gases, the Commission may make a proposal to the European Parliament and the Council by 31 December 2004 to amend Annex I to include other activities and emissions of other greenhouse. No later than 30 June 2006, the Commission shall draw up a report on the application of this Directive[11]. Further development also considers linking with project mechanisms (see below).	**Art.30**
Guidelines for monitoring, reporting and verification of emissions.	The Commission shall adopt guidelines for monitoring and reporting of emissions. The guidelines shall be based on the principles for monitoring and reporting set out in Annex IV. Member States shall ensure that each operator of an installation reports the emissions from that installation during each calendar year to the competent authority after the end of that year in accordance with the guidelines.	**Art.14 and Annex IV (monitoring and reporting) and Art.15 and Annex V (verification). See also, European Commission (2003c).**
Registries	Member States shall provide for the establishment and maintenance of a registry in order to ensure the accurate accounting of the issue, holding, transfer and cancellation of allowances. Member States may maintain their registries in a consolidated system.	**Art.19**
Links with other GHG emissions trading schemes.	Agreements should be concluded with third countries listed in Annex B to the Kyoto Protocol which have ratified the Protocol to provide for the mutual recognition of allowances between the Community scheme and other greenhouse gas emissions trading schemes	**Art.25**
Linking with Kyoto Mechanisms	Considered "desirable and important". The emission credits from the project-based mechanisms will be recognised for their use in the EU ETS. The use of the mechanisms shall be supplemental to domestic action (see "linking Directive" below).	**Art.30**

Source: Own elaboration.

Please clarify status of new MS: How is the link with new MS. Do they have own targets? Are they included in the EU ET scheme or only via Kyoto mechanism?

Formerly called "Accession countries" (Member States since may 1st 2004) are not part of the BSA and, therefore, most of them are subject to the individual –8% EU Kyoto commitment, with the

[11] In this report, it should consider: (a) how and whether Annex I should be amended to include other relevant sectors; (b) the relationship of Community emission allowance trading with the international emissions trading that will start in 2008; (c) further harmonisation of the method of allocation including auctioning for the time after 2012 and of the criteria for national allocation plans referred to in Annex III; (d) the use of credits from project mechanisms; (e) the relationship of emissions trading with other policies and measures (P&M) implemented at Member State and Community level (f) whether it is appropriate for there to be a single Community registry; (g) the level of excess emissions penalties; (h) the functioning of the allowance market, covering in particular any possible market disturbances; (i) how to adapt the Community scheme to an enlarged European Union; (j) pooling; (ja) The practicality of developing Community-wide benchmarks as a basis for allocation.

exception of Hungary and Poland (which have a Kyoto target of –6%) and Cyprus and Malta (which do not have Kyoto targets)(CEC 2003b). CEC (2003b) provides an analysis of the present situation of the emissions in these MS, which is summarised in the following table.

Table 2-18. Present situation in emission trends in the new MS (formerly Accession and Candidate Countries).

	Kyoto target (% change over base year)	GHG emissions base year (Mt CO2e).	Base year	**Emissions in 2001 (MtCO2e)**	% Change (2001-base year).	Distance-to target indicator in 2001	Projected GHG emissions in 2010 in WEM scenario (MtCO2e)	Projected GHG emissions in 2010 in WAMS (MtCO2e)
Czech Republic	-8.0	**192.1**	1990	**148.0**	-23,0	-18.6	131.7	125.3
Estonia	-8.0	**43.5**	1990	**19.4**	-55,4	-51.0	18.9	17.4
Hungary	-6.0	**102.6**	average 1985-87	**84.3**	-17,8	-14.4	95.6	
Latvia	-8.0	**29.0**	1990	**11.4**	-60,7	-56.4	12.8	
Lithuania	-8.0	**51.5**	1990	**20.2**	-60,8	-56.3		
Poland	-6.0	**565.3**	1988	**382.8**	-32,3	-28.9	394.0	372.0
Slovakia	-8.0	**72.2**	1990	**50.1**	-30,6	-26.2	53.2	48.2
Slovenia	-8.0	**19.9**	1986	**20.2**	1,5	6.0	22.1	19.9

Source: Own elaboration from CEC (2003b) and EEA (2003)

Apparently, these countries will be able to achieve their Kyoto target easily except, perhaps, Slovenia and Hungary. The former is the only new MS where emissions increased in 2001 compared to levels in the base year and also the only countries expecting uncompliance in 2010 in the WMS and the WAMS.

Hungary experienced a 18% reduction of emissions in 2001 compared to base year levels. However, emissions are expected to increase significantly in the 2001-2010 period. Although Hungary expects to comply with its target in 2010 in the WEMS, this will depend on technology choices and the coupling or decoupling between the trends in emissions and the high expected economic growth rates.

Although these new MS are not part of the BSA, they will be part of the EU ETS (except Malta and Cypris, which have no Kyoto target). Therefore, they will have the same obligations as the rest of MS. They will have to submit a National Allocation Plan on May 1st 2004 at the latest (and not by March 31st, as is the case in the rest of MS).

The following figure shows the status of the EU allocation plans in all EU-25 MS at the time of writting (May 21st 2004), with some counties lagging behind these obligation (for further details, see Betz et al 2001).

Table 2-19. Status of National Allocation Plans.

MS that have submitted to the EC.	Austria, Denmark, Finland, Germany, Ireland, Latvia, Lithuania, Luxembourg, Netherlands, Slovakia, Slovenia, Sweden, U.K.
MS that have issued drafts.	Estonia, Italy, Portugal, Belgium (draft regional

	level NAPs).
MS that have published nothing.	Czech Republic, France, Greece, Hungary, Poland, Spain.
Expected timeline for the remaining MS.	Drafts expected in May: Czech Republic, France, Hungary and Poland. Drafts expected in June: Belgium, Greece and Spain.

Source: Carbon Market Europe (2004b).

In preparation for the EU ETS, several companies have engaged in Demonstration trades of EU allowances (EUAs). All transactions have been forward trades (since EUAs have not yet been allocated to installations)(Lecocq and Capoor 2003). Transaction prices have increased from 6€/tCO2 in May 2003 to 12€/tCO2 in November 2003 (Lecocq and Capoor 2003), and down to 8€/tCO2 in April 2004. According to many authors, uncertainty about the National Allocation Plans is hampering EU trade.

Linking Directive

Although the EU Directive marks a new initiative to put the EU-Kyoto commitment in an EU-policy perspective, it does not regulate specifically the use of CDM/JI credits (Certified Emission Reduction units, CERs, and Emission Reduction Units, ERUs, respectively)[12]. In fact, one of the main criticisms to the Directive was that it provided an unclear link with the Kyoto Mechanisms. Not linking the allowance market with the Kyoto Mechanisms would create two markets, where two goods that are essentially identical (tCO2 (eq)) would be traded at different prices. A number of other arguments why the two markets (the European allowance system and credits from CDM/JI) should be linked have been put forward.

First, formally separating allowance and credit markets is ineffective because both markets are yet, albeit indirectly, linked through the MS´ freedom with regard to their national climate policy design. Although the first commitment period only starts by 2008, this policy link between the allowance and credit market already exists as soon as any allocations of allowances would actually take place, not only because CDM crediting is already possible, but also JI crediting via early action. As soon as governments would start to allocate allowances to their national installations, it is perfectly rational for them to weigh their allocation system and the likely resulting allowance prices against the various alternative climate policy options, including using KP mechanisms. If Member States would allocate differently this could result in one country through the ETS effectively making a transfer to another. There seems little incentive for individual governments to absorb a heavy burden in the allowance allocation (Jepma 2003, p.91).

On the other hand, if prices at the two markets would differ, with allowance prices surpassing those of credits, then the allowance regime would crowd out JI crediting within the EU region.

[12] The Directive states that "linking the project-based mechanisms, including Joint Implementation (JI) and the Clean Development Mechanism (CDM), with the Community scheme is desirable and important to achieve the goals of both reducing global greenhouse gas emissions and increasing the cost-effective functioning of the Community scheme. Therefore, the emission credits from the project-based mechanisms will be recognised for their use in this scheme subject to provisions adopted by the European Parliament and the Council on a proposal from the Commission, which should apply in parallel with the Community scheme in 2005. The use of the mechanisms shall be supplemental to domestic action, in accordance with the relevant provisions of the Kyoto Protocol and Marrakech Accords" (article 30, paragraph 3).

The main advantage, however, from combining both systems is probably a different one. Overall compliance costs for the EU Members would be reduced. This may support the Member States' position at any future climate negotiations. Earlier calculations with the help of the PRIMES/POLES2 model on the costs of an EU allowance-trading scheme with various trading options have made clear that while the KP costs for the EU were projected at some 20 billion for no trading options in 2010, those costs would come down to seven billion under an allowance-trading regime without a link to the flexibility mechanisms, and to five billion if Annex B trading would be included in the system. Therefore, not linking the allowance and credit trading systems could involve future costs for the EU of several billion euros (op.cit.).

On 23 July 2003 (only one day after the final adoption of the EU emissions trading Directive) the Commission adopted a draft directive on the link between its recently adopted GHG emissions trading scheme and the flexible mechanisms foreseen in the Kyoto Protocol. The proposal suggests that EU companies shall be able to make use of CERs and ERUs to comply with their obligations in the EU ETS from 2008 onwards, provided that the Kyoto Protocol will have entered into force. According to the draft linking proposal, those credits can be transformed into allowances for trade or compliance in the European scheme or be used directly in the emission trading market created from 2008 after the KP enters into force.

Even though the "linking directive" does not allow companies to use credits in the period 2005-2007, the availability and cost of credits from JI and CDM projects will have a key impact on prices in the Kyoto period from 2008-2012 (Point Carbon 2003).

According to Criqui and Kitous (2003), taking into account the Acceding Countries in the EU trading scheme results in an allowance price of 26 €/tCO2e. Unrestricted opening of the EU ETS to JI and CDM credits would lead to an allowance price of around 5 €/tCO2e. A 6% limit on the import of credits done by the enlarged EU ETS (meaning that 6% of the requested objective can be fulfilled by such credits obtained through JI and CDM) would result in an intermediate allowance price of 12 €/tCO2.

Although this may change in the near future after negotiations, the main features of the linking directive are:

1).- Linking means that JI/ CDM credits can be used by operators to fulfil their obligations under the EU ETS. Linking implies the recognition of JI/CDM credits as equivalent to allowances from an environmental and economic point of view (single currency in EU ETS). Linking JI/CDM to EU ETS implies a bridge between two different frameworks: Community Cap and Trade/Kyoto Project Mechanisms.

2).- Participant in EU ETS delivers project credit to national authority and gets issued an allowance in exchange for it.

3).- All types of credits allowed for conversion except ERUs and CERs from nuclear facilities and carbon sink enhancement projects. The conversion of credits from hydro projects is still being discussed.

4).- No linking in the first EU ETS period (2005-2007). According to the proposal, no ERUs before 2008 will be available, although companies can accrue CERs before 2008 and convert them in 2008

5).- Limitation on linking. According to the present proposal, there will not be any *ex-ante* constraints on the amount of credits that companies may use for compliance purposes. However, a

quantitative limit could be imposed for the remainder of the period were the amount of credits to exceed 6 per cent of the total quantity of allowances allocated by Member States[13]. In other words, as soon as credits amounting to 6 % of initially allocated allowances have been converted, the Commission must undertake a review and decide whether a quantitative limit of 8 % should be introduced.

Several design features of the initial proposal from the Commission are currently being discussed. The European Parliament's rapporteur has proposed several changes to the linking Directive (Carbon Market Europe 2004a, p.4).

1) It proposes to allow linking from 2005, regardless of the status of the KP. It proposes to accept CERs and EURs even if the KP has not entered into force (I.E., IF Russia has not ratified it).
2) While the Commission proposed that project credits may only be used from 2008, the rapporteur has proposed this date to be set to 1 January 2005 for CERs.
3) The Commission proposed that a review would be triggered when project credits make up 6% of the entire EU market, and that a cap would be set at 8%. The rapporteur prefers an early review, but allows for each MS to meet up to 50% of its emission reduction target through project mechanisms. This corresponds to 4% of the total market and therefore it is stricter that the Commission's proposal.
4) Finally, a ban on credits from large hydropower projects is proposed.

These proposals would probably have significant effect on the EU ETS, reducing uncertainty. Market liquidity and the CO2 allowance price would be affected.

On March 16th 2004 the European Parliament's Environmental Committee adopted a report on the linking Directive. The Committee agreed that the link with CDM would start on January 1st 2005 and with JI on January 1st 2008. The link would not be dependent on the KP´s entry into force. An amendment that lowered the limit on the size of hydropower plants that are eligible from 20MW to 10MW. Finally, the report also would require governments to set a cap on the amount of CERs and ERUs that each company can convert into EU allowances. Each MS would have to restrict its reliance on Kyoto Mechanisms to 50% of their reduction effort under Kyoto, according to the report (Point Carbon 16/3/2004).

Of course, this draft directive, which is currently under discussion, will still have to be approved by the European Parliament and the Council of Ministers. There still has to be agreement between these European institutions on a final text. Although in the initial negotiations Council and Parliament positions on the integration of CERs and ERUs differed in several important areas, positions have converged to some extent. For the reasons mentioned above, most players will eagerly await the final outcome of negotiations with these institutions.

Other measures.

[13] Somehow surprisingly, analyses by Point Carbon suggest that such a constraint would probably have little, if any, practical implications, largely for two reasons. First, the supply of credits is hampered by capacity and institutional constraints. Second, the price of EAUs could fall to a level resembling the marginal cost of JI/CDM projects, which could further impede project implementation. Notwithstanding these caveats, a recent analysis by Point Carbon suggest that carbon prices in year 2010 could drop by as much as 85% if the supply of credits reaches a limit of 6 per cent compared to a situation without linking *(see The Carbon Market Analyst* 14 July 2003, 'JI and CDM in the EU ETS').

(I) Use of the Kyoto Mechanisms to comply with Kyoto targets.

Countries with a shortfall in emissions are planning to make extensive use of the Kyoto project mechanisms (CDM and JI) to comply with their Kyoto targets. This is the case of Austria, Belgium, Denmark, Ireland, Italy, the Netherlands, Portugal, Spain and the U.K (the UK will probably have no shortfall but will still make intensive use of Kyoto based projects)[14]. According to European Commission estimates, the use of Kyoto mechanisms by MS would contribute some 0.5% of the base year emissions (European Commission 2003b).

(II) Other measures taken at the EU level.

Although several measures have been taken and will be taken by MS to curb emissions, Policies and Measures taken at the EU level may also have an impact in this regard. For example, most agricultural policy is directed at European level through the Common Agricultural Policy (CAP). A number of initiatives coming through from the European Commission should help to reduce emissions including:
-changes to the CAP should mean that livestock numbers will continue to fall;
-agri-environment schemes;
-implementation of the EC Nitrate Directive;
-the IPPC Directive applies to new and substantially changed, intensive pig and poultry farms above 2,000 pig places (750 breeding sows) and 40,000 poultry places (U.K. TNC)

Also, in the waste management realm, the European Community's Landfill Directive will have a significant effect on emissions as it imposes limits on the amount of biodegradable municipal waste that is landfilled.

In the industry context, the IPPC Directive has been transposed into national legislations and MS are applying it with the aim to increase the penetration of BATs (best available technologies).

In the EU jargon, policies at EC level which are an integral part of the EC's effort to achieve the Kyoto target are called "Common and Co-ordinated Policies and Measures" (CCPM). These policies have been applied to the energy, transport and industry sectors, as agreed under the first phase of the EU Climate Change Program. Annex VIII provides a summary of these proposals and of their status of implementation.

According to European Commission (2003b), the policies and measures currently adopted by the EC or those proposed by the European Commission would result, if adopted, in emission reductions of about 300 MtCO2e, potentially covering the gap of 7.5% between the "with existing measures" projection and the EC Kyoto target. However, the Commission admits that, given the uncertainties surrounding the adoption and implementation of these proposals, evaluation of their potential contribution should be viewed with caution.

[14] According to CDM Monitor (2004), the Netherlands, Italy, Belgium, Austria, Denmark and Ireland together envisage buying 33 million tonnes annually over 2008-2012.

3 EU-15 CROSS POLICY ANALYSIS

3.1.- Demand Side Energy Efficiency Policy & CHP

3.1.1- Introduction

The main objective of this section is to describe the policies adopted by MS in order to improve their energy efficiency records in a long-term perspective. Therefore in the following pages an overview of the strategies followed by the MS will be found. This overview will contain both some quantitative information about the energy efficiency policies adopted and some brief description of the some initiatives undertaken. In the next point some "methodological notes" about the data used in this section of the report in order to develop the quantitative aspects will be provided. In the third part an introductory picture of the European framework will be developed. After these points, an overview of the energy efficiency policies adopted in the different sectors (households, industry and tertiary) will be provided. The last section closes the report with some conclusions.

3.1.2- Methodological notes

When collecting and processing data on energy efficiency measures, two main problems arise. On the one hand, data are very difficult to obtain. Information on the specific measures targeted at improving energy efficiency are available, but often times the costs of these policies and the expected improvement in energy efficiency (reduction in energy intensity) are not made public. On the other hand, it is difficult to summarise these policies, because they are very different from each other.

The MURE II Database (MIID) provides the quantitative data for the following sections. This database provides information about energy conservation measures implemented in the MS in the last decades. The information available in MIID is presented in such a way that the potential impact of the measure in terms of energy efficiency improvement is facilitated.

Nevertheless, unfortunately precise and homogeneous information about the specific measure being adopted (such as penalties for non-compliance), available budgets (both for specific grants or information campaigns) is not available. Given the limitations concerning availability of information, the aim is to give insight into the degree of involvement of countries concerning energy efficiency measures. In this context we basically choose to both identify the measures adopted by MS and to classify them according to several criteria. The measures being analysed include those adopted by the federal government as well as those implemented by local authorities (when applicable). Albeit some of the measures considered in this scrutiny were adopted during the 70s (e.g. regulations on the indoor temperature of buildings or demonstration projects), most were adopted since mid 90s.

Before stating what will be the criteria used for the organization of the information, it could be useful to advice that we have followed the principle of "*n-counting*". This means that a policy that affects diverse sectors or categories is added up as many times as it affects sectors or categories.

It is also important to state that the policies that are considered are both the initiatives that are or were implemented as well as those that even though they are still not implemented will probably be adopted.

The classification process has followed three main criteria: sector to which the measure will be applied, the type or kind of policy and technology/uses involved. The following paragraphs will describe each of these sub-categories.

Since the transport sector is not considered in the Green-X project, the information analyzed in the following sections only will include measures that were adopted in the household, the industry and the tertiary sectors of the economy. In turn, the household sector includes individual and familiar dwellings, while the tertiary sector includes the commercial and the public sectors.

As it is well-known, there is a wide array of policies aimed at energy efficiency improvements. In order to make the information more manageable and taking into account the data availability, policy instruments were classified into four main categories:

- Education, information and training
- Financial/Fiscal
- Legislation
- Others

Finally, and regarding the technology/uses affected by the policy, some measures in MURE II Database which were part of a wide range of categories were re-classified as follows:

- **Specific sector appliances**: In the case of households these include the measures concerning appliances but for the industry and tertiary sectors other specific issues of these sectors such as motors and drivers, compressed air, process integration and other specific categories were also considered.
- **Spatial temperature**: This includes measures that were classified as heating, space heating, ventilation and conditioning, high and low temperature and refrigeration.
- **Hot water** which takes in account sanitary hot water and hot water itself.
- **Lighting**: Just lighting measures are included
- **CHP**: This includes initiatives concerning exclusively CHP and only industrial and tertiary sectors are covered.

3.1.3- General overview and main policies.

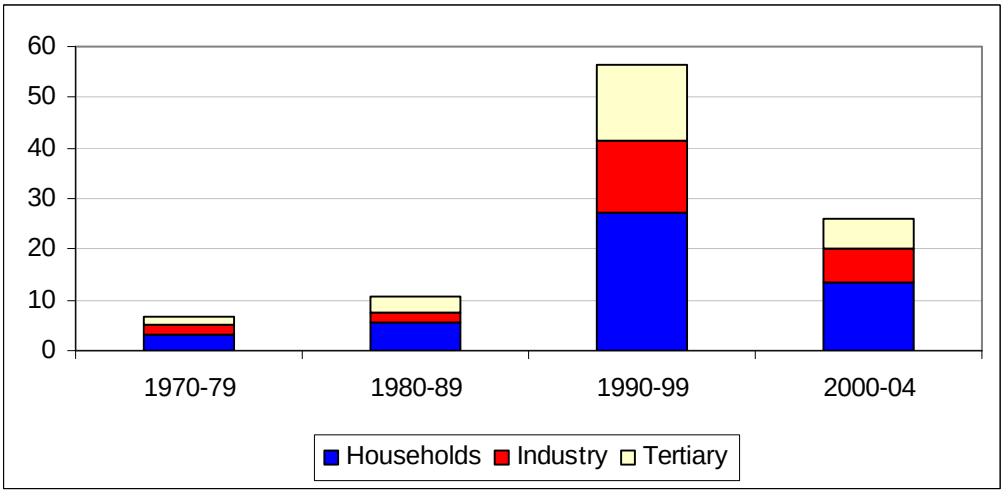
During the period being analysed, the central and local authorities have focused on measures concerning energy conservation and CHP. In fact more than 1.000 measures have been adopted in these years. The implementation of measures have not been uniform within the period, however.

Interest among MS governments concerning energy efficiency and CHP measures has not been uniform in the 1970-2004 period. Figure 3-1 shows how the energy efficiency and CHP measures adopted by MS were distributed within the period. The figure represents the percentage of all the measures that were adopted in each of the decades being considered[15]. We can identify the temporal distribution of measures for each sector of the economy analysed: household, industry and tertiary

[15] In order to clarify the notation used in this report an example could be illustrative: Column year (1970-1979)= measures adopted (1970-1979)/total measures adopted (1970-2004); in general column year (a-b)= measures adopted (a-b)/total measures adopted (1970-2004). During this document the "percentage" concept will be utilized several times not just in the "temporal" aspect, but also regarding "sector" and kind of measure performance. In this context could be useful to say that when we refer, i.e, to percentage of measures of energy efficiency adopted by the household we are telling: Energy Efficiency Measures adopted by household sector (1970-2004) / Energy Efficiency Measures adopted by all the sectors (1970-2004); in general Percentage of measures adopted by *x* sector (z kind of policy)= Energy Efficiency Measures adopted by *x* sector (z kind of policy)/ Energy Efficiency Measures adopted by all the sectors (all kind of measures).

It is shown that, even though there has been an increasing activity in the implementation of policies concerning energy efficiency and CHP, the largest increase takes place in the 90s. Most of the government actions regarding energy efficiency and CHP have been implemented since 1990 (more than 50% of the measures adopted in the 1970-2004 period were implemented since 1990 and a quarter of these were implemented since 2000).

Figure 3-1. Energy Efficiency "Policy-making review"
Percentage of total measures adopted (1970-2004) in each decade



The next table provides an overview of the dynamics of the energy efficiency policies adopted in the period analysed. The percentage of policies being adopted classified both by economic sector and by type of policy.

Table 3-1. Energy Efficiency Measures (1970-2004).
Percentage adopted in function of type of policy and economic sector

	Households	Industry	Tertiary	Total general
Edu-info-tra	9,3	9,6	5,1	23,9
Financial/Fiscal	17,1	13,6	4,0	34,7
Legislation	21,0	6,4	7,1	34,5
VA	0,0	3,4	3,5	6,9
Total general	47,4	33,0	19,7	100,0

Source: Own elaboration on MURE II Data Base

The first interesting issue is that more than 1.100 measures have been adopted by the MS aiming at energy efficiency improvement in the relevant period. The other main findings that can be discerned appear from the table above: first, strategies adopted by policy makers were mostly concentrated in the household sector; secondly Financial/Fiscal policies were predominantly used to achieve improvements in the energy performance of the countries. The latter conclusion, nevertheless, is not

true for all the sectors since in both the household and in the tertiary ones the predominant policies were those related to Legislation. In fact, and as it can be observed, financial/fiscal was the predominant strategy just among the industrial measures.

Before starting our examination of each of the three sectors, we must finish this general overview by trying to identify whether the energy policy formulation has some bias. In other words and with the assistance of the next table, the idea is to identify whether the strategies adopted by the authorities followed a regular path for different sectors and different technologies. In the next table we have tried to identify for each of the specific technologies previously defined the sort of policy that was the most used for the promotion of the energy efficiency improvements.

Table 3-2. Energy Efficiency Policy bias.

	Household	Industry	Tertiary	Total
Appliances	L	FF	FF	FF
CHP	-	FF	FF	FF
Hot water	L	L	L	L
Lighting	L	E-I-T	E-I-T	E-I-T
Space Temperature	L	L	L	L

L: Legislative, FF: Financial/Fiscal, E-I-T: Education-Information-training

Source: Own elaboration on MURE II Data Base

Concerning the sorts of measures adopted, household sector shows remarkable differences with the two other sectors. In this sense, the policies adopted in the four applicable technologies of the household sector were "Legislation–intensive". Industrial and tertiary sector, by the way, not only have a similar structure in-between them but also both show a more heterogeneous panorama than the household sector. In effect, in latter sectors different kinds of policies have enjoyed the prominence for the diverse technologies under scrutiny; meanwhile appliances and CHP are technologies "Financial/fiscal-intensive", hot water and Space temperature are "Legislative-intensive"; Lighting is the only technology with a "Education-information-training-intensive" bias. General performance of the economy follows the same pattern of the industrial and tertiary sectors.

- **Household sector.**

As stated before the household sector is the one where most initiatives have been taken in order to reduce the use of energy. Germany, United Kingdom, Netherlands, Denmark and Spain are the five countries that have put forward more proposals; together, these countries represent more than 48% of all the measures adopted by the MS.

Table 3-3. Household Sector: Energy Efficiency Measures.
Percentage adopted in function of type and kind of policy instrument

Technology/Use	Edu-info-tra	Financial/Fiscal	Legislation	Total general
Appliances	4,3	3,4	8,1	15,8
Hot water	5,3	11,9	12,1	29,2
Lighting	1,5	2,3	3,0	6,8
Space temperature	8,5	18,5	21,1	48,1
Total general	19,6	36,0	44,3	100,0

Source: Own elaboration on MURE II Data Base

Initiatives taken were very heterogeneous concerning both the technology/use involved and the kind of measure adopted. With reference to the latter, it is obvious that "space temperature" concentrates almost the half of the initiatives.

Legislation measures

Legislation or regulation kind of measures adopted in household sector is very wide. In this line, we can identify three different types of initiatives adopted in order to improve the energy efficiency records addressed to the two main technologies/use: space temperature and hot water categories:

a) Information on use of energy. Besides the energy labels policies –not described in this report-, several initiatives adopted concerns information aspects of energy efficiency improvements. In the following lines some of them are enumerated:

Austrian BGBI 1992/827 regulates how to share cost in buildings of more than three dwellings between heating consumers and heating provider. Finish Building Ordinance requires buildings to have maintenance instructions. In France according to the Law 79-1232 some collective heating cost must be split through tenants on an analytical basis. In Greece, Presidential Decree 27/9/1985, ongoing since 1985, regulates the billing of heating in multi-apartment based on the volume of each apartment and thermal losses.

b) Target fulfilment. This category concentrates measures aimed at the fulfilment of different targets. Since the importance that represents, it can be worthy to analyse in more detail some national experiences.

In Austria, and according to the Article 15a of the Federal Constitution, there are a national agreement between the Federal government and the provinces on the building shell insulation: even provinces have their own regulation -according with their own interest- they must fulfil national regulations; concerning the Heating system, there are also a decree that defines the maximum value of exhausted gas losses, the use of control devices and technical measures to reduce stand-by losses.

In Belgium, insulation standards for new buildings and retrofitting in the residential and tertiary sector are being implemented in the three regions (Flemish government, i.e. has issued a document with the objective of reducing the energy consumption of the residential sector in 2004 to 1998 level). Nevertheless the federalism of Belgium, interregional collaborations on inspections are taking place meanwhile a system of certifications is being studied. Results are not very stimulating since a very little portion of buildings constructed after the introduction of the code met the requirements.

Finland has prescriptive thermal insulation requirements for walls, roofs and windows, thermal conductivity values for building materials, and requirements related to indoor air quality, ventilation rates, equipment and design. The regulation that came into force in 2003 intents to reduce in 30% in energy consumption in new buildings compared to buildings constructed on the basis of today's regulation.

On February 2002, the new Energy Conservation Ordinance came into force in Germany. This ordinance aims at reducing the amount of energy consumed in heating, climate control, and hot-water provision in new buildings by roughly 25 to 30%. It unifies the previously separate thermal insulation and the heating installation ordinances. The Energy Conservation Ordinance means that, for the first time, an overall optimisation of measures for thermal insulation on the one hand, and heat unit efficiency on the other hand, is possible and specifically supported by statutes. Another new

provision of the Ordinance is that new buildings must have an energy-profile certificate showing information on its energy demand.

In Netherlands trough the Energy Performance Standard for new residential properties and buildings, the government fixes the standard that the new houses -and other new buildings such hospitals, office, school- have to met. The customers are then allowed to decide themselves how they will met this target, which means they can choose the option which is the most cost –effective for them.

In 2002 new mandatory standards for thermal insulations have been introduced in Spain.; autonomous regions are the responsible fore the enforcement.

c) Monitoring, Controlling and Audit Programmes. Schemes designed to regulate the inspection and audit mechanisms are presented in almost all the MS:

In Denmark there yearly supervisions of larger heating equipment and district heating system conducted by 700 specially trained consultants; also in Denmark statutory annual inspection of small heat furnaces are made. In France due to safety reasons, yearly controls are compulsory on instantaneous gas boilers, oil and gas thermal installations and chimneys. In Italy, all apartments must obtain an energy auditing certification to be presented in sales and rental transactions; also Law 10/91 and related acts require the regular inspection of domestic boilers for efficiency and safety. This programme started in 1994 and requires owners to have inspections at intervals of between 1 and 2 years, depending on the size of the boiler.

Financial and Fiscal Measures

As stated before, Financial and Fiscal initiatives also have an important weight in household sector. Logically measures adopted in MS were different. In the following lines main initiatives are described.

In Austria grants for the erection and renovation of residential buildings and dwellings are the most important kind of subsidies for energy conservation. Resources utilized for this purpose are provide mainly by the Federal government – close to € 1.700 millions-and in a minor way by the provinces – close to € 72 million-. The provinces are the government level in charge of allocation, establishment of the conditions and limits. In general, almost 80% of the resources is spent on the erection of new buildings. Renovation measures applicable for subsidies are improvement of building shell insulation, replacement of windows, installation of central heating, replacement of old heating equipment, connection to district heating, reducing energy losses of central heating and sanitary hot water equipment as well as installation of renewable equipment like thermal solar collectors and heat pumps.

In Belgium, several financial incentives in the form of subsidies have been introduced by the regions for the “retrofitting” of buildings. The Walloon Region has introduced subsidies in various areas: a) a maximum of € 1.364 to low income households to improve the EE of their dwellings, b) destined to municipal, provincial and regional buildings (like schools and hospitals) to promote their EE, and c) for the replacement of inefficient public lighting up to 70% of the cost. Brussels allocates subsidies up to 20% of the investment in order to improve EE to municipalities, local public bodies, schools and hospitals. Also a subsidy is granted up to 35% of the cost for investments (with a maximum of € 991,5) in solar water heater for domestic hot water.

In Germany there are loans for Modernisation of Buildings in the Old and in the New Länder. The programme on CO2 cuts adopted for the old federal states for a period of five years beginning 1996

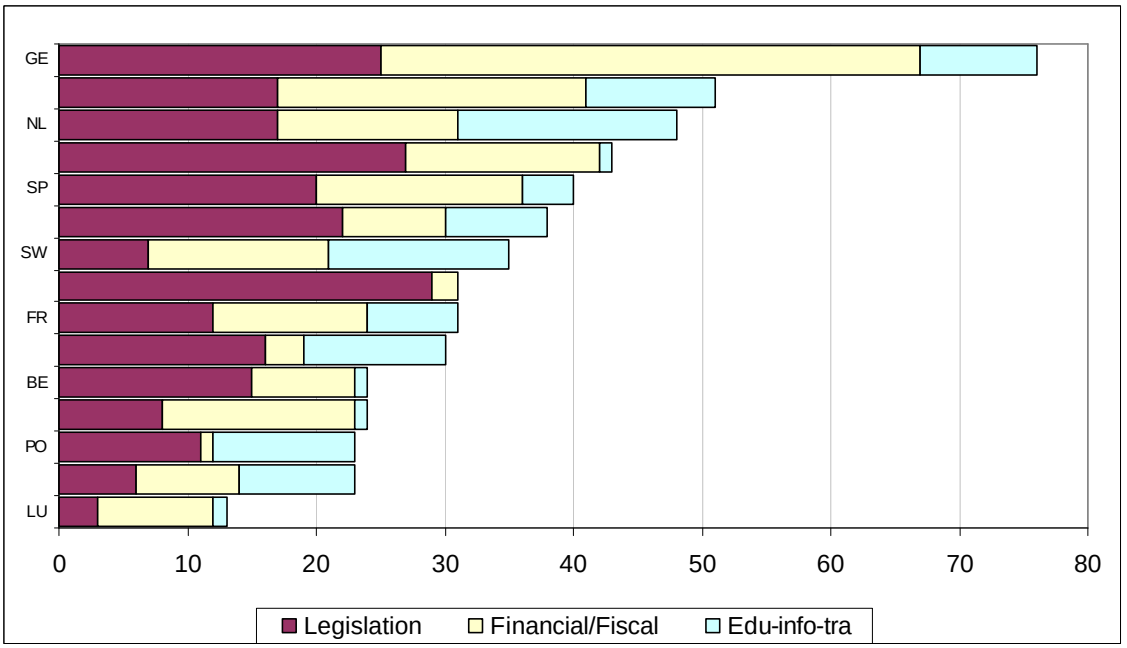
under which low-interest loans (1-2% below market rates for a ten-year period) are obtainable from Kreditanstalt für Wiederaufbau (KfW) has reached a total of DM 7.8 billion for 380 000 housing units. Of this, 38% was for thermal insulation, 44% for the construction of new low energy and passive housing units, and 16% for the installation of condensation and low temperature boilers. In 1999, the volume of approved loans stood at more than DM 4.5 billion. The housing modernisation programme of the KfW also provides loans -at some conditions than the former- for modernising and renovating housing in the new Länder. Up to the end of 1999, low-interest loans totalling DM 78.4 billion had been earmarked for the modernisation of 3.6 million dwellings. Some 22% of the funds were committed to energy conservation. In a second phase of the programme, from February 2000 to June 2002 about 11 400 loans comprising a volume of € 1 886 million were committed for financing the modernisation of 120 000 dwellings.

In Italy Law 449/97 allows a fiscal reduction of 41% of the cost related building restructuring carried out during 1998 and 1999. The reduction applies only to building owners who have to pay personal tax and is subdivided into five to ten annual rates. The reduction is applicable for costs limited to € 77.468 per building unit per person per year.

Swedish authorities have adopted different measures. On one hand, there are subsidies for investment in district heating systems, amounting to a maximum of 15 % of investment for connection of group heating systems, industries, industrial sources of waste heat and commercial premises and residential buildings to district heating systems. The grants are available only for work in connection with the conversion of electrically heated buildings to district heating systems, or which result in a substantial increase in the size of the heat sink for combined heat and power production. Both individuals and legal entities can apply for the subsidy. The subsidy is not granted for costs associated with obtaining planning permission, initial design, any purchase of ground or interest during the construction period. On the other hand , conversion grants for changing from electricity heating to some other for oh heating were re-introduced in 2001. These grants are also available for partial conversions, with electric heating being combined with rock heat or a pellets-fired stove.

Finally, the mix of policies taken by each country is not uniform. The next figure shows the total quantity of households' energy efficiency measures adopted in each MS during the 1970-2004 period. In the figure we can identify the importance of each kind of policy implemented (Legislation, Financial/Fiscal and Education/information/Training). It is shown that there is not a direct relationship between the quantity of measures adopted and the legislation intensity, we find that the countries that have adopted relatively few policies are those being "legislation-intensive" –such as Belgium- or "other measures-intensive" –like Austria-. Also we can appreciate that those countries with a relatively high number of measure adopted have followed a "legislation-intensive" strategy –e.g. Denmark- or, by contrast, they have mainly adopted a non "legislative-intensive" approach such as The Netherlands.

Figure 3-2. Household sector. Energy Efficiency Measures Instruments used by MS.



- **(II) Industrial sector.**

The relevance of the industry sector in the design of energy efficiency policies has increased during the 1990s. Nevertheless, its relative weight is still far away from the household sector. In fact, and as can be seen in Table 3-4, the only country where the measures in the industrial sector are predominant is Belgium. Again, a high concentration of measures in five countries can be observed: United Kingdom, The Netherlands, Denmark, Spain and Italy concentrate 50% of the initiatives taken in EU-15.

Table 3-4. Industrial Sector- Energy Efficiency Measures.

Percentage adopted in function of type and kind of policy instrument

Technology/Use	Edu-info-tra	Financial/Fiscal	Legislation	VA	Total general
Appliances	7,9	9,2	3,5	3,0	23,6
CHP	1,9	3,3	1,6	0,5	7,3
Hot water	1,9	2,7	3,3	0,3	8,1
Lighting	2,2	1,9	0,8	0,3	5,1
Space temperature	3,0	4,9	5,7	1,1	14,6
Specific	12,2	19,2	4,6	5,1	41,2
Total general	29,0	41,2	19,5	10,3	100,0

Source: Own elaboration on MURE II Data Base

The measure that concentrates most initiatives being adopted by the sector is "Financial/Fiscal". A large proportion of these measures target appliances and specific sectors although the four remaining uses have still a considerable importance.

Financial and Fiscal measures

Financial and fiscal measures adopted in the MS are very different on several respects: duration of the programme, kind of incentives used, resources available, etc. In the next table some examples of financial and fiscal measures adopted in the EU-15 countries in the lately are included.

Table 3-5. Industrial Sector. Selected Financial & Fiscal measures

Country	Period	Name of Measure	Main Specifications
Austria	1996-	Umweltfoerderung im Inland	Grants up 25% of investments in energy saving measures
Belgium	n.a.	VLIET	n.a.
France	2000-	Fogime/Fideme	Grants up 70% of investments in energy saving measures
Germany	1990-	European Recovery Programme	Low interest loans
Greece	2000-2006	Operational Programme for Competitiveness	Subsidies up to 40% investment
Irland	1995-1999	Energy Efficiency Investment Support Scheme	Grants up 40% of investments in energy conservation measures
Netherlands	1991-	VAMIL	Accelereted Depreciation of Environmental Investment

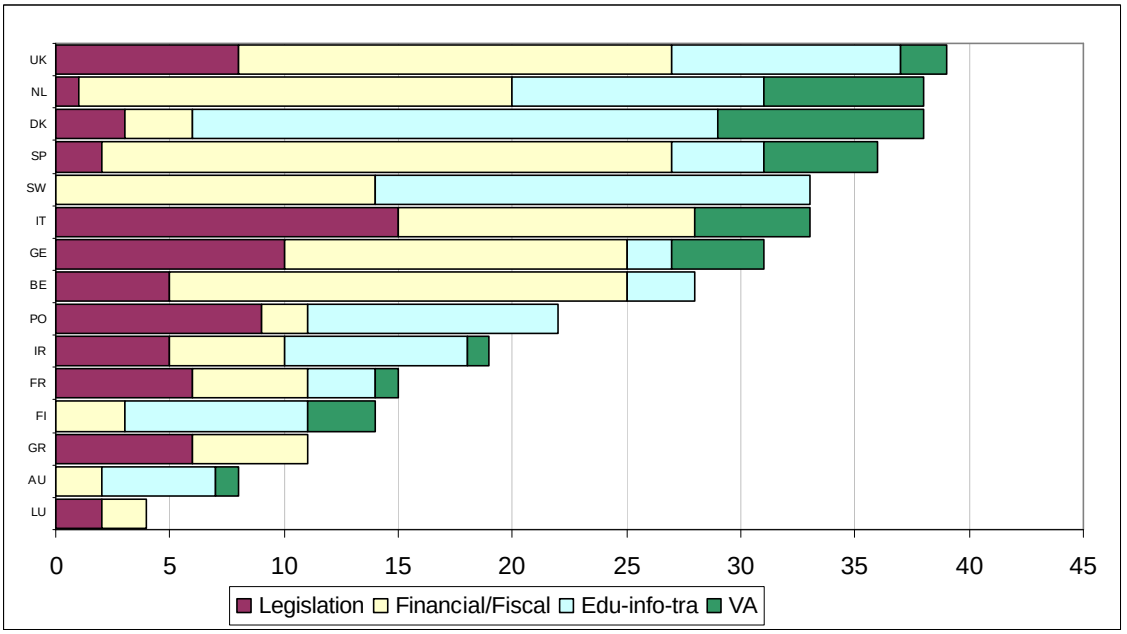
Source: Own elaboration

In the above sample we can identify some programs mainly designated to grant energy efficient investments. Austrian *Umweltfoerderung im Inland* is one of the most important subsidies for companies, focusing on climate protection, energy savings, RES and prevention of air pollution. In Denmark, the Tax Package of 1995 introduces, besides other measures, an investment grants for energy saving measures in firms. France's *Fogime* and *Fideme* are funds aimed at guaranteeing investments in energy management and energy efficiency. In the Flanders region of Belgium, especial attention has been paid to the rational use of energy through *VLIET* and *VLIET bis* programmes which give subsidies to energy technologies in order to promote RUE and RES. In Germany the *ERP for Environment and Energy Savings* provides loans for the financing of environmental protection and energy saving investments. Through the *Operational Programme for Competitiveness*, the Greek government allocates subsidies for energy conservation investments. Ireland's *Energy Efficiency Investments Support Scheme* administrated by Sustainable Energy Ireland provided grant assistance to organisations which proposed to invest in technically proven energy conservation technologies or measures. In the Netherlands VAMIL was designed to promote environmentally-friendly products; if the company chose to invest in goods that are included in an annually re-elaborated list, they obtain interest and cash flows benefits.

The "Education, information and training" category includes the policies measures which rank in second place in the industry sector. As already noticed with other measures and sectors, differences between strategies of countries are notorious. The range of the measures being adopted is very wide: some just look for dissemination information among the national industries and others aim to involve more directly the companies in energy efficiency improvements. Concerning the former, the Finish National Energy Awareness Week organized by Motiva allows companies, organisations as well as private citizens to actively pursue energy conservation. This is done through information dissemination (for example, in the Austrian UNIPEDE-Eta-award that since 1988 is awarded by the electric power utilities companies for the industrial and commercial sector that improved their productivity by innovative applications of electricity, e.g. reducing the energy consumption per output).

In the next figure both the quantitatively importance of each country and its composition in terms of the kind of measure being adopted is shown. We can see four interesting facts: a) measures corresponding to legislation strategy are concentrated in "middle-quantity adopted measures" countries, b) majority of "high-quantity adopted measures" have a substantial proportion of Financial/Fiscal measures, c) Countries with high percentage of Education/information & training measures can be clustered in two groups: those with "high-quantity adopted measures" like Denmark and Sweden and those "middle- quantity adopted measures" as Portugal and Ireland and d) almost 80% of the Voluntary agreements measures are concentrated in just 5 countries, all of them being part of the most active in the field of energy efficiency measures.

Figure 3-3. Industrial sector. Energy Efficiency Measures Instruments used by MS.



Voluntary Agreements for industrial and service sector policies

Denmark, The Netherlands, Germany, Spain and Italy concentrate the majority of voluntary agreements. In the next lines a brief description of VA instrumentations utilized in the industry and household sector of theses countries can be found.

In the framework of the Danish *Green Tax Package* 1995, enterprises with specific energy-intensive activities, or with energy tax exceeding 3% of value added, can reduce their tax rate through a voluntary energy savings agreement. The enterprise must first present an energy audit prepared by an independent certified consultant and an action plan based on the audit, which demonstrates how the enterprise will implement a system of energy management, apply procurement policies favouring energy efficiency and educate staff in energy efficiency. The audit may be disputed and reviewed, or the enterprise may propose alternative measures to achieve equivalent CO2 results. The enterprise must commit to implementing the energy efficiency investments recommended by the audit with payback times of up to four years. On the basis of the action plan, the enterprise signs a three-year agreement with the Government and is guaranteed a partial reimbursement of carbon tax rates conditional on the fulfilment of the obligations in the action plan.

By the end of 1998, 230 enterprises, accounting for 35% of total energy consumption in industry, had concluded an agreement with the Energy Agency. Of these, 101 were individual agreements and the rest were agreements concluded on the basis of a sector-wide agreement with specific subsectors (milk condensing, greenhouse gardening and brick burning).

Dutch economy has a deep tradition in the developing voluntary agreements. Diverse kinds of agreements exist in function of the sector –industry, commercial, etc- and the ministry involved. After the National Environmental Policy Plan in 1989, voluntary agreements, in order to improve energy-efficiency, were introduced in all industrial branches with energy consumption over 1PJ. Until now two "generation" of Long Terms Agreements have been developed: between 1992 and 1999 the MAE have signed 30 LTAs with different industries association, with about 100 industrial companies participated covering over 90% of the industrial primary energy consumption; in 2000 when most of the LTAs expired, it was announced several changes for the second round of LTAs: for the high energy intensive industries the Benchmark Covenant was launched and for the remain companies developed a new LTAs scheme

In Germany in 1995, 14 industrial sectors and four associations included in the Federation of German industries entered into voluntary agreements to increase energy savings and reduce CO2 emissions. In 1996, in its Declaration on Global Warming Prevention, German industry made a commitment to an updated version of voluntary agreements committing to reduce specific CO2 emissions "by 20% between 1990 and 2005". On November 2000, German industry and the federal government concluded a further updated voluntary commitment for climate protection: by 2005, CO2 emissions are to be lowered by 28% and by 2012 the greenhouse gases named in the Kyoto Protocol are to be lowered by 35% (each relative to 1990 levels); as supplement to this agreement, CO2 emissions are to be lowered by a further 45 million tonnes in 2010. A special focus is the greater use of cogeneration, which will allow 23 million tonnes of CO2 emissions to be avoided in 2010. To support this measure, the German government introduced new legislation for sustaining, modernising, and expanding cogeneration.

The programme on VAs is supplemented by low interest loans given to enterprises wanting to make investments in energy savings. *Kreditanstalt für Wiederaufbau* (KfW) and *Deutsche Ausgleichsbank (DtA)* run pollution control programmes to provide funding to these enterprises. In particular, this organisation provides low-interest loans to medium-sized private businesses for cogeneration projects.

Since 1994 Spanish IDAE has signed voluntary agreements with nine industrial sectors representing 56% of the total energy industrial consumption. Participants sectors are pulp and paper, structural ceramics, hollow glass, tanning, cement, food, chemicals, automobile accessories and textiles. Besides these agreements with the private industry, Spanish authorities have developed a important net of VA within the public companies as the agreement with RENFE (National Railways Company). Additionally, several agreements have been signed with different dependences of the national government as well some autonomic and provincial ones.

Italian government has been deeply working with FIAT, the major Italian car manufacturer, in order to develop a low consumption car. Besides that, glass industry has signed a VA with the government to reduce GHG emissions by about 10% by 2005. A new VA was celebrated I 1998 when the industry subscribed the *Patto per l'energie ed ambiante* in order to reduce CO_2 emissions through increased energy efficiency and use of RES.

Besides the MS mentioned before, some other countries have also developed VA policies as Finland; Sweden, UK, Belgium and Ireland.

In Finland industrial EE policy relies mainly on voluntary agreements. In signing the framework agreement, the industrial organization is committed to promoting and inducing their members to accede to the policies signed. A company joining the agreement is committed to have a responsible of the energy efficiency affairs, auditing and analysing of energy consumption, preparing their own energy conservation plan, put it in operation and reporting annually to the concerned sector's representatives. Initiated in 1992, some 115 companies had joined the voluntary agreement at the end of 2001 representing about 85% of total energy divided as follows: in the power plant sector, companies represented the 90% have signed, in the district heating sector 7.% and in the electricity transfer and distribution 76%.

In 1994 Swedish STEM started the EKO-Energi programme in order to improve the energy efficiency within the larger intensive industrial companies. More than 70 companies signed the voluntary agreement. Then, government offered several incentives as free energy audits by an external auditor, free environmental audit to speed up EMAS or ISO 14001 certification, education in ENEU 94, free access to information material produced by STEM for energy efficient installations and machinery, promotion activities and the right to use the EKO-Energi logotype in any promotion activity.

In the United Kingdom the Department for Environment, Food and Rural Affairs (Defra) has been negotiating with trade bodies representing energy intensive business sectors for climate change agreements. In these agreements the sector undertakes to meet a challenging energy efficiency or carbon saving target in return for an 80% discount from the levy. Several sectors have already signed this agreements: Brewing, Cathode ray tube manufacturing, Cement, Maltsters, Mineral wool producers, Motor manufacturers, Semi-conductor manufacture, Slag grinding, Steel, Wood panel manufacture, Agricultural Supply, Lime, Printing, Non-Ferrous Metals, Renderers, Aerospace, Chemical, Dairy, Glass, Gypsum Products, Metal Packaging, Paper, Poultry Meat Processing, Poultry Meat Rearing (BPMF), Red Meat Processing, Spirits, Wallcovering, Aluminium, Food & Drink – Supermarkets, Leather, Metal Forming, New Rubber Tyre Manufacturing, Surface Engineering, Apparel and Textiles, Ceramics, Egg Processing, Foundries, Reprotech - Waste Pellets, Egg Production, Food and Drink, Pig Farming, Poultry Meat Production, Craft Baking, Vehicle Coatings

In Belgium in recent years voluntary agreements have started to be introduced in the regions nevertheless only Flanders has made important advances: for large energy-intensive industries the agreement are based on the principle of benchmarking (agreements have been reached with the iron, steel, paper, chemical and cardboard sector and chemical industry); for small energy-intensive industries, companies will be requested to carry out all economically justified energy savings investments with a pay-back time of less than five years.

In-between the measures included in the Irish NSCC, there is a series of negotiated agreements aimed at achieving agreed global energy efficiency benchmarks in all sectors. The negotiated agreements will include clear targets to be achieved, and will provide for an open and transparent system of reporting and monitoring. IEC has been preparing the launch of full-scale binding NA with a three pilot projects in order to develop and test the most appropriate approaches and frameworks.Nevertheless until July 2003 three pilot agreements with individual and groups of industrial firms were implemented.

- **(III) Tertiary Sector.**

The tertiary sector has not concentrated many energy efficiency measures. In fact, this sector is the less intensive of all those being analysed in this report. Even though Legislation concentrates most of the measures –like the Household sector- its composition concerning the ranking by measures adopted is different to both sectors reviewed before.

Table 3-6. Tertiary Sector- Energy Efficiency Measures.
Percentage adopted in function of type and kind of policy instrument

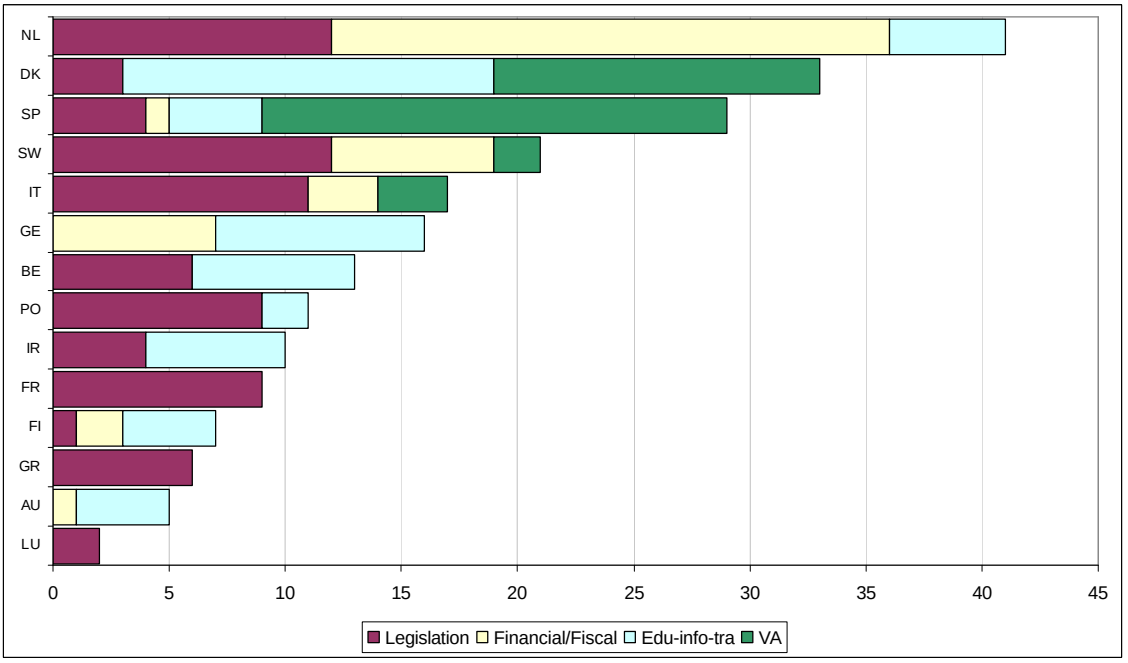
Technology/Use	Edu-info-tra	Financial/Fiscal	Legislation	VA	Total general
Appliances	5,9	6,4	4,1	4,1	20,5
CHP	2,3	3,2	0,5	2,3	8,2
Hot water	2,7	2,7	9,5	2,3	17,3
Lighting	4,5	2,3	0,5	2,7	10,0
Space temperature	10,5	5,9	21,4	6,4	44,1
Total general	25,9	20,5	35,9	17,7	100,0

Source: Own elaboration on MURE II Data Base

In the same way as in the household sector, Space temperature use in Tertiary sector concentrates the majority of the measures adopted. “Appliances” and “Hot water” uses follow in that ranking.

Legislation concerning the tertiary sector has two main characteristics, which it shares with the policies implemented in the household sector. On one hand, there are several energy efficiency measures that have been applied in both sectors. On the other hand, and as a consequence of the former, several different strategies were developed by national authorities in order to improve the energy efficiency records in the tertiary sector.

Figure 3-4. Tertiary sector. Energy Efficiency Measures Instruments used by MS



Regarding the measures adopted by countries, it can be observed that the majority of MS concentrate their efforts in no more than just a couple of policy groups, e.g. Legislation/ Financial-Fiscal, Legislation/Education-Information-training. Besides the fact that legislation is the instrument most frequently used in this sector, it can also be appreciated that legislation is the most widespread instrument in almost all the countries under scrutiny. Finally, both Financial/fiscal and Voluntary agreements are concentrated in a few countries, generally in those with "high or medium- quantity adopted measures".

Public sector buildings initiatives

One interesting issue to be described is the initiatives addressed to improve the energy efficiency at the public sector. In the following lines most important programmes undertaken in main MS are found.

In several Austrian provinces and municipalities were launched initiatives for energy book-keeping in public buildings. Related with this, the Ministry of Economic Affairs have been asigned assigned special agents responsible for energy matters in buildings used by the Federal Government. In 2001, the Council of Ministers decided to initiate a energy saving programme for Federal Buildings. Also, different attempts to study and promote the more efficient use of energy have been motivated by the government: the Ministry of Science and Transport ordered a research project carried out by the electrical utilities of Voralberg and the Energy Institute of Voralberg in order to investigate the energy saving possibilities in different kinds of buildings; it also initiated an energy saving project among the Austrian universities.

Different municipalities have adopted diverse strategies with the objective of reach higher energy efficiency figures. In 1997 Vienna adopted the KLIP programme. The objective of the programme is to develop appropriate instruments and pilot projects for effective climate protection. In the context of the KLIP programme, Companies in the Climate Alliance was launched. This programme allows the companies interested in to set their own CO2 reduction goal and get first advice foe energy-related improvement free of charge, paid by the City of Vienna. Vienna has granted the advises for companies with € 0.7 million within the period 1997-2002. The City of Graz has introduced the Municipal Energy Concept (KEK) with emphasis on energy conservation and RES. The Austrian Energy Agency and the Ministry of Environment developed the Municipal Energy Concept, a strategic planning instrument for cities for identify and reach the energy conservation potentials appropriated to each city.

In order to promote the rational use of energy, two Belgium regions allocate subsidies to municipalities and other local bodies, hospitals and schools. Wallonia implements two subsidy programmes to promote energy efficiency, AGEBA for municipal, provincial and intermunicipal buildings and ECHOP for schools and hospitals. Third party financing also plays an imoprtant role: in the Walloon Region resources are granted in the framework of the AGEBA programme; In the Flemish Region this method was implemented in the 1998 relighting programme of a government building in Antwerp; in the Brussels-Capital Region which has budgetary provisions for TPF in public bodies.

Since 1992, energy management and annual reporting of energy consumption have been mandatory in every building used by the Danish State (central administration and state institutions, defence, and state-owned entities like the railways, etc.). Until 1999 it was a grant scheme for financing

investments in energy-saving measures central government. Also, and besides the energy tax, government institutions had to pay a special tax of 5% of their energy expenses in 1996 and 10% in 1997 and 1998. In genral terms, the government want to improve the incentives to implement energy conservation in public buildings. In order to achieve this, it must be enured that a proportion of the money saved on the energy bill can be used for other purposes. Local commitment should be ensured at the county and municipal level. Energysaving efforts will be promoted at the local level, including the introduction of "green accounts". In addition, it is intended to promote the use of third-party financing of the implementation of energy-saving measures in the public sector.

In order to further promote energy conservation in their own properties, the federal government of Germany and Länder ones have initiated third-party financing projects. Based on the first results of these projects, as well as of several projects successfully conducted in Baden-Wurttemberg, the federal government has recently published a guide to third-party financing for its own properties. The building administrators have been instructed to use this guide for implementing new projects. The federal government thus aims at supporting the dissemination of this relatively new financing model in order to make it better known.

The Land of Berlin has set in motion a project *Berlin heat supply model* to modernise many inefficient heating facilities in the eastern part of the city. Private sector operator models have managed to reduce considerably current expenditure on fuels in schools without the state having to meet investment costs. Based on this experience, Berlin has started a comprehensive project entitled *Energy Conservation Partnership Berli*n. With three partners (so far), energy management contracts have been concluded for a total of 120 buildings. The first interim results are very promising. It is planned to invite bids for further groups of buildings. Several Länder, including Bavaria, Brandenburg, North-Rhine-Westphalia, Hesse, Rhineland-Palatinate and Thuringia are looking into similar projects.

By mid-1999, all government and Greek public sector buildings had established *Energy Management Offices (EMO)* in charge of planning energy saving measures. Provision had been made for a specific timetable of action; procedures and responsibilities were specified and plans of action suggested. As of 2000, new public buildings (2004 for all public buildings including existing ones) are required to have an energy certificate -i.e. an energy identity card-, stating the energy performance of the building based on an energy audit. The cost of this instrument is estimated at €1,130 million by 2010; energy savings are estimated at 0.14 Mtoe/year and the reduction of CO2 emissions 0.53 Mt/year in the Greater Athens area. The certificate system will be launched together with an introduction of the new building energy code.

In Ireland SEI has established several plan to stimulate the energy efficiency in the public sector. In this context trough the Public Sector Programme for Energy Efficiency in the Built Environment. Under the Design Study Support Scheme € 2 millions is being available to ensure that state sector bodies employ the very best in energy efficiency design strategies in all new buildings and refurbishments projects. At the same time, the Model Solution Investment Support Scheme has € 9.1 millions to provide direct support to non-commercial building sector organizations who propose to include energy efficiency technologies or energy savings solutions in new or existing building projects. Finally, with a founding of € 1.6 millions a Energy Management Bureaux scheme was established. It function is to collect energy data, monitor and report on energy use in the largest energy consuming groups of non-commercial buildings of the public sector

In designing energy efficiency policies in 1994, the government of Portugal decided to put greater emphasis on municipalities. Through the Directorate General for Energy, it designed an Action Plan (Plano de Acção nos Municipios (PAM)) to foster the creation of local energy entities and the

implementation of energy policy measures at the local level, using financial support available under the Energy Programme. This action is going on under the new incentive programme. Projects aimed at reducing reduce the consumption by public lighting and water supply systems are being developed.

In Sweeden the *Eco* energy municipality programme started in March 2001. Seventy municipalities applied for participation and ten were selected for the first year of the programme. The responsibility of the municipalities is to decide on an energy policy, carry out measures to improve energy efficiency and introduce renewable energy sources.

Even the British public sector accounts for a relatively small percentage of the UK's total greenhouse gas emissions -less than 5%-. a number of energy consumption targets have been set as a educational policy: energy consumption in its own buildings must be 80% of 1990/91 levels; schools in a five-year period must increase their energy savings in 10%; National Health Service (NHS) bodies in England have to reduce primary energy consumption by 15% of 2000 levels by 2010

Besides that, the *Home Energy Conservation Act* (HECA) 1995 requires all UK local authorities with housing responsibilities to prepare, publish and submit to the Secretary of State, an energy conservation report identifying energy conservation measures which they consider practicable, cost-effective and likely to result in significant improvement in the energy efficiency of all residential accommodation in its area.

- **(IV) Some final remarks.**

After examining the three sectors in the previous section, we can highlight some facts concerning the energy efficiency adopted by the MS, both in terms of the sector (and use categories) and the type of policies adopted. Table 3-7 will help us with this task. It provides two sets of data (see second and fourth columns): a) the weight of the most important sector concerning energy efficiency measures adopted for each MS and b) the weight of each MS in the most "policy intensive" technology/use in energy efficiency measures. The third and fith columns shows the most common category of measures in every "economic sector" and "technology/use", corresponding to the percentage of the second and fourth columns.

Table 3-7. Percentage of energy efficiency measures applicable to the most frequent policy used.

Member State	Economic sector		Technology/Use	
	Percentage	Name *	Percentage	Name *
AU	63,2	H	44,7	SH
BE	51,9	I	42,6	SH
DK	37,7	H	36,0	SH
FI	61,2	H	34,7	SH
FR	54,4	H	42,1	SH
GE	61,3	H	40,3	SH
GR	60,8	H	37,3	SH
IR	39,7	H	37,9	SH
IT	41,3	H	39,1	SH
LU	76,5	H	52,9	SH
NL	41,7	H	33,0	SH
PO	41,8	H	23,6	A
SP	35,0	T	33,3	SH
SW	46,7	H	37,3	A
UK	49,5	H	36,3	SH
Total general	47,4	H	31,1	SH

**H: Households; I: Industry; T: Tertiary; SH: Space Heating; A: Appliances*

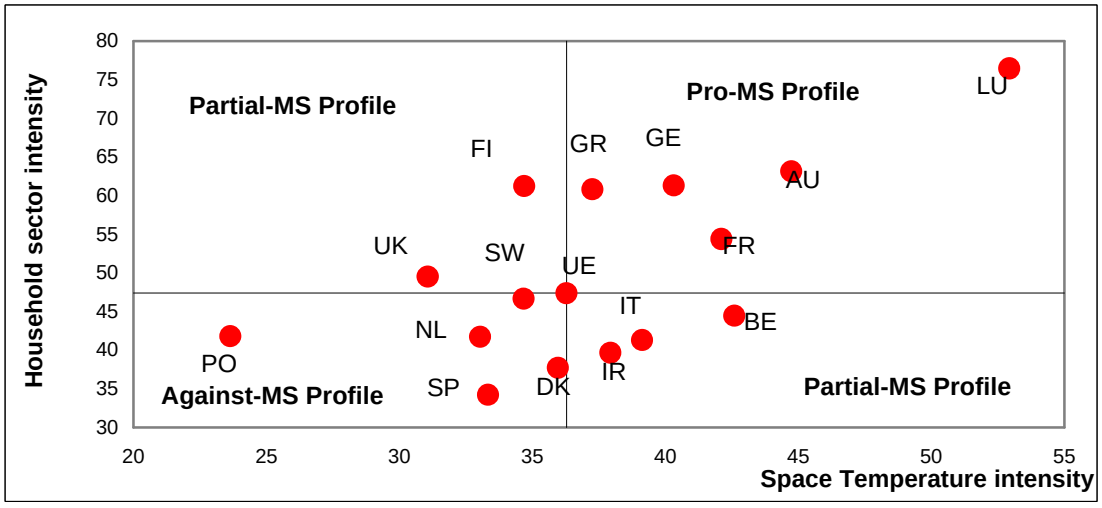
Source: Own elaboration on MURE II Data Base

Household has been the sector of the economy that concentrates the majority of energy efficiency measures adopted in each MS (with the sole exception of Spain and Belgium). In Spain, there is a concentration of measures in the tertiary sector, whereas industry is the most predominant sector in Belgium. In relative terms, Luxembourg, Austria and Germany are the three countries paying most attention to household sector. By contrast Spain, are Denmark and Ireland are the nations paying less attention to this sector.

Concerning the sector where the measures are applied, the table shows that in 13 of the 15 MS priority is focused on the Space temperature sector. Only Sweden and Portugal have a main concern on other sectors. Sweden prefers the appliances sector, whereas in Portugal the priority is shared between Space temperature and Appliances. In relative terms, Luxembourg, Austria and Belgium are the three countries more focused on Space Temperature. By contrast, the nations paying less attention to this sector are Portugal, The Netherlands and Spain.

In the next figure countries are represented according to sector and use/technology relevance. On the horizontal axis countries are ordered according to their relative Space temperature use importance whereas in the vertical one, the 15 MS are organized taking into account their relative household importance. Again, four main regions can be discerned. The North-East and South-West quadrants are the most interesting since in these two, countries "Pro-MS profile" and "Against-MS profile" can be found.

Figure 3-5. Legislation and Space Temperature bias.



"Pro-MS profiles" countries are those having two main tendencies: predominance of both the household sector and the Space Temperature use in their policies targets. By contrast, "Against-UE profile" contemplates economies that are in both dimensions mentioned in the contrary side of the majority of MS. Finally there are two other regions –North-West and South-East- that can be classified as "Partial-MS profile" because they follow the European trend in just one of the indicators.

In this context, Luxemburg, Austria, Germany, France and Greece are part of the first group mentioned above: their polices are totally consistent with the overall European tendency. On the opposite side of the picture, Sweden, Denmark, Spain, Netherlands and Portugal are part of the second group. Logically, the remaining countries are part of the two other zones.

In the next table MS are represented according to the relative intensity in each of the four types of policy analysed in this report. In this way, countries were classified in four quartiles according to the relative intensity in the use of each policy. Also, countries with their names in brackets means that policy has been the one mostly used by that country.

Table 3-8:Energy Efficiency Measures.
Intensity of different policies adopted by MS-UE

	Edu-Info-Tra	Financial/Fiscal	Legislation	VA
Relative Low Intensity	GR, LU, BE, IT, GE, SP	PO, GR, FI, DK	SW, IR, NL	BE, GR, LU, PO SW, IR, FR, UK, AU, SP, GE
Relative Medium-low Intensity	AU, FR	(NL), FR, IT, IR	DK, SP, LU, UK, FI, AU, GE, BE, PO, (FR)	FI, IT
Relative Medium-High Intensity	UK, NL, (DK)	SW, (UK), (AU), (GE)	(IT)	
Relative High Intensity	(IR), (FI), (SW), (PO)	(SP), (BE), (LU)	(GR)	DK, NL

Source: Own elaboration on MURE II Data Base

Table 3-8 reveals several interesting issues. The first is the heterogeneity of the MS's disposition in each of the four kinds of policies: whereas polices such as VA are generally very rarely used, Education-information-training and Financial/Fiscal policies are more widespread. Legislation is intensively used in Greece and Italy.

Secondly, The Netherlands and Denmark are the only two countries with a relatively large importance of the Voluntary Agreement within the set of policies adopted. VA is a very "marginal" strategy in the rest of countries.

The geographic situation could play some role in this context. Southern countries have relative high or medium high intensity on legislation (Italy and Greece). Even France and Portugal were classified as relative medium-low intensity, their respective values are on the "edge". Spain, in this context, is a notable exception. Northern Europe nations (Denmark, Finland and Sweden) have followed a very intensive Education-information-training scheme. This strategy is also applicable to some North Atlantic countries such as United Kingdom, Ireland and Netherlands.

Finally, Austria and Germany have similar patterns of policy strategy. Both of them tend to be together in the matrix. Their main strategy tends to concentrate on energy efficiency through the financial/fiscal instrument.

3.2.- Renewable Energy Policies

3.2.1.- Introduction. Renewable Energy Promotion Policies

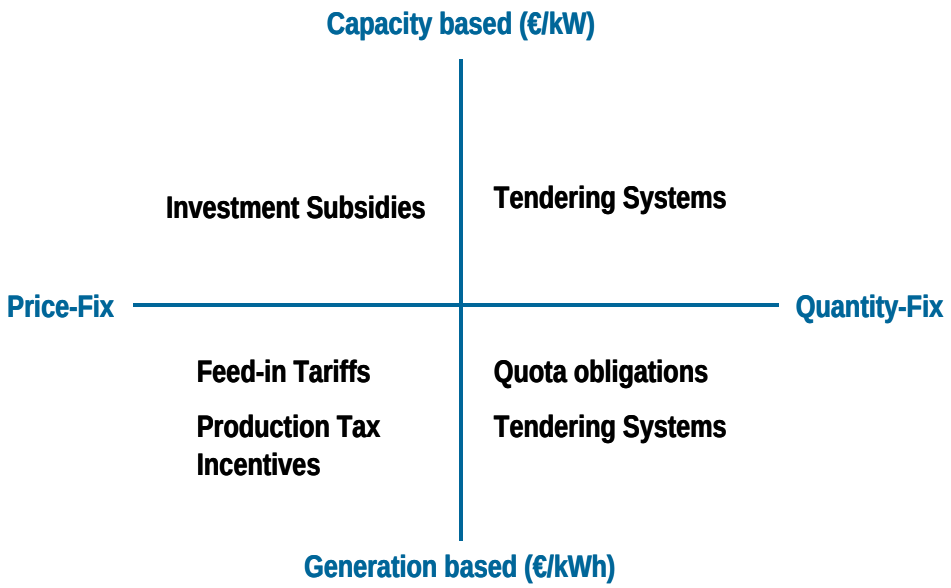
Policies to promote renewable energy in EU15 are diverse, usually technology and site specific regarding the incentive level, and applied in a still non-homogeneous electricity market.

There have been many efforts to conceptualise and organise RES-E policies in a structured understandable manner. Probably the most exhaustive work in this sense was done by Haas, R. et al 2001, where distinctions were made between regulatory and voluntary, direct and indirect policies based on investment or generation and qualified as price-fix or quantity-fix. Another more graphic way of looking at policies was introduced by Boots, M. et al 2000, and it organised the discussion in terms of Supply and Demand policies based either on generation or capacity.

In this report, we take up a simplified and combined version of both attempts (Figure 3-6):

- ✓ Capacity based policies include all those one-time mechanisms that place incentives on certain projects based either on a percentage over total costs, or on a quantity of Euros per installed kW.
- ✓ Generation based policies refer to those incentives which provide monetary support to each kWh produced through renewable energy.
- ✓ Price-fix mechanisms refer to policies that establish a certain price level for each renewable kWh produced.
- ✓ Quantity-fix instruments set a binding amount or target for renewable energy and then use other mechanisms to distribute this target among producers.

Figure 3-6. Classifying Renewable Energy Promotion Policies



Investment subsidies are thus capacity based price-fix mechanisms, which establish an incentive on the development of renewable energy projects as a percentage over total costs, or as a quantity of Euros per installed kW. The levels of these incentives are usually technology specific and vary significantly between regions.

Feed-in Tariffs are generation based price-fix incentives that usually take the form either of a total price for renewable production, or an additional price on top of the electricity market price paid to RES-E producers. Furthermore, feed-in tariffs may be constant through time – the case of Spain, where a fixed government defined tariff[16] is paid to all producers, - or implicitly flexible – the case of Germany, where a scheme of declining tariffs are set through time to for technology improvements and provide more stability to investors in renewables.

Production Tax Incentives are generation based price-fix mechanisms that work through payment exemptions of electricity taxes applied to all producers. This type of instrument differs from feed-in schemes in terms of the cash flow of RES-E producers, since it represents a minus cost instead of an additional income; however its impact on projects should be the same.

Tendering systems can either be capacity based or generation based, but is both cases are quantity-fix mechanisms. In the first case, a fixed amount of capacity to be installed is announced and contracts are given following a predefined bidding process, which offers winners a set of favourable investment conditions, including investment subsidies per installed kW. The generation based tendering systems work in a similar way; but instead of providing one-time investment subsidies, offer a "bid price" per kWh produced to winner projects that may receive it through out the duration of the contract.

Finally Quota obligations based on TGC schemes are generations based quantity-fix instruments. These instrument are usually implemented through government defined targets and obligations on consumers or suppliers of electricity. Once defined, a parallel market for renewable energy certificates is established and their price is set following demand and supply conditions (forced by the obligation).

3.2.2.- Renewable Energy Policies in EU-15

A first glance at figure 3-7 provides an idea of the variety in the types of instruments applied in each Member State (MS) and in the EU.

[16] Tariffs are government defined every four years

Figure 3-7. EU-15 RES-E Policies Summary.

	Investment Subsidies	Production Price Incentive		Tendering	Quota / TGC
		Feed-in Scheme	Tax Incentive		
Austria	■	■			
Belgium	■	■			■
Denmark	■	■			
Finland	■		■		
France	■	■		■	
Germany	■	■			
Greece	■	■			
Ireland				■	
Italy	■	■			■
Luxembourg	■	■			
Netherlands	■	■	■		
Portugal	■	■			
Spain	■	■			
Sweeden	■				■
UK	■		■		■

Almost all countries have implemented some type of investment subsidy. This might be explained by the early phase of development in which some technologies are, such as Tide, Wave, Solar PV, Solar Thermal or Wind Off-shore… This type of instrument is generally applied to these technologies as a way to penetrate the mainstream electricity market.

The most widespread mechanism promoting renewables production is the so-called feed-in systems. The countries that have been, and are more successful in deploying RES-E are characterised by high (feed-in) incentive-levels and long-term stable frameworks (Germany, Denmark & Spain are good examples in wind technology development).

Tax incentives are applied in Finland, Netherlands and the UK. In Finland the tax break works almost as a feed-in scheme reducing the real cost of renewables significally. In the Netherlands and the UK, the tax break is a small part of a wider scheme. In the first case, the REB provides a "minus cost" of about 2 €cents/ kWh to renewable producers, which in combination with the feed-in scheme (MEP) represents the basic renewables incentive. In the case of the UK, the Climate Change Levy (CCL) provides some 0,63 €cents/kWh exemption to renewable producers.

Tendering systems are being applied in France for onshore and offshore wind projects, and in Ireland through the AER scheme to a variety of technologies.

Finally, quota systems based on Tradable Green Certificates (TGC) schemes are applied in the UK (replacing the NFFO tendering system), Belgium, Italy and Sweeden.

The reasons behind this apparent variety have been explored to different degrees and include: 1) technology specificity – different stages of development and costs, varied sources, varied uses… -, 2) Political willingness and coherence – countries which have undergone past liberalisations and are embedded into market oriented policies (Uk, Ireland)

are prone to apply quantity-fix (TGC) schemes; while countries with a more institutional planned approach usually apply price-fix (feed-in) schemes - and, 3) unlevelled electricity markets – Important differences appear when analysing the individual EU15 electricity markets in terms of their work-arrangements, institutional set-ups and fiscal schemes (heterogeneous energy tax levels…) -.

As it can be seen in figure 3-8, the technologies that receive greater attention in EU15 are: Wind, Solar PV, Small Hydro and Biomass in its different forms.

Figure 3-8. EU-15 Technology-Policy Summary

	Investment Subsidies	Production Price Incentive		Tendering	Quota / TGC
		Feed-in Scheme	Tax Incentive		
Biomass*	Be, Fi, Fr, Lu, Po, Sp, Gr, Ge	Au, Dk, Fr, Ge, Gr, Lu, NL, Po, Sp, It	Fi, Uk	Ir	Be, Sw, It, Uk
Geothermal	Fr, Gr, Ge	Au, Fr, Ge, Gr, Sp, It	NL,		Sw, It, Uk
Small Hydro	Be, Fi, Fr, Po, Sw, Gr, Ge	Au, Fr, Ge, Gr, Lu, NL, Po, Sp, It	Fi, Uk	Ir	Be, Sw, It, Uk
Solar - Photovoltaic	Be, Fr, Lu, Po, Sp, Uk, Gr, Ge	Be, Fr, Ge, Gr, Lu, NL, Po, Sp, It	Fi, NL, Uk		Be, Sw, It, Uk
Solar - Thermal	Be, Fr, Lu, Po, Sp, Gr	Gr, Sp	Fi		Sw, It
Tidal/ Wave	Po	Gr, NL, Po, Sp	Fi, NL, Uk		Sw, It, Uk
Wind Off-shore	Be, Fi, Fr, Po, Sw, Uk, Gr, Ge	Be, Dk, Ge, Gr, NL, Po, Sp, It	Fi, NL, Uk	Fr, Ir	Sw, It, Uk
Wind On-shore	Be, Fi, Lu, Po, Sw, Gr, Ge	Au, Dk, Fr, Ge, Gr, Lu, NL, Po, Sp, It	Fi, NL, Uk	Fr, Ir	Be, Sw, It, Uk

**Biomass - Includes all forms of Biomass, Biogas, Sewage & Landfill gas*

3.2.2.1.- Investment Subsidies

Investment subsidies for renewables in the EU average 30% over total costs. These subsidies are different in each country and they usually range 10% up or down depending on the technology and the political availability of funds. Almost all investment subsidies come out of public budgets, so they may change very much from one period to the next. Furthermore, it has to be pointed out that this type of mechanisms is usually applied to the least competitive technologies.

Figure 3-9. Investment Subsidies in EU 15.

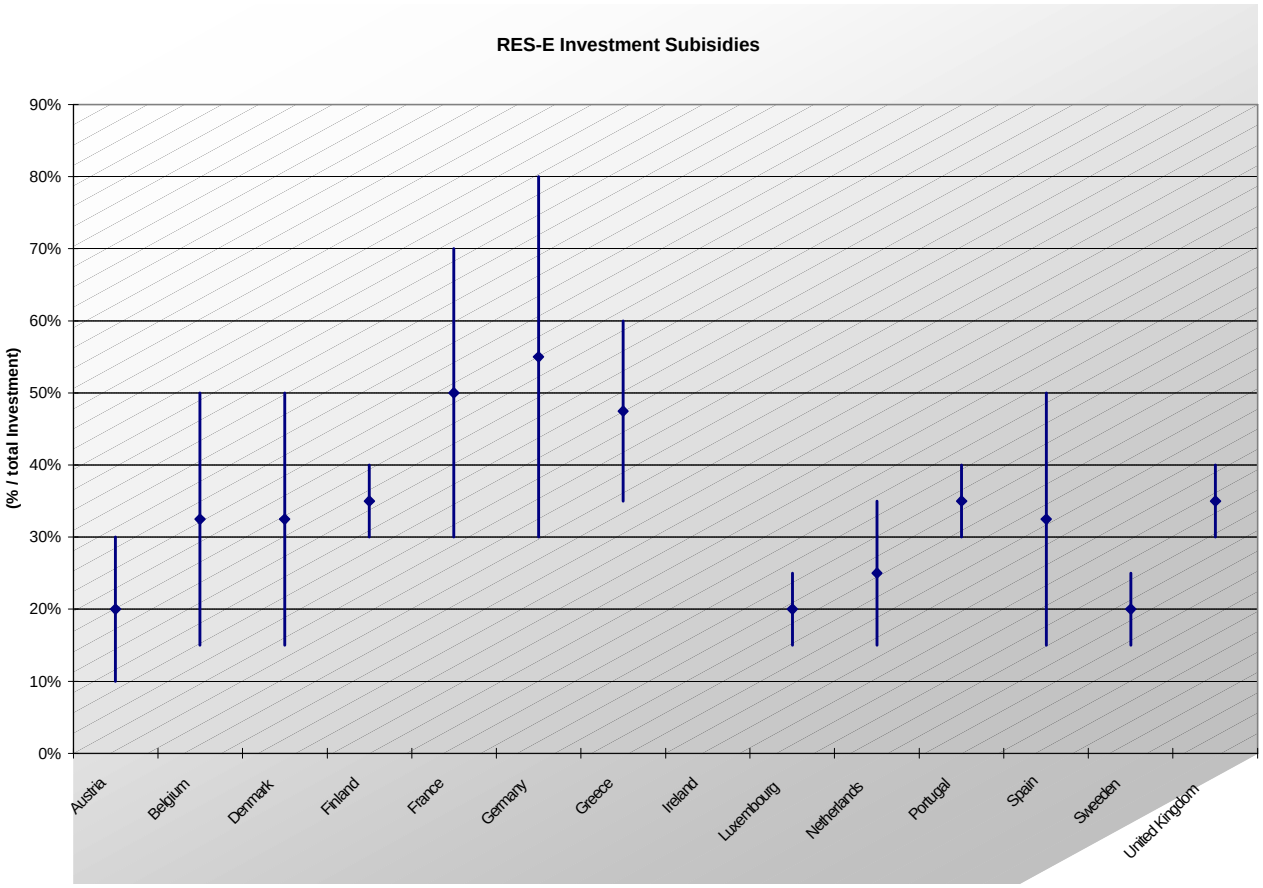


Figure 3-9 shows investment subsidy ranges in each MS for some technologies. It is important to note that this data serves only as reference points to analyse and compare the different types of subsidies available, which as pointed out before, are technology specific. In this sense, we may find several ways to support renewables: 1) %/total investment (most commonly applied), 2) €/installed kW, 3) €/m^2 usually applied to solar thermal electricity, 4) as a financial incentive in the form of reduced interest rates (%) for a given amount of funds, etc. Furthermore, al these instruments present different subsidy-price levels depending on whether they are connected (lower subsidy-level) or not (higher subsidy-level) to the electrical net.

3.2.2.2.- Production Incentives

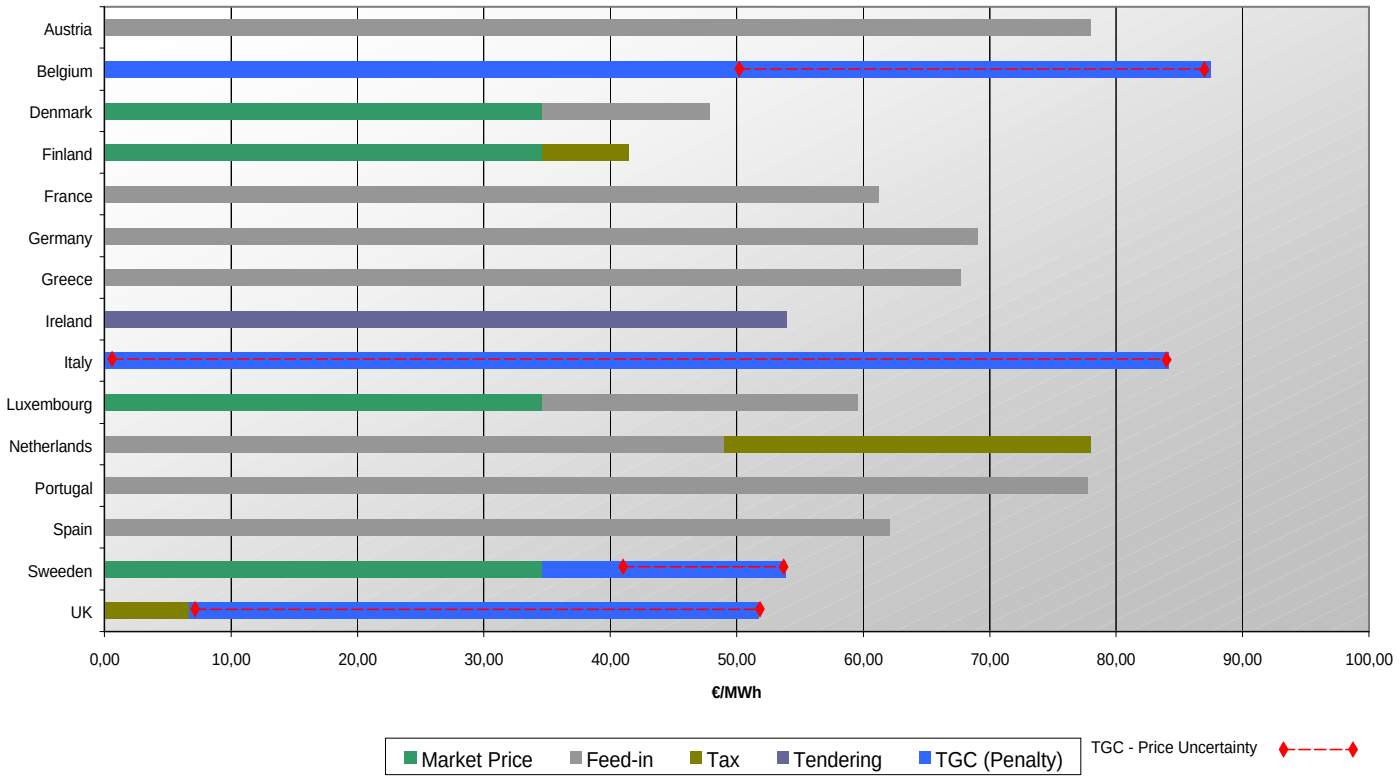
The most important policies used to introduce renewable energy in energy markets are production incentives in the form of "Feed-in schemes", "Quota Obligations with Tradable Green Certificates", "energy production-tax breaks", and "Tendering procedures".

In this section, we will try to cross-analyse these production incentives in terms of the most important renewable technologies and present, in each case, the various levels of subsidisation provided in every MS.

Wind Onshore Production Policies

Wind energy technologies have registered the greater levels of market development in the last decade. Germany, Denmark and Spain are the countries experimenting greater growth rates, and all of them have more or less stable feed-in schemes in place.

Figure 3-10. Production Incentives in EU15 - Wind Onshore[17].



The crosscheck analysis of country policies per technology allows for various interesting insights. In this sense, figure 3-10 provides a picture of the different incentive levels and type of instruments in place in each MS to promote wind onshore technologies. However,

[17] Ireland, Greece, Germany and France - Average incentive levels. Red dotted line shows the price range for TGC markets.

some caution in its interpretation is required, in this analysis we will group countries and policies to unveil differentiating characteristics.

Countries with Feed-in and combined Tax Schemes

The group of countries that pertain to this category are: Austria, Denmark Finland, France, Germany, Greece, Italy, Luxembourg, Netherlands, Portugal, and Spain. These countries basically share their main mechanism to promote wind energy production through a price regulation. However, important differences appear when looking at their implementation. Therefore, a further subdivision is necessary:

- Austria, Denmark, France, Germany, Greece, Italy, Luxembourg, Portugal and Spain all have in place a Feed-in scheme that directly offers RES-E producers an extra price for the electricity they produce. Within this group, Austria, France, Germany, Greece, Italy and Portugal provide a full feed-in price independent of the wholesale price of electricity, but in most cases dependent on the price paid by final consumers and indexed to inflation rates or other price indicators. Spain offers the possibility to RES-E producers to decide either a full feed-in price, or the market price of electricity plus a fixed premium (Most producers have opted for this procedure, since it seems to provide higher incentives). Denmark and Luxembourg provide a premium on top of the wholesale electricity market price.

- In terms of the system stability and assured incentive-price level duration, Germany provides the most extensive coverage with 20 years plant specific incentives, with a decreasing element that modifies the rate yearly (but this is previously known). In the case of Wind 1,5% decrease from 2002. Austria, Greece, Italy & Portugal provide an average of 10 years assurance for the incentive, and levels are either legally fixed and revised or automatically revised based on avoided costs calculations and indexation. Spain provides a 4 year period guarantee, but every four years rates may be modified. Luxembourg offers legally binding incentive levels, so they may only be changed through law alterations.

-

- Finally Finland and The Netherlands have a combined feed-in and tax incentive system. Finland provides an incentive to RES-E producers coming from the electricity tax paid by consumers, on top of the electricity market price, as in Luxembourg this is legally defined. The Netherlands provides a full feed-in price to producers plus an exemption from the REB tax. Furthermore, it offers 10-year plant specific incentives.

Countries with TGC schemes and Tendering Systems

Belgium, Sweden and the UK have some kind of TGC scheme in place. Furthermore, Italy has a partial TGC scheme for producers or importers with over 100 GWh/y. On the other hand, Ireland has a tendering system in place and France has a specific programme (EOLE) for wind onshore and offshore based on a bidding scheme (besides the main Feed-in system). The main characteristics of these schemes may be consulted in the following summary table.

Table 3-9. Summary of RES-E Promotion Schemes in EU-15.

EU15	Main Policy	Incentive Price level determination	Incentive Price (Plant Level assured period coverage)	Barriers*		Main Technologies Incentive Level (€/MWh)	Other Considerations
				Adm.	Grid		
AU	Feed-in System	Legally fixed by Federal Gov	13 years	☺	☹	Shy (31,5- 62,5) Bio (70-134,5) Won (80) Pho (412,95) Biogas (134,5) Landfill gas (45) Sewage gas (45) (Full Feed-in price – Average)	Investment subsidies and Fiscal incentives available at Regional and National level (up to 30% Investment costs)
BE	Quota System based on TGC scheme with obligation on suppliers. Flanders: 1TGC = 1000 kWh Wallonia: 1TGC = 450Kg avoided CO2 (p.e. 1MWh wind = 1 TGC)	TGC Market at Province level - Demand is obligation-driven (as % of generation). Flanders: 1,5% in 2002 to 5% in 2010. Wallonia: 3% (2004) to 7%	No TGC price level assured. - Minimum Feed-in Prices - Penalty Price for non-compliance: Flanders: 50 €/TGC (2002) to 124 €/TGC (2010) Wallonia: 75€/TGC Minimum price in Wallonia = 65€/TGC	😐	n.a.	Shy (50) Bio (20) Won (50) Woff (90) Pho (150) Geo (-) Other (20) *Minimum Feed-in Prices per technology All technologies subject to the same TGC price (once market price above minimum feed-in prices).	Obliged actors: Electricity Suppliers Banking : Yes Borrowing: No Validity of TGC = 5 years Subsidies and Fiscal measures at the regional level are available for most technologies.

DK	Feed-in System "settlement price"	Legally fixed	10 years Max Price for Wind = 13,3 €/MWh premium + 48€/MWh electricity price.	☺	☺	Shy (-) Bio (67,1) Won (13,3) Woff (-) Pho (242) Geo (-) CHP (42,4) Wind: Electricity market price + premium Bio, Ph & CHP - Full "settlement price"	Important Fiscal incentives available for Wind. Investment subsidies available for all renewable technologies
FI	Production Tax incentive	Legally fixed	Legally defined – No Min or Max period coverage defined	n.a.	n.a.	Shy (4,2) Bio (5,3) Won (6,9) Woff (-) Pho (4,2) Geo (-) Other (4,2) Price = Only Tax incentive – Electricity market price also received (Av: 34,6 €/MWh)	Electricity tax paid by consumers is refunded as production subsidy to RES-E producers (Consumption of RES-E is also exempt from tax). Investment Subsidies ranging 30-40% are available for some technologies.
FR	Feed-in System	Legally fixed (indexed to labour costs and consumer price index)	15 – 20 years	☹	☹	Shy (60-75) Bio (49-60) Won (85-65-30)* Woff (-) Pho (150) Geo (77,5) CHP (58) *Won = Max price applied for first 5 years, then 10 more years 65 €/MWh & 5 last years 30 €/MWh.	Bidding system for further RES-E development (EOLE) Projects > 12MW Investment subsidies available for most renewable technologies

GE	Feed-in System	Legally fixed	20 years Decreasing rates from 2002 levels (1%/annum for bio, 1,5%/anumm for wind, and 5%/anumn for PV)	☺	☺	Shy (76,7) Bio (101) Won (91) Woff (91) Pho (590) Geo (88,5) BioG (76,7) (Full feed-in tariffs) – some restrictions: Won: 1st 5 years 91€/MWh; next 61,7€/MWh Woff: 1st 9 years 91€/MWh; next 61,7€/MWh	Investment subsidies available for some renewable technologies. Specially PV.
GR	Feed-in System	Legally defined 70% Consumer tariff for auto-producers & 90% for independent power producers	10 years	☹	☹	Shy Bio Won Woff Pho Geo Other Not Technology Specific, tariffs depend on peak-low demand, auto or independent producers, Connected or not connected (island) systems. Auto-Producers: 15,80 to 58,26 €/MWh Ind. Prod: 60,59 to 74,91 €/MWh Full Feed-in Price	Investment subsidies and fiscal incentives available for most renewable technologies.

IR	Tender Scheme (AER)	Defined by each tender winning bid price	10 –15 years	☺	☹	Shy (70) Bio (64-70) Won (52-57) Woff (85) Pho (-) Geo (-) Other (-) Price caps for AER 6	Some fiscal measures available for small RES projects.
IT	Quota System based on TGC scheme with obligation on producers and importers.	TGC Market – Defined indirectly by mandatory Demand RES-E Quotas for producers = 2% in 2002. Increased annually by 0,35% up to 2008 (starting 2004)	No price level period assurance (market dependent).	n.a.	n.a.	Shy Bio Won Woff Pho Geo Other (TGC Penalty Price 84,2 €/MWh)	Investment subsidies available for some technologies (roof-top for PV) Favourable carbon tax for RES producers. Authorisation problems at local level and high grid connection costs.
LU	Feed-in Scheme	Legally defined (Support programme limited initially to 5 years)	10 – 20 years	n.a.	n.a.	Shy (25) Bio (25) Won (25) Woff (-) Pho (250*-450-550) Geo (-) BioG (25) Shy, Bio, Won, BioG (up to 3MW; 10 years) *PV Municipalities (Up to 50 kW; 20 years) PV Non Municipaliites (Up to 50 kW; 20 y)	Investment subsidies up to 40% of investment costs available for most renewable technologies

NE	Feed-in Scheme + Tax exemption	Legally defined	10 years	☹	☺	Shy (68) Bio (58) Won (49) Woff (68) Pho (68) Geo (-) Wave (68) Tax Exemption = 29 €/MWh Full Feed-in price + tax incentive	Investment subsidies available for most renewable technologies.
PO	Feed-in Tariffs	Legally defined (Avoided costs calculation)	12 years (regularly updated through CPI)	☹	☹	Shy (72) Bio (61,9) Won (72,5-83.1) Woff (-) Pho (224-410) Geo (-) Wave (225) Won – Incentive level depends on full load hours (W>2800; 72,5 … W<2000; 83,1)	Investment subsidies and fiscal incentives available for most renewable technologies.
SP	Feed-in Tariffs	Legally defined	Legally defined every 4 years and applicable to all plants.	☺	☺	Shy (64,9) Bio (60,5-68,5) Won (62,1) Woff (-) Pho (216-396) Geo (64,9) Wave (64,9) (Full Feed-in Price) There is the option to receive only a fixed premium + the electricity wholesale market price. (Premium for solar thermal-electric: 120 €/MWh)	Investment and financial subsidies available for some technologies, especially PV and Solar Thermal

SW	Quota System based on TGC scheme with obligation on Consumers	TGC Market – Defined indirectly by mandatory Demand. RES-E Quotas on electricity consumption = 7,4% in 2003 and up to 16,9% in 2010 (with intermediate targets)	No TGC price level assured, however minimum by-out prices from 2004 to 2007 should provide a smooth transition. (See Technologies)	☺	☺	Shy Bio Won Woff Wave Geo Minimum buy-out floor prices – 2003 = 6,6€/MWh; 2004 = 5,5€/MWh; 2005 = 4,4€/MWh; 2006 = 3,3€/MWh; 2007 = 2,2€/MWh; >2008 No floor price For Wind – Environmental Bonus = 1,9€/MWh Penalty Price = 150% of TGC market price (19,3€/MWh in 2003; 26,5€/MWh in 2005)	Important Fiscal Tax exemptions exist for RES-E producers providing an extra benefit of around 17,9€/MWh. Investment subsidies available for Wind of up to 15% investment costs.
UK	Quota System based on TGC Scheme with obligation on Suppliers + CCL Tax exemption	TGC Market - Defined indirectly by mandatory Demand. RES-Quotas on supplied electricity = 3% in 2003 up to 10,4% in 2010 with intermediate targets. Further Targets set up until 2027	No TGC price level assured. Only Buy-out Penalty Price for non-compliance which revenues are recycled back into RES-E suppliers in proportion to certificates used.	😐	😐	Shy Bio Won Woff Pho Geo Other No technology specific tariffs. Penalty Price = 45 €/MWh annually adjusted in line with the retail price index. Climate Change Levy exemption = 6,75€/MWh	Investment Grants available for Biomass related projects.

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Other Sources: National Renewable and Energy Agencies consulted for specific issues
**Administrative and Grid access barriers assessment from: Commission of the European Communities (2004)*

☺ = Good conditions
😐 = Medium conditions
☹ = Insufficient / strong barriers
n.a. = Information not available

3.3.- GHG Policies

3.3.1.- Country grouping and analysis by common policies.

Of course, no review of national policies and measures to mitigate climate change can ever be complete. As stressed by IEA (2002, p.12) "multiple factors affect how comprehensive such an effort can be and it is often difficult to determine what qualifies as a "climate change" policy and what does not"[18]. We have considered primarily those policies that were specifically intended as part of a climate change strategy. Policies which have an effect on GHG emissions reductions are only considered if the climate change mitigation was ONE of the reasons for their implementation (IEA 2002)[19].

Policies aimed at GHG mitigation in the different Member States can be grouped according to the sector to which they are being applied. In the following, an overview of policies in different sectors and different countries is provided. Although it is a complex task, we have only considered here measures specifically aimed at GHG mitigation and not those which reduce GHG emissions only as a secondary effect, which have been included in other sections of this report (i.e., RES and energy efficiency). In this context, expanded use of RES is mentioned by all countries as a way to reach their KP commitments.

Third National Communications (TNC) of the countries to the United Nations Framework Convention of Climate Change (UNFCCC) provide the main data source. In some cases, this was complemented by information from other sources. The reason we relied on TNCs was two-fold: they are relatively recent and they provide uniformity, since they keep basically the same structure and share the same format. This allows comparison of policies across countries. Of course, heterogeneity is not totally avoided, but reduced significantly. An effort has been made to maintain the same length for all countries. However, this was not always possible.

The following table provides the date for the TNCs used in this report.

Table 3-10. Dates of TNCs used in this report.

Country TNC	Submission date (to UNFCCC)
Austria	**29/1/01**
Belgium	**29/4/02**
Denmark	**2/6/03**
Finland	**20/11/01**
France	**30/11/01**
Germany	**2003**
Greece	**14/2/03**
Ireland	**10/10/03**
Italy	**20/1/03**
Luxembourg	*****
The Netherlands	**23/11/01**

[18] "For example, policies and measures to promote nuclear power existed long before climate became an issue. And yet such policies directly mitigate the effects of climate change since they promote the replacement of energy sources which emit carbon with those which produce none" (op.cit.).

[19] IEA (2002) also provide an overview of climate change policies in (OCDE) countries. However, this overview has several limitations, the most important of which is that its focus is on energy-related policies and measures. For many countries, efforts to mitigate emissions from activities in industry or agriculture that are not related to energy issues constitute a large part of the national programme.

Portugal	**23/6/03**
Spain	**1/4/02**
Sweden	**30/11/01**
U.K.	**30/10/01**

***** TNC not submitted and therefore not available yet (as of April 2004). Information for Luxembourg has been based on European Commission (2004b).

Here we have considered both measures being currently implemented and projected for the future. Policies and measures applied in the past having an impact up to 2005 at least have also been considered. Policies are not listed in a manner that implies any relative weighting.

In general, measures aimed at GHG mitigation can be grouped in two categories: cross-cutting and sectoral measures. The latter applies only to one sector. The former applies to more than one sector (energy transformation, manufacturing and construction, transport, residential and service, industrial processes, agriculture and waste).

Austria

Jurisdiction for policies and measures to mitigate greenhouse gas emissions is distributed among several federal ministries and other policy making and implementing entities, namely the federal provinces (Länder) and the municipalities. Most Länder have already adopted their own regional climate change programmes. However, below, only measures taken at federal and Länder level are considered (i.e., not those at the municipal level).

Table 3-11. GHG policy measures. Country table Austria.

Sector	Measures
Energy transformation	-Energy Supply Agreement between the Federation and the Länder -RES and CHP. -Energy efficiency. -Agreement between the Federation and the Länder to promote energy savings in heating installations and electricity consumption. -Promotion of replacement of old heating systems by RES and district heating. -Voluntary Agreement (VA) for GHG reductions in energy industry (planned).
Industry and construction	Energy efficiency programme for industry leading to energy savings and RES-E promotion in industry.
Transport	-CO2 labelling of passenger cars. -Reduction of emissions from passenger cars by raising market share of advanced engine technologies with low fuel consumption (FED). -Fuel consumption levy (fiscal incentive for low fuel consumption vehicles)(FED). -Road tolls, aimed at internalisation of external costs for use of highways (FED). -Vehicle tax adaptation 2000 aimed at internalisation of external costs, especially for strong engines (FED). -Rail infrastructure and public transport investments aimed at modal split to the benefit of rail/public transport (FED, L, M). -Improvement of fuel quality and promotion of “bio-diesel” (FED). Aimed at GHG emissions reduction through fuel improvement and RES. -Model projects and programmes for environmentally sound mobility (basically, it consists of model projects with the aim to raise public awareness and to demonstrate new technologies)(FED, L, M). -Model projects and programmes for environmentally sound logistics, aimed at GHG reductions in the transport sector by logistic support and avoidance of insufficient transportation (FED). -Mileage based toll for lorries aimed at internalisation of external costs of road transport (FED).

	-Promotion of energy efficient and alternative motor concepts (reduction of fleet fuel consumption)(planned, FED). -Public awareness raising measures aimed at reduction of individual private traffic (FED, L). -Improvement of transport logistics to avoid the inefficient and unnecessary transportation of goods and reduction of road transport (FED, L). -Further internalisation of external costs of road transport/private traffic (planned, FED). -Promotion of walking and cycling, shifting modal split, improving living conditions and safety. -Improvement of spatial planning to avoid traffic-inducing settlement structures (L). -Traffic management and speed limitation to avoid congestions (FED, L). It also includes the promotion of economic driving.
Domestic and services	-Support schemes for energy efficient construction and renovation. -Agreement between the Federation and the Länder to promote energy savings in buildings. -Minimum thermal standards for buildings (L). Aimed at energy savings in buildings. -Housing support schemes for energy savings in new and renovated dwellings (L). This includes thermal insulation of dwellings as well as support schemes for energy efficient construction and the use of renewable energy sources. -Consumption-related heating costs calculation (FED). Aimed at energy saving in buildings. -Harmonised energy codes for buildings (FED, L). Objective is the transparent and comparable declaration of energy consumption of buildings. -Regular inspection of heating systems (L). Aimed at energy-savings in buildings by efficiency-raising of heating systems.
Public sector	-Increased energy efficiency for public buildings. -Green electricity for public buildings.
Agriculture and forestry	-Extension of ecological farming to protect the rural environment and to produce high quality food (FED, L). -Cultivation of oil-seed crops for the production of biofuels (FED, L). -Further enforcement of measures to reduce methane and N02 emissions (FED, L). -Aimed at protection of rural environment with more specific focus on GHG mitigation (FED, L). -Maintenance and extension of vital forests (FED, L). The objective is to maintain diversity, productivity, regeneration capacity and vitality of forests.
Waste	-Landfill regulation aimed at minimisation of waste landfilling. -Expansion of waste treatment capacities other than landfilling. Banning disposal on landfills by 2004/2008. Expanding share of other capacities, e.g. energy efficient incineration. -Promotion of waste recovery. -Efficient energy recovery from waste incineration. -Other programmes to launch waste prevention and recovery (prevention of waste, higher share of energy recovery/recycling
Cross-cutting	Energy tax on electricity and natural gas (part of revenues are earmarked for energy saving projects).

Belgium

Measures to combat climate change are taken at, both, the federal and the regional levels: Walloon region (W), Flanders (F) and Brussels region (B).

Table 3-12. GHG policy measures. Country table Belgium.

Sector	Measures
Energy transformation	-Promotion of RES, rational use of energy (RUE) and CHP.

	-Energy efficiency measures (standards and labels). -Support for energy audits (grants)(F, W and B).
Industry and construction	-Tax reductions on investments in energy efficiency. -Subsidies to companies for investments in energy efficiency and RES (F, B). -Voluntary Benchmarking Agreements on energy efficiency in industry (F). -VA on energy efficiency in industry (W). -Voluntary sector agreements to reduce GHG emissions (W). -Limitations on N2O emissions released by production of nitric acid (VLAREM regulations)(F). -Regulations limiting the use of fluorinated GHG (F).
Transport	-Measures affect passenger transport, transport of goods, reduction of polluting emissions from vehicles and other measures. -Pushing for a modal shift. -Better public transport systems: improvements in infrastructure, more frequent services, better connections and integration of ticketing (train, tram, bus, metro) and, improved personal security, passenger information systems, etc. -Promotion of alternative means of transport: a series of – mainly tax – measures aimed at encouraging people to use public transport, car-pooling, bicycling or walking for everyday journeys; business transport plans. -Large infrastructure works: multiannual railway investment plan (capacity extension, improving rolling stock, works for high speed passenger train (TGV) network, enhancing mobility in Brussels); improving the transport infrastructure around the port of Antwerp (new multimodal platform, better access through additional railway track); *Regional Express Network* in the Brussels area. -Reduction of pollution from vehicles: taxation according to the performance of vehicles in terms of pollution. -Promotion of "clean" vehicles (F). -Traffic Regulation (F). -Training of Mobility Advisers (W). -Mobility observatory (W). -Setting up of a mobility observatory (B). -Campaigns to promote the use of bicycles in town (B).
Domestic and services	-Tax reductions on investments in energy efficiency (residential sector). -Subsidies to households for energy efficiency improvement (W). -Energy certification of buildings. -Energy efficiency labels of domestic appliances. -Insulation standards for residential buildings and for the service sector. -Subsidies for highly efficient bulbs. -Improvement of thermal insulation of new buildings in housing and service sectors. -Promoting the use of energy efficient households appliances and lighting (education and labelling).
Public sector	-Subsidies to public buildings (schools and hospitals and municipalities).
Agriculture and forestry	-Reducing the factors of production (establishing new land application standards of animal manure, limiting the growth of the livestock population) and improving farming practices (treatment, storage and spreading of manure, recovery of waste, combating soil degradation, etc..). -Reforestation and forest conservation are encouraged through a system of grants. -Research projects on the use of wood as a source of energy and on carbon sequestration are also being conducted. -Manure Action Plan (F). -Reduction in pig breeding (F). -Plan for Reducing Ammonia (F). -The "Organic Farming" Action Plan (F). -The Flanders Rural Development Programme (POP)(F).

	-Rural Development Plan (RDP)(W). -Agri-environmental measures (W). -Storage, handling and spreading of farmyard manure (W). -Reduction in the application of mineral nitrogen (W). -Measures for supervising reforestation (FED). -Reconversion of lands (reforestation)(F). -Prohibition on deforestation (F). -Preservation of the ecological stability of forests (W). -The Wood Energy Plan (W) and Study of carbon sequestration (W).
Waste	Measures to reduce landfilling of organic waste and recovery of landfill gas based on environmental taxation (favouring re-usable packagings), on tightening regulations (ban on landfill, compulsory treatment of landfill gases, standards for incinerators) and on the development of specific channels for treating and recovering waste materials. -Moratorium on dumping organic waste (F). -Maintenance of obligations of elimination and reinforcement of the regulations regarding the putting to good use of gas from landfill sites (F). -Setting up of specific channels of waste management (W). -Ban on dumping organic biodegradable waste (W). -Remedial treatment of old landfill sites (W). -Modifications to waste incineration installations (B). -Waste reduction at source (B). -Waste recovery (B).
Cross-cutting	Fuel taxes

Denmark

Table 3-13. GHG policy measures. Country table Denmark.

Sector	Measures
Energy transformation	-Danish Trading Scheme for CO2 emissions from power plants (see Annex I for details). -CO2 tax.
Industry and construction	-Green tax package (CO2 and energy tax) aiming to reduce energy consumption in industry (see Annex II). -Tax on industrial GHG emissions (HFCs, PFCs and SF6)(see Annex II). -Statutory order regulatory industrial GHG (in force since July 15th 2002). It includes a general ban on use of the industrial GHG in a wide range of new installations/products from 1 January 2006 including domestic refrigerators and freezers, PUR foam, etc. Several exceptions apply.
Transport	-Green owner tax on motor vehicles. -Information campaign on new cars´ fuel consumption. -Low-energy driving techniques. -Action for compliance with current speed limits. -Establishment of intermodal installations. -Promotion of public transport. -Promotion of use of bicycles. -Promotion of environmental-friendly freight transport. -Promotion of company plans for road safety and environment, together with transport plans for reduced travelling time for public transport. -Reduction of traffic through physical planning.
Domestic and services	-Promotion of electricity savings (labelling schemes). -Savings on energy consumption for space heating. -Fuel conversion.
Public sector	-Energy efficiency and energy savings in public institutions. -Public procurement.

Agriculture and forestry	-Action Plan for the Aquatic Environment and Action Plan for Sustainable Agriculture. Their aim is to reduce emissions of nitrous oxide and to increase carbon storage in soil. Measures include re-establishment of wetlands, afforestation, agreements on Environment friendly Agricultural Measures, organic farming on an additional 170,000 ha, improved use of fodder, reduced animal density, use of catch crops, reduced fertilisation norms and stricter requirements concerning the use of nitrogen in manure. -Ammonia Action Plan (aim: to reduce ammonia and N2O emissions). -Ban on burning of straw (leading to net reductions of CO2 emissions). -National forest programme to increase carbon sequestration through subsidies on afforestation[20].
Waste	Measures include CAC regulation (statutory orders) and economic incentives (grants, waste tax and other taxes and fees). -Reducing landfilling of organic waste -Utilising gas from closed-down and existing landfill sites -Using the waste as an energy source. -A ban on landfilling combustible waste was set from 1 January 1997.
Cross-cutting	

Finland

According to Finland's TNC, the main policies and measures applied by the Government to reduce GHG emissions include energy and carbon taxation, energy conservation, bio-energy promotion, energy-related research, development and the promotion of efficient and environmentally friendly traffic.

Table 3-14. GHG policy measures. Country table Finland.

Sector	Measures
Energy transformation	-Limit on the use of coal, while promoting the use of natural gas. -Promotion of RES and energy conservation. -Energy taxation. -VA on energy conservation and energy auditing.
Industry and construction	-National programme on ecologically sustainable construction. - Reductions of N2O emissions from nitric acid production and slow down the increase of F-gases with the use of leakage control and alternative technologies and substances. -Since industry is an intensive energy user, P&M in the energy sector are also relevant in industry.
Transport	-Additional tax on transport fuels (see Annex IV). -Vehicle taxation (Annex IV). -Differentiation of vehicle taxation in order to promote purchase and use of energy efficient vehicles (proposed). -Increasing share of public and non-motorised transport. -Adoption of energy saving agreements between administration and transport operators. -Increase of fuel taxation and additional measures to maintain compact urban structure (through transport planning and land use planning).
Domestic and services	
Public sector	

[20] In addition, the green tax package and the grant scheme for energy savings in the business sector are resulting in energy savings and thus a reduction in CO_2 emissions from use of energy in agriculture. The aim is to increase use of biomass for energy purposes by establishing power stations and CHP plants using this fuel.

Agriculture and forestry	-Horizontal Rural Development programme. It provides agrienvironmental support[21]. -National Forest programme promoting sustainable forest management, use of wood and forest certification.
Waste	-Government decisions on landfills (The objective is to limit more effectively than at present the quantity of bio-degradable, methane-producing waste ending up at solid waste disposal sites.). -Waste minimisation, collection and recovery of waste paper and other waste fractions (efforts will be made to utilise source-separated waste fractions as materials and to utilise combustible, unusable waste separated at source or at a processing utility as energy in existing energy production plants.). -The waste tax. -Landfill gas recovery and utilisation. -Waste minimisation, the utilisation of source-separated waste fractions as material and energy.
Cross-cutting	-CO2 tax (some exemptions for specific fuels or sectors based on the carbon content of fuels)[22]. See Annex IV.

France

Table 3-15. GHG policy measures. Country table France.

Sector	Measures
Energy transformation	-Dual taxation of electricity with general taxation being completed by a price-signal based on the carbon content of the fuels used by the producer. -Priority given to DSM measures. -Replacement of coal and oil-based thermal installations by CHP and CCGT (tax incentives). -Doubling of Incineration Capacity for Household Waste and Ordinary Industrial Waste works -Agreements Negotiated with Relevant Industries on Fugitive CH4 Emissions from Gas Networks -Agreements Negotiated with energy industries (Nuclear Fuel Cycle and Losses from Electrical Power Cables). -Information and Training for the Promotion of Efficient Appliances -Introducing Requirements Into the Thermal Regulations Relating to Equipment Connected to Specific Uses of Electricity -Substituting Traditional Power Stations with Gas Combined Cycles (GCC) and Co-generation. -Development of Renewable Energies.
Industry and construction	-Exceptional Depreciation for Companies[23]. -VA to encourage the use of wood in construction. -Measures to encourage the use of RES in building. -Thermal Regulations (New Buildings) -Reinforcement of Thermal Regulations -Reinforcement of Control Means and Procedures -Reduced rate of VAT for Work on Old Buildings -Reductions in income tax -PALULOS. The grant for improving rented accommodation and public housing (PALULOS) helps council lessors to improve all their housing. -Conditions for Making Grants to the Property Business. -Overhaul of Public Housing. -Voluntary Agreements.

[21] However, its main focus is not to reduce GHG emissions.
[22] US$ 8.50 per tonne of CO2.

	-Action on Pilot Sector Buildings.
Transport	-Reduction in taxation differential between petrol and diesel. -Development of inter-modal services. -Reinforce the pricing of urban travel. -Improve urban travel in town planning policy.
Domestic and services	-Energy efficiency standards for residential and non-residential buildings. -Tax measures and financial measures also apply to existing buildings. -Audits at the time of sale or rental have been planned for the service sector.
Public sector	Measures aimed at energy savings in public buildings.
Agriculture and forestry	-Production and distribution of biofuels (industrial-scale experiment). -Carbon storage in forests through a revival of the policy for planting trees on agricultural land. -Move towards implementing a duty on excessive mineral and organic nitrogen. -Increase in funding for afforestation of agricultural land, to achieve a rate of 30,000 hectares per year by 2006, has been confirmed. -However, the National Plan for French Forests will initially lead to a fall in the level of afforestation of agricultural lands, of probably less than 10,000 hectares per year, in favour of forest re-planting.
Waste	-Control of waste production; -Development of the re-use of matter and organic products; -Recovery of the heat produced by incinerators; the overall balance in terms of greenhouse gas emissions from incineration is critically dependent on the way the energy is re-used; -Equipping of all landfill sites with harnessing systems; there will be an in-depth assessment of the efficiency of harnessing systems; -Assessment of the value of biological pre-treatment.
Cross-cutting	-Ecotax on energy and carbon[24].

Germany

Table 3-16. GHG policy measures. Country table Germany.

Sector	**Measures**[25]
Energy transformation	-Energy efficiency and cogeneration. -Promotion of RES (federal and Länder).
Industry and construction	-Commitment made by industry to maintain, modernise and expand cogeneration (supported by Act of 1 April 2002). -Ordinance on Energy saving aiming at reduction of emissions in industry. -VA between the federal government and industry on climate protection. -Other sectoral VA (aluminium, adipic acid production, XPS hard foams).
Transport	-Promotion of intermodal transport. -Introduction of emissions-based motor-vehicle taxation for automobiles. -motor-vehicle-tax breaks have provided incentives for market introduction of automobiles with especially low CO2 emissions -Distance-based autobahn-use fee for trucks, with emissions-based fee categories, will provide incentives to shift goods transports from roads to railways and waterways. -Continuing development of low-emissions vehicles are encouraged through the voluntary commitment made by the German Association of the Automotive

[23] The exceptional depreciation scheme allows companies to depreciate immediately, over a twelve-month period from the putting into service of the energy-saving equipment purchased or manufactured between 1 January 1991 and 31 December 2002.
[24] The Constitutional Council rejected the proposed ecotax at the end of 2000.
[25] Although mitigation measures at both the federal and Länder level exist, only federal measures will be considered in this overview, except for the energy sector.

	Industry (Verband der Deutschen Automobilindustrie – VDA) to reduce average fuel consumption of automobiles made by German manufacturers by 25%, by 2005, with respect to 1990 levels. -Intensifying optimisation and use of environmentally friendly fuels. -Use, in new vehicles, of low-viscosity oils and tyres with low roll resistance. -A legally defined prohibition on use of the main emissions sources of SF6 is proposed. -Promotion of telematics systems in the transport sector with the aim to pursue an intermodal approach as well as a greater reliance on railways.
Domestic and services	-Campaign for Climate protection in the residential and institutional sectors (public-private partnership aimed at providing information and advise). -Ordinance on energy saving (reducing energy consumption in new buildings)[26]. -CO2-oriented building modernisation programme (providing loans to modernise residences). -Measures taken by Länder to improve energy-efficiency in existing buildings.
Public sector	Measures taken by Länder to improve energy-efficiency in existing buildings.
Agriculture and forestry	-Fertiliser ordinance. Provides for biogas use in liquid- manure- treatment systems built primarily for manufacturing fertiliser products for precision nitrogen fertilisation. The aim is to use substitutes for fossil fuels. It also provides for fertiliser use in keeping with proper practice; this is expected to reduce nitrogen input into the soil from 174 kg/ ha in 1990 to 160 kg/ ha in 2005. The aim is to prevent N2O emissions. -Expansion of organic farming (on-going project). -Management and protection of existing forests/initial afforestation (CO2 sink). -Use of biogas in agriculture.
Waste	Ordinance on Environmentally Compatible Storage of Waste from Human Settlements. As of 1 June 2005 at the latest, waste may be stored only if it does not endanger achievement of potential reductions in emissions of greenhouse gases.
Cross-cutting	-Ecological tax reform. -Energy efficiency measures in several sectors (energy transformation, industry, residential and building).

Greece

Table 3-17. GHG policy measures. Country table Greece.

Sector	Measures
Energy transformation	-Promotion of natural gas, RES and CHP.
Industry and construction	-Energy conservation and promotion of CHP plants in industry (subsidies). -Penetration of RES and natural gas for thermal uses in industry.
Transport	-Regulatory technical control of vehicles. -An *exhaust-control card* (renewed annually), which is required for all vehicles. -The differentiation of the taxation applied to vehicles according to their anti-pollution technology (Law 1682/99). -The differentiation of the excise-tax rates applied to the different motor fuels, with lower rates for unleaded gasoline. -Interventions in public transportation: Construction of metro lines, efficiency improvements in buses and interventions in the traffic network of buses.
Domestic and services	-Energy conservation in residential and tertiary sector (energy efficiency in all types of buildings). -Promotion of CHP in tertiary sector. -Improvements in the thermal behaviour of existing buildings. -Promotion of solar energy for water heating and biomass for district heating.

[26] It aims at reducing energy requirements of new buildings by an average 30%.

	-Promotion of energy efficient appliances and heating equipment. -Promotion of national gas for space heating and cooling in service sector.
Public sector	
Agriculture and forestry	-Manure management systems. -Organic farming.
Waste	-Removal of unmanaged solid-waste disposal sites by 2006. -Limits on the amount of biodegradable municipal waste that is landfilled.
Cross-cutting	

Ireland

Table 3-18. GHG policy measures. Country table Ireland.

Sector	Measures
Energy transformation	Promotion of RES, CHP, shift to gas and improving energy efficiency and DSM.
Industry and construction	Negotiated Agreements between industry and government to improve energy efficiency, reduce emissions of industrial gases and substitute polluting processes (cement industry).
Transport	-VA and taxation aimed at efficiency improvements. -Alternative transport systems. -Public investments in switching modes in public transport. -Education, taxation and negotiated agreement aimed at freight transport (switch to rail and increase road haulage efficiency). -Taxation aimed to increase more efficient car purchase. -Traffic management (taxation and investment aimed at reducing congestion). -VA between the government and car manufacturers aimed at improving fuel efficiency of car fleet (labelling).
Domestic and services	-Economic instruments aimed at energy efficiency in commercial and residential sectors. -Residential building standards and fuel switching.
Public sector	
Agriculture and forestry	-Subsidies and regulatory measures aimed at reducing CH4 from herd. -Subsidies aimed at farm forestry sequestration. -Regulatory measures aimed at reducing fertiliser use and at substituting biogas for other fuels. -Measures to manage manure. -Grants to promote carbon sinks (additional sequestration).
Waste	-Measures at local level to promote energy recovery from landfill and thermal treatment (investments).
Cross-cutting	-Carbon taxes (planned). -Emissions trading for business (planned).

Italy

Table 3-19. GHG policy measures. Country table Italy.

Sector	Measures
Energy transformation	-Increased energy efficiency, change to natural gas in thermal plants (CCGTs), promotion of RES-E and CHP, upgrading of existing plants and reduction of electricity and gas demand. -VA with Enel (its goal is to reduce emissions of 22 MtCO2 by 2006, compared to the emissions of 1990, by increasing the efficiency of existing plants and converting 15.000 MW to CCGTs, increasing the use of renewable sources (2% obligation), reducing leaks from distribution networks by 0.1 MtCO2 and DSM measures.
Industry and	-VA with the glass sector.

construction	-Direct or indirect financing in several specific sectors (i.e., the steel sector) to modernise industry according to EU standards: -Increase of cogeneration in the industry sector.
Transport	-Biodiesel exempted from excise tax. Promotion of biofuels. -New infrastructure leading to the transportation of passengers and goods from road to railways and coasting navigation (also, promotion and development of automobile transport on trains and reorganisation of urban traffic). -Promotion of the production and use of high-efficiency vehicles and fuels. -Subsidies for the replacement of existing automobiles with new vehicles providing consumption rates lower than 5 lt/100 km). -Optimisation of private transportation systems and measures promoting the use of collective transport means. -Increasing the efficiency of goods transport: the reduction achievable through the shift of 12 Gt/km from road to rail/sea traffic -VA with Fiat to reduce specific car emissions. -Increasing diffusion of natural gas, LPG and biodiesel vehicles. -Measures proposed in the General Transport Plan: use of low-carbon fuels, increase in transport infrastructures in urban areas, reduction/restrictions of car use in cities and freight traffic from road to rail and sea. -Promotion of campaigns to increase awareness regarding methods of driving vehicles. -Improvement in the energy efficiency of heavy transport vehicles. -Revision of the method for calculating the owner's tax on vehicles so that it no longer reflects only the maximum horsepower of the vehicle, but also: a) the weight of the vehicle, in this way pointing users towards lower-weight vehicles, with significant advantages in terms of CO2 emissions b) a return to annual vehicle inspections.
Domestic and services	-Deductibility of 41% of buildings retrofitting expenses. -Reduction of energy consumption for residential uses. -Use of fuels with a lower carbon content, increased building insulation and promotion of more efficient equipment, both electric and thermal. -More extensive use of thermal solar energy. -Regional measures in the residential and tertiary sector.
Public sector	
Agriculture and forestry	-Reforestation, afforestation and management of existing forests.
Waste	-Progressive phasing-out of landfills and increased energy production from waste;
Cross-cutting	Carbon tax

Luxembourg

Table 3-20. GHG policy measures. Country table Luxembourg.

Sector	Measures
Energy transformation	-Promotion of RES through regulation and subsidies. -Improved efficiency in power and heat generation through subsidies.
Transport	-New technologies. -Promotion of community transport. -Information
Domestic and services	-Energy efficiency for commercial and residential sectors (regulation, fiscal measures and VA).
Cross-cutting	Fiscal measures (taxation).

Source: European Commission (2004b).

The Netherlands

One of the conditions for climate change policy, defined by the new government in 1998,was that international agreements should allow sufficient latitude (around 50%) for using the Kyoto mechanisms to meet commitments. It was therefore decided that half of the necessary efforts (25 Mton per year) would have to be achieved by national policies and measures.

Table 3-21. GHG policy measures. Country table the Netherlands.

Sector	Measures
Energy transformation	-Increasing the regulatory energy tax. Revenues recycled for incentive programmes on RES and energy conservation. -An agreement (in principle) was reached in mid 2000 between the government and the owners of existing coal-fired electric power plants. The latter have committed themselves to replacing coal with biomass in 475 MW of installed coal-capacity. They will also participate in the benchmarking covenant for both gas-fired and coal-fired plants. As part of this agreement, the government has changed the fuel tax on fuel inputs in electricity production into a tax on kWh-output. -The government has made € 18 million available for 10-year programme to speed up the introduction of new, climate-neutral gaseous and liquid energy carriers (GAVE Programme).
Industry and construction	-Benchmarking covenant signed between government and energy-intensive companies. Fiscal incentives support this covenant. -Environmental permits serve as the policy tool to enforce VAs. -The *Energy Investment Tax Deduction* (EIA) encourages entrepreneurs to invest in relatively innovative energy-efficient technologies or in renewable energy. Part of the investments may, under certain conditions, be deducted from the company 's profit tax[27].
Transport	-Energy labels of new passenger car indicating CO2 emissions. -"New Ways of Driving" programme aimed at promoting fuel-efficient purchasing and driving behaviour of individual vehicle drivers and fleet managers.
Domestic and services	-A voluntary *Energy Performance Advice* (EPA), provides advice about the most appropriate energy-saving measures that can be taken and gives information on energy savings and costs of these measures. -An *Energy Premium* for energy-efficient appliances and insulation came into effect in January 2000 targeting existing housing and providing a partial rebate to consumers who purchase the most efficient type of household appliances (A-label appliances) or certain kinds of insulation (double glazing).
Public sector	
Agriculture and forestry	National Green Fund (under this scheme agreements are made with various parties to plant new forests and to maintain them in a sustainable manner for a period of at least 50 years). The fund issues certificates for the number of hectares for which CO2 sequestration rights have been acquired. An energy company wanting to acquire CO2 sequestration rights can deduct € 4538 from the energy tax it owes to the government, provided that an equal amount of money is transferred to the *National Green Fund*. This enables the *Green Fund* to continue its activities by paying landowners with whom a contract has been signed.
Waste	The 1998 tax plan introduced a special arrangement for electricity generated by waste incineration plants. The energy companies pay 50% less than the normal energy tax rate to the central government for electricity originating from waste

[27] Approximately 27%of investments by industry benefit from this facility, 24% in the agricultural sector and 5%in transport. Other eligible sectors include banks and other business services and the energy sector.

	incinerators on the condition that this advantage is passed on to the waste incineration plant
Cross-cutting	-Tax incentives to stimulate growth in CHP. -ROB programme (cross-sectoral programme to reduce non-CO2 GHG). -Tax incentives for energy investments.

Portugal

Table 3-22. GHG policy measures. Country table Portugal.

Sector	Measures
Energy transformation	-E4 programme (measures to improve energy efficiency and RES). -Introduction of higher efficiency in CCGTs. -Promotion of RES, rational use of energy and CHP.
Industry and construction	The Regulation on the Management of Energy Consumption (RGCE), which aims at reduction of energy consumption by large power consumers and at establishing specific consumption reduction targets for businesses through Plans for Rational Use of Energy,
Transport	-Reformulation of the current Vehicle Tax (IA) within the Special Tax on Vehicles (IEV), and the creation of a Single Tax on Circulation (IC); -Tax revision favourable to the renovation of the national vehicle stock. -Changes in the means of intercity merchandise transport, and reduction in the frequency of empty haul journeys in shot distance distribution. -Changes in the means of urban transport from private vehicles to public transport.
Domestic and services	Promoting a better energy efficiency in the services and residential sector by improving the energy efficiency requirements of the Building Regulations: Regulation on the Thermal Behaviour of Buildings (RCCTE); Regulation of the Energy Systems for Acclimatisation of Buildings (RSECE); Regulation on the Management of Energy Consumption (RGCE); and the labelling of equipments as an information instrument.
Public sector	
Agriculture and forestry	Measures in agriculture and forestry are based in "Plan to a Sustainable Development of Portuguese Forestry" and other Programmes (AGRO, RURIS, AGRIS) that promote a better countryside management, reducing fertiliser use, protecting and enhancing forests (reforestation and afforestation) and encouraging biomass energy use.
Waste	A set of national plans are either implemented or planned, with the aim to Promote reduction, reutilization and recycling of the various types of waste, thus promoting direct and indirect GHG emissions reduction: Plan of Action for Urban Solid Waste; Strategic Sectoral Plan for Management of Urban Solid Waste; National Plan for Prevention of Industrial Waste; Strategic Plan for Hospital Waste; Strategic Plan for Industrial Waste; Strategic Plan for Reduction of Industrial Waste; Application of Landfill Directive.
Cross-cutting	

Spain

Table 3-23. GHG policy measures. Country table Spain.

Sector	Measures
Energy transformation	-RES-E promotion (PFER and Plan of electricity and gas infrastructures). -PROFIT programme (promoting investments in more efficient and less polluting technologies through subsidies). -Energy efficiency and Energy Savings Strategy (E4) providing subsidies for the adoption of more efficient technologies and processes (see also Hernandez et al

	2004)..
Industry and construction	-PROFIT initiative (subsidies on technological development aimed at energy savings and clean technologies). -Tax regime for stimulating investments in tangible assets for environmental protection.
Transport	-Differentiated tax rates for low and high octane lead-free gasoline, regulatory and voluntary measures regarding the control of emissions from vehicles, measures aiming at improvement of energy efficiency by improving infrastructures and developing intermodal forms in the interurban transport system and collective urban transport. -Incentives for vehicle removal.
Domestic and services	-Measures aimed at improving energy efficiency in buildings. -Information campaigns aimed at encouraging domestic energy efficient appliances (light bulbs, home electric appliances...).
Public sector	
Agriculture and forestry	-Forest management and reforestation. -Measures for the reduction of mineral fertilisers and good practices in the management of manure that should contribute to curb nitrous oxide emissions and measures for the control of CO2 and methane emissions from burning stubble and from animal feed (Tábara 2003, p.25).
Waste	National Plan for Urban Waste aiming at CH4 emissions reductions through action on landfills (environmentally sound disposal in controlled landfills, elimination of uncontrolled landfill before the end of 2006. Existing landfills must adapt to the requirements of Directive 99/31/EC, the elimination and use of biogas from large landfills for obtaining electric power must be increased.
Cross-cutting	

Sweden

Table 3-24. GHG policy measures. Country table Sweden.

Sector	Measures
Energy transformation	-RES. -Energy efficiency improvements (long-term agreements). -Other measures (funding to reduce the use of electricity for heating purposes, grants for conversion to district heating, grants for conversion from electric heating to other individual heating systems (not including district heating) and solar heating grants).
Industry and construction	“Regional Growth Agreements” leading to the development of environmental technology.
Transport	-Adjustment of petrol and diesel taxation. -Investments in rail infrastructure. -Joint project between the state and vehicle manufacturers to reduce environmental degradation from road traffic. -Training courses in "Ecodriving" and procurement of ethanol/petrol-driven hybrid vehicles.
Domestic and services	-Measures to promote energy savings and conversion of energy carriers. -Urban and regional planning (siting residential areas and routing public transport systems). -Systems of grants for ecological buildings.
Public sector	
Agriculture and forestry	-Forest management, reforestation and afforestation (increased biomass). The carbon dioxide tax makes forest fuels relatively cheaper than fossil fuels, particularly for district heating production. -Environmentally-related certification of forestry.

	-Tighter restrictions on the use of nitrogenous fertilisers on forest soils. -Agricultural measures with an indirect impact on emissions (support to reduce nitrogen leaching and environmental tax on artificial fertilisers).
Waste	-Tax on landfill and a ban on landfill of burnable waste from 2002 and organic waste from 2005. -Most organic waste is expected to be recycled for energy by incineration in the district heating sector.
Cross-cutting	-Energy/CO2 taxation (see Annex IV). -Several environmental policy initiatives have had a significant impact on GHG emissions, such as the LIP (Local Investment Programme) and the Environmental Code.

U.K.

The U.K.´s climate change programme, published in November 2000, sets out how the U.K. will meet its Kyoto target to cut GHG emissions by 12.5% below 1990 levels by 2008-2012 and move towards its domestic goal to cut CO2 emissions by 20% below 1990 levels by 2010.

According to DEFRA (2001), the main policies to achieve the above-mentioned target are:
– the climate change levy package;
– a UK-wide emissions trading scheme;
– a target for the renewables obligation that 10% of sales from licensed electricity suppliers will be generated from eligible renewable sources by 2010, subject to the cost to the consumer being acceptable;
– a target to at least double the capacity of combined heat and power by 2010;
– European-level agreements with car manufacturers to improve the fuel efficiency of new cars by at least 25% by 2008-2009;
– the 10 Year Plan for Transport;
– better energy efficiency in the residential sector; and
– improving performance standards in the Building Regulations.

Table 3-25. GHG policy measures. Country table U.K.

Sector	Measures
Energy transformation	-RES. -Doubling of CHP capacity by 2000[28]. -Energy efficiency (Carbon Trust, see Annex IV).
Industry and construction	-Climate Change Levy (CCL, see Annex IV) and Carbon Trust. -Amendment of the Building regulations. -Measures to tackle emissions of HFCs.
Transport	-10-year Plan for Transport including the following measures: (a) more sustainable distribution, with improvements in the operational and fuel efficiency of the commercial vehicle fleet; (b) an 80% growth in rail freight volumes as a result of improvements in rail freight's relative competitiveness, through reductions in rail costs and improvements in service quality; (c) substantial improvements to local public transport; (d) the delivery of a 50% increase in rail patronage, measured by passenger kilometres. -Other measures: improving fuel efficiency of cars, commercial and public

[28] The following measures were introduced in April 2001 to help stimulate the take up of CHP: exemption of Good Quality CHP from the climate change levy (Good quality CHP refers to CHP production that is energy efficient in operation), eligibility for enhanced capital allowances offering tax incentives to companies investing in energy saving technologies, including Good Quality CHP and exemption of CHP plant and machinery such as turbines and engines from business rating.

	transport vehicles, developing and promoting cleaner technologies including alternative fuels. These measures are supported through several fiscal incentives (see Annex VIII).
Domestic and services	-Better energy efficiency in the residential sector. -Improving performance standards in the Building Regulations. -Commercial use of energy (see Annex VI). -Amendment of the Building regulations. -Energy Efficiency Commitment (obligation on energy utilities to encourage or assist consumers to take up energy saving opportunities). -Community Energy Programme (promoting community heating through grants to install new schemes, refurbish obsolete infrastructure and equipment, and spread knowledge and good practice. -New Home Energy Efficiency Scheme (). -Appliance standards and labelling.
Public sector	
Agriculture and forestry	-Encouragement in the growth of renewable energy crops on intensively managed land. -Agricultural businesses are subject to the climate change levy (the government has given a temporary 50% discount for up to five years for horticultural businesses). Businesses in the intensive pig and poultry rearing sectors can also join climate change agreements and obtain an 80% discount from the levy. -Forestry activities.
Waste	policies aimed at reducing landfilling of biodegradable waste. For example, the landfill tax was raised in 1999 to £10 per tonne of active waste to encourage recycling of methane generating waste that would otherwise be landfilled. The Government also announced in April 1999 that the tax would increase by £1 per tonne of active waste per year for the next five years, so that the standard rate will be £15 per tonne in 2004 at which point the tax escalator will be reviewed.
Cross-cutting	-CCL package and Carbon Trust (see Annex V). -Emission trading (see Annex VI).

Concerning cross-cutting measures, from the above we can conclude that their implementation differs per country. Austria, Denmark, Finland, France, Germany, Italy, the Netherlands, Sweden and U.K. have relied on the implementation of some form of energy/carbon tax (although the link with the carbon content of energy is sometimes weak). Voluntary agreements now exist in most countries (Netherlands, Germany, Spain, Finland, France, Belgium, Ireland and Italy) while the U.K. has also implemented an emissions trading scheme.

On the contrary, although different emphasis may be given to certain policies in different MS, there seems to be a common pattern in the sectoral measures applied. In general, MS policies to tackle climate change rely mostly on measures for the mitigation of emissions in the energy sector and, to a lesser extent, in the transport sector. Some measures included in the energy sector can be regarded also as ”cross cutting” measures, since they may have an impact on the emissions of more than one sector (i.e., industry and residential sectors).

More or less widespread planned or implemented measures are:
- Energy. Promotion of renewable energy, investment support (tax reductions, subsidies, R&D support) for energy efficiency, information and awareness measures aimed at reduction of energy demand and energy efficiency (demonstration projects), voluntary

agreements with energy-intensive industries in order to optimise energy efficiency (or cost-efficient GHG reductions) in several sectors.
- Industry. Measures aimed at energy savings and efficiency (investment support, voluntary agreements...), actions to reduce nitrous oxide and to limit fluoride gas emissions, measures aimed at reduction of non-energy related emissions, implementation of BATs in the context of the IPPC Directive...
- Building, commercial and residential sectors: energy savings and energy conservation, increased energy efficiency for public buildings, insulation standards for buildings (ordinances...), increased energy efficiency of household appliances, labelling schemes...
-Transport: promotion and improvement of public transport (multimodal systems), fiscal incentives for low fuel consumption vehicles, promotion of biofuels, increased fiscal pressure on private transport aimed at internalisation of external costs of road transport/private traffic, promotion of economic driving, public awareness raising measures aimed at reduction of individual private traffic, speed limits, spatial/physical an transport planning to reduce traffic...
-Agriculture and forestry. Measures to reduce methane and NO2 emissions, actions to reduce the factors of production and to improve farming practices. Production of biofuels. Promotion of reforestation and forest conservation (grants). Maintenance and enhancement of diversity, productivity, regeneration capacity and vitality of forests.
- Waste Management. Minimisation of waste landfilling, reduction of disposal of waste on landfills, promotion of waste recycling and waste recovery.

Of course, not all these measures are specifically aimed at GHG mitigation but they certainly affect GHG emissions.

In the following tables a quantitative assessment of the projected policies and measures per sector, country and scenario is provided. This is done by considering two scenarios: "with existing measures" and "with additional measures" scenarios (WMS and WAMS, respectively). These scenarios are included in the Third National Communications (TNCs) of the Parties to the UNFCCC. The WMS projections includes the domestic policies and measures currently implemented, including EU common and coordinated P&M. The WAMS projections also include P&M which are under discussion and have a realistic chance of implementation.

Table 3-26. Projected impact of policies and measures. Expected % change in 2010 relative to emissions by sector and by country in the "with measures scenario" (%).

	Energy supply	Business	Indust. proc.	Transport	Resid. (domestic)	Public	Agric. Forestry	Waste manag.	Others	Total
Austria	20.3	0	11.6	0	0	0	-14.8	-22.4	0	11.5
Belgium (3)	1	0	11.4	47	33	0	-7	-58	78	15.7
Denmark (7)	39	0	23.7	33	0	0	-32.6	-30	-12	14
Finland	32.3	0	55.2	11,1	0	0	-32.7	-57.9	16.7	16.5
France (1)	17.4	0	1.2	0	0	0	-6	-49.5	-26.7	9
Germany (8)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	-19.7
Greece (8)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Ireland (9)	62	0	50.6	178	-4	68	3	-36	0	40
Italy (2)	-2	0	-8.7	30.1	-3.1	0	-3.4	-45.3	96	1.4
Luxembourg		0	-62	53	38	0	0	0	-32	-22.5
Netherlands (4)	-1,8	0	14.9	33.3	0	42.9	-25.9	0	-50	6,1

Portugal (10)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Spain (6)	33.7	0	32.7	75	72.7	60	37.5	0	0	48
Sweden (5)	-4	0	25	13	0	0	-8	-60	0	0.7
U.K.	-30.7	-0.8	-64.5	23	5	0	-22.7	-63.2	0	-14.8

Source: Own elaboration using data from TNCs and European Commission (2004b).

(1) Energy supply includes energy use in industry.

(2) Significant adjustments for Italy have had to be carried out. CO2 emissions from energy uses in the different sectors have had to be added to "other sources" of emissions from these sectors. In the scenario "with additional measures" we have taken the average between the "high" scenario and the "low" scenario. Finally, the total includes carbon credits from CDM/JI projects.

(3) In Belgium, emissions from "manufacturing and construction" and "industrial processes" have been added together.

(4) In the Netherlands, data for the energy sector includes waste management. The public sector includes trade, services and government.

(5) In Sweden industrial processes includes F gases.

(6) In Spain, the energy sector data includes the "electricity generation" sector and the "refineries" sector. The public sector only includes data for the service sector.

(7) In Denmark, Industry includes "industrial processes" and "manufacturing industry".

(8) Data for emissions in the base year for Germany and Greece are not available. Therefore, we have not been able to calculate emissions reductions relative to the base year.

(9) In Ireland, data for the public sector only includes the data for the "commercial/Institutional" sector.

(10) There are no data available for Portugal on the impact of the measures per sector neither in the "with measures" scenario nor in the "with additional measures" scenario.

Table 3-27. Projected impact of policies and measures. Expected % change in 2010 relative to emissions by sector and by country in the "with additional measures scenario".

	Energy supply	**Business**	**Indust. proc.**	**Transport**	**Resid. (domestic)**	**Public**	**Agric. Forestry**	**Waste manag.**	**Others**	**Total**
Austria	-3.3	0	1.6	0	0	0	-17.4	-39.7		-7.3
Belgium	-16	0	0	44	24	0	-7	-58	78	6
Denmark	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Finland	8.9	0	20.1	9.6	0	0	-33.7	-79.5	16.7	-0.5
France	9.5	0	-45	0	0	0	-9	-49.5	-26.7	-1.7
Germany	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Greece	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Ireland	12	0	19	123	-11	48	-11	-39	0	13
Italy	-2	0	-22	-17.2	-10.4	0	-5	-49.6	89.5	-5.7
Luxembourg	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Netherlands	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	3.3 to 4.7
Portugal	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Spain	12.1	0	20.4	48.3	45.5	60.0	25	0	0	28
Sweden	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
U.K.	-30.7	-18.5	-64.5	7	-16.1	-13.6	-25.7	-63.4	0	-23.4

Source: Own elaboration using data from TNCs and European Commission (2004b).

Table 3-28. Projected impact of policies and measures (MtCO2). Expected emissions reductions by sector and by country in the "with measures scenario" in 2010.

	Energy supply	**Bus.***	**Indust. proc.**	**Transp.**	**Residential (domestic)**	**Public and other**	**Agric.**	**Sinks**	**Waste****	**Non-CO2**	**Total**

Austria	10,2	0	1,7	0	0	0	-0,8	-0,8	-1,4	0	8,9
Belgium	0,4	0	5,2	9,5	8,3	0,7	-1,1	0,1	-2,9	2,6	22,8
Denmark	10,3	0	1,8	3,6	0	-1	-3,4	-1,2	-0,4	0	9,6
Finland	**15,2**	0	1,6	1,4	0	0,1	-3,3	0	-2,3	0	12,7
France	**65,1**	0	0,7	0	0	-0,8	-5,4	0	-10,3	0	49
Germany	**-93**	0	**-63,3**	**-40**	**-20**	0	**-21**	0	**-31,3**	0	-249,9
Greece	**-18,9**	0	0	-0,4	-0,01	0	0	0	-5,9	0	-25,2
Ireland	7,2	0	3,7	9,1	-0,2	1,7	0,6	1,4	-0,7	0	76,6
Italy	**14,6**	0	-5,5	0	0	0	-2,4	0	-6,2	13,6	7,1
Luxembourg	0,7	0	0,5	0,7	0,6	0,1	0	0	0	0,1	2,6
Netherlands	-1	0	10	10	0	1	-7	0	0	0	13
Portugal	**37,95**	0	1,2	0	0	0,1	-0,1	3,75	-4,2	0	38,7
Spain	**25**	0	**16**	**45**	8	3	3	0	0	0	100
Sweden	-1,3	0	1,4	2,6	0	0	-0,6	0	-1,5	0	0,5
U.K.	**-75,9**	-1,1	**-36,6**	**30,1**	4	0	-8	-9,1	**-15,7**	0	-112,9
Total (EU)	-41,4	-1,1	-62,8	71,6	0,69	4,8	-49,4	-9,6	-78,6	16,3	-85,2

Source: Own elaboration using data from TNCs and European Commission (2004b).
*Business sector.
** Waste management sector.

Table 3-29. Projected impact of policies and measures (MtCO2). Expected emissions reductions by sector and by country in the "with additional measures scenario" in 2010.

	Energy supply	**Bus***	**Indust. proc.**	**Transp.**	**Residential (domestic)**	**Public**	**Agric.**	**Sinks**	**Waste****	**Non-CO2**	**Total**
Austria	-1,6	0	0,2	0	0	0	-1	-0,8	-2,4	0	-5,6
Belgium	-5,3	0	0	8,8	6,1	0,7	-1,1	0,1	-2,9	2,6	9
Denmark	**-26,6**	0	-7,6	**-10,8**	0	-9	**-14,1**	0	-1,3	0	-69,5
Finland	4,2	0	0,6	1,2	0	0,1	-4,4	0	-3,1	0	-0,4
France	**35,7**	0	**-25,5**	0	0	-0,8	-8,1	0	**-10,3**	0	-9
Germany	0	0	**-12,8**	-0,2	0	0	0	0	-7	0	-20
Greece	0	0	**-12,2**		0	0	-0,01	0	-0,01	0	-12,3
Ireland	1,4	0	1,4	6,3	-0,8	1,2	-2	0,7	-0,7	0	61,3
Italy	**-14,2**	0	**-11,7**	0	0	0	-2,9	0	-6,8	**12,8**	-29,8
Luxembourg	0,7	0	-4,2	0,5	0,5	-0,4	0	0	0	0,2	-2,8
Netherlands	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Portugal		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Spain	9	0	**10**	**29**	5	3	2	0	0	0	58
Sweden	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
U.K.	**-75,9**	**-24,5**	**-36,6**	9,2	**-13**	-2,2	**-10,2**	-9,1	**-15,7**	0	-178,7
Total (EU)	-72,6	-24,5	-98,4	44	-2,2	-7,4	-41,81	-9,1	-50,21	15,6	-199,8

Source: Own elaboration using data from TNCs and European Commission (2004b)..
*Business sector.
** Waste management sector.

First of all, it should be mentioned that the data is not always available for all scenarios and countries. In the WMS, there is no absolute data for Portugal and no relative data for Germany, Greece and Portugal. In the WAMS scenario absolute data is lacking for the

Netherlands, Portugal and Sweden and relative data is lacking for those three countries and for Denmark, Germany, Greece and Luxembourg. Caution should also be taken when interpreting these data and, particularly, when making comparisons between sectors in different countries. The reason is that those magnitudes may not be homogeneous. In other words, the effect of measures included in one sector in one specific country may not be included in another sector in another country.

On the one hand, the data show that the largest relative (%) reductions in the WMS compared to emissions in the base year will occur in the agricultural sector and in waste management. On the other side of the picture, no reductions in emissions are expected in the transport and public sectors. In addition, most countries will not reduce their emissions in the energy supply and the industry sectors, with the notable exception of the U.K and, to a lesser extent, of other countries (Italy, the Netherlands and Sweden). The same conclusion applies to the residential sector, where only Ireland and Italy reduce their emissions in the WMS compared to the base year.

In absolute terms (MtCO2), the largest reductions in emissions in the WMS compared to emissions in the base year take place in the waste management sector, followed by industry, agriculture, energy supply and sinks. The largest increase in emissions is expected in the transport sector (an increase of 71MtCO2 in the 1990-2010 period in the WMS), followed by the rise in emission of non-CO2 gases, the public and the residential sectors.

It should be noted that the absolute figures are biased by the emissions reductions in UK. and Germany, which partially or totally compensate the expected increase in the emissions in the rest of countries. The notable exception is the transport sector, where the large increase in emissions expected in some countries (specially Spain, UK, the Netherlands, Ireland and Belgium) is not compensated by the emissions reductions in Germany. The largest reductions or increases in emissions are highlighted in the table.

Concerning the data on relative (%) reductions in the WAMS compared to emissions in the base year, waste management is the only sector where emissions are reduced in all countries for which data are available.

The absolute data in the WAMS show that a significant increase in emissions is expected in the transport sector (44MtCO2 by 2010 compared to 1990 levels). Increases are also expected in the non-CO2 gas sector. In the rest of sectors a reduction in emissions is predicted. The largest absolute reduction would occur in the industrial sector, followed by energy supply, waste management and agriculture. Data are especially affected by the trends expected in the U.K. The largest absolute increases or reductions are highlighted in the table 3-28 and 3-29, respectively. In general, the largest reductions/increases in absolute terms correspond to the five largest EU countries (Germany, U.K., France, Italy and Spain).

3.3.2.- Compliance/Interactions with EU Policy/Programmes.

An analysis of the achievement of KP targets by MS can take two forms. On the one hand, an analysis of the current emissions compared to their 1990 levels can be carried out. This has already been done in a previous section of this report (i.e., distance-to-target indicator). Alternative, we can

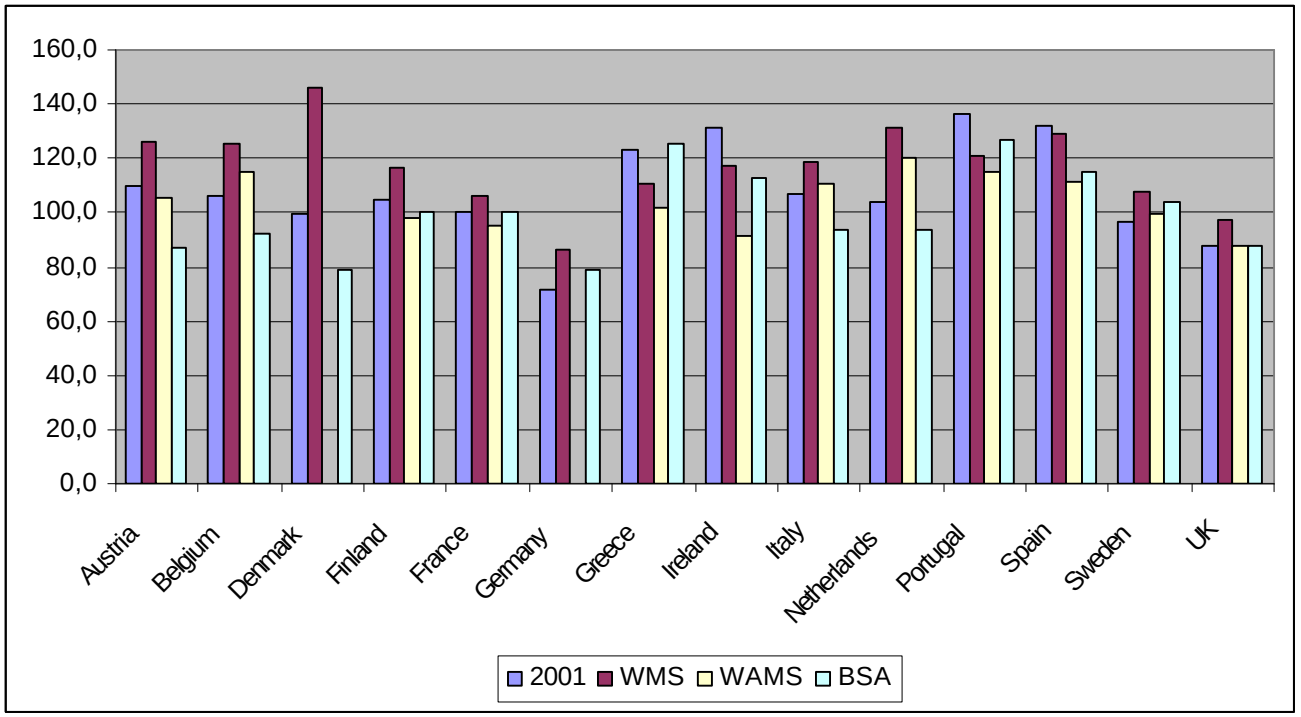
analyse the emissions projections to 2010. This can be done, since in the TNCs all MS include the policies and measures that they will apply in order to comply with the Kyoto targets (see above) and since they all make projections on their emissions trends up to 2010.

This analysis can be undertaken by taking a look at the WMS and WAMS. Concerning the WMS at the aggregate EU level, MS' projections suggest that existing policies and measures will not be sufficient to reach EC's Kyoto targets. The WMS projection suggest that in 2010 the emissions of the EC will have decreased by only 0.5%, leaving a significant gap of 7.5% from the Kyoto target (European Commission 2003b).

Concerning the WAMS at the aggregate EU level, the projections show that the overachievement of six MS in this scenario would result in reductions of GHG emissions for the EU as a whole by 7.2% below base year emissions, still leaving a small gap of 0.8% to the EC Kyoto target (op.cit)[29].

The following figure shows the emissions in 2001, the projections per MS, i.e. the expected emissions trends in the 1990-2010 period in both scenarios (2010 is taken as the middle year of the 2008-2012 period) and the index representing the Burden Sharing Agreement of each MS.

Figure 3-11. Emissions in 2001 and expected emissions trends in the 1990-2010 period (base year = 100).



Source: Own elaboration.

The above figure shows that all countries except France, Germany, Greece, Sweden and U.K. are currently above their BSA targets. What is worse, according to the MS predictions in the WMS, most will not comply in 2010 with their own BSA (all except Greece and

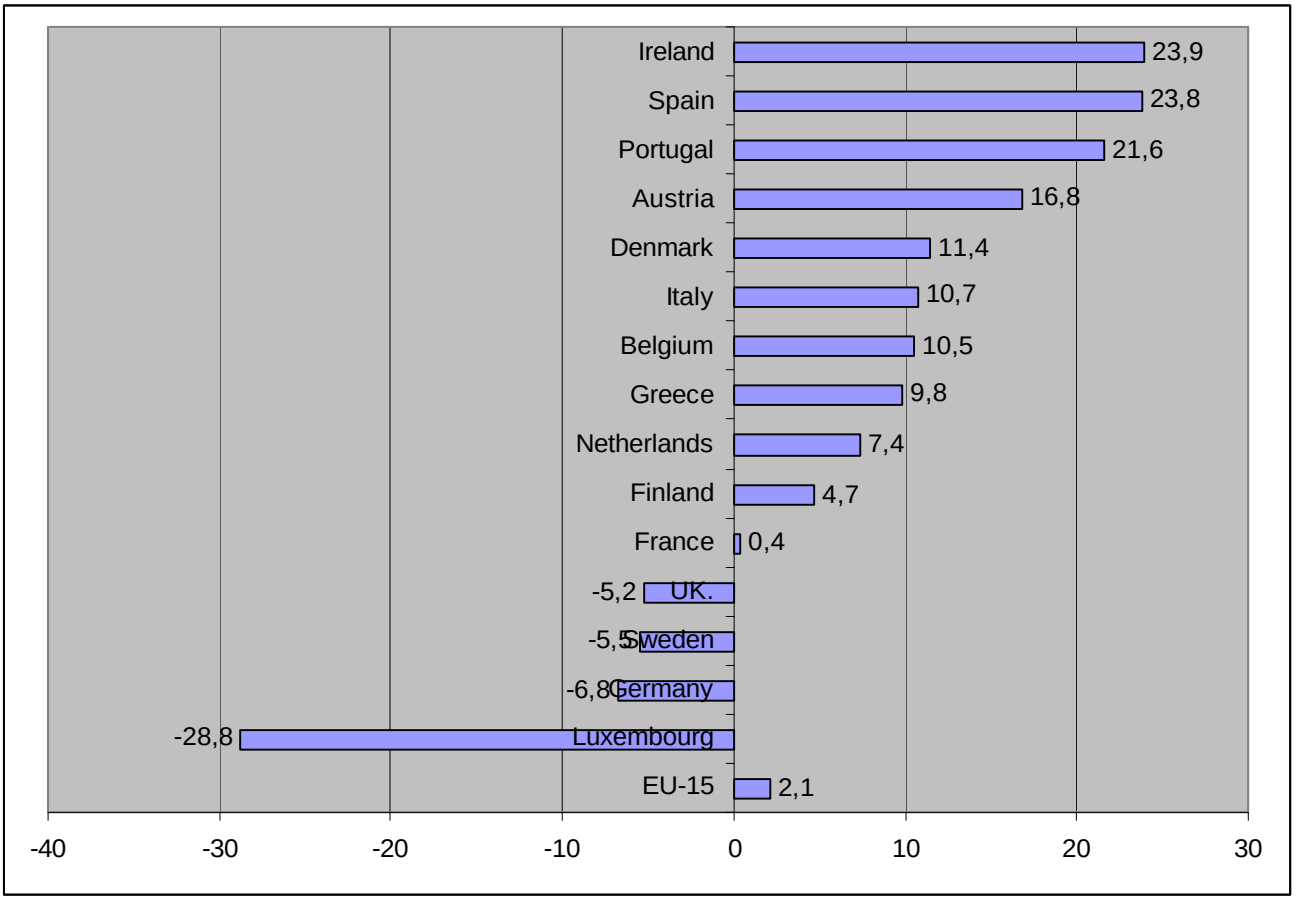
[29] All MS except Austria, Denmark and Germany have identified additional policies and measures.

Portugal). In this scenario, Denmark would be by far the largest non-compliant country (a 66% difference between its BSA target and expected emissions in 2010), while other countries would incur substantial non-compliance: Austria (39,1% difference), Netherlands (37,1%), Belgium (32,9%), Italy (25,5%), Finland (16,6%) and Spain (13,8%).

Obviously, the WAMS shows a better situation. In this scenario, most countries would reach their BSA targets (all except Austria, Belgium, Italy and the Netherlands). Neither Denmark nor Germany provides data for this scenario.

To sum up, countries could be grouped in several categories. A group of countries do not comply with their targets in any of the dates/scenarios (Austria, Belgium, Denmark, Italy and Netherlands. Although there is no data for Denmark for the WAMS, its expected uncompliance in the WMS is so high that it could also be considered to be a non-compliers in a hipotetical WAMS. Other countries are currently and will be probably be above their targets in 2010 in the WMS, but not in the WAMS (Finland, France, Ireland and Spain). Portugal does not currently comply with its target, but is expected to do so in 2010 in both scenarios. Greece is the only country complying with its commitments now and in the future. Finally, three countries comply now (or do not comply now by a very small margin as is the case in the UK) and will probably not achieve their targets in the WAMS but will do so in the WMS (Germany, Sweden and UK).

The following figure shows the distance-to-target indicator elaborated by the European Environmental Agency (2003) and reproduced from European Commission (2003c, p.11).
Figure 3-12. Distance-to-target indicators (in index points = percent) for the KP and the BSA targets of EU MS.



Source: European Commission (2003c, p.11).

Note: Distance to target in percent (the bars) show the deviation between a hypothetical target (in 2001) and what actually has been achieved (in 2001), under the assumption that reductions as a percentage of 1990 levels take place on a linear basis. It assumes that the MS meet their target entirely on the basis of domestic measures and, therefore, does not include the use of Kyoto mechanisms or sinks allowed for under the PK. The Danish distance-to-target indicator is +2.6 index points, if Danish GHG emissions are adjusted for electricity trade in 1990 (op.cit.).

4.- CONCLUSIONS.

A cheap and stable energy supply is a prerequisite for social and economic development. Although energy contributes essentially to human welfare, energy production and consumption also lead to serious environmental problems (both at the global and local levels) which may lead to nuisances and even jeopardise the global long-term sustainability. The relationship between energy (consumption and production) and sustainability is, therefore, a complex one.

At the EU level, the White Paper on an Energy Policy for the EU, the Amsterdam Treaty and other document set the three major and interrelated objectives of EU energy policy:

*Security of energy supply.
*Competitive energy systems ensuring low cost energy for producers and consumers with the aim to increase the general competitiveness of the European Economy,
*Environmental protection.

However, the achievement of those goals and the implementation of these instruments are major challenges for both the EU and the MS, as shown by the trends in energy efficiency, RES-E deployment and GHG emissions.

The aim of this report is to provide an overview of major trends, policies, goals and instruments in the energy and environment realm at both the EU and MS levels. >>

Therefore, a close link between energy and environmental goals (and instruments) exist. As stated in the Amsterdam Treaty, environmental protection is one of the major goals of energy policy. On the other hand, the energy sector is instrumental in the success of environmental policy.

In this context, the EU and its MS have set ambitious goals in the environmental and energy policy realms. Both policies interact. Although there might be conflicts between both, there are also interesting sinergistic and reinforcing effects with significant policy implications.

The EU and its MS have a wide array of instruments at their disposal to achieve these goals. Particularly, Demand Side Management (DSM) activities, promotion of electricity from renewable energy sources (RES-E) and measures aimed at the mitigation of Greenhouse Gas (GHG) emissions are arguably three of the main instruments which have the potential to contribute to energy and environmental goals.

The EU has particularly focused on climate change mitigation. Reduction of CO2 emissions can be achieved through the promotion of renewable energy sources and also by implementing energy efficiency measures. In turn, these two sets of measures have other relevant benefits apart from that of climate change mitigation. Local environmental benefits, job creation, security of supply, reduction in energy dependence and, in some cases (i.e. energy efficiency in industry), even private cost reductions may result.

However, in spite of those benefits, the achievement of those goals and the implementation of these instruments are major challenges for both the EU and the MS, as shown by the trends in energy efficiency, RES-E deployment and GHG emissions.

An overview of major trends, policies, goals and instruments in the energy and environment realm at both the EU and MS levels (and, when possible, also at the sector level) has been provided in this report.

The report shows that in each of these fields, the EU policy initiatives provide a general framework but that the policy measures applied by the MS differ depending on many factors (geographical situation, strategic considerations...).

A number of stylised facts can be inferred from this report regarding policy measures and trends in the considered fields.

The EU legislative measures do not have the same degree of obligatory nature and the same character. For example, concerning targets: The CO2 emissions trading Directive (indirectly) sets obligatory targets for the short-term, the RES-E Directive sets indicative ones for the longer term (i.e., 2010), and in principle the CHP Directive does not set any country specific goals[30].

Concerning policies and measures at the EU level, the CO2 emissions trading Directive (and the related linking Directive) are currently the ones having the largest impact on electricity actors, as can be inferred from the discussions taking place in the context of NAPs.. In the RES-E field the 77/2001/EC Directive on the promotion of RES-E is a major milestone which is already having a substantial impact on RES-E deployment in Europe but whose main effect will be a long-term one. According to some actors and commentators, some positive features from this Directive are the setting of (indicative) targets, provisions on grid connection and guarantees of origin. However, the community support framework envisaged in the Directive has been received with mixed opinions by actors in different MS. Finally, a number of initiatives have been recently taken regarding energy efficiency and CHP, of which probably the most relevant are the Energy Performance of Buildings Directive and the CHP Directive.

Concerning policies and measures at the MS level, both the intensity and types of measures taken in the considered policy fields can be deemed highly heterogeneous. In the RES-E realm, countries can be differentiated in policy terms by their reliance on quota with TGC schemes and feed-in tariff schemes, while the implementation of investment subsidies and

[30] Although the CO2 Directive does not set specifically quantitative targets per MS, it does so indirectly by referring to the KP targets, i.e., by stating in its Annex III that “the total quantity of allowances to be allocated for the relevant period shall be consistent with the Member State's obligation to limit its emissions pursuant to Decision 2002/358/EC and the Kyoto Protocol, taking into account, on the one hand, the proportion of overall emissions that these allowances represent in comparison with emissions from sources not covered by this Directive and, on the other hand, national energy policies, and should be consistent with the national climate change programme. The total quantity of allowances to be allocated (...) shall be consistent with a path towards achieving or over-achieving each Member State's target under Decision 2002/358/EC and the Kyoto Protocol”.

R&D measures is more or less widespread in most MS. The available data (and several studies) suggest that the EU as a whole will not be able to reach the RES-E Directive target (that 22% of electricity consumption comes from RES) unless additional policy efforts are made by MS.

Regarding GHG abatement, measures are being concentrated in the industry and energy supply sectors (the ones covered by the CO2 Directive), while effective measures to tackle emissions from the transport and residential sectors are starting to be timidly implemented in many countries. These measures focus on energy efficiency improvements. However, the data show that the control of emissions in the transport sector will be a major challenge, since they are expected to increase in the EU and in most countries in the 1990-2010 period in all scenarios being considered (i.e., WMS and WAMS). The European Commission predicts that this sector will be the largest contributor to GHG emissions in 2010.

The implementation of the GHG emissions abatement measures both at the EU and the MS level will probably result in non-compliance with the EU-KP target. Most MS will probably not comply with their own Burden Sharing Agreement targets. In the RES-E realm, compliance with the RES-E Directive targets is uncertain. According to some studies only some countries would reach their targets with a continuation of the current MS schemes and others would need to substantially raise the support levels in order to reach those targets. Finally, energy efficiency measures are expected to lead to significant energy savings in several sectors.

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ANNEX I. Danish Trading Programme for CO2 Emissions from Power Plants.

Aspect	Comment
Legal basis	CO2 Quota Act passed in 2001.
Year	Parliament passed the programme June 1999; approved by European Commission April 2000 (scheduled for 2000but delayed due to late approval of the system by the EU). Programme is in effect from 2001-2003 (compliance period).
Sources included	All electricity producers in Denmark, excluding renewables generators and CHP plants with annual historical emissions under 100,000 tonnes CO2 . Currently, only 8 companies are required to participate. Participation is mandatory.
Emissions covered	More than 90% of the total CO2 emissions from electricity (about 30% of total Danish GHG emissions).
Cap	Reduces national emissions from 23 MtCO2 (2000), 22 MtCO2 (2001), 21 MtCO2 (2002), 20 MtCO2 (2003).
Allocation Type	Grandfather; may switch to auction. Emission allowances are grandfathered based on the average historical emissions in 1994-1998 of the participating companies (30.3 Mt CO2 on annual average for the period). Allowances are issued per company, and not per unit or plant. Annex 1 shows the allocations for the compliance period (in Mt CO2). Note that the allocation for 2003 is only preliminary.
Metric	Emissions (applying emission factors to average fuel use in 1994-1998)
Allocation Years	Average during the period 1994-1998.
Description	Allowance allocations for each unit are proportional to the unit's average historical emissions from electricity production during the period 1994-1998. Emissions are calculated based on standard emissions factors for each fuel. Allocation follows a two-tiered process: all CHP units receive allowances first (up to their average 1994-1998 emissions); remaining allowances go to non-CHP units.
Recipient & Set Asides	Set-aside for smallest CHP facilities with annual emissions under 100,000 tonnes amounts to approximately 10 percent of total. These facilities do not trade, and the set-aside is held by the government and deducted from the total available quota. Some portion may be withheld for new entrants before 2003, though none are expected ("New producers on the Danish market will be allocated allowances based on objective and non-discriminatory criteria").
Monitoring and registry	The participants reported their actual 2001 emissions by 31 March 2002. A final decision on compliance, banking, and possible non-compliance penalties will be made by the Danish Energy Agency in 2002. Monitoring is based on existing monitoring systems for fuel consumption and standardised fuel-to-CO2 conversion factors as laid down in the CO2 Quota Act. The participants reported their actual 2001 emissions by 31 March 2002. A final decision on compliance, banking, and possible non-compliance penalties will be made by the Danish Energy Agency in 2002. Monitoring is based on existing monitoring systems for fuel consumption and standardised fuel-to-CO2 conversion factors as laid down in the CO2 Quota Act.
Sanctions and compliance	The penalty for non-compliance is set at 40 DKK per tonne CO2

mechanisms	emitted in excess of the company's allowance. The revenue from any non-compliance fines is to be invested in energy savings initiatives.
Links to external systems	The scheme is in principle open for inclusion of credits from JI or CDM projects, although to this date no such credits have been included. The scheme can also in principle accommodate credits from other emissions trading systems, although this is subject to mutually agreed verifications. The first ever transboundary swap of government issued greenhouse gas emissions allowances took place between Shell (UK) and Elsam (Denmark) in May 2002.
Banking and borrowing	Permits not used in one year can be banked for subsequent years, with technical limitations on banking in 2001 and 2002.
Liability regime	The CO2 Quota Act does not give guidelines on liability, but practice shows that the system operates with seller's liability. The CO2 Quota Act does not give guidelines on liability, but practice shows that the system operates with seller's liability.
Taxation and transaction costs	No information available. Search information.
Future Changes	Grandfathering allocation may be temporary – may switch to auction after 2003. The system for the period after 2003 is to be renegotiated building on the experiences with the current system and the outcomes of the COPs/MOPs to the Kyoto Protocol. There is also the matter of adapting to the proposed EU scheme.

Source: IETA (2004), Harrison and Radov (2002).

ANNEX II. Denmark's taxes on GHG.

Green Tax Package.

The main measure used to get the business sector's energy consumption down is a green tax package for the business sector, which was introduced in 1995. The package contained a combination of taxes and return of the proceeds to businesses through government grants etc. to promote energy savings in companies. The package led to a higher CO_2 tax and the introduction of a space-heating tax for businesses. At the same time, a scheme was introduced in which companies with a large energy consumption have the possibility of gaining a discount on the taxes in return for entering into an agreement on energy efficiency improvements. The combination of taxes and return of the proceeds was intended to ensure a marked reduction of businesses' CO_2 without affecting their international competitiveness. The grants were also intended to promote the use of more energy efficient technologies and production methods.
The objective with the green tax package was to get the business sector to contribute to a reduction of Denmark's total CO_2 emissions. The target contribution was about 4% in 2005 in relation to the emissions in 1988.

Tax on fluorinated gases.

The emissions of the industrial greenhouse gases (HFCs, PFCs and SF_6) are regulated in two ways - partly by a tax and partly by a statutory order on discontinuation of use of the gases in new installations.
Since 1 March 2001 a tax has been payable on the industrial greenhouse gases corresponding to their GWP, combined with the Danish CO_2 tax of DKK 0.1/kg CO_2. This means that HFC-134a is subject to a tax of DKK 130/kg because it has a GWP of 1,300. There is a ceiling of DKK 400/kg so although SF_6 has a GWP of 23,900, the tax is only DKK 400/kg and not DKK 2,300/kg.
The tax is imposed on the substances on importation into Denmark because the substances are not produced in Denmark. The tax is payable whether the substances are imported as pure substances or

are part of imported products. If the content in the products is not known, the tax is based on a fixed tariff. The tax is payable on a wide range of products.

Source: Denmark's TNC.

ANNEX III. U.K. emission trading programme.

Aspect	**Comment**
Legal basis	
Year	The UK Emissions Trading Scheme (ETS) was launched on 14 August 2001. The rules for the scheme were in place in early 2002, and the auction of incentive money was held in March 2002. Trading in the system commenced in April 2002.
Sources included	Participating firms and industries. Electricity generators excluded from cap-and-trade. Participation is voluntary
Emissions covered	CO2 emissions (although "participating entities will have the choice between a cap on CO2 only or on all six GHGs
Cap	Depends on participation, including auction results.
Allocation Type	Auction (firms bid for emissions reduction credits below emissions baseline). Bidders can not receive more than 20% of the total budget, in order to prevent one company company receiving a disproportionate share of allowances and to allow sufficient numbers to enter the scheme. Subsequent programme may grandfather. Firms that meet the reduction target for 2002, following verification in January-March 2003, will receive payments from the incentive fund in April 2003. The incentive funding was distributed through an auction in March 2002 where companies traded their emission reductions to the government for the period 2002-6.
Metric	Emissions adjusted according to emissions reductions bid under auction
Targets	Emissions reductions in the UK scheme will be made against a 1998-2000 baseline. The targets were set through the auction for UK£215 mill in incentive money held in March 2002. The overall initial target was set at 4,028,176 tonnes CO2e reduction from baseline in 2006. Due to linear reductions from baseline this would result in a total overall reduction target of 12,084,528 tonnes CO2e for the five-year period. However, according to the U.K Comptroller and Auditor General (2004), the scheme secured 3.96 million tonnes of GHG emissions reductions in 2006 (about 6% of the 65.8 million tonnes reduction it was estimated that the policies and measures in the Climate Change Programme might deliver by 2010). This was after three Direct Participants dropped out of the Scheme. Targets for the years 2002-2005 increase by 20% a year towards the 2006 total. Taking into account the need to meet the targets for 2002 to 2005 and 2006, over this period Direct Participants will be required to deliver reductions from baseline totalling 11.88 million tonnes, at a price of £17.79 a tonne (op.cit., p.3).

Allocation Years	1998 – 2000
Description	The programme is voluntary, with three ways of participating: 1) Firms may bid an absolute CO2 emissions cap for a share of £30 million per-year after taxes, offered as an incentive by the government for five years. - Electricity generators are excluded from voluntary cap-and-trade programme. -Facilities are accountable for indirect emissions to allow participants to reduce overall energy consumption, but without "outsourcing" of emissions, e.g. by moving on-site electricity production off-site to a non-participating firm. - Allocations to participants will be a version of grandfathering that also incorporates the emissions reductions that each participant commits to under its winning auction bids. 2) Firms in energy intensive industries can negotiate agreements with the government under which they agree to achieve reduced emissions rate targets in exchange for a reduction in the new Climate Change Levy. Targets can be achieved via trading. 3) Firms may opt-in to the programme by investing in projects that generate tradable emissions reduction credits.
Formula	Allocation = 1998–2000 Emissions – Emissions Reduction Obligation
Recipient & Set Asides	Participating firms and industries. Because the programme is voluntary, no set-asides are expected.
Compliance period	The first compliance period started on 1 January 2002 for the calendar year. Participants will have to deliver annual emission reductions. The system will run for a five year period from 2002-2006.
Monitoring and registry	All participants are to measure and report their emissions annually according to the Guidelines for the Measurement and Reporting of Emissions for the UK ETS. Reporting should be consistent with IPCC guidelines and good practice, and there will be third party verification by an accredited certifier.
Sanctions and compliance mechanisms	In cases of non-compliance there is a three-month reconciliation period after the end of the compliance period where participants can get back into compliance. Non-compliant participants covered by a CCA will have their 80 % reduction of the CCL removed for the following two-year period. Non-compliance for companies with absolute targets will result in non-payment of the incentive, return of previous years' payments with interest, and docking of allowances for subsequent years. The allowances for the next year will be reduced by the shortfall and a penalty of 30%. Financial penalties are expected as soon as the scheme gets statutory backing. These penalties are proposed set at GBP20 per tonne CO2e, or twice the mean average price during the three-month reconciliation period. The financial penalties will replace the 30% penalty mentioned above.
Allowance prices	Spot prices have spiked up from 4£ in April 2002 to 12£ in September 2002, and then fallen down to 2.50£ in early 2003, where they have remained since (Lecocq and Capoor 2003).
Links to external systems	Credits from UK based or international projects that result in

	verified emissions reductions can be included, although rules for the inclusion of such credits have yet to be established. The system can also accommodate credits from other international trading systems.
Banking and borrowing	There is no limit on banking from one year to another in the period 2002-2006. There will probably be some limits on banking into the first commitment period under the Kyoto Protocol, e.g. to 2008.
Liability regime	For trades in the absolute and unit sectors liability is with the seller. There is a possibility that project-based trades will have shared liability, but these rules are not yet established.
Taxation and transaction costs	The incentive money resulting from the auction is subject to tax. Transaction costs are low because of well-functioning infrastructure for transactions.
Future Changes	After five years, the government may expand the programme and make it mandatory.
Evaluation of the scheme	Varma (2003ª, 2003b) and the U.K Comptroller and Auditor General (2004) provide the first assessments of the scheme. According to the later source, companies participating in the scheme have gained greater understanding of how they can reduce emissions and practical experience of using the emissions market. The number of Direct Participants was finally enough (34) to make the auction viable, and the total amount of reductions committed was in line with predictions. In 2002, Direct Participants reported reductions of 4.64 million tonnes compared to targets for that year totalling 0.79 million tonnes (an excess of 3.85 tonnes). Since participants can sell excess allowances or bank them for later use, the ultimate impact of Direct Participants' 2002 performanceon reported reductions will be less than 4.64 million tonnes (op.cit, p.3). The Comptroller and Auditor General (2004) acknowledge that, although companies have in practice made significant additional efforts to cut emissions, the scheme has several weak points: difficulty in attracting participants, limitations of the auction design and undemanding targets. According to this source, limitations stem from the voluntary nature of the scheme and the consequent need for an incentive payment (op.cit., p.4).

Source: IETA (2004), Harrison and Radov (2002), Defra website.

ANNEX IV. CO2/energy taxation in Finland.

Finland was the first country to introduce a CO 2 tax in 1990, initially with few exemptions for specific fuels or sectors. Since then, however, energy taxation has been changed many times and substantially, from a low but "pure " CO2 tax to a much higher but much less CO2 -related tax. After a number of increases in the CO2 tax rate in the early 1990s,the first major change occurred in 1994, when an additional component based on the energy content of the fuels was introduced, as well as special taxes on nuclear power and hydropower. Imported electricity was taxed at the average rate applied to domestically produced electricity.

The second important revision of energy taxation took place in 1997, prompted by the opening of the Nordic electricity market. Domestic industries, and in particular the electricity sector, felt disadvantaged by the fact that energy-intensive sectors were exempted from the CO2 tax in the other Nordic countries while electricity imports could not be taxed according to their carbon

content. At the same time, the border tax on imported electricity was found to be out of line with the EU single market legislation. Therefore, to avoid harming the competitiveness of domestic industries, the carbon/energy tax based on fuel inputs in the electricity sector was scrapped and an electricity consumption tax was introduced, with a lower rate for industry and greenhouse cultivation (slightly above half the rate on households and service sectors). Source fuels for heating and transport continued to be taxed, but only on their carbon content, with a reduced rate for natural gas and peat. Since then, tax rates have been raised on several occasions and further exemptions added. In addition, some taxes paid by energy-intensive industries are refunded since 1998.

The present energy taxation consists of three tax components:
–a basic excise tax is levied on oil products,
–additional CO2 based excise tax is levied on transport and heating fuels,
–additional differentiated (industrial and other use)excise tax is levied on electricity consumption.
To improve the competitiveness of renewables in electricity production, wood based electricity production, wind power, small hydro-power and small CHP plants using peat as fuel get a tax subsidy. This subsidy is equal to the industrial electricity tax, except for wind power the subsidy is paid according to the higher tax rate.
An energy intensive industry is entitled to a tax refund under certain conditions. A company which has paid energy taxes more than 3.7% of its value added has a right to a refund. The amount of the refund is 85% of the taxes paid over the 3.7% limit. However, refund is paid only for the part exceeding the limit of EUR 50 500.
The present tax rates came into force in September 1998. The basis for the additional tax on transport and heating fuels is EUR 17.2/t CO 2 .The tax on electricity is EUR 4.2/MWh for industrial users and EUR 6.9/MWh for other users.
Vehicle and fuel taxation has traditionally been at a relatively high level in Finland by international comparison. The state receives an income from vehicle taxation of about EUR 1.2-1.3 billion. In 1999 the state received EUR 1.2 billion through the vehicle taxation (4.6%of total incomes). Moreover, each passenger car owner has to pay annually a user charge of EUR 117, if the car is registered after 31 December 1993 or EUR 84 if the car is registered before 31 December 1993. The state receives an income annually of around EUR 200-220 million.
The fuel taxation in Finland contains differentiation scheme according to which the price of diesel fuels is differentiated taking into account the sulphur content. The differentiation of petrol fuels is implemented between the reformulated and non-reformulated fuels. The waste tax is EUR 15.1/t and it is applied to wastes excluding soils disposed to municipal landfills.

Source: Finland's Third National Communication.

ANNEX V. Energy/CO2 taxation in Sweden.

Taxes and charges play a central part as a means of achieving the objectives of energy and climate policy. The tax burden on energy (fossil fuel) consumption has been raised while that on labour is being eased; there is also a shift in the tax emphasis between energy tax and carbon dioxide tax.
Energy and carbon dioxide taxation changed in the 1990s. Twenty-five per cent VAT on energy use was introduced in 1991. The carbon dioxide tax was introduced the same year. This was subsequently raised on two occasions in the 1990s. Energy tax has been raised a number of times and the fuels and applications covered by the tax have also been extended. Energy tax was also levied on industrial use in 1990. A shift in the relative levels of energy tax and carbon dioxide tax was made in 2000. State revenues from energy and carbon dioxide taxes totalled about SEK 65 billion in 1999, almost double total revenues from energy taxes in 1990. Changes in Swedish energy and carbon dioxide taxation in the 1990s have had a great effect on carbon dioxide emissions. Estimates using the MARKAL model, which also includes the effect of subsidies for renewable electric energy generation, indicate that emissions of carbon dioxide in 2000 were at

least 5,000 ktonnes less than they would have been if no changes had been made in energy and carbon dioxide taxation in the 1990s. This estimate includes the effects of changes in fuel use and some technological changes, but not the inhibitory effect of the taxation on consumption. The effect of these taxation changes on carbon dioxide emissions increases as time goes by. The carbon dioxide tax is one of the main reasons behind the dramatic increase in the use of biomass fuels in the district heating sector.

ANNEX VI. UK's CLIMATE CHANGE LEVY AND THE CARBON TRUST.

Climate Change Levy

The Government introduced the climate change levy in the UK in April 2001. The levy applies to energy used in the business and public sectors. Revenues are recycled to levy payers via a 0.3% cut in employers' National Insurance Contributions and £120 million of additional support for energy saving measures. The levy package as a whole is expected to be revenue neutral, as a 0,3% cut in employers national insurance contributions is applied (as well as measures to support energy efficiency schemes and RES).

The CCL is charged only on industrial and commercial use of energy and exempts domestic use of energy, energy used by public transport. Renewable energy (with the exception of large scale hydro of more than 10MW) is exempt from the levy, Good quality CHP is also exempt.

According to Varma (2003a), the levy rates for 2001-2002 were:

Electricity	0.43£/kWh (0.70 €/kWh)
Gas	0.15£/kWh (0.25 €/kWh)
Coal	0.15£/kWh (0.25 €/kWh)
LPG	0.07£/kWh (0.11 €/kWh)

The CCL is applied when energy sources are supplied to commerce and industry for heating, lighting, motive power and power for appliances.

The Government gives an 80% discount in the levy rates for those energy intensive sectors of industry that have agreed to meet challenging targets for improving energy efficiency or reducing greenhouse gas emissions within a climate change agreement (CCA)[31]. This is based on the condition that the firms will reduce energy use or increase energy efficiency over a 10-year period. The levy thus raised £831 (€1350) million instead of the £1 (€1.6) billion initially envisaged, due to a number of firms signing CCAs during the year (Varma 2003b).

Quantitative targets have been derived at sector level by negotiating the potential improvements that could be made in a cost-effective way compared to a base year. Targets may be absolute or relative. Absolute targets are either based on energy use or carbon emissions by a sector and relative targets are based on energy use or carbon emissions per unit output.

The Government has also said that participants in agreements will be able to achieve their targets either by trading emission allowances with other companies in an agreement or by participating in the wider UK emissions trading scheme.

[31] These are firms that are regulated by the EU IPPC Directive or are in sectors regulated by the IPPC, but which are themselves too small to be covered by the directive (Varma 2003b).

It is estimated that the climate change levy, including the exemption for renewables and CHP, will save 2 MtCO2 by 2010. These savings have already been included in the baseline *with measures* projections for this sector. The climate change agreements are estimated to save an additional 2.5 MtCO2 per year by 2010.

Varma (2003a, 2003b) provides interesting results concerning the functioning of the CCL, CCA and EU ETS. The CCL, CCA and ETS should be seen as an integrated system, rather than as individual measures, because they are interrelated.

The Carbon Trust.

The Government set up the Carbon Trust in April 2001 as a new, independent, non profit-making company that will recycle around £100 million of climate change levy receipts over three years to accelerate the take up of cost effective, low carbon technologies and other measures by business and levy payers. The Trust will run an integrated programme of measures, which will evolve over time, ranging from:
-advice and information;
-fiscal incentives including the enhanced capital allowances scheme;
-education and training;
-research, development and demonstration;
-strategic studies; and
-the business related elements of the Energy Efficiency Best Practice Programme.

The Trust will administer the enhanced capital allowances (ECA) scheme, which has been operational since April 2001. The ECA scheme will be worth £200 million over two years, depending on the take-up. The scheme gives 100% first year capital allowances for approved energy saving investments for businesses

It is estimated that energy efficiency measures under the climate change levy package will save 0.5 MtCO2 in 2010. This means that the climate change levy package as a whole is estimated to save at least 5 MtCO2 per year by 2010.

Source: Varma (2003a, 2003b), DEFRA´s website and U.K.s TNC.

ANNEX VII. UK EMISSION TRADING SCHEME.

The UK Emissions Trading Scheme is now scheduled to begin April 2002. The programme is currently a hybrid combination of a cap-and-trade, emissions reduction credit, and averaging system, although in later years it may switch to a pure cap-and-trade programme. For the first five years, the cap-and-trade portion of the programme will be voluntary, with firms bidding on emissions reductions in a “descending clock” auction. The government has allocated £215 million over five years to be awarded to participating firms. In effect, the government will first propose a rate at which it will compensate participating firms for each tonne reduced. If the total cost to the government of the reductions offered at that auction price exceeds £215 million, then the government will reduce the proposed rate per tonne until the total amount required does not exceed £215 million. The resulting caps will be binding on participating firms, which may trade among themselves—and with others participating in the programme via alternative mechanisms—to meet their targets.

Aspect	**Comment**
Year	The UK Emissions Trading Scheme (ETS) was launched on 14 August 2001. The rules for the scheme were in place in early 2002, and the auction of incentive money was held in March 2002. Trading in the system

	commenced in April 2002.
Sources included	Participating firms and industries. Electricity generators excluded from cap-and-trade. Participation is voluntary
Emissions covered	CO2 emissions (although "participating entities will have the choice between a cap on CO2 only or on all six GHGs
Cap	Depends on participation, including auction results.
Allocation Type	Auction initially (firms bid for emissions reduction credits below emissions baseline). Subsequent programme may grandfather. Firms that meet the reduction target for 2002, following verification in January-March 2003, will receive payments from the incentive fund in April 2003. The incentive funding was distributed through an auction in March 2002 where companies traded their emission reductions to the government for the period 2002-6.
Metric	Emissions adjusted according to emissions reductions bid under auction
Targets	Emissions reductions in the UK scheme will be made against a 1998-2000 baseline. The targets were set through the auction for UK£215 mill in incentive money held in March 2002. The overall target is set at 4,028,176 tonnes CO2e reduction from baseline in 2006. Due to linear reductions from baseline this results in a total overall reduction target of 12,084,528 tonnes CO2e for the five-year period.
Allocation Years	1998 – 2000
Description	The programme is voluntary, with three ways of participating: 1) Direct participation. For firms that are required to take on absolute annual GHG emission reduction targets for the years 2002-2006. Firms may bid an absolute CO2 emissions cap for a share of £30 million per-year after taxes, offered as an incentive by the government for five years. - Electricity generators are excluded from voluntary cap-and-trade programme. -Facilities are accountable for indirect emissions to allow participants to reduce overall energy consumption, but without "outsourcing" of emissions, e.g. by moving on-site electricity production off-site to a non-participating firm. - Allocations to participants will be a version of grandfathering that also incorporates the emissions reductions that each participant commits to under its winning auction bids. 2) Participants in CCAs. Firms in energy intensive industries can negotiate agreements with the government under which they agree to achieve reduced emissions rate targets in exchange for a 80% reduction in the CCL. This explains the high CCA participation. CCA participants can make use of emission trading in order to meet their CCA reduction targets. They can also sell any over-achievements based on a baseline credit approach (Varma 2003b). 3). Firms may opt-in to the programme by investing in projects that generate tradable emissions reduction credits. Direct and CCA participants have the following three options (Varma 2003b): 1.- They can reduce their emissions to the agreed target. 2.- They can reduce their emissions below the agreed target while selling or banking their excess allowances.

	3.- They can leave their emissions above the agreed cap or even increase them if they buy a sufficient number of allowances from other ETS participants so that they can meet their agreed targets.
Formula	Allocation = 1998–2000 Emissions – Emissions Reduction Obligation
Recipient & Set Asides	Participating firms and industries. Because the programme is voluntary, no set-asides are expected.
Compliance period	The first compliance period started on 1 January 2002 for the calendar year. Participants will have to deliver annual emission reductions. The system will run for a five year period from 2002-2006.
Monitoring and registry	All participants are to measure and report their emissions annually according to the Guidelines for the Measurement and Reporting of Emissions for the UK ETS. Reporting should be consistent with IPCC guidelines and good practice, and there will be third party verification by an accredited certifier.
Sanctions and compliance mechanisms	In cases of non-compliance there is a three-month reconciliation period after the end of the compliance period where participants can get back into compliance. Non-compliant participants covered by a CCA will have their 80 % reduction of the CCL removed for the following two-year period. Non-compliance for companies with absolute targets will result in non-payment of the incentive, return of previous years' payments with interest, and docking of allowances for subsequent years. The allowances for the next year will be reduced by the shortfall and a penalty of 30%. Financial penalties are expected as soon as the scheme gets statutory backing. These penalties are proposed set at GBP20 per tonne CO2e, or twice the mean average price during the three-month reconciliation period. The financial penalties will replace the 30% penalty mentioned above.
Links to external systems	Credits from UK based or international projects that result in verified emissions reductions can be included, although rules for the inclusion of such credits have yet to be established. The system can also accommodate credits from other international trading systems.
Banking and borrowing	There is no limit on banking from one year to another in the period 2002-2006. There will probably be some limits on banking into the first commitment period under the Kyoto Protocol, e.g. to 2008.
Liability regime	For trades in the absolute and unit sectors liability is with the seller. There is a possibility that project-based trades will have shared liability, but these rules are not yet established.
Taxation and transaction costs	The incentive money resulting from the auction is subject to tax. Transaction costs are low because of well-functioning infrastructure for transactions.
Future Changes	After five years, the government may expand the programme and make it mandatory.

Source: Harrison and Radov (2002) and IETA (2004).

ANNEX VIII. U.K. FISCAL MEASURES IN THE TRANSPORT SECTOR

EU CO 2 from cars strategy and changes to vehicle taxation
The Government is encouraging a market transformation for passenger cars through a combination of fiscal measures, initiatives to provide cleaner vehicles, and the European Union CO 2 from cars strategy which has a target of reducing average carbon dioxide emissions from new cars to 120 grammes of carbon dioxide per kilometre by 2005, or 2010 at the latest 50 . The main element of this strategy is the voluntary agreements between the European Commission and European,

Japanese and Korean car manufacturers to reduce average carbon dioxide emissions from new cars by at least 25% below 1995 levels by 2008.

The Government is supporting the aims of the agreements through the UK's taxation system. Vehicle excise duty (VED) – the annual vehicle tax charge – has been reformed to encourage the use of less polluting vehicles. Owners of existing cars with engines up to 1,549 cc are now able to claim a £55 reduction in their VED. In March 2001, the Government introduced a graduated VED system for new cars, which are now placed in one of four VED rate bands according to their level of carbon dioxide emissions.

The Government has introduced a broadly revenue neutral reform of company car taxation based on carbon dioxide emissions. From April 2002, company cars first registered after January 1998 are to be taxed on a percentage of their list price according to one of 21 carbon dioxide emission bands. Older company cars will be taxed on the basis of engine size. The reform will remove the perverse incentive in the current system to reduce the tax due by driving unnecessary, extra business miles and it will provide a significant incentive to company car drivers to choose more fuel efficient vehicles. It is estimated that the voluntary agreements, along with the changes to Vehicle Excise Duty and company car taxation, will save around 4 MtCO2 per year by 2010.

Fuel Duty Escalator

The fuel duty escalator – annual fuel duty increases above the rate of inflation – has delivered reductions in emissions from road transport. The escalator was introduced in 1993, first at an annual rate of 3% above inflation and then at 5%. It was increased to 6% in July 1997 and has been very successful. It sent a clear signal to manufacturers to design more fuel efficient vehicles, and to motorists to avoid unnecessary journeys and to consider alternatives to the car. Taken in isolation, increases in duties between 1996 and 1999 are estimated to have produced annual carbon savings of between 1 and 2.5 MtCO2 by 2010.

Source: U.K. TNC.

ANNEX IX. PROGRESS IN COMMON AND COORDINATED POLICIES AND MEASURES.

PROPOSED MEASURE	**STATUS OF IMPLEMENTATION**
Cross-cutting issues	
Emission trading Directive	Adopted by Council and Parliament
IPPC Directive	Ongoing work on various sector-specific BAT reference documents (BREFs). Revision of published BREFs to start in 2003.
Linking Directive	Proposal adopted by the Commission
Review of the monitoring mechanism	Proposal adopted by the Commission
Energy	
Directive on taxation of energy products	Adopted by the Council
Directive on energy performance of buildings	Adopted by the Council and Parliament
Directive on the promotion of RES-E	Adopted by the Council and Parliament
Proposal for a framework Directive on eco-efficiency requirements for energy using products	Adopted by the Commission
Proposal for a Directive on energy demand	In preparation
Proposal for a Directive on CHP	Proposal adopted by the Commission
Initiatives on increased energy efficient public procurement.	In preparation
Public awareness campaign and campaign for take-off	Included in 2003 Work Plan "Intelligent Energy for Europe".

Transport	
VA of EU, Japanese and Korean car manufacturers to reduce fleet average CO2 emissions to 140g/km by 2008/2009[32]	Monitored through yearly report. Review in 2003/2004.
Shifting the balance between modes of transport	Package of actions, in accordance with the White Paper on a Common Transport Policy.
Proposal for improvements in infrastructure use and charging	Proposal adopted by the Commission.
Promotion of the use of bio-fuels for transport	Adopted by Council and Parliament.
Proposal on special tax arrangements for diesel fuel used for commercial purposes and on the alignment of excise duties on petrol and diesel fuel	Proposal adopted by the Commission.
Proposal on a regulation on the granting of Community financial assistance to improve the environmental performance of the freight transport system	Proposal adopted by the Commission.
Agriculture	
Common rules for direct support schemes under the common agricultural policy and establishing certain support schemes for farmers.	Adopted.
Support for rural development from the European Agricultural Guidance and Guarantee Fund (EAGGGF).	Adopted.
Industry	
Proposal for legislative action on fluorinated gases.	Proposal adopted by the Commission.

Source: European Commission (2003b).

PENDIENTE:

-Pasar ortografía.
-Cuidado con comas y puntos en cifras.
-Cuidado a referencia a las figuras y tablas en el texto

[32] Voluntary agreement with European, Japanese and Korean industries. Agreement signed between ACEA and the European Commission to promote the increase of fuel efficiency of light passenger vehicles (voluntary agreements between the European Commission and European, Japanese and Korean car manufacturers to reduce average carbon dioxide emissions from new cars by at least 25% below 1995 levels by 2008).