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COMMUNICATION FROM THE COMMISSION TO THE COUNCIL

A Community Strategy to limit Carbon Dioxide emissions and  
to improve energy efficiency

## Communication from the Commission to the Council

### A Community Strategy to limit Carbon Dioxide emissions and to improve energy efficiency

#### 1. A GLOBAL CHALLENGE

1. In 1990 a comprehensive report assessing the nature and the consequences of global warming was presented by the Intergovernmental Panel on Climate Change (IPCC). It represented for the first time a consensus amongst scientists on the possible impact and risks of the greenhouse effect. Taking into consideration the long lead times involved in changes in the global climate system, some immediate action is recommended. In this respect, a decision to stabilise CO<sub>2</sub> emissions is a first important step.
2. CO<sub>2</sub> emissions are recognised as being the main contributory factor to the greenhouse effect (see Annex 1). They arise primarily from the burning of fossil fuels. Removal of CO<sub>2</sub> from emissions at present is not only uneconomic but at the technical level such methods are far from being sufficiently developed. As a consequence, no feasible solution exists in the short and medium term other than to reduce the growing use of fossil fuels. This can be achieved through improved energy efficiency and through substitution by other energy sources which emit less or no CO<sub>2</sub>.
3. The greenhouse problem is global in nature. The climate system as a whole is influenced by CO<sub>2</sub> emissions, regardless of their place of origin; their impact is also global, although the economic and social consequences differ according to geographical conditions. Until now the industrialised world has been the major emitter of CO<sub>2</sub>, but the developing world is expected to experience the fastest increase in the years to come. It is therefore of critical importance to reach a global solution in which all countries of the world, developed and developing, are ready to participate.
4. With the completion of the Internal Market, the European Community will be the biggest economic/trading partner in the world with the potential to exercise an important level of moral, economic and political influence and authority. As such the Community owes it to both present and future generations to put its own house in order and to provide both leadership and example to developed and developing countries alike in relation to protection of the environment and the sustainable use of natural resources. This responsibility has been acknowledged and a political commitment undertaken in the declaration "The Environmental Imperative" adopted by the Heads of State and Government of the Community at their meeting in Dublin in June 1990. The willingness of the

Community to fulfill its responsibilities offers an important opportunity to fill a current vacuum in global foreign policy and a catalytic role in regard to the Global Climate Convention to be adopted at the UNCED Earth Summit in June 1992.

5. Already Article 130R of the Treaty adopted in the 1986 Single European Act urges the Community "to ensure a prudent and rational utilisation of natural resources", it requires "that environmental damage should as a priority be rectified at source", "that the polluter should pay" while the Community shall take into account "the potential benefits and costs of action or lack of action". This article of the Treaty is in line with economic theory which advocates the internalisation of external costs such as environmental damage caused by energy use, to improve overall economic efficiency.
6. The Joint Energy/Environment Council of 29.10.90 decided to stabilise CO<sub>2</sub> emissions in the Community in the year 2000 at 1990 levels. The purpose of this Communication is to outline a comprehensive strategy to reach this commitment along the lines already discussed by the Joint Energy/Environment Council and to invite the Council to say whether they consider that this strategy should now be developed and, where necessary, translated into specific proposals. This strategy is based on an intensification of non-fiscal measures, a fiscal volet involving a possible tax directed to energy saving and to a reduction of polluting sources of energy but not involving any increase in taxation in total, and on complementary national measures. If the Council wishes to go forward in these directions, it would be possible to indicate to the Community's major international partners that the Community would be prepared to go ahead with the reduction of CO<sub>2</sub> pollution by these means and to invite them to indicate whether they are equally prepared to take action of a similar kind. It is evident that the adoption of a clear strategy would increase the credibility of the Community in ongoing international negotiations and guarantees the cohesion of the Internal Market.

## 11. THE PROBLEM

7. With an average of 2.2 tons of carbon per head, the Community represents 13% of global CO<sub>2</sub> emissions, compared to 23% for the U.S., 5% for Japan and 25% for Eastern Europe and the USSR. Four main sectors in the Community are responsible for these emissions : power generation (31%), transport (26%), industry (20%), and residential/commercial (20%) (see Annexes 2 - 4). During the period 1970 - 1985 emissions almost stabilised. During the period 1986-1990, however, this positive tendency has been reversed and emissions have grown by 4%. The positive effects on CO<sub>2</sub> emissions resulting from a consistent improvement of energy efficiency and a substitution towards less CO<sub>2</sub> emitting energy sources, practically came to an end with the drastic decrease in energy prices and the slowing down of investments in nuclear power generation. For the period 1990-2000, CO<sub>2</sub> emissions are likely to continue to grow by another 11% (see Annex 5).

### III. IN SEARCH OF SOLUTIONS

8. CO<sub>2</sub> emissions are related to the very different uses of fossil energy by millions of consumers and businesses. Efficient use is in many cases not the rule for a variety of reasons: lack of information, behavioural habits, reluctance to make investments even when they have economic pay-back periods (e.g. longer than 3 to 5 years), adverse price incentives, lack of capital, short-term interest of energy suppliers, lack of alternatives, uncertainty of energy prices. As a consequence, an efficient and effective policy needs to involve a set of mutually reinforcing measures of a regulatory, voluntary and fiscal nature. Moreover, on the basis of the subsidiarity principle, the package needs to consist, on the one hand, of measures requiring some degree of coordination or harmonisation amongst the Member States, and on the other, of measures which can be implemented most efficiently at national, regional or local level.
9. A first step in controlling CO<sub>2</sub> emissions needs to include measures which involve the lowest economic costs and which at the same time lead to benefits in other policy areas. In this respect, most attention needs to be paid to the exploitation of cost-efficient technical possibilities to improve the energy efficiency in the Community. Such possibilities appear to exist in all sectors and for all energy sources. Apart from reducing CO<sub>2</sub> emissions, an ambitious programme to improve energy efficiency will increase energy security, improve the efficiency of the transportation system, limit energy related air emissions other than CO<sub>2</sub> and can strengthen industrial competitiveness. Such a programme will re-establish the momentum of the various energy conservation efforts which have slowed down considerably since the 1986 drop in energy prices.
10. The fuel switching option also has a role to play in the stabilisation exercise for 2000, although for technical, political and economic reasons the full extent of this role may not be achieved. For the transport sector clearly in the time horizon envisaged there are no possibilities for fuel switching. For power generation there is some wider margin of manoeuvre. Current economics and policy trends are such that substitution of solid fuels by gas is to be expected. The extent to which a CO<sub>2</sub> motivated redirection of energy supplies in favour of a much more substantial contribution of natural gas to the detriment of coal and possibly oil supplies could negatively affect the present situation of fairly secure and moderately priced energy supplies, depends on the pace of such developments as well as on geopolitics. The presently known resource endowment of Europe and the neighbouring regions with gas would allow substantially increased Community gas imports, in particular in the framework of a European Energy Charter. It is however not clear, whether the infrastructure investments can be financed and completed well before 2000 and what the price effects would be. It is clear that the fuel switching option will become an important ingredient of policies aimed at reducing CO<sub>2</sub> emissions after the year 2000. It is therefore important that the correct signals are already made at this stage.

11. Renewable energy sources may have a role to play in all economic sectors. They could represent up to 5% of total energy consumption by the year 2000 and over 8% in 2010. They are thus likely to contribute significantly to the stabilisation of CO<sub>2</sub> emissions, on the condition however that their market position as well as current RD & D programmes are being reinforced. For example, biomass may undergo development, in particular in the context of the modification of the Common Agricultural Policy which may release large land areas for new uses. Certain kinds of renewable energy will increasingly be linked to energy efficiency measures (e.g. passive solar) whilst wind energy and hydro energy will continue to be increasingly used. However such developments are only likely to happen if some technical obstacles can be overcome and if the economic position of these energies can be improved.

#### IV. APPROACH TO BE FOLLOWED : A PACKAGE OF MEASURES

12. The Commission is conscious that there are a number of solutions to the problem. In determining the strategy to follow, the Commission has taken into account the need to base its approach on actions which on the one hand minimise the economic costs and on the other hand maximise the advantages in terms of the environment and which also have a clear benefit on other policy areas. The package which is proposed is based on three types of measure :

- specific measures including RD & D programmes, sectoral measures, other types of regulatory and voluntary measures;
- fiscal measures;
- complementary national programmes.

#### V. SPECIFIC MEASURES

##### RD & D programmes

13. In the light of the longer term perspective, RD & D programmes need to be reviewed and intensified, while programmes of dissemination of technology such as THERMIE need to be enlarged. The Community and its Member States will need to reshape and strengthen their efforts in the area of energy technologies and on the economics of CO<sub>2</sub> policies. The third Framework programme of research and technological development of the Community (1990-94) already covers RD & D activities in these areas. In particular, the specific programme in the field of non-nuclear energies (1991-94) which is a development and extension of the JOULE programme, will be pursued in the field of minimum-emission power production from fossil sources including the development of carbon abatement technologies, renewable energy sources and energy utilisation and conservation including energy efficient transport. Particular attention will need to be paid to the transfer of environmentally friendly technology and know-how to the developing countries.

##### Sectoral measures

14. A set of regulatory and voluntary measures will need to be developed in the four sectors identified above as the major emitters. Many of those reviewed in this paragraph are already covered to some extent by Commission proposals such as the SAVE program, but will need to be strengthened.

- **Power generation**

New and critical initiatives for the future involve the Altener programme on renewable energy and a proposal on least cost planning. The latter will create incentives for energy utilities to consider energy saving potentials with its clients on the same basis as the expansion of its production capacity. The US experience has shown that this instrument can result in an important improvement of energy-efficiency.

Specific measures are needed to encourage users to accelerate low pollution/high performance technologies (combined heat and power generation). The electricity sector is likely increasingly to make use of renewable energy sources and biomass products (urban waste).

- **Industry**

For most companies, energy represents a small share of overall production costs. The scope for improvements in energy efficiency is nevertheless considerable in these firms and a widespread application of energy auditing is therefore needed. Although the relative potential is smaller for some highly energy-intensive industries (e.g. steel, chemicals, non-ferrous, pulp and paper, glass, cement), significant reductions can be realised through voluntary agreements or other means. In this respect the potential of combined heat and power generation needs to be exploited carefully. Finally, third party financing systems can be established in this sector as in others, to overcome substantial financing needs for investments in energy saving.

- **Transport**

Transport is currently the source of around 25% of the Community's CO<sub>2</sub> emissions. This share is liable to increase in the future, mainly as a consequence of the expected further growth in the volume of road traffic. Because road traffic also entails other considerable external costs (acid emissions, congestion, etc.), structural policies are urgently needed at the Community level and in the Member States to encourage a more environmentally rational approach towards mobility. To reduce or at least contain the external costs, a full range of measures will be necessary. These will cover three main areas :

- The application of best available technology to reduce exhaust emissions and increase fuel efficiency.
- Transport policy measures aimed at increasing efficiency within each transport sector as well as at systematic promotion of the most environment-friendly mode of transport. This is likely to result in a shift from road to rail, inland waterways and combined transport as well as from the private car to collective transport.

- A change in user behaviour. Reduced individual car use will need to be encouraged through i.e. information, public education and public awareness campaigns. The general introduction of more stringent speed limits is needed and will need to be rigorously enforced.

The required structural changes in the transport sector clearly represent a major challenge to the Community. For that reason, the Commission will present before the end of this year a Communication on transport and the environment.

- **Household/Commercial**

Regulatory measures will be developed based on stricter norms and standards for electric appliances (freezers, refrigerators, boilers, etc.), lighting, improvements to insulation of buildings, especially existent ones, and better information (e.g. labeling). The institutional process of adopting such new standards is cumbersome, and long. Moreover, the penetration rate of new energy efficient appliances is slow as consumer durables have a long life time.

**Other regulatory and voluntary measures**

15. In addition to the four sectors already mentioned, as part of an overall CO<sub>2</sub> policy other actions will need to be developed. In this respect, recycling of waste, afforestation schemes and schemes to improve the quality of life in urban centres are examples of the kinds of action which could contribute to the strategy. Certain measures of this kind have already been initiated at the Community level and will need to be reinforced in the future.

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16. Even with a significant increase in the speed of introduction and the coverage of all of these regulatory and voluntary measures, they are unlikely to be sufficient to reach the stabilisation target. On the basis of the Commission's analysis it appears that these measures, together with the results of technical progress that would in any case have taken place with capital replacement and other market developments, will contribute about half of the objective (see Annex 6). For that reason additional measures are necessary, to create incentives for speedier introduction of new energy efficient equipment.

**VI. FISCAL MEASURES**

17. Fiscal measures have been advocated as a useful means of tackling the CO<sub>2</sub> problem in terms of their economic efficiency by the Council, the European Parliament and the Economic and Social Committee, as well as by international bodies such as OECD and by academics. In the Commission's view, given the characteristics of carbon dioxide emissions (global character without direct negative

health impacts), the use of policy instruments based on market mechanisms to give incentives for the reduction of emissions will be more cost-effective than relying solely on regulatory means. Regulations are often economically inefficient, given that they generally do not take into account the marginal costs of reaching different norms and standards, nor do they give a permanent economic incentive for developing and applying technological improvements to go beyond existing norms. Such instruments also allow the internalisation of external costs and are in line with the polluter pays principle.

#### **Existing fiscal initiatives**

18. Some of the existing fiscal proposals are likely to make an important contribution to the strategy but will need to be reinforced. This is the case in particular for those on the internalisation of the environmental costs in the circulation tax on lorries<sup>1</sup> or by enlarging the use of tax differentiation. This approach will need to be extended to private cars. Following the experience with fiscal incentives for leadfree petrol and cars equipped with 3-way catalytic converters, the Commission has decided to follow a new type of legislative approach providing for an orderly use of fiscal incentives by the Member States within the Internal Market. This model is particularly relevant for the Member States in cases where they wish to speed up a general application of stricter standards for new energy efficient equipment within the Community.

#### **A new fiscal initiative**

19. The proposals described above cannot achieve the economic objective set out in paragraph 17. For these reasons the Commission has come to the conclusion that it is necessary to envisage the possibility of a more specific tax in addition to the other measures of the package in order to attain the stabilisation target in an efficient and cost effective way. In fact, it seems difficult to motivate economic agents to improving their energy efficiency if energy prices are too low. Moreover, some energy sources, in particular some renewables, which are favourable for the stabilisation objective as well as for overall environmental quality, will not be able to develop significantly if their market position is not enhanced by the internalisation of their comparative environmental advantage into their price. A new specific tax is considered to be the most appropriate means of giving a long-term price signal and to bring about a change in the economic behaviour of 340 million energy consumers. It would act as an overall support to, and increase the effectiveness of, the other measures of the policy package. A Community initiative would avoid a proliferation of separate actions by individual Member States which could lead to distortions of competition and disruption to the Internal Market. It would allocate a value to natural resources that are limited and which need to be safeguarded for future generations.
20. A key characteristic of the new tax will be its revenue neutrality. This means that it should not result in any increase in statutory contributions and charges. The new tax needs to be offset by fiscal incentives and by tax reductions for companies and individuals. In the Commission view this should not involve increasing the tax



burden, rather the modification of the tax mechanism by means of a progressive reform to make it more environmentally friendly. In addition, great care will be needed when putting such incentives in place to avoid introducing any new distortions of competition.

21. The new tax needs to be designed with great care if it is at the same time to limit any adverse economic effects on the competitive position of Community industries and on the economy in general, to maximise the potential gains in terms of CO<sub>2</sub> reduction and to take into account benefits in other policy areas. In particular it will be necessary to ensure that security of energy supplies is not affected and that disproportionate socio-economic difficulties are not created.
22. It is essential to avoid more pronounced economic costs for some industrial sectors, in particular those employing energy intensive production processes and with a large involvement in international trade (steel, chemicals, non-ferrous, cement, glass and pulp and paper). Until the Community's main competitors take analogous measures, special treatment needs to be envisaged. This special treatment, which could be given to the most affected industries in exchange for agreements to reduce CO<sub>2</sub> emissions, could take the following forms :
  - partial or total exemption;
  - application of a zero rate;
  - introduction of fiscal incentives, tax reductions or reductions in charges for employers.

The choice between these different approaches, which are in any case not exclusive - fiscal incentives could be combined with one of the first two options - needs further reflection. At this stage it appears that the most appropriate option would be to apply a zero rate. Further consideration of these options needs to be carried out in consultation with the industries most affected.

23. It will also be important to ensure that the creation of a new tax does not result in an increase of taxation on individuals. It will be necessary to reduce taxes or to give tax incentives for environmental protection actions or for energy efficiency schemes to compensate the effects of the new tax. The particular situation of each Member State would need to be taken into account in the final choice of solution. In introducing such a tax it will be necessary to provide for its temporary suspension and for modification of the rate in the light of economic developments and progress towards the stabilisation objective. It is also necessary to put forward a regular and thorough assessment of the efficiency of the tax and of the implementation of the principle of revenue neutrality.
24. Two types of tax can be envisaged : an energy tax which would apply equally to all energy sources or a CO<sub>2</sub> tax modulated on the basis of carbon content. An energy tax would be more effective in encouraging energy efficiency; a carbon tax would provide more specific incentives to reduce CO<sub>2</sub> emissions. However, this second option would put a relatively high burden on coal, which is the most secure energy supply. Moreover, it would favour nuclear energy, which has advantages in terms of CO<sub>2</sub> reduction but which leads to its own particular problems. A 100% carbon tax option

would also have, according to their energy structure, a significantly different impact on the industrial competitive position of the Member States. Finally, because of technical, economic and political limitations to fuel substitution, only a significant improvement in energy efficiency will be able to contribute significantly to the 2000 stabilisation objective.

25. In the light of this analysis, the Commission considers that the best option would be a tax based on an energy component and on a component based on carbon content. In order to stimulate alternative sources of energy, the energy component will need to exclude renewables, but not large scale hydro electric schemes. It will also need to exclude energy sources used as raw materials. The energy component of the proposed tax should not exceed 50%. The mix could be reviewed at a later stage in the light of new technical developments or particular developments in the field of energy security.
26. The tax rate required to reach the Community stabilisation target by the year 2000 depends, on the one hand, on the evolution of a set of key variables (in particular, economic growth, world energy prices and the diffusion of technical progress) and, on the other hand, on the response of economic agents to the proposed policy measures. Both variables are subject to a considerable degree of uncertainty, which partly explains a certain divergence in the results obtained by different studies. Based on these different studies, there is a convergence of views that a tax rate equivalent to \$10 per barrel of oil in combination with the other elements of the strategy, including those taken at the national level, is likely to be sufficient to ensure that the overall strategy can come close to the CO<sub>2</sub> stabilisation target (see Annex 7).
27. In order to ensure a smooth introduction of the increased energy prices which will result from such a tax and to reduce the overall cost effect to consumers and industry, an early announcement and a gradual introduction is essential. In the light of the various possibilities which exist (see Annex 8), and taking into account the need to ensure the cohesion of the Internal Market, it could be envisaged that a tax of \$3 per barrel would be introduced on 1.1.93 with an additional \$1 per barrel in successive years until 2000. An early introduction of this scheme is justified given the limited time available to arrive at the stabilisation target. A later start would involve higher increases over a shorter period and could result in national incentives which could prejudice Community cohesion. The precise timetable could however be modified in the light of economic developments as part of the monitoring process.
28. The precise details of the tax need to be worked out in collaboration with the Member States within the requirements imposed by the Internal Market and by international obligations. As part of the exercise it will be necessary to take account of the fact that the introduction of the tax has as its objective the modification of consumer (final or intermediary) behaviour. To keep administrative costs to the minimum, it will be necessary, as far as possible, to use existing fiscal mechanisms. Thus for

hydrocarbons it would be appropriate to use the existing excise framework. For coal and electricity, the specific fiscal framework needs further consideration. As far as the rate is concerned, a rate expressed in money terms appears to be preferable to an ad valorem rate.

## VII. ECONOMIC IMPACT

29. On the basis of the analyses carried out by the Commission the introduction of the policy package described above would entail modest macro-economic costs. This is essentially due to the revenue neutrality of the new tax (the revenue is likely to be some 50 billion ECU) as well as its gradual and predictable introduction. An analysis of the entire package of policy measures indicates that, in the Community as a whole, there might be a small reduction in the annual economic growth rate compared to what would otherwise occur during the period under consideration (between 0.05 and 0.1 percentage points) and a temporary increase in the rate of inflation (0.3 to 0.5 per annum) (see Annexes 9 - 10). This analysis of the economic impact does not take into account any evaluation of the positive effects in other policy areas and in particular the direct economic benefits related to the rational use of energy. Moreover, the costs of not taking action although difficult to measure, would be significant.

## VIII. COMPLEMENTARY NATIONAL PROGRAMMES

30. The proposed Community strategy requires actions at Member State level, in line with the concept of subsidiarity. Community measures involve actions which require coordination or harmonisation at Community level if the programme is to be efficiently implemented and if it is to be inserted in the most optimal way into overall Community policies in particular concerning the internal market, competition, economic and social cohesion, and macro-economic convergence. Member States will need to complement the Community package with measures adapted to their own particular economic, cultural and geographical circumstances, as well as to differences in the pattern and level of CO<sub>2</sub> emissions.
31. Amongst the areas in which action will be needed are the following :
- RD & D, e.g. to stimulate clean technologies, renewables and energy efficiency;
  - fiscal incentives, e.g. insulation of houses;
  - carbon sinks, e.g. forestry planting, development of more green spaces at local and urban levels;
  - information, education and training programmes in the field of energy efficiency;
  - transport infrastructure and environmentally friendly means of transport.
32. The Commission takes note that some Member States with per capita levels of CO<sub>2</sub> emissions above the Community average, such as the Netherlands and Belgium have decided to reduce their emissions by 5% by the year 2000. Denmark and the Federal Republic

of Germany have decided to reduce their emissions by 20% and 25% respectively by the year 2005. The Commission recalls that, according to the conclusions of the Joint Energy/Environment Council of 29.10.90, Member States with, as yet, relatively low energy requirements can be expected to grow in step with their development and may need targets and strategies which can accommodate that development while improving the energy efficiency of their economic activities. In any event, the Commission considers the implementation of the Community measures described above as a minimum requirement.

#### IX. BURDEN SHARING

33. In order to reduce the temporary burden arising from the application of this strategy in certain Member States whose economic development is lagging behind the rest of the Community, the Community should in principle state its readiness to contribute to the costs of such adjustments. In addition, the timing of the gradual introduction of the Community strategy could be modified according to the specific needs of individual Member States.
34. Consideration needs to be given to the appropriate financial instrument(s) through which such assistance could be offered, including for example the Structural Funds, to the extent that the measures required are compatible with the objectives of the Funds. Certain measures which contribute towards this adjustment effort and which are fully compatible with Community structural policy are already receiving support from the Funds under both Community Support Frameworks and Community Initiatives. Any commitment to further measures, which may have to be on a much larger scale, should not prejudice the priorities which remain to be determined for the post-1993 period of structural assistance. The Structural Funds could contribute in so far as the measures concerned are eligible, but financing needs would need to be taken into account in the determination of the overall financial envelope for 1994-98.

#### X. MONITORING MECHANISM

35. A monitoring mechanism should be set up to follow whether the CO<sub>2</sub> stabilisation target of the Community is being reached. The Member States will be required to submit their national programmes, as well as other necessary information, to the Commission for evaluation. The Commission will examine and will inform the Council whether the national plans are in conformity with other Community legislation as well as whether additional efforts are required to meet the CO<sub>2</sub> Community stabilisation target. In this latter case, the common strategy may have to be intensified or some Member States may have to commit themselves to take further action.

#### XI. INTERNATIONAL CONTEXT

36. The overall strategy set out above can stand on its own and have positive benefits for the Community. However, in view of the need to combat the global warming problem, Community action should be part of an overall international effort to stabilise CO<sub>2</sub> emissions. The Community will have to make every effort to ensure its partners undertake comparable concrete action. All industrialised countries (except the USA) seem to be ready to stabilise CO<sub>2</sub> emissions at 1990 levels by the year 2000. As far

as the means of achieving this objective are concerned, most of the EFTA countries are already applying or are considering fiscal measures of the type proposed in this Communication. On the other hand, the USA and Japan until now have put their faith in regulatory instruments. In the case of the developing countries, although their CO<sub>2</sub> emissions have been limited, it is expected these will grow rapidly in the coming years. It is essential that the industrialised countries set an example if they wish the developing countries to take part in the development of a global strategy. In a similar vein, it is important that the Central and Eastern European Countries and the USSR which contribute an important part of global CO<sub>2</sub> emissions, are at this stage in their development ready to take appropriate measures as a cost effective part of their economic restructuring. The Community is already making a substantial financial contribution to this process.

## XII. CONCLUSION

37. The Community strategy set out above will make an important contribution to reaching the Council decision to stabilise CO<sub>2</sub> emissions in the Community in 2000 at 1990 level. Given the existence of scientific uncertainty about global warming and the long-term character of the results of any policy measures, the basic principle which has been applied is to undertake only those actions which involve the least adaptation costs and which have also a clear benefit on other policy areas. The package of regulatory, voluntary and fiscal measures will achieve a considerable improvement in energy efficiency and will also provide incentives to move in the longer term towards the use of energy sources which emit no or less CO<sub>2</sub>.
38. The Council is invited, in the light of the Communication, to take a position on the strategy proposed by the Commission. The Commission will put forward the necessary legislative proposals.

**ANNEXES**

- Annex 1 : Basic facts on greenhouse gases.**
- Annex 2 : Total and per capita CO<sub>2</sub> emissions.**
- Annex 3 : Contribution of the various sectors to the total CO<sub>2</sub> emissions in the EC.**
- Annex 4 : Structure of gross energy consumption in the EC.**
- Annex 5 : CO<sub>2</sub> emission stabilisation effort, 1990-2000.**
- Annex 6 : Sectoral CO<sub>2</sub> emission reduction potential of current policies and SAVE programme.**
- Annex 7 : Change in fuel prices.**
- Annex 8 : Options concerning obligatory character of tax level.**
- Annex 9 : Macro-economic impact of the proposed package.**
- Annex 10 : GDP and price effect of package of measures including a carbon/energy tax of 10\$/b.**

ANNEX 1

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**BASIC FACTS ON GREENHOUSE GASES**

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	Relative contribution to the Greenhouse effect over 100 yr period	Long Lifetime?	Sources known?
Carbon dioxide	61.0 %	yes	yes
Methane*	15.0 %	no	semi-quantitatively
Nitrous oxide	4.0 %	yes	qualitatively
CFCs	11.0 %	yes	yes
HCFC-22	0.5 %	mainly no	yes
Others* (Ozone)	8.5 %	no	qualitatively

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Source : IPCC

\* These values include the indirect effect of these emissions on other greenhouse gases via chemical reactions in the atmosphere. Such estimates are highly model dependent and should be considered preliminary and subject to change.

**ANNEX 2**

<b>TOTAL AND PER CAPITA EMISSIONS OF CARBON (1989)</b>			
<b>COUNTRY</b>	<b>TOTAL million t of Carbon</b>	<b>% OF WORLD TOTAL</b>	<b>PER CAPITA t Carbon</b>
B	29.1	0.5	2.93
DK	13.8	0.2	2.69
D	186.1	3.2	3.02
GR	18.6	0.3	1.86
E	55.0	0.9	1.42
F	97.5	1.7	1.74
IRL	8.0	0.1	2.27
I	102.8	1.7	1.79
L	3.3	0.1	8.83
NL	38.7	0.7	2.61
P	10.3	0.2	1.00
UK	154.0	2.6	2.69
<b>EUR 12*</b>	<b>760.9</b>	<b>12.9</b>	<b>2.34</b>
USA	1352.7	23.0	5.45
JAPAN	296.5	5.0	2.40
USSR and Eastern Europe	1463.2	24.9	3.63
REST OF WORLD	2011.9	34.2	0.49
<b>WORLD TOTAL</b>	<b>5885.2</b>	<b>100.0</b>	<b>1.13</b>

Source : Commission's services.

\* The EUR-12 total includes emissions from bunker oil (not included in Member States data) and does not match the sum of Member States emission due to statistical differences.



## ANNEX 3

1989 CONTRIBUTION OF THE VARIOUS SECTORS TO THE TOTAL CO2 EMISSIONS IN THE EC (In %)													
SECTORS	EC	B	DK	D	GR	E	F	IRL	I	L	NL	P	UK
POWER GENERATION	31.3	21.1	43.2	35.1	46.2	32.9	13.5	34.0	29.3	11.9	30.8	39.1	37.9
RESIDENTIAL/ COMMERCIAL	19.7	24.5	20.5	19.6	11.9	9.8	25.4	30.2	20.2	10.6	24.3	8.4	18.8
TRANSPORT	25.5	21.7	24.5	21.6	24.2	32.3	34.0	20.0	26.0	21.4	21.4	28.3	24.1
INDUSTRY	19.6	28.3	10.5	20.7	14.8	20.1	23.6	15.4	19.8	56.1	16.7	20.7	15.1
ENERGY SECTOR	3.9	4.4	1.3	3.0	2.9	4.9	3.5	0.4	4.7	0.0	6.8	3.5	4.2
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source : Commission's services.

ANNEX 4

1989	STRUCTURE OF GROSS ENERGY CONSUMPTION IN THE EC (in %)												
	EC	B	DK	D	GR	E	F	IRL	I	L	NL	P	UK
COAL	21.0	20.6	33.2	28.0	36.3	22.7	9.6	38.4	9.2	33.9	12.5	16.3	30.7
OIL	44.8	40.1	52.9	39.7	62.1	52.5	41.8	41.4	60.9	43.3	36.7	78.8	38.5
GAS	18.3	17.1	8.9	17.6	0.6	5.3	11.7	19.6	24.7	12.0	47.9	0.0	21.6
NUCLEAR	14.3	22.1	0.0	13.8	0.0	17.1	36.6	0.0	0.0	0.0	1.5	0.0	8.4
OTHER	1.6	0.0	5.1	0.9	0.9	2.4	0.3	0.6	5.2	10.8	1.3	4.8	0.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source : Eurostat.

ANNEX 5

CO<sub>2</sub> EMISSION STABILISATION EFFORT, 1990-2000 (EUR-12)

	Emissions Million tons of CO <sub>2</sub>	Amount by which the stabilisation objective is exceeded (in %)
CO <sub>2</sub> emissions in 1990	2738	
CO <sub>2</sub> emissions in 2000 (without efficiency gains according to current trends)	3264	19%
CO <sub>2</sub> emissions in 2000 taking into account also market & "normal policy" gains(1)	3032	11%
CO <sub>2</sub> emissions in 2000 taking into account also gains to be expected from the SAVE programme(2)	2955	8%

Source : Commission's services

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(1) According to scenario 1, Energy in Europe, special issue, July 1990, update of July 1991; in the assumption of a higher economic growth, the increase of CO<sub>2</sub> emissions could be twice as high.

(2) SAVE programme, COM (90) 365 final; it has to be noted that the impact of some SAVE measures are already included in scenario 1 "gains from market and policy".

ANNEX 6

SECTORAL CO<sub>2</sub> EMISSION REDUCTION POTENTIAL OF  
CURRENT POLICIES AND SAVE PROGRAMME (1990-2000)  
(In million tons of CO<sub>2</sub>)

SECTORS	Gains from market & policy <sup>1</sup>	Additional gains through SAVE <sup>2</sup>	Total savings	CO <sub>2</sub> Reduction need	Additional programme
Domestic/tertiary	95.4	35.0	130.4		
Industry	72.4	35.0	107.4		
Transport	63.9	7.8	71.7		
TOTAL	231.7	77.8	309.5	526.4	216.9
Percentage over total CO <sub>2</sub> reduction needed to achieve stabilisation	44%	15%	59%	100%	41%

Source : Commission's services

<sup>1</sup> According to Scenario 1, Energy in Europe, special issue, July 1990, including update July 1991.

<sup>2</sup> SAVE Programme, COM (90) 365. It has to be noted that the impact of some SAVE measures are already included in scenario 1 "gains from market and policy".

ANNEX 7

CHANGE IN FUEL PRICES  
(% INCREASE OF A 10\$/B TAX<sup>1</sup>)

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POWER STATIONS AND INDUSTRY

hard coal	58
heavy fuel oil	45
natural gas	34

HOUSEHOLDS

light fuel oil	16
natural gas	14

TRANSPORT

gasoline	6
diesel	11

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Source : Commission's services

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- 1) - prices and exchange rates as of 1990;  
- modulation according to 50%/50% carbon/energy tax;  
- assumption that the tax is totally passed on to the energy user  
(first round effect).

**ANNEX 8 : OPTIONS CONCERNING OBLIGATORY CHARACTER OF THE TAX LEVEL**

Several different options exist for the tax rate to be applied, with different degrees of obligation for the Member States. The options which can be envisaged (in order of increasing constraint for the Member States) are :

- target rates (horizon 2000), free progression, no minimum rate;
- target rates with a fixed minimum rate at the beginning and free progression;
- target rates with a fixed minimum rate and obligatory predetermined progress;
- definitive rates fixed from the outset.

The target rate would correspond to the convergence level in the medium term which the Member States would have to move to in their own time.

## ANNEX 9 : MACRO-ECONOMIC IMPACT OF THE PROPOSED PACKAGE OF MEASURES

The overall macro-economic impact of the proposed package of measures is the net effect of positive and negative impulses that generate in their turn indirect effects. Energy efficiency investments generate positive demand effects while related costs and price increases due to the carbon/energy tax cause negative cost effects. As the revenues of the carbon/energy tax would be used to reduce other taxes in parallel, additional positive demand impulses will be generated.

The likely quantitative impact on the main macro-economic aggregates is based on three different sets of simulation results, i.e. based on the HERMES model for the four largest Member States, on DRI's econometric models for eight Member States (D, E, F, GR, IRL, I, P, UK) and on the QUEST model for all Member States, Japan and the United States.

They all assume the introduction of a carbon/energy tax of the order of 10\$ per barrel of oil, even if the detailed modalities differ somewhat. The DRI scenario also contains the non-fiscal measures, as well as a reinforcement of existing tax initiatives, e.g. in transport.

When interpreting these simulation results, it is important to keep in mind that the simulations may contain a positive bias to the extent that they implicitly assume that the tax is defined and implemented in an economically sound way and that the response of private economic agents and public authorities is such that macro-economic disturbances are avoided. Should this not be the case, the economic effects could be substantially different.

An important general conclusion is that the three sets of simulations show a remarkable convergence in their results, and conform the empirical findings from the academic literature.

### a) Gross Domestic Product (GDP)

The use of the tax revenues is one of the main determinants of the GDP effects. In the hypothesis of a strict tax neutrality the impact on GDP, estimated on the basis of the HERMES model, is estimated to be modest and the potential impact on the average annual growth is likely to vary from -0.2% to +0.04 (which equals -1% to 0.2% for the GDP level after 5 years). The negative effect is considerable higher in case the tax burden increases (-1.6% on GDP level after 5 years).

The DRI analysis containing also non-fiscal measures but not a full tax neutrality (up to 85%) largely confirms the HERMES analysis : an average reduction of the annual growth rate of 0.06%.

**b) Prices (CPI/PPI).**

The three simulations clearly reveal the carbon/energy tax-induced increase in consumer (CPI) and producer (PPI) prices. The precise amount depends on whether the tax revenues are used for reducing other indirect taxes (e.g. VAT) or charges (e.g. employers' social security contributions) or whether the tax revenues are either not recycled or used for reducing direct taxes. In the former case, the price increase tends to be only half as high as in the latter case, where in the medium term the consumer price level is roughly 4% higher than otherwise. This would approximately correspond to an increase in the annual inflation rate of the order of 0.3-0.5 percentage points. It is generally assumed that no destabilising wage-spiral is set in motion.

**c) Employment**

In view of the comparatively short time period under consideration, it is not surprising to see that total employment moves broadly in line with economic activity. Provided the tax is introduced in a budget neutral way, the employment effects are generally small. Should the tax revenues be used for lowering labour costs, the employment effects may even be positive, at least in the medium and long run.

**d) Government Budget Balance**

Evidently, the public finance aspects are to a large extent determined by the decision on the revenue use. Although without revenue redistribution the government's budget balance is set to improve, this improvement is likely to be at least partly eroded by the negative budgetary impacts of the resulting slowdown in economic activity.

**e) External Balance**

The impact of the introduction of the carbon/energy tax on the external balance is, to a significant extent, determined by positive effects of lower energy import requirements, positive trade balance effects of a possible slowdown in domestic economic activity and eventual negative trade effects if the country's export structure is biased towards energy intensive products. Because of those compensating movements, the aggregate current account effects generally tend to be small.



## Conclusions

There is a remarkable convergence in the results of these independent simulation exercises. The introduction of a 10\$ per barrel of oil carbon/energy tax is likely to have noticeable, but relatively modest macro-economic consequences, provided certain rules are respected. These macro-economic effects mainly consist of an increase in the general price level, implying at least a temporary rise in inflation. This is likely to be inevitable. Whether the inflationary impulse remains transitory or whether it leads to a wage-price spiral with subsequent monetary policy induced recession largely depends on the reaction of private and public economic agents.

The other macro-economic effects, notably the GDP response, are largely a function of the modalities of the tax introduction (in particular the gradual and predictable introduction of the tax, the size of the tax rate and the use of the tax revenues) as well as of the wage/price and central bank behaviour. In principle, a policy to reduce CO<sub>2</sub> emissions or energy consumption can be expected to entail costs, including macro-economic costs (i.e. GDP losses). The lower the degree of flexibility with which the economy adapts to the tax, the higher these costs. If, however, the introduction of the carbon/energy tax is taken as an opportunity for structural reform, e.g. by using the tax revenues for reducing other taxes, then the gains from such a policy may well exceed the costs of the emission reduction.

The benefits of the proposed package in terms of environmental improvement (greenhouse and other gases), increased energy security or other positive effects (e.g. health and health costs, transport problems, ...) are difficult to quantify and to integrate in macro-economic simulations. It should therefore be taken into account that the figures and results presented do not include these benefits.

ANNEX 10

GDP AND PRICE EFFECTS OF A PACKAGE OF MEASURES, INCLUDING A  
CARBON/ENERGY TAX OF 10\$/b (EUR-8 : D, E, F, GR, IRL, I, P, UK)

	Annual growth rate	Level(1)
GDP	-0.06	-0.8
PPI	0.29	4.0

Source : DRI Report for the European Commission.

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(1) Percentage change in the level after 15 years compared to the reference case.