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(出國類別：考察)

赴法國考察氣候變遷政策出國報告書

服務機關：行政院環境保護署
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關鍵詞: 氣候變遷、溫室氣體

內容摘要: 為促進我國與法國在因應氣候變遷相關政策與措施上的交流與合作，本署依據九十年度中法環保合作計畫派員於九月二十三日至十月一日赴法國考察氣候變遷政策。共考察法國能源及環境管理署、跨部會氣候變遷工作小組、環境及國土管理部、國家氣候動力學實驗室、ARIA科技公司、CDC IXIS財務工程公司、空氣污染跨學門技術中心、法國石油機構與國際能源總署等相關單位。

本文電子檔已上傳至出國報告資訊網

目錄

壹、考察目的	1
貳、行程	2
參、考察主要內容	3
一、法國能源及環境管理署	3
二、跨部會氣候變遷工作小組	3
三、環境及國土管理部	4
四、國家氣候動力學實驗室	4
五、ARIA 科技公司	5
六、CDC IXIS 財務工程公司	5
七、空氣污染跨學門技術中心	6
八、法國石油機構	6
九、國際能源總署	6
肆、結論與建議	7
伍、附錄	8
附錄一：法國國家氣候變遷計畫報告	
附錄二：空氣污染跨學門技術中心（CITEPA）簡介	
附錄三：國際能源總署 Cedric Philibert 先生論文—Considering the options: climate targets for all countries	

壹、考察目的：

為促進我國與法國在因應氣候變遷相關政策與措施上的交流與合作，
本署依據九十年度中法環保合作計畫派空保處楊工程員啟仁於九月二十三日至十月一日赴法國考察氣候變遷政策。

貳、行程：

日期	地點	工作內容
九十年九月二十三日	台北->巴黎	起程
九十年九月二十四日	巴黎	拜會法國能源及環境管理署及跨部會氣候變遷工作小組，考察其氣候變遷相關政策。
九十年九月二十五日	巴黎	拜會環境及國土管理部及國家氣候動力學實驗室，考察其氣候變遷相關政策與工作情形。
九十年九月二十六日	巴黎	拜會法國能源及環境管理署經濟部門及 ARIA 科技公司，考察其氣候變遷相關政策與工作情形。
九十年九月二十七日	巴黎	拜會 CDC IXIS 財務工程公司及空氣污染跨學門技術中心，考察其氣候變遷相關工作情形。
九十年九月二十八日	巴黎	拜會法國石油機構與國際能源總署，考察其氣候變遷相關工作情形。
九十年九月二十九日至十月一日	巴黎->台北	回程

參、考察主要內容

一、 法國能源及環境管理署

九月二十四日下午，在法國外交部 Sabina Skarbova 女士陪同下，拜會法國能源及環境管理署國際事務處副處長 Jean-Claude Oppeneau 先生，Oppeneau 先生針對法國能源及環境管理署之主管業務進行簡報，並說明此次考察之相關安排。Oppeneau 先生並說明法國環境及國土管理部、能源及環境管理署，以及跨部會氣候變遷工作小組之任務分工關係，環境及國土管理部負責政策訂定，能源及環境管理署負責各項技術支援，跨部會氣候變遷工作小組則負責整合與協調政府各部門有關氣候變遷之相關政策與措施。

九月二十六日上午再度赴法國能源及環境管理署拜會經濟處處長 Jean-Pierre Tabet 先生，Tabet 先生簡介法國能源及環境管理署有關氣候變遷相關之各項經濟分析，說明法國的分析結果認為京都議定書所要求的減量目標所造成的經濟衝擊應該是在法國可接受的範圍之內。即使法國國內減量完全失敗，法國也有足夠財力向國際購買減量額度。

二、 跨部會氣候變遷工作小組

二十四日下午拜會法國跨部會氣候變遷工作小組資深顧問 Arthur Riedacker 先生，法國跨部會氣候變遷工作小組是法國有關氣候變遷

的最高主管機關，該小組負責氣候變化綱要公約的各項談判與協商、國家通訊編撰、以及協調整合政府各部會有關氣候變遷之相關工作。會中談及其對於將於摩洛哥舉辦之第七次締約國大會之展望，其認為第七次締約國大會將不會有重要進展。

三、 環境及國土管理部

二十五日上午拜會法國環境及國土管理部，由負責氣候變遷研究工作之 Maurice Muller 先生接見，Maurice Muller 先生簡介法國在氣候變遷相關研究工作進展情形，並說明未來之規劃。

四、 國家氣候動力學實驗室

二十五日下午拜會法國國家氣候動力學實驗室，由 Laurent Z.X. Li 先生介紹法國國家氣候動力學實驗室有關氣候變遷相關模擬研究情形，他說近年來已觀察到墨西哥灣流有減弱的跡象，若是墨西哥灣流繼續減弱或消失，則將對歐洲氣候造成重大衝擊，歐洲可能變成像西伯利亞一般嚴寒，他並指出學界亦懷疑全球溫暖化可能對亞洲季風型態產生影響，但目前該實驗室研究重點集中於歐洲，對其他地區的研究結果較少，但該實驗室樂於與其他地區之相關研究計畫進行合作。

五、 ARIA 科技公司

二十六日下午拜訪 ARIA 科技公司，由 Armand Akbergel 博士、Stanislas Verley 先生與 Genevieve Guerinot 博士簡報其工作與研究成果，ARIA 科技公司主要工作是開發空氣品質模擬與預測模型，目前正與本署洽談合作事宜。

六、 CDC IXIS 財務工程公司

二十七日上午拜會 CDC IXIS 財務工程公司資深副總裁 Heneage Legge-Bourke 先生，CDC IXIS 是法國國營之銀行，目前正規劃溫室氣體排放交易登錄管理系統，Legge-Bourke 先生針對該系統進行簡報，該系統之設計已近於完成階段，但由於尚未經官方正式認可，因此尚無法對外公開。

七、 空氣污染跨學門技術中心

二十七日下午拜會法國空氣污染跨學門技術中心主任 Remy Bouscaren 先生，空氣污染跨學門技術中心是負責編纂法國各種空氣污染物排放清冊與溫室氣體排放清冊之民間組織，Bouscaren 先生就溫室氣體排放清冊編纂工作進行介紹，並談及該工作之複雜性極高，造成事後檢證之工作幾乎成為不可能。

八、 法國石油機構

二十八日上午拜會法國石油機構，由該機構環保部門主管 Alain Feugier 先生接見，Feugier 先生簡介該機構有關環境保護與節約能源之相關研究，並說明該機構在節能引擎與燃料電池之技術具有世界領導地位。

九、 國際能源總署

二十八日下午拜會國際能源總署能源與環境部門主管 Cedric Philibert 先生，Philibert 先生除介紹國際能源總署與氣候變遷之相關工作外，並談及其對氣候變化綱要公約未來之展望，他認為開發中國家之大排放國（如：中國大陸、印度）終將被要求設定非拘束性的減量目標，而韓國、新加坡之類的新興工業化國家可能會被要求採與類似阿根廷所提出的隨經濟成長變動的動態減量目標，由於政治的敏感性與複雜性，國際間對於台灣的溫室氣體排放問題多避而不談。因此我國在氣候變化的議題上幾乎可說是完全被忽略。

肆、結論與建議

本次考察行程可謂在法國外交部、法國在台協會與法國環境與能源管理署鼎力協助圓滿順利，除增進我國對法國在氣候變遷相關政策與研究成果之瞭解外，並藉訪問之機會宣傳我國在對抗氣候變遷工作之努力與成果，未來建議基於此次之基礎上，洽談進一步合作之機會，以使雙方在資訊分享上達到互惠的效果。

伍、附錄

附錄一： 法國國家氣候變遷計畫報告

national programme

*for tackling
climate change*

2000/2010



This document has been created under the direction of the Interministerial Task-Force on Climate Change, in collaboration with the Ministry of Land Planning and the Environment. It responds to a request made by the Prime Minister, expressed during the Inter-ministerial Committee on Climate Change in November 1998, and was validated by the Committee on 19th January 2000. This programme identifies around one hundred measures by which France will honour the commitments made in Kyoto to bring the level of greenhouse gases produced in 2010 down to their 1990 level. It is the result of numerous reports produced by various working groups which included ministerial representatives, experts and those working in business and representative groups.

Foreword

The Hague conference is fast approaching and will be critical to the implementation of the Kyoto Protocol. In parallel, France has developed an ambitious national programme to tackle climate change.

It was, at the initiative of France once before in the Hague, in 1989, that the world negotiations on the greenhouse effect were first launched. Again, it was a Frenchman, Jean Ripert, who then led the preparatory work for the Climate Convention leading to its adoption in Rio in 1992. Evidence, if any were needed of our country's significant role in bringing this project to fruition.

Since then, France has further confirmed its decisive role in these negotiations, as part of European Union, during the conferences which followed the signature of the convention and in its initial implementation. For almost three years now it has done this under the leadership of Mrs Dominique Voynet, the Minister for Land Planning and the Environment.

In 1998, the current government set itself the task of developing national measures to fight global warming so as to fulfil our international commitments, particularly those resulting from the Kyoto Protocol. These measures build on those adopted in 1993 and added to in 1995. All the public administrations and actors involved in this task have done so with great earnest and rigour.

This programme aims to maintain our country's economic competitiveness and the overall ecological balance. It is perfectly in keeping with the continuity of government action, integrating our concerns about global warming with a raft of decisions already taken in such fields as renewable energy, the overall priorities for the plan contracts and the reorientation of transport towards rail.

Several key principles have inspired this report: putting in place economic instruments; striking the right balance between domestic measures and market mechanisms; ensuring efficiency and economy in the use of energy both in production and in consumption; and making sure that we have detailed information on the consequences, in terms of emissions of greenhouse gases, of all public and private investment decisions.

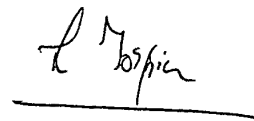
Significant uncertainty surrounds the relationship between global warming and climate changes. In the face of such uncertainty our political duty is to take account of scientific findings through the implementation of the principle of precaution. In this, we are simply putting into effect article 3 of the Framework Convention on Climate Change. This article holds that the lack of scientific certainty should not be used as a reason to postpone the adoption of precautionary measures destined to anticipate, prevent or minimise the causes of climatic change and mitigate its adverse effects.

However all our efforts even if widely shared in Europe, will be of little effect if they are not matched on other continents. Our American partners have, of course, pressing obligations. I would say that they are gradually becoming aware of this fact. Attitudes are also changing in developing countries all the more important as these countries are the first affected by the consequences of global warming. Some are in a very vulnerable position indeed.

We owe a particular duty of solidarity to these countries which must be translated into better adapted cooperation policies. Hence France's intention, through its cooperation policy, to favour the so-called clean development and joint implementation mechanisms, so long as a real, international system of verification of such projects can ensure their authentic and lasting nature.

I have no doubt that this programme will contribute to increasing the sustainability of our country's growth. As this report shows, we cannot reach this objective without an appropriate system of "governance" which requires partnership between business, local authorities and non-governmental organisations at the local, national and international levels.

In this way, the government's ambition, will become the ambition of all French citizens.

A handwritten signature in dark ink, appearing to read 'L Jospin', is written above a horizontal line.

*Lionel Jospin
Prime Minister*

Introduction

Month after month, the alert given by the world's scientific community and ecologists on the risk of global climatic changes is confirmed. The Earth's temperature has probably increased by over 0.6°C during the 20th century. Precipitation is increasing, particularly in medium and high latitudes. The surface area and thickness of the ice caps are decreasing. Alpine and continental glaciers continue to diminish.

Scientists also estimate that climate change will result in an increase in the frequency of freak climatic phenomena. Although one cannot attribute with any degree of certainty the double storm which has just hit France to climate change, this storm has revealed the vulnerability of our country to extreme climatic developments. The principle of precaution must force us to take action to reduce the risk and to anticipate probable consequences.

The first stage in this effort which must be continued throughout this new century is to implement without delay the commitments made by industrialised countries in Kyoto in December 1997. Developed countries must indeed work towards reducing their greenhouse gas emissions and stop offering countries in the southern hemisphere a development model based on ever-increasing energy consumption.

It is with this in mind that I wanted a national programme to be established, setting the objective to respect our commitments by implementing measures to reduce emissions within our country.

The programme is the result of a considerable amount of technical work which has been undertaken under the direction of the Interministerial Task-Force on Climate Change, with the active participation of my ministry. Developments in our greenhouse gas emissions between 1990 and 2010 had to be assessed in every sector of activity and possible measures had to be found in order to reduce them. Taken individually, each of these measures (regulatory or incentive, covering information, training or taxation) may appear to be limited in scope; taken as a whole, this raft of measures constitutes a coherent programme which should enable us to achieve the Kyoto objective.

This national programme is both a range of measures to be applied immediately and a work schedule indicating the fields in which we must specify measures to be taken in the forthcoming years. I place particular importance on its effective implementation.



Dominique VOYNET

Contents

1. France's responsibility in terms of climate change

- 1 The phenomenon, gas emissions and potential impacts
- 2 International negotiations and European commitments
- 3 France's efforts to reduce emissions

p 13
p 15
p 20



2. The programme's main options

- 1 Measures taken, reference forecast
- 2 New measures reinforcing and extending existing measures
- 3 Recourse to economic mechanisms
- 4 Long-term structural action on the supply side

p 31
p 33
p 36
p 45



3. The industry sector

- 1 Emissions in the industry sector
- 2 The existing measures
- 3 New measures

p 51
p 54
p 58



4. The transport sector

- 1 Emissions in the transport sector
- 2 The existing measures
- 3 New measures

p 65
p 69
p. 75



5. The building sector

- 1 Emissions in the buildings sector
- 2 The principal existing measures
- 3 New measures

p. 99
p 102
p 104



6. The agricultural sector, forests and forest products

- 1 Emissions and absorption in the "agriculture and forest" sector
- 2 The principal existing measures
- 3 New measures

p 123
p 128
p 129



7. The waste sector

- 1 Emissions in the waste sector
- 2 The principal existing measures
- 3 New measures

p 141
p 142
p 143



8. The energy production sector

- 1 Emissions in the energy production sector
- 2 The principal existing measures
- 3 New measures

p 147
p 149
p 150



9. The refrigerant gas sector

- 1 Gas emissions
- 2 The existing measures
- 3 New measures

p 161
p 163
p 163



10. The various territorial levels

- 1 Europe
- 2 Territorial anchoring
- 3 Local districts and major cities

p 171
p 175
p 178



11. Cross-cutting measures

- 1 Information and training
- 2 Research and development
- 3 North-South co-operation

p 181
p 183
p 187



12. Managing the fight against the greenhouse effect

- 1 Tools for monitoring emissions and measures
- 2 Assessment of measures and development of emissions
- 3 Steering and adapting the national plan

p 201
p 202
p 203



Annexes

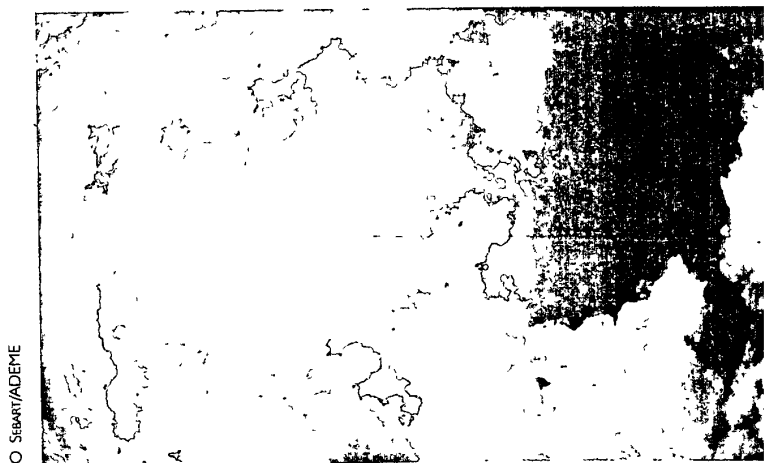
Recapitulation of the measures in the national programme on the greenhouse effect in MtCe	p 207
Acronyms/Abbreviations	p 211
Graphs and tables	p 213
Bibliographic references	p 215



NATIONAL PROGRAMME FOR TACKLING CLIMATE CHANGE

France's responsibility in terms of climate change

- 1 The phenomenon, gas emissions and potential impacts
- 2 International negotiations and European commitments
- 3 France's efforts to reduce emissions





France's responsibility in terms of climate change

1 The phenomenon, gas emissions and potential impacts

What is the greenhouse effect?

The average temperature on our planet is the result of a balance between the flow of rays which reach it from the sun and the flow of infrared rays sent out into space. The distribution of temperature at ground level depends on the quantity of greenhouse gases (GHG) present in the atmosphere. Without these gases, the average temperature would be -18°C and the earth would be uninhabitable. Their presence takes the temperature up to 15°C . The gases responsible for the anthropogenic greenhouse effect are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), tropospheric ozone (O_3), CFCs and HCFCs ⁽¹⁾, synthetic gases responsible for damage to the ozone layers, along with CFC substitutes: HFCs, PFCs and SF_6 .

Greenhouse gases occur in only very small amounts naturally. However, due to human activity, the concentration of these gases in the atmosphere has been considerably modified. For example, the concentration of CO_2 , the main GHG, has increased by 30% since the pre-industrial era. The combined effects of all GHGs together today equal a 50% increase in CO_2 over this same period.

What are the effects on climate of the increase in GHG emissions?

The Inter-governmental Panel on Climate Change (IPCC ⁽²⁾) produced its second assessment report in 1995. It concluded, amongst other things, that: -

– since 1750 the level of CO_2 in the atmosphere has increased by 30% and that of CH_4 by 145%.

1 CFCs and HFCs are governed by the Montreal Protocol

2 The Inter-governmental Panel on Climate Change (IPCC) was set up jointly by the world meteorological organisation and by the United Nations programme for the environment in 1988. Its role is to assess (i) scientific data available on climatic change, (ii) ecological and socio-economic effects of this change and (iii) to put forward strategies to parry these effects, so-called attenuation or adaptation. The IPCC produced an initial assessment report back in 1990 and a second assessment report was produced in 1995.

- since the end of the 19th century, the earth's temperature has increased 0.3°C to 0.6°C and we have observed a rise in sea levels of between 10 and 25cm.
- every analysis confirms the significant effect of human activities on these variations, even though there remain many uncertainties as to assessments and particularly as to the consequences which may result.
- "The comparison between the change observed in the average global temperature and the result of simulations suggests that global warming over the last hundred years is probably not due to natural causes alone and that the geographical characteristics of warming due to human activities are identifiable in climate observations"

What can be said for the future?

According to the IPCC report, between now and 2100 according to various scenarios linked to the development of society, global warming could reach 1° to 3.5°C and sea levels could rise by 15 to 95cm (mainly under the effect of thermal expansion). The increase in temperatures should provoke more powerful hydrological cycles, i.e. more severe drought and flooding and an increase in precipitation. Rapid, sustained climatic development could also modify the balance between species and lead to deterioration of the forests, which are CO₂ sinks.

Forecasts obtained are more reliable at hemispheric or continental level than at regional level. We can rely more on forecasts in terms of temperature than on those concerning the hydrological cycle.

As for Europe, forecasts predict a warming trend, along with intensified hydrological cycles, the amplitude of which would increase in the northern part of Europe and would decrease in the southern part. In France ⁽³⁾, the rise in sea levels would lead to permanent flooding of coastal areas which are currently scarcely or incompletely emerged. In continental France, the regions most concerned with this phenomenon are the delta areas of the Camargue region and the lagoon coast of the Languedoc region. Also, in the Overseas Departments and Territories, the rise in the temperature of sea water could be harmful for coral which, for the most part, would not survive beyond 29°C–30°C. It is also liable to increase the frequency and amplitude of cyclones, which are particularly damaging to atolls. The increase in temperature would also lead to a clear decrease (by 20 to 30%) of the length of time the lower altitude Alps (1,500m) are snow-covered. It is important to underline here that these forecasts do not include the possibility of the appearance of large-scale effects which could be linked, for example, to major changes in oceanic drifts.

³ A document entitled "Potential impacts of climate change in France during the 21st century" has been published by the Interministerial Task-Force on Climate Change and the Ministry of Land Planning and the Environment.



What will be the probable dangers linked to global warming?

It is probable that the least developed countries and the most vulnerable ecosystems will suffer the most from climatic changes. Increased drought will lead to a fall in agricultural yields in arid zones and therefore add to the risks of famine, coastal areas, islands and archipelagos will fall below sea level, etc.

In a general way, the scale and frequency of storms, floods, high winds and cyclones could increase, thereby leading to an intensification of meteorological accidents.

Except for cold regions, where mortality due to the cold will decrease, global warming will be for the most part prejudicial to human health. Moreover, the reinforcement and extension of hot periods will increase mortality and cases of cardio-respiratory disease, mainly in cities. Also, areas affected by infectious diseases transmitted by tropical insects will be considerably extended.

Finally, on a global scale, according to the second report of the IPCC, the cost of damage linked to a 2.5°C increase in temperature is estimated at 1.5 to 2% of world GDP. This cost is reduced to 1–1.5% of GDP for developed countries and could be over 2% for developing countries.

2 International negotiations and European commitments

The experts' view is that **climate change would appear to be irreversible**. To stabilise CO₂ concentration at current levels, one would actually have to immediately reduce gas emissions by 50 to 70%, which is clearly impossible. In order to moderate expected effects, one must, however, act very quickly because we are facing a **cumulative problem**. "Stabilisation of CO₂ concentrations at any given time will depend more on accumulated emissions of CO₂ of human origin up until that date, than on the development of emissions up until then. This implies that to obtain stabilisation of concentrations at a certain level, one would have to reduce emissions more dramatically later if they remain higher initially" (IPCC report, 1995). The longer one waits before taking action, the more brutal the measures that need to be taken. Furthermore, climatic system development times are such that by the time that scientists have sufficient elements to inform us of the scale of the risks, it will be too late to undertake any kind of preventive action.

It is therefore on the basis of the *principle of precaution* that the international community has mobilised to combat climate change.

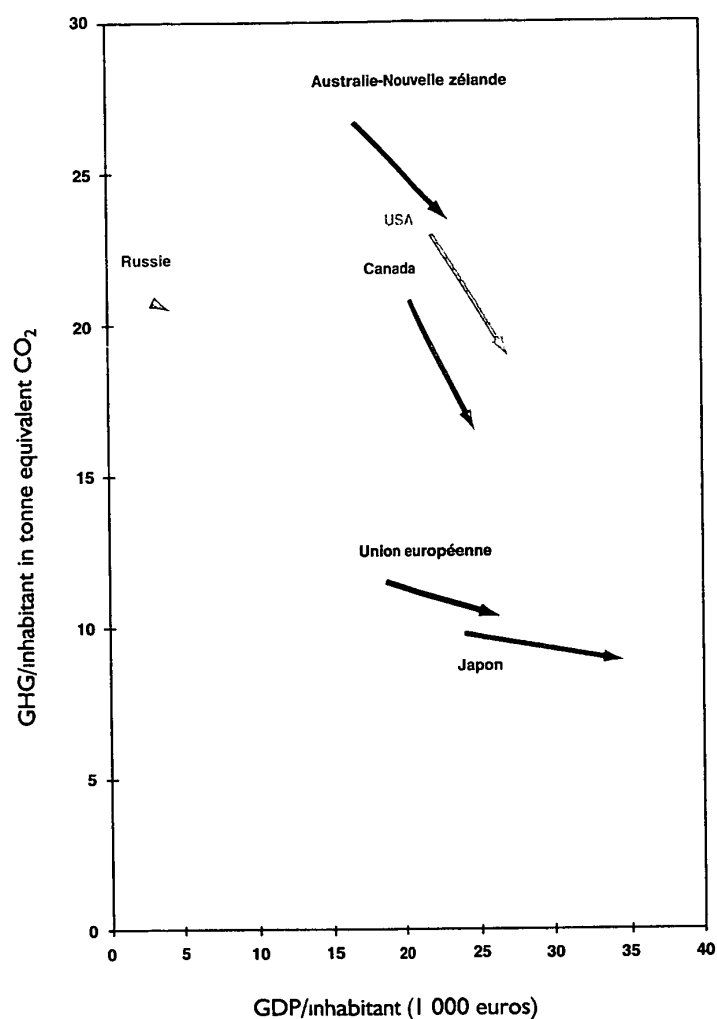
At the initiative of France, Spain and the Netherlands, the first major international conference was held on climate change in the Hague in March 1989 and was attended by eighty countries. The Earth Summit was then held in Rio in June 1992 and the United Nations Framework Convention on Climate Change (UNFCCC) was signed by 176 States, including all European states, plus the European Community. This link which the Climate Convention shares with the Rio Conference on biodiversity and desertification should be underlined here since it forms part of the fight against climatic change in the wider search for sustainable development. The UNFCCC commits the Parties listed in its annex I ⁽⁴⁾ to maintain GHG emissions at their 1990 level in the year 2000. To this end, all Parties commit themselves to publish regular greenhouse gas inventories and to adopt national programmes. The UNFCCC came into force on 21st March 1994. The "Conference of Parties to the UNFCCC" has met every year since 1995.

The Kyoto Protocol, drawn up during the third Conference of Parties in November 1997, strengthened the commitment and shared the effort between the signatory countries to annex I. These countries must reduce their overall emissions by 5.2% compared with 1990 levels, for the period 2008-2012. The Kyoto Protocol specifies which greenhouse gases are concerned in its annex A: CO₂, CH₄, N₂O, HFC, PFC and SF₆ ⁽⁵⁾. "Legally binding" emission reduction quotas were set for each of the Parties to annex I after the Kyoto negotiations, which endeavoured to take account of their specific characteristics (*figure 1*).

4 Developed countries and countries in transition towards a market economy

5 These gases each have a different global warming potential (GWP). This is expressed in units of mass taking CO₂ as a reference. Thus, 1 kg of N₂O has the same GWP after 100 years as 310 kg of CO₂. The GWP after 100 years of CH₄ is given at 21 kg/kg, of PFC at 6,500 kg/kg, of SF₆ at 23,900 kg/kg and of HFC at between 300 kg/kg and 11,700 kg/kg. The extremely high GWP of fluoride gases is observed.

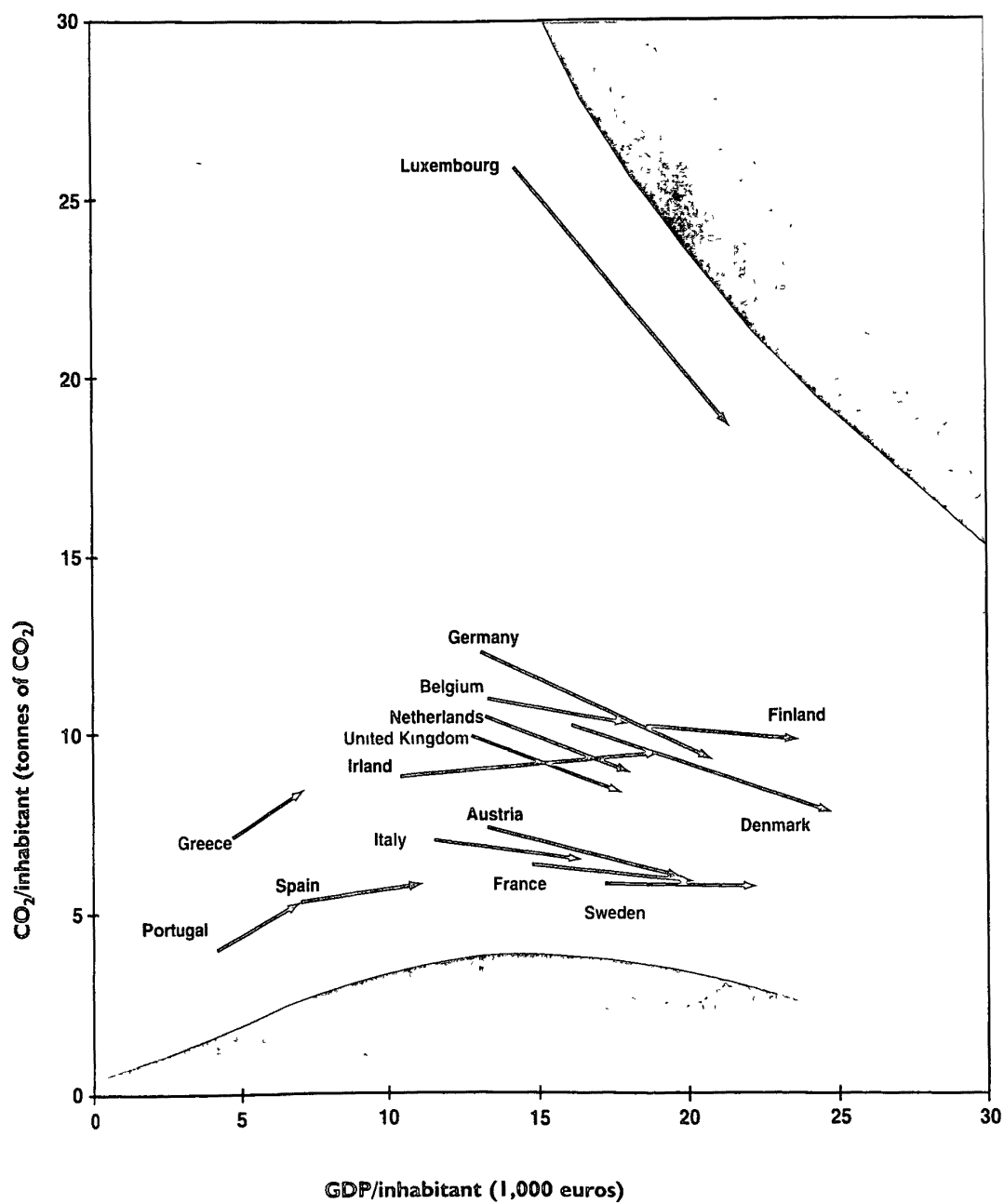
Figure 1 - Commitment made in Kyoto by industrialised countries:
1990 position and 2010 forecast (objectives retained in Kyoto).



Source I C E. 1999

The European Union has committed itself to an 8% reduction in emissions for the 2008-2012 commitment period and each of its members has also been attributed its own emissions reduction quota, in application of article 4 of the Kyoto Protocol. Burden-sharing within the European Union was established during the European Union Council of Ministers for the Environment held on 17th June 1998. For its part, France should limit its average emissions over this commitment period to its 1990 emissions level (figure 2).

Figure 2 – Distribution of commitments within the European bubble
(Environment Council proposal dated June 1998)



Source ICE 1999



I - FRANCE'S RESPONSIBILITY IN TERMS OF CLIMATE CHANGE



Article 2 of the Kyoto Protocol states the importance of national policies to combat the greenhouse effect for Parties to annex I. Thus, each of these parties "in order to meet quantified commitments applies and sets up policies and measures according to its own domestic position....".

Alongside quantified, strict and obligatory commitments made by countries in annex I, the Kyoto Protocol also provides for the possibility for these countries to have recourse to three mechanisms which introduce a degree of flexibility in the implementation of actions aimed at achieving their objectives (figure 3).

- Trade in emissions credits between countries in annex I, which will start in 2008. One refers to Tradable Emissions Permits.
- The Clean Development Mechanism, or CDM, provides for the possibility for a country in annex I to be granted, from the year 2000, certified emissions credits as a result of projects implemented in non-Annex I countries. Such projects must, according to article 12 of the Kyoto Protocol, also meet the target of sustainable development.
- Transfer of emissions credits obtained by the intermediary of projects between annex I countries will commence in 2008. This mechanism is known as Joint Implementation, or JI.

Figure 3
The three Kyoto mechanisms

<i>Mechanism</i>	Tradable emissions permits	Joint implementation	Clean development mechanism
<i>Scope of application</i>	Restricted to Annex I countries		All countries
<i>Type of operations</i>	Trade in emissions rights	Project implementation	

"The Parties included in Annex B may participate in emissions trading for the purposes of fulfilling their commitments under Article 3. Any such trading shall be supplemental to domestic actions for the purpose of meeting quantified emission limitation and reduction commitments under that Article".

There is currently a debate within annex I countries about what should be the relative importance of emission reductions obtained by domestic policies and emission rights obtained by recourse to these mechanisms and, consequently, on the interpretation of article 17 of the Kyoto Protocol. Both France and the European Union take the position that their usage can only be in addition to national efforts which constitute the major part of the commitment made in the Protocol. The reason they exist is to facilitate implementation over time, in space, by sector and even to substitute for domestic policies, whence the necessity of agreement as to a limit for their usage. In practice, during the European Council meeting in Cologne in June 1998, the Union proposed setting a ceiling on the volume of exchangeable emission quotas.

France's efforts to reduce emissions

In accordance with international decisions, France has successively drawn up several national programmes to combat the greenhouse effect. Thus, for the commitment period which corresponds to the objective set by the Convention, i.e. 1990-2000, and in order to attain the objective of maintaining GHG emissions in 2000 at their 1990 level, France supplied the European Commission, back in March 1993, with the *"first elements for a French programme to combat the greenhouse effect"*. Then, in February 1995, *"an initial national programme to prevent climate change"* was designed and presented in the *"First National Communication to the Framework Convention on Climate Change"*. In November 1997, a second plan was drawn up (*"Second National Communication to the Framework Convention on Climate Change"*). The measures proposed at that time were then reinforced, prior to the Kyoto Conference, by decisions taken at the Council of Ministers on 26th November 1997.

Later, commitments made in Kyoto by the European Union on the one hand, and the burden-sharing within the European Union on the other, required the implementation of a new national programme. This decision was taken by the Interministerial Commission on Climate Change which was held on 27th November 1998 and chaired by the Prime Minister.

⁶ The list of countries given in annex B of the Kyoto Protocol differs from that in annex I of the UNFCCC, for several countries it includes Croatia, Liechtenstein, Monaco, the Czech Republic and Slovakia (replacing the former Czechoslovakia) and Slovenia. However, it does not include either Turkey or Belarus.

Energy consumption and emissions of carbon dioxide by sector of activity in France in 1997

274

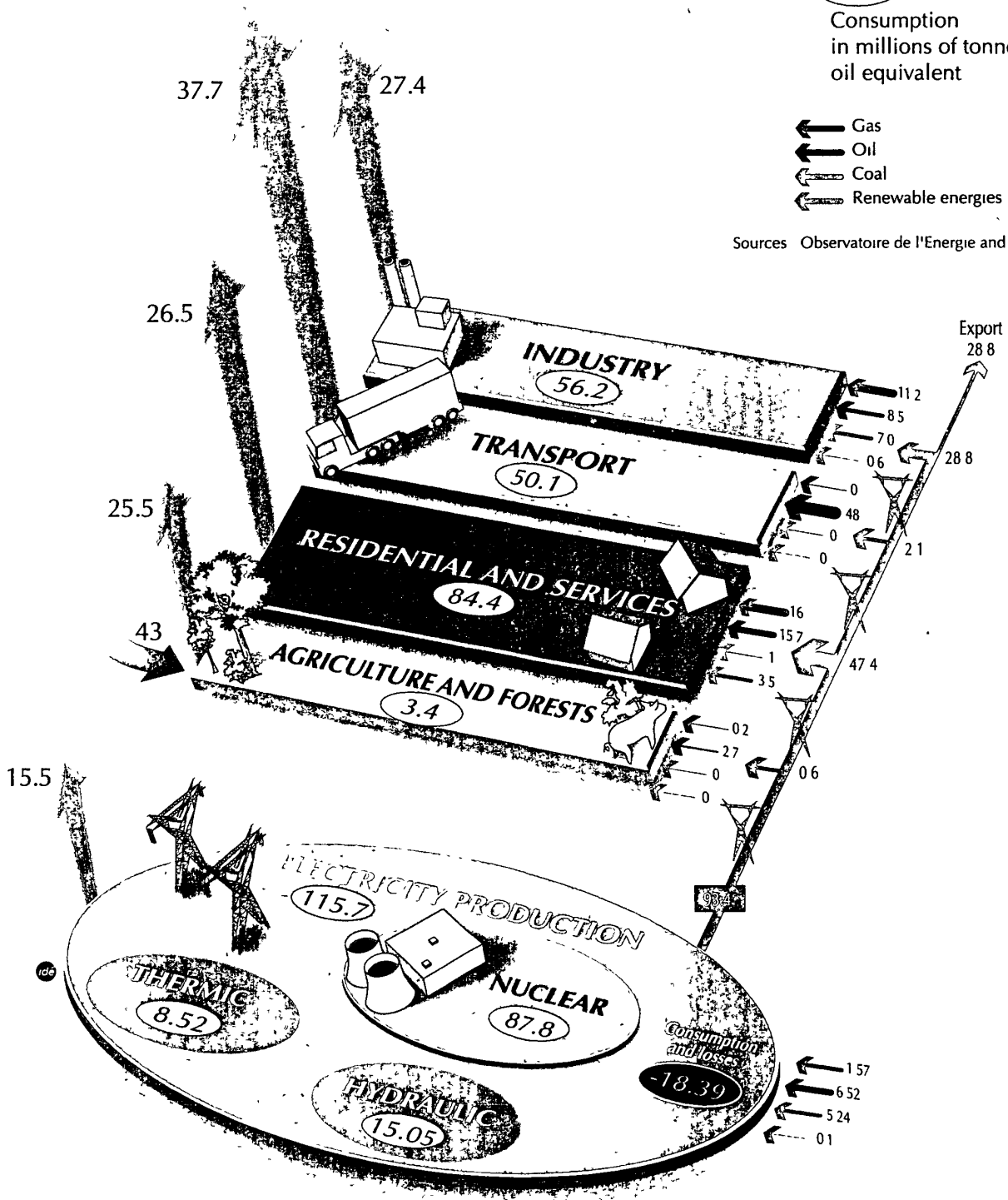
CO₂ emission
in millions of tonnes
of carbon

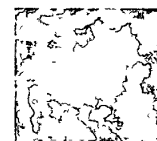
56.2

Consumption
in millions of tonnes
oil equivalent

- ← Gas
- ← Oil
- ← Coal
- ← Renewable energies

Sources Observatoire de l'Energie and CITEPA

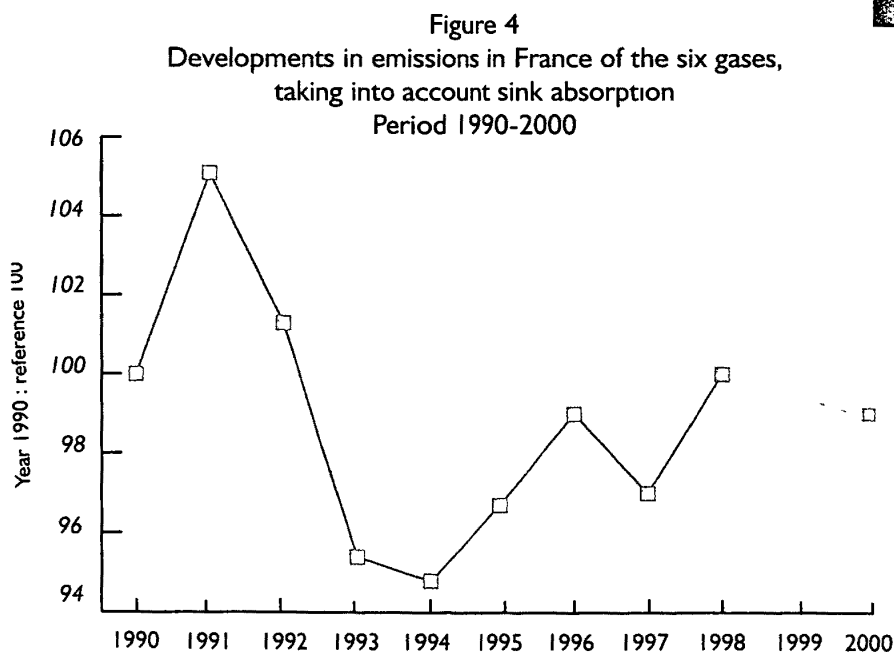




- What is our current position in terms of the commitments made in Rio?

Figure 4 presents the development of emissions of the six greenhouse gases retained by the Kyoto Protocol for the period 1990-2000. These emissions take account of the global warming potential of the various gases. In accordance with the Convention, they also include absorption by carbon dioxide sinks: this is calculated by means of the sinks estimation method used by France in its annual inventories of greenhouse gas emissions. Finally, a forecast of emissions for the year 2000 has been produced ⁷.

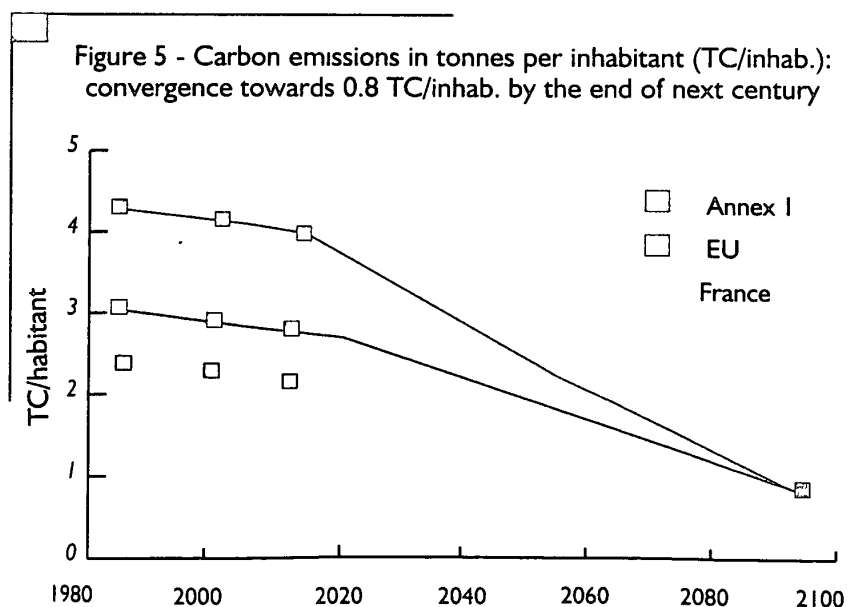
It would now appear that France will be able to show in the year 2000 that it has correctly fulfilled its commitments under the terms of the UNFCCC. However, this result cannot be dissociated from the economic climate at the start of the decade. It is also attributable to the reduction in N₂O emissions in the industrial sector, and the effects of measures taken should stabilise between 2000 and 2002. In reality, if additional measures to those already decided on were not taken, a constant increase in greenhouse gas emissions is forecast between 2000 and 2010, mainly due to increased consumption of fossil fuels in the transport, residential and services sectors.

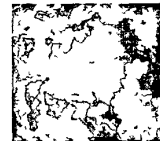


⁷ This forecast uses data currently available

For France, the Kyoto Protocol, and the European burden-sharing results in the obligation of not exceeding on average, over the five years between 2008 and 2012, the level of atmospheric greenhouse gas emissions which it had reached in 1990. *The fact that this stability would appear to be more or less achieved for the decade between 1990 and 2000 should not mislead us*, compliance with this commitment is not easy. One must take account, for the forthcoming decade, of possible developments in our use of fossil resources; one must even expect, after 2010, still greater restrictions. Although, in this programme, reference is made, as in the works done by the General Plan Commission, to the horizon of 2020, this is in order to take better account of what is in fact a triple transition:

(1) Transition compared with medium and long term developments in the fight against climate change – In the debates on the future of the Convention, our country insists specifically on the ideas of fairness and convergence. This of course concerns first and foremost developing countries. However, amongst the many defects and weaknesses of the mechanism adopted in Rio and completed in Kyoto, one notes that an initial step towards convergence in the long term has been taken thanks to the distribution of effort made in 1997 between industrialised countries. If the commitments made by our main European and OECD partners are kept to, a trajectory towards significant reduction in emissions per inhabitant will have been launched during the first decade of the next century. Figure 5 shows that we will also be required to





organise an inflection in the same direction: not delaying this inescapable development complies both with our ethics and our interests.

(2) Transition for our energy system – The impact, in terms of carbon dioxide emissions, of the energy policy implemented since the first oil crisis, has continued to be important over the past decade. However, the feeling of lesser vulnerability of our energy supply reveals threats for our energy efficiency. About ten years ago, France was at a relatively low energy intensity level compared with most developed countries; however, both in primary and final energy terms, other countries have had a tendency to get closer to French levels which, for their part, have been marked by lower reductions ⁽⁸⁾. Also, recourse to nuclear energy for electricity generation has reached a level such that it is no longer liable to offer additional substitutions to the use of fossil fuels, beyond the bases offered by current over-capacity. Already today, beyond this base, recourse to nuclear power for energy generation represents a cost in terms of carbon savings which appears high when compared, for example, to the best sectors using gas ⁽⁹⁾. Moreover, savings would still appear to be possible with consistent rationalisation of electricity usage.

The period covered by this programme is not directly affected by problems linked to ageing of the nuclear stock. However, the debate announced by the Government on strategies to be adopted will start from this point at the very least. The current programme must allow options to be kept open, despite the probable severity of commitments for later periods. Thus, one will also observe that room for manoeuvre would risk being too narrow if one were to lack courage in objectives and in the spirit of innovation in measures taken.

This is the reason why it was specified in the mandate given to the ITFCC that preparatory work on this programme would take its inspiration from work undertaken by the General Plan Commission under the general title "Energy 2010-2020" and specifically from the three scenarios studied at the time. Of course, these scenarios were not specifically designed to accompany decisions relating to the 2000-2010 programme. Nonetheless it is scenario S₃, a scenario of transition towards greater energy restraint, which describes developments most compatible with France's commitment for 2010. Reference is therefore made to this scenario in the definition of sectorial policies.

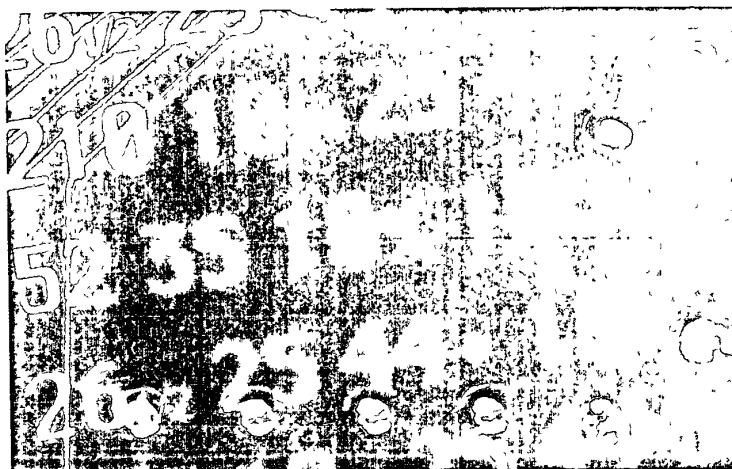
⁸ See assessment report "Energy Control" produced by the Interministerial Commission on the Assessment of Public Policies under the chairmanship of Yves Martin

⁹ "At the request of the Prime Minister, a study is currently being undertaken on economic data for the entire nuclear sector – economic comparisons being carried out in this perspective in terms of complete costs of other energy sources" This study has been entrusted to Mr Charpin, Mr Dessus and Mr Pellat and the report should be ready before end March 2000

(3) *Transition towards an economy using less raw materials and more service-orientated.* – The major players in the sectors studied in the programme all agree: their customer-service activity, particularly in terms of consumption moderation, will, in the normal course of events, become increasingly important. One will sell not only energy, transport and buildings, but also ways of using them more moderately. The challenge which such a development represents goes far beyond industrialised countries alone. Amongst “technology transfers” which will be necessary with regard to developing countries, this service engineering sector will play an essential role in the future. □

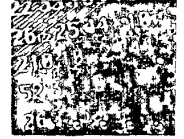
The programme's main options

- 1 Measures taken, reference forecast
- 2 New measures reinforcing and extending existing measures
- 3 Recourse to economic mechanisms
- 4 Long-term structural action on the supply side





The programme's main options



In 1990, France emitted, for the six gases listed in the Kyoto Protocol, 144 million tonnes carbon equivalent ⁽¹⁾. Without implementation of measures aimed at reduction, these emissions **would reach a level of 175MtCe by 2010**, i.e. almost one quarter more.

Assuming the complete implementation of measures decided before the adoption of the Kyoto Protocol, this level should be reduced to **160 MtCe**, i.e. still **16 MtCe higher than the reference year, 1990** ⁽²⁾. These indications correspond to what will be considered, in the rest of this document, as the *reference forecast*.

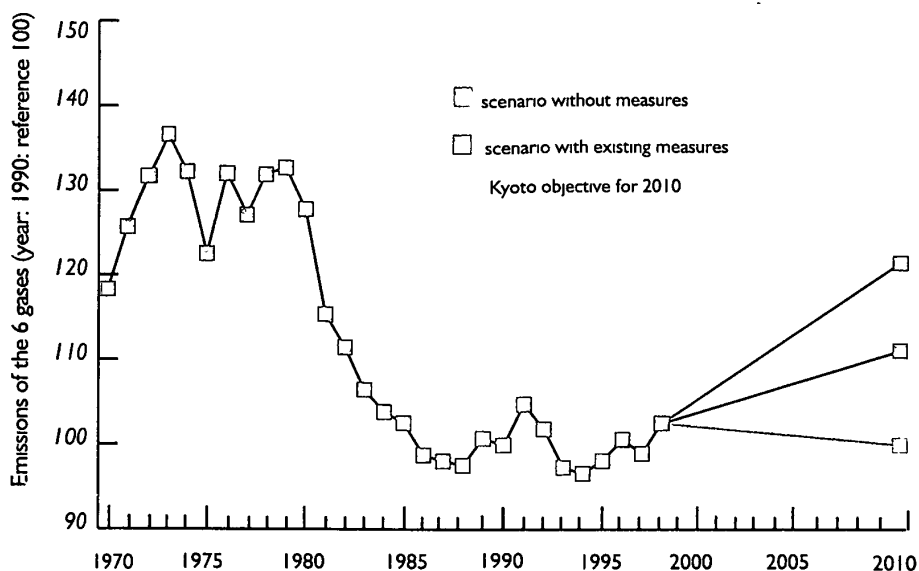
In other words, the additional effort, over and above measures already decided, to meet France's commitment of returning to its 1990 emissions level in 2010, consists of an additional reduction of around 10% of emissions which represents a limitation comparable to the European average.

One should also note, however, that the estimate of the effort required was done on the basis of a hypothesis of growth in accordance with that used by the General Plan Commission for its own work: 2.2% per year over the next decade. To give an idea of the sensitivity of emissions to growth, if this were to reach 2.8%, and given existing measures, emissions would be liable to reach 171 MtCe in 2010 compared with the 160 MtCe referred to above.

¹ Hereinafter referred to as MtCe

² Figures coherent after adjustment with the "Second National Communication" presented by France in accordance with the obligations of the Framework Convention on Climate Change (1997)

Graph 4 - GHG emissions in France from 1970 to 2010



This programme, has been put together to set out the tools which the Government intends to implement to enable France to meet its commitment of limiting its emissions to 144 MtCe, by the end of the 2008-2012 budgetary period. It sets out the following “pivot” objective, for 2.2% growth over the period 2000-2010 the programme is made up of a raft of “domestic” measures and actions aimed at avoiding the emission of 16 MtCe, thereby allowing the above-mentioned objective to be reached in terms of physical emissions effectively observed within the country.

In the “pivot” situation thus described, France, as a Party to the Kyoto Protocol, finds itself in a position as neither purchaser nor seller of emissions permits. The terms of this assumption are worth recalling here:

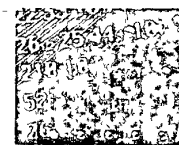
- as a Party, but without prejudice to the possibility for internal legal entities such as companies to use the mechanisms provided for in the Protocol and to which they have right of access.
- in the hypothesis chosen within the context of the programme, and particularly in terms of growth. If growth were to be different, steering of the programme must ensure the necessary adaptations to ensure that the nominal objective of 144 MtCe is not exceeded, including by means of recourse to emissions credits resulting from application of articles 6, 12 and 17 of the Kyoto Protocol up to the strict limit which will be decided on in order to respect their additional nature.



2 - THE PROGRAMME'S MAIN OPTIONS

The route taken to establish this programme of domestic measures corresponding to the 16 MtCe prevented (for all gases) is thus as follows:

- firstly one must ensure effective implementation of measures taken previously,
- then, one must complete exploration of various other measures of the same type: measures specific to each field of activity, some "without regret" at low or even negative cost: regulations, standards, labelling, training and information action, etc.
- work carried out by the sectorial groups which met during the first half of 1999 shows that this is not sufficient. The question must therefore be asked as to whether there should be recourse to economic regulatory mechanisms.
- finally, one must not ignore the linking of pluri-annual sequences in the reduction of emissions and the necessity of anticipating the period after 2012.



Measures taken, reference forecast

France is no stranger to the strong trends towards an increase in its emissions which could, in the twenty years between 1990-2010, have increased by almost 25% with a tendency towards acceleration during the second decade. The first decade was in fact marked by both the economic climate, with recession during the first few years, and structural effects, with the end of the process of transformation of industrial components favourable to moderation of CO₂ emissions of energy origin. Emissions are now, on the contrary, tending to increase in all sectors and specifically in the transport sector. Moreover, nitrous oxide and above all fluoride gases, the new arrivals from the Kyoto Protocol and partial inheritors of the Montreal Protocol, are also contributing to the increase in emissions.

Policies implemented or continued with during the nineties are correcting these developments: the reference forecast means that one can estimate that such policies will prevent almost 15% of emissions by 2010 (*table 2*).

Table I – 1990 Emissions (MtCe) *

1990	CO ₂	CH ₄	N ₂ O	HFC	Other fluorides	Total
Industry	28.03		7.60	0.60	1.50	37.73
Transport	32.41		0.30			32.71
Build/Services	26.30					26.30
Agriculture	2.60	8.71	16.90			28.21
Waste	0.50	2.60	0.10			3.20
Energy	15.91	1.77				17.68
Refrig. gas						0.00
(climate correction)	-2.36					-2.36
Total	103.39	13.08	24.90	0.60	1.50	143.47

* These figures are the result of France's Second National Communication. They have been adapted to take account of changes in method which have since occurred in the calculation of N₂O emissions for the agriculture / forests sector, changes which result in a very large upwards revision of corresponding assessments. We also observe that the sectional breakdown varies somewhat from that used for national inventories, this is to remain compatible with methods used for forecasts.

Table 2 – 2010 : Reference forecast

2010 reference	CO ₂	CH ₄	N ₂ O	HFC	Other fluorides	Total
Industry	26.40		1.80	1.20	1.15	30.55
Transport	41.90		1.50			43.40
Build/Services	28.40					28.40
Agriculture	2.75	8.71	17.30			28.76
Waste	3.15	0.50	0.55			4.20
Energy	20.20	0.67				20.87
Refrig. gas				3.40		3.40
Total	122.80	9.88	21.15	4.60	1.15	159.58



2 - THE PROGRAMME'S MAIN OPTIONS

However, the reference forecast does not change the general direction of most developments. It underlines persistent trends towards an increase in the buildings/services energy sectors and, above all, in the transport sector.

One should also note that many of the measures underlying the forecast have already achieved, over the past decade, the major part of their effects. This is the case for:

- elimination of nitrous oxide in the processes of some industries which emitted massive amounts of this gas,
- the linking of the final nuclear power plant units to the network, which were planned to be put into service.

Other measures are the result of decisions taken or on the point of being taken just prior to the Kyoto conference, and whose effects have been fully taken account of in reductions of emissions used for this forecast, such as:

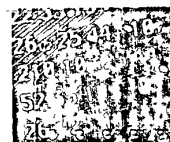
- taking account of the reduction in CO₂ emissions of private cars, such as indicated in the agreement made between the European Motor Vehicle Manufacturers Association (ACEA) and the European Union. Negotiations on this agreement were already well advanced when the Kyoto Protocol was signed. Incorporation of its effects into measures taken ⁽³⁾ underlines, in terms of differences observed, the large-scale growth in emissions in the transport sector once actions concerning vehicles have been implemented.
- actions, in terms of control of the use of cars in towns and cities, undertaken within the context of urban travel plans (UTP) reinforced by the law on air quality.

Most of the other measures, which are much more numerous but less spectacular, are the result of the 1993 and 1995 plans and of supplements made to them during the autumn of 1997, just prior to the Kyoto conference.

Implementation and monitoring of these measures are an integral part of this programme. This is why each of the sectorial chapters below refers to the main provisions of these measures.

2 New measures reinforcing and extending existing measures

Sectorial groups brought together by the Interministerial Commission on Climate Change (ICCC) during the first half of 1999 proceeded with a clean-up of measures likely to reinforce and extend those already integrated into the preceding programmes, supplemented by those of



³ The improvement of private car emissions is included in the agreement, in the measures taken for 2.8 MtCe, without the possibility of distinguishing what would happen without the agreement from the additional effect of said agreement

November 1997. This research was carried out with the particular help of the assessment report "Energy Control" ⁽⁴⁾, works carried out by ADEME (French Agency for the Environment and Energy Efficiency), specific reports such as work carried out by the Energy Centre of the "Ecole des Mines" in Paris on fluoride gases and also consultations with experts, professionals and representatives of civil society involved with each of the subjects.

A group responsible for economic methodology accompanied this sectorial work. It specifically ensured that, as far as possible, the work was based on an analysis grid which stressed four aspects:

- the context within which the measure was implemented ("reference position")
- its cost – benefits results
- discussion as to the choice of mechanisms
- European dimension

This analysis, undertaken by each of the groups, meant specifically that measures could be identified and characterised by their low costs, their negative costs (double-dividend effect), by the fact of being "without regret" (to which, beyond the relative concerns for the environment, one would have excellent reasons for recourse) or by the fact that their efficiency depended primarily on reasons other than the greenhouse effect but into which the latter gained from being integrated.

This is the case, typically, for measures linked to the control of specific electricity consumption. Indeed, in view of the high growth of consumption in the residential and services sectors and of the appearance of new uses and of current consumption behaviour patterns, which are barely aware of the challenges linked to savings, these measures represent a significant potential for electricity savings and are, as such, low cost or even negative in cost. In view of the structure of the national electricity generation plants, their impact in terms of CO₂ savings is, for 2010, relatively low. However, the situation could be modified in the longer term, due to diversification of means of production. Given this, efforts made by France in this field must form part of a wider movement to improve energy efficiency of electrical appliances within a European context and thus contribute to large-scale CO₂ savings within the European Union. At national level, actions to control the demand for electricity should mean, in the medium term, that national consumption distribution is optimised per usage type and per energy type, on the one hand and, on the other hand, that the greatest possible margin for manoeuvre is obtained, which is necessary in order to manage development in the electricity generation plants in the longer term.

⁴ See assessment report "Energy Control" produced by the Interministerial Committee on the Assessment of Public Policies under the chairmanship of Yves Martin

2 - THE PROGRAMME'S MAIN OPTIONS

Thus, almost one hundred measures and actions have been chosen, based on this work. They are detailed hereafter, by sector, in chapters 3 to 9. These measures, known as "first category" are very close in type to those which were chosen up until 1997: regulations, energy efficiency in construction and other specific electricity uses, improved operation of the transport system.

Re-launch of the energy efficiency policy decided by the Government in February 1998 after the Kyoto Conference by means of an additional grant to the ADEME (500 MFF/year) is an essential contribution to the implementation of this programme. Its sustainability is thus one of the major options of the programme.

The treatment of emissions factors not directly linked to energy use is part of the same question of actions and measures to be implemented.

Table 3 below describes reductions obtained with these measures, by comparison with the reference forecast.

Table 3 - Effect of 1st category measures

Δ 2010 1 st category	CO ₂	CH ₄	N ₂ O	HFC	Other fluorides	Total
Industry	0.12		0.50		0.50	1.12
Transport	1.10			0.05		1.15
Build/Services	1.34					1.34
Agriculture	0.15	0.25	0.15			0.55
Waste	1.60	-0.80	0.30			1.10
Energy	0.73					0.73
Refrigerant gas				1.05		1.05
Total	5.04	-0.55	0.95	1.10	0.50	7.04

All of these measures are therefore used to directly achieve almost half of the 16 MtCe required to regain 1990 levels by 2010. However, they have been studied based on stable prices of energy, fossil carbon and its equivalents. Whereas, even if one may suppose that low prices in the oil and gas markets since the end of the eighties will remain low and that world internalisation of external factors due to climate change, despite evaluation efforts made by the IPCC, over the next decade is unlikely, no-one is unaware of the fact that the

effort in terms of emissions required by the Kyoto Protocol will have a cost. An initial cost at any rate which one must endeavour to minimise and compensate as far as possible *ex post*, by the relevance of the choice of economic mechanisms used to take it into account.

Recourse to economic mechanisms

The possibility of controlling emissions beyond what is possible with so-called “first category” measures, as defined above, rests upon giving a price signal. Its efficiency depends on the ability to modify decisions of those involved in emissions to be controlled, specifically its ability:

- to directly re-orient consumption patterns (intermediate consumption by companies, end-consumption by households) to apply directly to uses linked to targeted emissions.
- to encourage producers to adapt products available according to these immediate or foreseeable changes in the market.
- to arouse anticipation of price increases in investment decisions and technological research.

Recourse to a price signal is therefore not unconnected to the measures described previously. On the contrary, it works around them, on the one hand consolidating and amplifying the effect of those measures which have already been taken and, on the other, causing the appearance of new ranges of measures, initially at least more costly but profitable in view of new price conditions. Efficiency of the price signal depends, reciprocally, on the existence of mechanisms to facilitate the response of those involved. Thus, implementation by the ADEME of the “Fogime” guarantee fund (see *chapter 3*) will constitute a powerful factor for small and medium sized businesses to adapt to new energy prices.

This range of considerations has led the French government to make a certain number of choices regarding the mechanism, price developments and sectorial application terms.

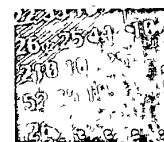
3.1 – Choice of the mechanism: the carbon/energy ecotax

The Government has indicated several times (statement of ICCG decisions dated 27th November 1998, memorandum on the community directive on taxation of energy products, *White Paper* on terms to extend the GTPA (General Tax on Polluting Activities) to companies intermediate energy consumption that taxation could, alongside traditional policy means, be efficient in the fight against the greenhouse effect.



2 - THE PROGRAMME'S MAIN OPTIONS

- This choice falls within a global context of a reduction in the tax burden. Following the creation of the GTPA in the Finance Bill for 1999 and above all its extension in the Social Security Finance Bill for 2000, it will comply with the principles which lay down on the one hand its non-hypothecation and on the other, its neutrality with regard to the overall tax burden. The principal of full compensation by reductions in other elements of taxation, chosen according to the economic and social environment to produce a "second optimal dividend" must be strictly applied within this context ⁽⁵⁾. Recent calculations in France ⁽⁶⁾ and in neighbouring countries ⁽⁷⁾ confirm the positive effect on employment and growth of compensation for such taxation by reducing social charges. In some cases, the income of the economic players involved, initially hit by the duty, will eventually be increased due to improved employment conditions, the quality effect on added value and, finally, economic growth. The taxation differentiation of the energy chosen will therefore be recycled franc on franc into reductions in charges levied on salaried employment.
- It falls in line with policies implemented in most European countries, developed particularly recently in the United Kingdom, in Germany and in Italy. However, the greatest possible uniformity should be sought for the taxation system across the European Union. This is the reason why the French government, in its memorandum dated April 1999, decided to offer its active support to the quick adoption of the draft European directive on the taxation of energy products. Although this directive's main function is to organise the progressive rise in minimum amounts, it will also act as the first useful step in the organisation of a tax mechanism which will enable the European Union as a whole to meet its Kyoto commitment, particularly by limiting the risks of competitive distortion.
- In this memorandum, the Government indicated that it was in favour of "duality" of taxation on electricity, general taxation of the latter being supplemented by a price signal according to carbon content of fuel used by the producer. Although it is necessary to incorporate the cost of carbon into the price of the electricity according to the share it represents, one must also ensure that the remaining, non-carbon level of taxation on electricity remains sufficiently high to encourage moderation in electricity consumption, generated by any source. Even from the point of view of the future of CO₂ emissions, such moderation is necessary over the long term: it constitutes the essential precaution to take in counterpart to any modification, whether voluntary or obligatory, in the structure of French electricity generation.



⁵ See conclusions to the works carried out by the Economic Analysis Committee, in Les Cahiers du CAE, n°8, 3^e quarter 1998

⁶ "Effets redistributifs d'une ecotaxe : présentation et analyse des résultats du modèle IMACLIM" Enc Fortin, CIRED 1999

⁷ For example in Fiscal Studies 1998 vol. 19 "Equity and ecotax reform in the E.U. achieving a 10% reduction in CO₂ emissions using excise duties. Stimulating Innovations, competitiveness and jobs" Förderverein ökologische Steuerreform e.V., Hamburg, 1998

Implementation of the economic approach defined here will result in a differential in energy taxation and will be based on the choice of a reference price for equivalent carbon tonne for 2010. This will be used as a basis for the decisions which will determine the banding of this taxation differential.

The Government has already set medium term orientations in terms of energy taxation: gradual increase in importance of the GTPA-energy from 2001, gradual reduction between now and 2005 in the tax differential between diesel fuel and petrol

At the end of this first stage (2005), the Government will set objectives for 2010 for the various components in energy taxation. This will be done in coherence with this programme and with a concern for tax harmonisation at Community level.

It is therefore a question of picking the right price for carbon savings to use as a base for the taxation differential to be introduced for the period to 2010. It must be sufficiently high to encourage the behaviour patterns and decisions expected from this programme, whilst remaining within acceptable limits, particularly at international level, failing which it will lead to excessive cost for the French economy. Light may be shed on this matter – it may even be finally decided – by using simulations involving economic models.

3.2 – Data from economic models and assessment of the carbon reference price

Two models, the geographical breakdown of which isolates France, were used to simulate the economic impact of the Kyoto agreement on France. These were GEMINI-E3, a general equilibrium model developed by the METL and CEA ⁽⁸⁾ and POLES ⁽⁹⁾ a partial equilibrium model of the world energy sector, developed by the IEPE (Institute of Energy Economy and Policy)

Their main conclusions were as follows:

- taxation levels on carbon required to stabilise CO₂ emissions linked to energy in France in 2010 at 1990 levels would be close to 1,300 FF/tC, and the overall economic impact would remain limited (under 0.2% of GDP).
- if there were to be recourse to flexibility mechanisms, France would carry out over half of its reduction effort using national measures for a carbon taxation level of between 500 and 600 FF/tC.

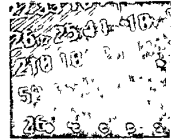
⁸ Alain Bernard and Marc Vielle

⁹ Patrick Cnqui



2 - THE PROGRAMME'S MAIN OPTIONS

These results should be interpreted cautiously: price signals (increased cost of fossil fuels due to carbon tax) are the only means of taking action on the CO₂ emissions level in these models which, moreover, use the hypothesis of an economically optimum reference scenario (particularly the absence of "without regret" options). However, the strategy developed in the new plan to fight climate change includes a raft of technical, statutory, information, decision-making, etc. measures which, as we have just seen, represents *half* of the effort without use of other mechanisms and which improves the response of those involved to the new pricing context. Moreover, the reference scenario chosen for these models, in relation to which the reduction effort is determined, does not coincide exactly with the "including existing measures" scenario which constitutes the starting point of considerations within the context of the new plan.



They suggest, nevertheless, that a reasonable value per tonne of fossil carbon to be taken into consideration within the context of the new plan to fight climate change is between 500 and 1,000 FF.

To avoid risking a situation which could appear paradoxical in which the additional cost due to taxation was higher than that which could result from the purchase of a traderble permit on the international market, it would be reasonable to take, as a "ceiling rate" for taxation, the "lower rate" of the assessments referred to above, i.e. 500 FF. Such differential in taxation should mean, depending on what is learned from responses from those involved, that additional emissions reductions are triggered, which amount to around 6 MtCe. This amount is not sufficient to complete the required effort of 16 MtCe with "first category" measures, but enough if one takes account of longer-term actions, as referred to in *paragraph 2.4.*

The Government takes the reference price of 500 FF. per equivalent carbon tonne to define the level of taxation to aim at in 2010. In the short term, this level will start at between 150 and 200 FF.

These levels are coherent with those used:

- by European countries which have already begun to implement an ecotax
- by the European directive currently being negotiated on energy taxation.

They seek to be the same for all uses of fossil carbon subject to taxation under the terms of this programme, on condition that the sectorial adaptation modalities referred to below (*paragraphs 3.3 to 3.5*) are complied with.

Economic models and climate change

Different types of economic models have been developed as decision-making tools on the matter of climate change. They are mainly limited to CO₂ emissions linked to the usage of fossil fuel.

An initial set of models sought to describe, over the long-term, on the time-scale of a century, scenarios for the development of CO₂ (or carbon) concentrations in the atmosphere or flows affecting the latter, taking account both of costs linked to risks associated with climate change and implementation costs. This work was used to assist economic work done by the IPCC and can be used as a basis for drawing up certain strategies, for example in the insurance field. On the other hand, their practical utility remained limited and they did not play a major role in the setting of Kyoto objectives or in European burden-sharing. Their results are highly sensitive to the values used for certain economic parameters, such as the up-dating rate or the degree of "substitutability" between natural and artificial capital.


Calculable general equilibrium models were used to assess the economic consequences of the Kyoto Protocol and particularly to define price levels to be considered for 2010 in order to reach these objectives.

Simulations notably explored the influence of the degree of usage of the Kyoto mechanisms and their results are broadly consistent: as the scope of Kyoto mechanisms is extended, the value of fossil carbon is reduced and OECD countries implement fewer and fewer domestic actions. Thus, for the European Union (France is generally not identified separately in these models), compliance with the Kyoto agreement using exclusively national measures would lead to a carbon cost, within the Union, of between 100 and 200 \$/tC. In the case of total flexibility within annex B, (unrestricted recourse to tradeable permits), the price of carbon reaches between 50 and 100 \$/tC. Finally, at the other end of the scale, the price of between 20 and 30 \$/tC would correspond to total flexibility at world-wide level (unhindered recourse to tradeable permits and to CDM).

For a certain number of reasons which we will not go into here, the hypothesis of total flexibility at world-wide level, of the full tradability of "hot air" and unlimited recourse to the clean development mechanism is certainly unrealistic and, in any case, illustrates the ambiguities of the role given to the tradable permits market, as it can be used to describe a scenario in which Annex B countries refrain from implementing domestic policies and measures. Consequently, it is more reasonable to count on a "guide line" price for fossil carbon of between 50 and 100 \$/tC, with a stronger probability of being at the top of this bracket.

3.3 – *Questions relating to industry*

On 20th May 1999, the Government decided to extend the general tax on polluting activities (GTPA) to intermediate energy consumption in order to reinforce the fight against the greenhouse effect and to improve energy efficiency. This approach fits in with continuing Community level debate which, from the outset, through discussions on possible fiscal directives has sought to get the agreement of all member States to the terms of a harmonised tax on energy consumption and greenhouse gas emissions. Already, several European countries have announced or implemented energy taxation programmes which anticipate the adoption of a harmonised community framework.



As an instrument of incentive and prevention, the GTPA, extended to intermediate energy consumption and alongside the initial dividend it creates - the environmental dividend – means that resulting resources can be used to obtain a second dividend, the employment dividend. In order to reduce the tax burden which weigh heavily on the labour market, the product of the GTPA will be fully used to finance the lightening of social contributions on low wages.

This tax concerns more particularly those companies whose industrial processes are major energy consumers. Wishing to retain the competitiveness of French industry, the government is favourable to firms which consume large amounts of energy being able to benefit from a reduction on the amount of tax they pay. With this aim, the government published a white paper in July 1999 on this question, which was submitted on 7th July 1999 to economic players. Industrialists responded favourably to this consultation approach, suggesting various tax waiver and ceiling rate solutions.

However, the tax waiver and ceiling rate solutions necessarily reduce incentives to control energy consumption. Therefore, over and above taxation and in return for these tax waiver and reduction mechanisms, industries which consume large amounts of energy must implement voluntary, quantified and checkable programmes, negotiated with the public authorities and including sanctions should they fail to comply with requirements.

These programmes could integrate, when the time comes, the possibility for those industries concerned to take part in trading of emission credits, in return for emission reduction objectives.

It would therefore be a matter of defining how a market could be organised, particularly at community level, intended to form part of a world-wide mechanism after 2008.

France will be putting forward proposals within the context of the community debate which will commence after presentation by the Commission of the Green Paper on greenhouse gas emissions trading, a market

whose rules should be specified during the sixth Conference of Parties in November 2000.

On the basis of initial discussions which have been held since July, and insofar as voluntary greenhouse gas emission control programmes will be implemented, the government retains the principle of exoneration of certain uses of energy, on the basis of article 13 of the draft directive on the taxation of energy products. Thus, energy (either fuel or electricity) could be exonerated from the GTPA when used principally:

- for chemical reduction
- in metallurgical and electrolysis processes
- as a raw material
- for electricity generation.

If these tax waivers prove insufficient to promote the competitiveness of all the firms or industrial sectors involved, additional work will be undertaken to define, in addition to the tax waivers announced, mechanisms to reduce the tax.

Discussions will continue in two working groups:

- on implementation of the tax waivers announced for industrialists (specific demarcation and definition of how tax waivers will be administered)
- on mechanisms to reduce the tax for companies and their incentive towards a reduction in greenhouse gas emissions (tradable permits within the context of the Kyoto Protocol, negotiated agreements).

The establishment of this kind of mechanism demonstrates the two meanings one can give to the Kyoto Protocol when it indicates that exchange mechanisms must be "in addition to domestic actions": on the one hand it is clear that this measure can only be a limited fraction, with a restricted upper limit, of the effort to be made, and, on the other hand one is indeed looking here at the case of a supplement made to this classic "domestic" measure, which is taxation.

3.4 – Questions relating to transport

In accordance with the directions set by the Government in November 1998 to prepare this programme, preparatory work for its fine-tuning was undertaken in close association with work done on "outline service plans", particularly taking account of environmental assessments undertaken as part of their development. First category measures, supplemented by the reduction planned between now and 2005 in the IDPP (Inland Duty on Petroleum



2 - THE PROGRAMME'S MAIN OPTIONS

Products) differential between petrol and diesel fuel and by the completion of implementation of compliance with working rules in the road transport profession, only represent reductions of around 1 MtCe.

This kind of result is clearly not commensurate with the challenge which the transport sector represents in terms of greenhouse gases, since it is already the main emission sector and its emissions alone have increased by 10 MtCe since 1990. It poses the double question, in terms of the 2010 objective, of a contribution to overall reduction of emissions more in line with its role in terms of the risk of climate change and, in the longer term, of a lasting turnaround in the trends which characterise it. This second aspect of the question of transport policies is dealt with in *paragraph 2.4*. However, one cannot ignore that long-term measures, however indispensable they are, have relatively lengthy return times, in terms of impact on emissions.

These data could suggest massive recourse to fuel taxation, in order to guarantee significant results within the 10-year time limit. The Government has, however, taken account both of the existing high level of fuel taxation in France and of action already commenced in terms of reducing the diesel fuel/petrol differential.

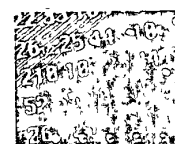
The reference price taken for the carbon tonne equivalent will be used as a basis for later stages, which should enable, by 2010, fair account to be taken of greenhouse effect externalities for the various fuels.

This orientation should not call into question the convergence objective which, by 2005, will already have meant that the IDPP difference between petrol and diesel fuel will have been brought to the European average.

These price signals will have the advantage both of moderating demand, directing demand toward low-emission uses and accompanying, within the framework of a coherent strategy, the more structural actions undertaken at the same time on land planning, infrastructures and the vehicle fleet.

3.5 – Questions relating to domestic consumption of fossil fuels

Measures in this field are more than any others dependent on decisions taken at European level since here, we are, with the exception of domestic fuel-oil, looking at the case of an initial situation of non-taxation and therefore of full impact on the increase of minimum levels which will be introduced by the draft directive on taxation of energy products. This draft provides, in article 8, for



minimum taxation levels on natural gas used as a fuel, to be defined gradually from 0.2 ECUs per gigajoule during the first year of application to 0.7 ECUs per gigajoule during the fifth year. This represents an increase from 85 to 300 FF. per tonne of carbon up until 2005 on the assumption that one began in 2001. A comparable development is proposed for LPG. These figures are fully in line with the proposals contained in this programme.

A mechanism such as this, particularly if used in combination with measures to encourage gas consumption savings by households, could be an asset in our quest to reach our objectives of emissions stabilisation.

Indeed, in terms of consumption linked to heating and domestic hot water, work carried out by the "buildings" group demonstrated excessive consumption of energy in premises which used gas compared to their equivalent heated by electricity, in a ratio of around 2 to 1.

This observation is to some extent attributable to insufficient heating regulation devices in premises, particularly if one compares the possibilities of this kind offered by electrical appliances. However, it is probably also due to the fact that natural gas used for domestic purposes is not charged IDNGC (Inland Duty on Natural Gas Consumption) which means that almost half of all consumption in France is exonerated.

If it were to be decided to implement a tax on fuel gas, this should be combined with a re-examination of the IDPP on domestic fuel-oil, since this fuel emits far greater amounts of CO₂ than gas and should be prevented from enjoying a competitive advantage.

The price signal applied to this fuel consumption should produce two positive effects:

- improvement of competitiveness of gas for domestic usage from the point of view of its contribution to the greenhouse effect, which will add to future diversification possibilities for our energy system
- considerable modification of consumption, which should be all the more in view of the fact that the gas distributor and operators such as the ADEME will offer diagnostic and decision-making assistance adapted to suit households's requirements.

This additional taxation on domestic energy consumption should necessarily be compensated by a reduction in other taxation on households.

2 - THE PROGRAMME'S MAIN OPTIONS

Application of these measures will lead to the additional reductions summarised in the table below:

Table 4 – Effect of taxation measures

Δ 2010 tax C	CO ₂	CH ₄	N ₂ O	HFC	Other fluorides	Total
Industry	2.00		0.30			2.30
Transport	1.10					1.10
Buildings/Services	1.20					1.20
Agriculture			0.20			0.20
Waste						0.00
Energy	1.50					1.50
Refrigerant gas				0.40		0.40
Total	5.80	0.00	0.50	0.40		6.70

4 Long-term structural action on the supply side

Placing a ceiling rate on carbon taxation in 2010 at 500 FF. per tonne will not completely cover the difference between the 16 MtCe reduction sought and the expected result from implementation of first category measures. This fact could justify the choice of a higher level of taxation. However, the difference can be covered in another way: by taking into account the first effects in 2010 of measures implemented during the first decade, but which aim principally to prepare for the future, placing our country in the position of being able to meet increasingly restrictive levels of commitment than those during the first "budgetary period".

In particular, these measures must involve sectors with a structural tendency towards increased emissions:

- In the "buildings – services" sector, such action is already being undertaken within the context of medium-term planning of statutory action combined with recourse to a price signal whose efficiency should make itself felt over time.

Action could be reinforced by means of measures to make it obligatory to take account of medium and long term risks relating to energy and the risk of climate change in the definition, selection and authorisation of architectural and town-planning measures.

- In the field of energy production, increased effort in favour of renewable energy sources (REn) is proposed in addition to a carbon emission avoidance cost of 500 FF. per tonne, going up to around 1000 FF., ex ante at least. Indeed, although little is yet known about them, economies of scale in this field could combine cost reductions with greater developments in terms of industrialisation (for example in wind-power), as well as with progress in technical performances (solar energy) and the efficiency of other sectors (wood). Corsica and the Overseas Territories and Departments are, for their part, working with a target REn development programme.

Table 5 – Summary of the impact of “REn” measures

Carbon emissions avoided in 2010 (ktC per year)

Wood burning	400
REn in Overseas Departments	74
REn in Corsica	56
Wind power	400
Solar heating in continental France	10
Geothermics	20
Total	960

- However, the most important measure is certainly in the field of transport. The section relating to infrastructures referred to in *paragraph 3.3 of the Transports Chapter* does not only aim to form one of the terms of the compromise between action on demand and action on supply. It takes account of this sector’s specific inertia and the necessary lead times required for structural changes to produce their effects in terms of traffic, modal distribution and, finally, emissions. **It reflects a major priority in the policy of public authorities in this field: to achieve by 2020 – the “outline service plans” deadline – a turnaround in the upward trend of these emissions.** The objective is that the latter should not exceed 40 MtCe from the period 2010-2020, for all gases. This means that in addition to the necessary control of emissions in the air transport sector, road transport must not absorb any more additional traffic than that permitted by the improvement of its carbon efficiency.

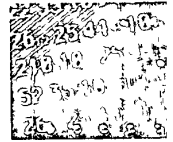


2 - THE PROGRAMME'S MAIN OPTIONS

This means a maximum of 38 MtCe in terms of CO₂ by 2010, thanks to which the programme will be complied with, but on condition that all the necessary action is taken without delay, even (and above all) if its impact needs time to be felt. Thus, it is necessary:

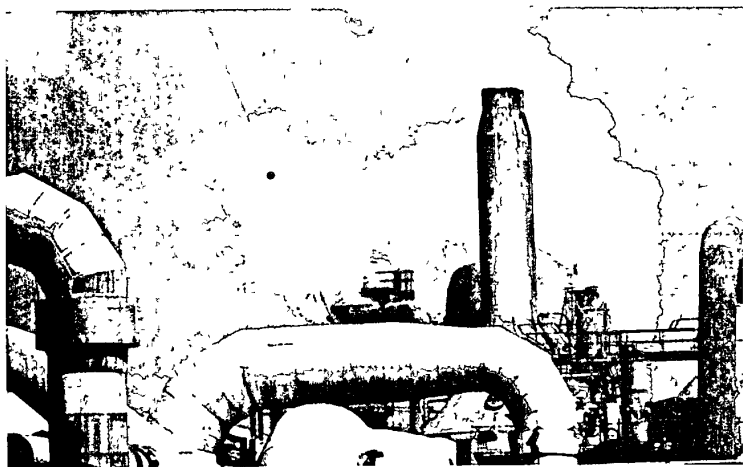
- to take, at national and European level, action on the provision of infrastructure, equipment and materials, with a view to reinforcing the attractiveness of those methods of transport which are most favourable to the environment (particularly rail, sea and river transport) and to developing true inter-modal services.
- to improve and reinforce pricing of urban travel.
- to investigate, within the context of land planning and the community space development plan, how this space can be organised to limit the need for travel.
- to take strong action on the development of urban structures in order to reduce travel constraints.

Much of this action falls within the scope of decisions where central and decentralised authorities are closely linked. The point of agreement has often been established in the past around the steepest graph line, resulting in solutions least favourable to fuel savings. The law on town planning, housing and travel and contracting procedures between territorial authorities and the State should be opportunities for the latter to play a better role in guiding the choice of responses which are coherent with its own commitments. Highlighting what citizens have to gain, in terms of quality of life, satisfaction with services and the environment, should facilitate dialogue between the partners. ■



The industry sector

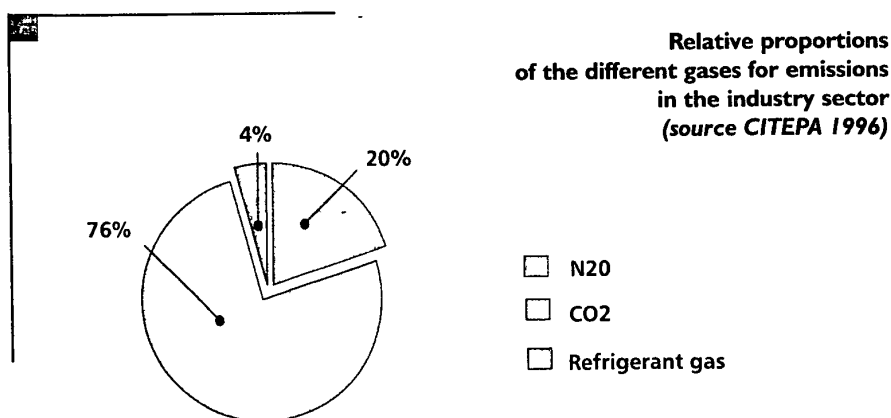
- 1** Emissions in the industry sector
- 2** The existing measures
- 3** New measures proposed



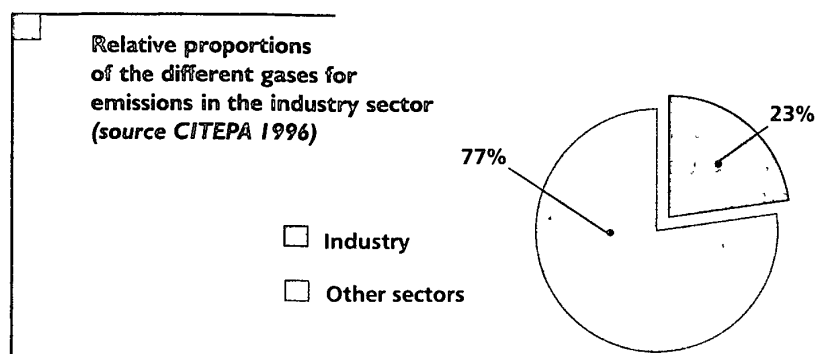
The industry sector

1 Emissions in the industry sector

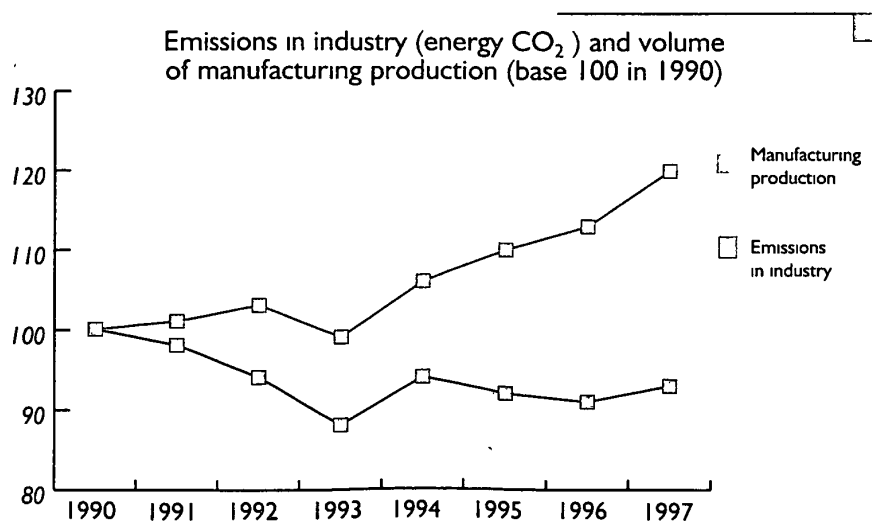
Just like production in this sector, the origins of the emissions of greenhouse gases in industry are extremely varied. The data to be dealt with in this chapter include emissions due to the production of energy by industry for its own needs, but do not include its electricity supplies. CO₂ is preponderant in these emissions, and N₂O also plays an important part. The fluorinated gases HFC, PFC and SF₆ form 4% of the emissions, to the same extent as methane. The latter gas will, however, not be taken into account, since it results almost exclusively from energy production (coal extraction and losses in gas pipelines). The emissions associated with the production and distribution of energy for general requirements will not be dealt with in the remainder of this chapter, since this case comes under the chapter devoted to energy. The data presented will be those which relate to the recent work of the General Planning Commission, in order to preserve consistency between past estimates of emissions and projections into the future.



The share of the industry sector in greenhouse gas emissions in France is 23%, as illustrated by the following diagram. The industry is ranked third in the sectors considered.



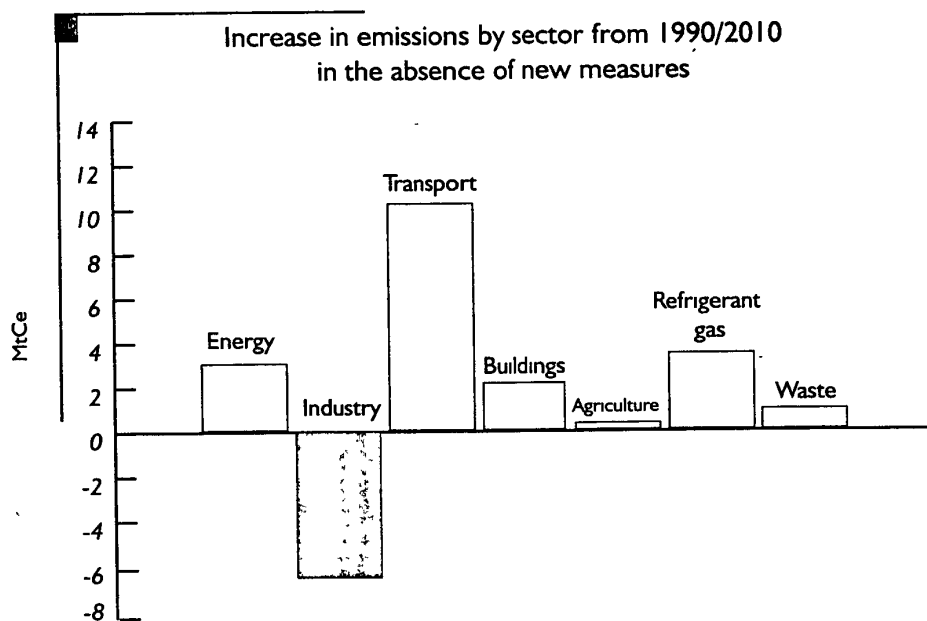
Emissions in industry are principally concentrated in a small number of so-called energy intensive fields. In the past, these emissions were characterised by a great decrease during the period 1970-1993, followed by a stabilisation during the following years. As indicated by the graph, after having fallen by approximately 10% between 1990 and 1993, emissions in industry have returned since to a level closer to that of 1990. During the same period, the volume of manufacturing production increased by approximately 20%.



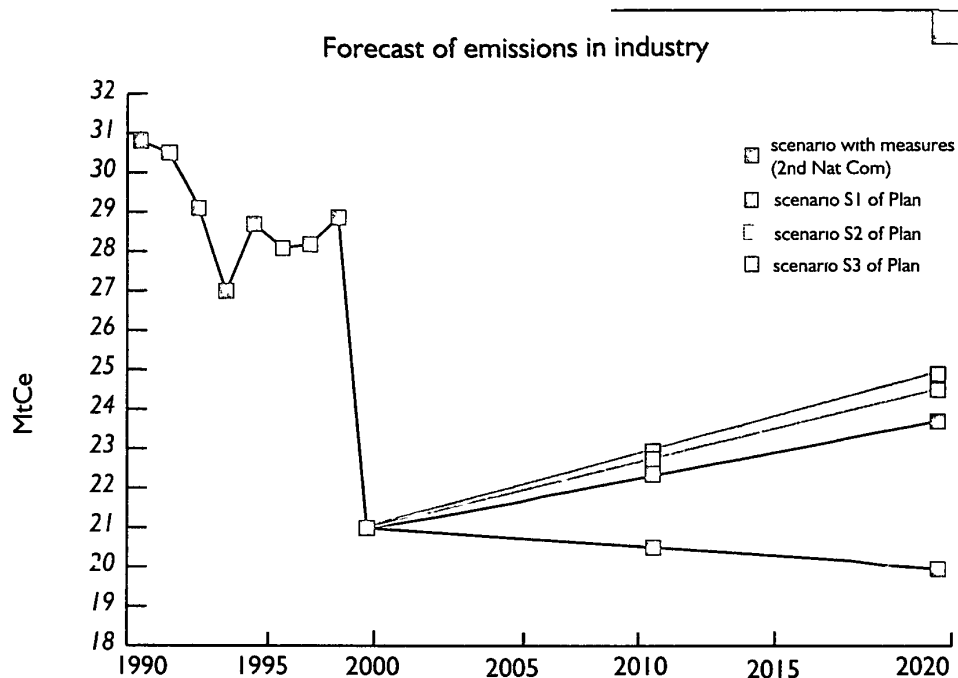
Sources INSEE, SEI

3 - THE INDUSTRY SECTOR

It should also be noted that the consumption of electricity by industry, including steel-making, has increased during the past few years, since it increased from 18.7 million tonnes of oil equivalent in 1973 to 28.9 MtOe in 1997. This currently represents 36% of the consumption of electricity in France.



The following graph reproduces the past emissions in industry (CO_2 and N_2O), and their future development according to four scenarios: the scenario "with new measures" presented in the French Second National Communication, and three scenarios produced by the General Planning Commission (S1, S2, S3). The results of scenario S1 (the so-called "market economy" scenario) correspond roughly to the case in which only the measures announced in the Second National Communication would be applied. Scenario S2 (the so-called "industrial state" scenario) would end in a result very close to scenario S1. Only scenario S3 (the so-called "environmental protection state" scenario) would lead to a reduction in industrial emissions. In the three cases, the drop noted in 2000 is due mainly to the expected reduction in N_2O emissions, following currently existing measures.



Sources 2nd National Communication, General Planning Commission, MATE/DPPR

2 The existing measures

2.1 Public grants in favour of industry

The public grants to industry having a positive effect on the greenhouse effect include the system of exceptional depreciation for energy-saving equipment, as well as the grants administered principally by the ADEME and by the Regional Directorate for Industry, Research and the Environment. The French authorities decided at the beginning of 1998 on a renewal of the energy efficiency policy, whose provisions are described below in the context of new measures, since this is a decision subsequent to the 1997 programme.

2.2 Voluntary commitments

Voluntary commitments on the reduction of greenhouse gas emissions have been given by several industry federations.

1) In 1996, **Pechiney** undertook to reduce, in 2000 compared with 1990, the total quantity of carbon dioxide emitted per tonne of aluminium produced by 19%, and the emissions of carbon tetrafluoride (CF₄) by 73%.



3 - THE INDUSTRY SECTOR

The objective for the reduction of specific CO₂ emissions planned for 2000 was already exceeded in 1998; and these emissions have been reduced by 23.6% compared with 1990.

In 1998, the specific CF₄ emissions dropped by 66% compared with 1990.

With regard to CF₄, a powerful greenhouse gas with a high global warming effect (5100 times CO₂), the performance achieved puts industry at a good level compared with its opposite numbers in the OECD. A major part of this progress results from process modifications implemented since 1993.



2) **The French Steel Federation** has undertaken (commitment of 19th December 1996) to reduce the total annual CO₂ emissions by 10% compared with the emissions in 1990, the specific consumption of reducing agents and fossil fuels by 16% and emissions of CO₂ per tonne of steel produced by 15%

In 1997, the results, compared with 1990, were as follows

- reduction of total emissions of CO₂ by 11.2%;*
- reduction in the specific consumption of reducing agents and fossil fuels by 9.8%;*
- reduction in emissions of CO₂ per tonne of steel produced by 12.5%*

The fact remains that the energy intensity of steel production in France is relatively high compared with the other countries in the OECD.

3) **The National Syndicate of Manufacturers of Rich and Magnesium Limes** (2nd July 1996) has undertaken to reduce, by 5% per tonne of lime produced, both the quantity of carbon dioxide emitted (kg of CO₂/tonne) and the quantity of thermal energy used (tonnes of oil equivalent/tonne).

In 1997, the emissions per tonne of lime manufactured were reduced by 3.2% compared with the amount in 1990; the thermal quantity used has been in a stable trend since 1990, but is now greater than that of 1990 by 1.4%.

Measures tending to improve the performance of industrial equipment (automatic operation of furnaces, optimisation of particle size analysis) should make it possible to reach the second planned objective, but perhaps after 2000.

4) **The French Cement Industry Union** has planned to reduce by 25% between 1990 and 2000 all its CO₂ emissions resulting from the consumption of fossil fuels, which corresponds to a reduction of 10% in emissions per tonne of cement of manufactured products (10th October 1996).

In 1998, the total emissions of CO₂ dropped by 37% compared with the 1990 level, and the emissions of CO₂ per tonne of cement manufactured dropped by 18.88% compared with their 1990 level.

This progress results essentially from the increased use of waste as fuel.

5) The **French Mechanical Glassworks Union**, in the field of packaging glass, plans for a reduction in carbon dioxide emissions of 10% between 1990 and 2005 thanks to the recycling of glass, improvement in the performance of glass furnaces and equipping them with dual-energy systems (undertaking signed in February 1997). This agreement provides for intermediate objectives every three years as from its signature.

At the end of 1998, compared with the intermediate objective fixed for 1999, the results were as follows:

- in absolute value, increase in emissions of CO₂ of 5% as against predictions of stabilisation;*
- specific emissions: ratio/t –15% whilst the planned objective in 1999 is –18%.*

Because of the central position devolved to industry in the target-setting process on the one hand, and the difficulties in control and individual sanction on the other hand, the environmental effectiveness of such agreements may be put in doubt. In view of the ambitiousness of our objectives for 2010, it does not appear that voluntary undertakings of this type should be the instrument which government should favour in the context of the new programme for combating the greenhouse effect. On the other hand, in certain cases, agreements between companies and the state could be envisaged, which would limit emissions on the basis of annual objectives for emissions combined with a system of checking and sanctions in the event of non-compliance.

2.3 Regulation

The favoured framework for current regulation consists in France of the Law on Air Quality and the Rational Use of Energy and the Law relating to Installations Classified for the Protection of the Environment, as well as, on the European level, the IPPC directive of 1996. In the case of emissions of N₂O by industrial complexes (manufacture of adipic acid, glyoxal and glyoxilic acid), regulation is exerted on a case by case basis by means of regional orders, in the context of legislation on classified installations; the effects of encouraging industry to process waste have been very real. In the case of the production of nitric acid, the ministerial order of 1.3.93, repeated by the order of 2.2.98, limits emissions of N₂O to 7 kg per tonne of nitric acid produced.



3 - THE INDUSTRY SECTOR

With regard to CO₂ of energy origin, the Law on Air Quality and the Rational Use of Energy constitutes the legal basis for regulatory action. The decrees 11.09.1998 and 16.09.1998 made under this law have, on the one hand, increased by almost 10% the energy efficiency thresholds which must be met by boilers with a capacity of between 400 kW and 50 MW, and on the other hand have simplified and modernised the checking procedure by an approved third-party organisation to which the combustion plants with a capacity greater than 1 MW are subject. Instructions have been given for this obligatory checking procedure for large combustion plants to be better complied with in future. The obligatory audit for large consumers of their energy use conditions which existed previously has been replaced by a procedure encouraging assistance with energy consulting open to SMEs in the context of regional consulting grant funds.



There are currently no regulations concerning the efficiency of industrial electric motors, used for example in machine tools, materials transportation, refrigeration equipment and compressed air production equipment.

With regard to fluorinated gases, in addition to the 1976 regulations, which could be applied to them, the only existing regulations are those which stem from the decree of 07.12.1992, laying down obligations with regard to tightness for refrigeration equipment containing more than 2kg of HFC. This concerns approximately 2,500 companies, mostly of a commercial nature. It should be stated that, as indicated by industry itself, very few checks are made.

2.4 Taxes on energy consumed by companies

Industry, and particularly so-called energy-intensive industry, currently enjoys in this field a special situation in comparison with other sectors, as indicated by the White Paper on the extension terms of the general tax on polluting activities to intermediate energy consumption by companies. This also states that the energy consumption of companies is often taxed more lightly in France than in other European countries:

"Thus the local taxes on electricity consumption do not affect industrial uses of this energy, unlike that which is observed in several European countries where taxes have been imposed (Italy, Denmark, Austria, Finland, Spain, the Netherlands and Germany in particular)

With regard to natural gas, taxes in France (Inland Duty on Natural Gas Consumption) apply only to annual consumption greater than 5 TWh with a monthly threshold of 0.4 GWh. In fact, out of the 400 TWh of natural gas consumed in France in 1997, 126 were taxed. 98% of these 126 TWh were consumed by 2,900 industrial establishments subject to the Inland Duty on Natural Gas

Consumption. In total, the industrial consumption of natural gas is for the most part taxed but at a level more than 40% lower than the EU average.

Finally, with regard to heavy fuel oil and coal, mainly used industrially, the taxes levied in France are lower than the EC average (in the case of fuel oil) or non-existent (in the case of coal)."

2.5 Other existing taxes having a bearing on the greenhouse effect

The N₂O emissions on industrial sites are currently taxed in the framework of the General Tax on Polluting Activities at 250 francs per tonne emitted, that is to say 3 francs per tonne of carbon equivalent, in the same way as other nitrogenous oxides. No other specific tax has been identified by the working party devoted to industry.



New measures proposed

I-1 Industry assistance measures

It is recommended the renewal of the energy policy decided on by the government in 1998 be pursued, entailing the following actions, included in the ADEME company plan for the period 2000-2008:

- I-1.1 Firstly, the revival of "aid to decision" (whose average annual budgetary funding will be around 40 million francs) on the ADEME budget, to which will be added loans from the Regional Consulting Grant Funds.
- I-1.2 Secondly, directing long-term choices and improving technologies and processes through support for research and development (an average annual budget of 20 million francs).
- I-1.3 [Thirdly, support for exemplary technological demonstration projects (average budget of 30 million francs).]
- I-1.4 Finally, the participation of ADEME in establishing with the banking sector new financing methods for companies.
- I-1.5 For this programme to have all the effectiveness that one is entitled to expect of it, it will be necessary for it to be promoted and managed in accordance with an identical procedure from the point of view of the user, whether funds are coming from the ADEME or the Regional Consulting Grant Funds.



I-2 Measures of a regulatory nature for gases other than CO₂

The regulatory measures presented here are addressed to gases other than CO₂. The new regulatory measures concerning CO₂ emissions which should where necessary, be associated with the possible implementation of a system of tradable permits, should be situated in the context of the "best available technologies" currently being debated within the European Union, in application of the IPPC directive.



It should also be indicated that it was not possible to deal with all sectors. This is the case in particular for the efficiency of electric motors; normative or regulatory measures will have to be studied concerning the use of industrial electric motors, used for example in the circulation of fluids, compressed air production equipment, machine tools, materials transportation and refrigeration equipment. This is also the case with the compression and storage of fluorinated substances.

- I-2.1 N₂O:** strengthening of regulatory requirements in the context of legislation relating to installations classified for the protection of the environment (orders of the Ministry responsible for the environment and regional orders).
- I-2.2 PFCs in the production of aluminium:** regulations will be drawn up, in consultation with the manufacturers concerned, in the long-term limiting the average emissions of PFCs (in this case CF₄) per tonne of aluminium produced (to be studied according to the technology) and guaranteeing good control of emissions.
- I-2.3 SF₆ and PFCs in the electronics industry:** regulations will be drawn up, through the 1976 legislation on installations classified for the protection of the environment, with a view to obtaining a satisfactory rate of recovery or destruction of gases emitted in newer units in particular, and also to guarantee good monitoring of emissions.
- I-2.4 SF₆ in magnesium foundries:** regulations will be drawn up in liaison with the manufacturers concerned, based on the 1976 legislation.
- I-2.5 SF₆ in electrical equipment:** in view of the small number of companies concerned and the absence of any known substitution product, an agreement on an emission level will have to be sought. Technical regulations guaranteeing good monitoring of emissions and limiting leakage, notably at the end of equipment life, will if necessary be considered.
- I-2.6 Industrial uses of HFCs in refrigeration and air conditioning equipment:** the measures to be taken will be specified in the chapter relating to fluorinated gases, which applies both to industry and to the general public. In particular, a strengthening of the monitoring means and

procedures will be sought, in the context of the existing obligation to recover loads greater than 2 kg of fluid (*decree of 7th December 1992*).

- I-2.7 HFC in foams, aerosols and fire-fighting equipment:** on the basis of preliminary studies currently being carried out by the CITEPA and the ADEME, measures for limiting emissions in these business sectors are to be examined with the manufacturers. In addition, emission limits will be proposed in the context of the 1976 legislation on installations classified for deposits of HFC (*section 1185*) and for refrigeration and compression installations (*section 2920*).

I-3 Taxation of energy and the case of energy-intensive consuming industries

The present chapter is based on the analysis presented in the *White Paper on extending the general tax on polluting activities to the intermediate consumption of energy by business*, with which the Government initiated consultation with the representatives of the companies concerned in July 1999. It also refers to the results of the reflections of the "Industry" working group, which met during the first half of 1999 on the initiative of the Interministerial Commission on the Climate Change.

The objective is to ensure that industry ⁽¹⁾ contributes to the same extent as the other sectors to combat the greenhouse effect, so that France's commitments in the context of the Kyoto Protocol are abided by, and the subsequent phased timetables are suitably prepared. To this end, the measure for applying the General Tax on Polluting Activities to this sector adopts the same reference price for a tonne of carbon equivalent as for the other sectors (*cf Chapter 2, § 3 2*).

Without anticipating the results of the current consultation or any consequences of this, a statement of the different recommendations issued by the "Industry" working group is set out below.

Application of the General Tax on Polluting Activities to industry

The reasoning is set in the context defined by the proposed European directive restructuring the European framework for the taxation of energy products, and the contribution of the French government to this draft directive dated April 1999 (the so-called French *Memorandum* text). When the taxation on industry is set up, the following principles will be applied:

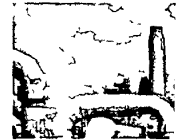
- providing a start at modest levels, as proposed by the French *Memorandum*; the levels appearing in the draft European directive may be suitable initially;

¹ The service sector is also concerned (*cf "Buildings" chapter*)



3 - THE INDUSTRY SECTOR

- it is important that the potential rise in the level of tax should be visible and predictable, both for the ability of those affected to adjust their strategy and to guarantee the best effectiveness of the price signal;
- the means of procuring a fine adjustment of this potential rise will be studied so that, at any time and in any case annually, it will be possible to take account of the consequences, the problems encountered, the general economic situation, any perverse effects which might have been underestimated, etc;
- as stated in the White Paper: *"The importance of electricity in the final energy consumption in France makes it necessary for it to be inserted in the taxation field ... Moreover, it is necessary to take into account from now on the deadline's subsequent to those adopted in the Kyoto Protocol (the period after 2010) which will coincide with the choices of renewing electricity production capacities, so as to be able to extend beyond 2010 the energy resource diversification policy to which the government is committed"*;
- the possibility of integrating this national measure in the context of the future EU directive on energy taxation will be kept open, and at this level a quick adoption of this directive will be encouraged;
- the **indirect taxation** system appears to be the most suitable.



The particular case of industries which are intensive consumers of energy

Particular provisions have been set up for these industries. They are presented in *Chapter 2 § 3.3*.

I-4 Other taxes

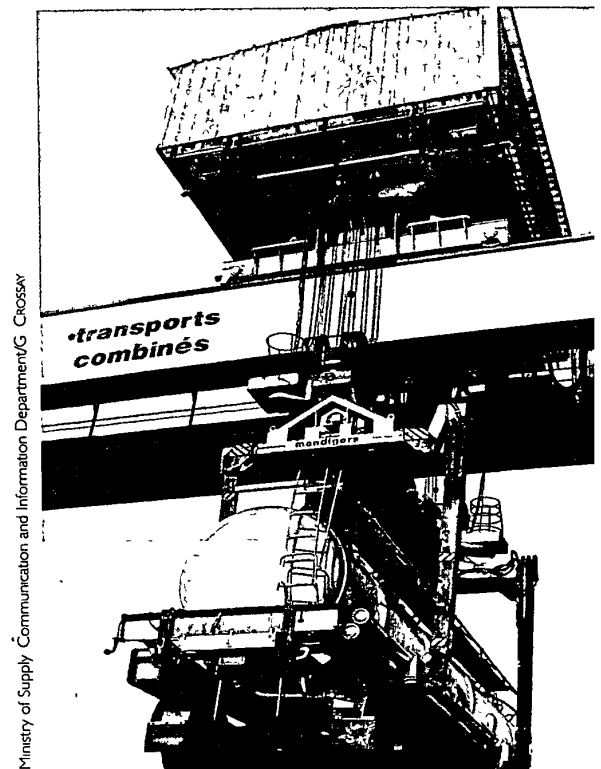
- I-4.1 **HFC used notably in refrigeration and air conditioning:** this question is dealt with in the context of fluorinated gases. The recommended measures will apply equally well to industry and to the other sectors.
- I-4.2 **N₂O:** very high reductions in emissions, already integrated into the reference projections associated with the previous programme, are currently being accomplished with regard to N₂O emitted by industry. They are based on recourse to the legislation on classified installations. The current tax, integrated into the General Tax on Polluting Activities, is of a very low amount (around 3 francs per tonne of carbon equivalent) and should be raised in order to better reflect the contribution of N₂O to climate warming.

I-5 Labelling, information and training

- I-5.1** The pursuit and reinforcement of a *labelling policy* constitutes an important element of information for decision-makers in matters marked by a high technical content. In particular, as recommended by the assessment report on energy control, it will be necessary to ensure that specifications for the allocation of an NF mark completely evaluate the actual energy efficiency. A procedure of the same nature will be aimed at electric motors.
- I-5.2** In more general terms than simple labels, it is necessary to continue to develop *information for companies*. It is a question of enabling them to exercise their choices, notably when combustion or heating apparatus is being renewed, or on the occasion of new investments, by including up-to-date data concerning energy savings and combating the greenhouse effect. The fields in which it appears particularly important to advance are certain items of equipment and fuels which for the moment do not benefit from sufficient information on performance. It is a question in particular of combustion apparatus and electric engines used by SMEs.
- I-5.3** *The qualification of workers* has a direct influence on the quality and efficiency of certain aspects of combating the greenhouse effect. This is particularly the case with agents in charge of the installation and operation of boilers and electric motors in SMEs: information can in particular relate to better installation and operation of equipment and to the choices which are open concerning the most highly performing equipment and the benefits which can result therefrom for the users, particularly with regard to energy savings. □

The transport sector

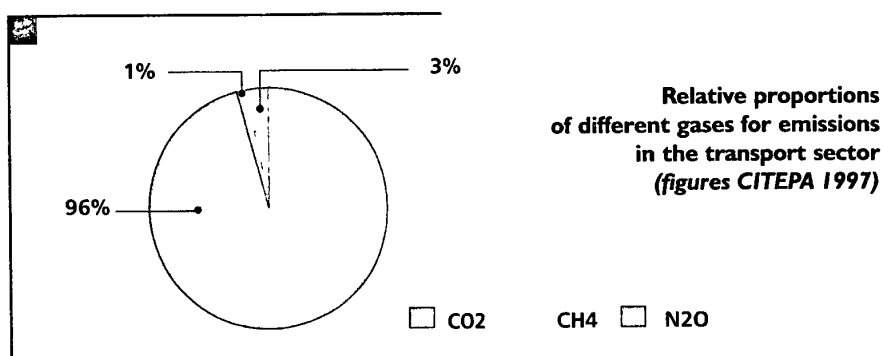
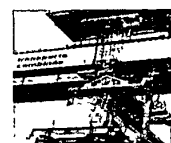
- 1 Emissions in the transport sector
- 2 The existing measures
- 3 New measures



The transport sector

1 Emissions in the transport sector

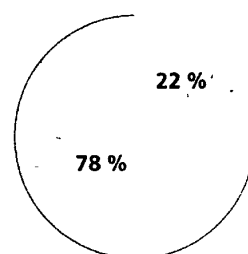
Greenhouse gas emissions in the transport sector are essentially due to the combustion of fuel for road and air transport (respectively 84.3% and 10.8% of greenhouse gases in the sector, including international bunker fuel, in 1997). The gases produced are in the vast majority CO_2 but also N_2O . The other types of emissions are connected to cold, either from the increasing use of air conditioning or from refrigerated transport.



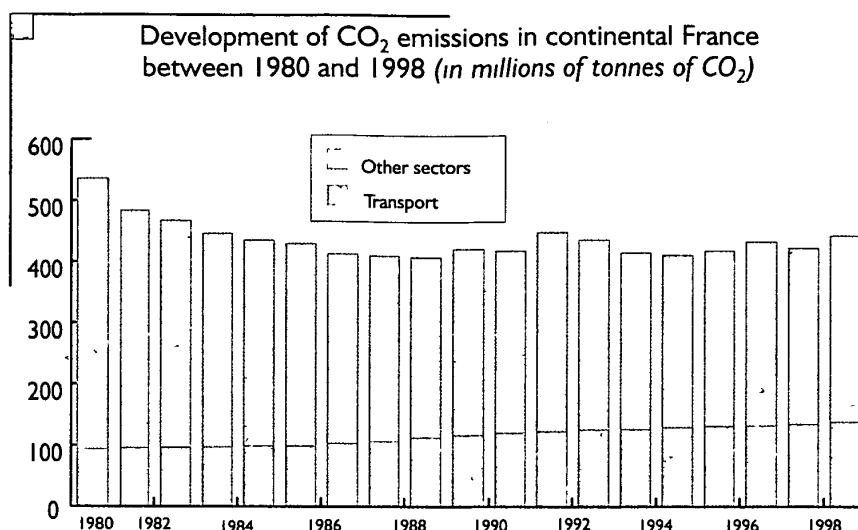
The share of the transport sector in greenhouse gas emissions is extremely high in all industrialised countries. This appears even more marked in France due to the fact that the electricity sector is a relatively low producer.

Relative share of the transport sector in greenhouse gas emissions (figures CITEPA 1997)

☐ Transport
☐ Other sectors

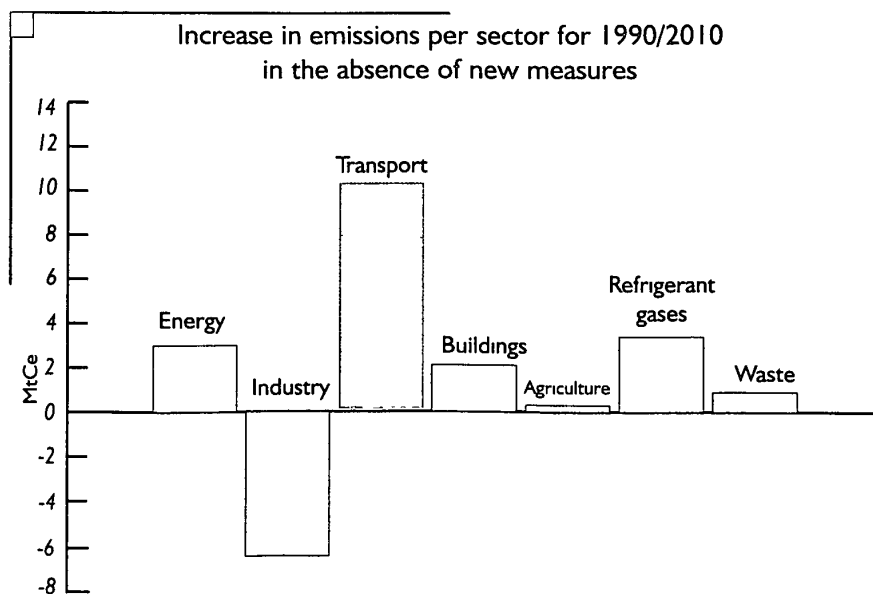


This sector is distinguished too by a strong tendency for growth, even with the measures already existing. It takes an increasingly significant place in CO₂ emissions.



according to data from CITEPA/CORALIE/format SECTEN, 1999 issue

Thus, in France, it is the transport sector that is producing the main growth of carbon emissions between 1990 and 2010 (here, with existing measures):

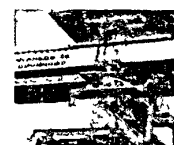




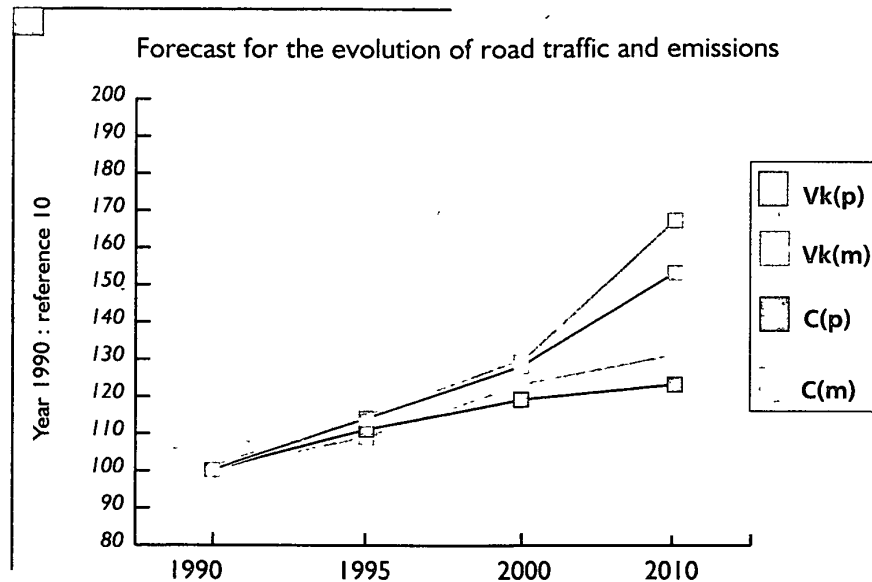
4 - THE TRANSPORT SECTOR

One part of this increase is attributable to N_2O and to HFCs (the increasing use of air conditioning and transport with controlled temperature). However, the variations of CO_2 play a vital role. The share of transport in CO_2 emissions went from 25% in 1990 to 28% in 1997; the reference scenario gives a forecast of 34% in 2010. The inertia of these emissions is essentially linked to the continuing increase in mobility of people and goods, particularly in the highest emission-producing modes (road and air transport) for which the gains in energy efficiency thanks to technological progress are not sufficient compensation.

This mobility is itself encouraged by both internal and external features in the transport system. Among these internal features, we can cite in particular the growth of the infrastructure, the under-allocation of external costs for the road transport of goods, the under-allocation of external costs for car traffic in towns, subsidies on urban passenger transport. Among the external features, we can cite the organisation of just-in-time industrial production, the location of production zones on a European scale, the evolution of commercial and residential urban planning with the development of peri-urbanisation. What is more, internal and external causes can mutually strengthen their effects by increasing the difficulties of policies to be implemented. So, in the field of urban passenger transport, subsidies are intended to correct the equilibrium that affects the different methods of transport; but, it creates a vicious circle of subsidies which involves moving housing out to the far suburbs, encouraging the use of the car and aggravating the shortfall in public transport.



However, one can differentiate between the rate of traffic increase and that of emissions. In the current forecasts, this is particularly true when we assume the full effect of the European agreement with automobile manufacturers (called the ACEA agreement, cf. below).



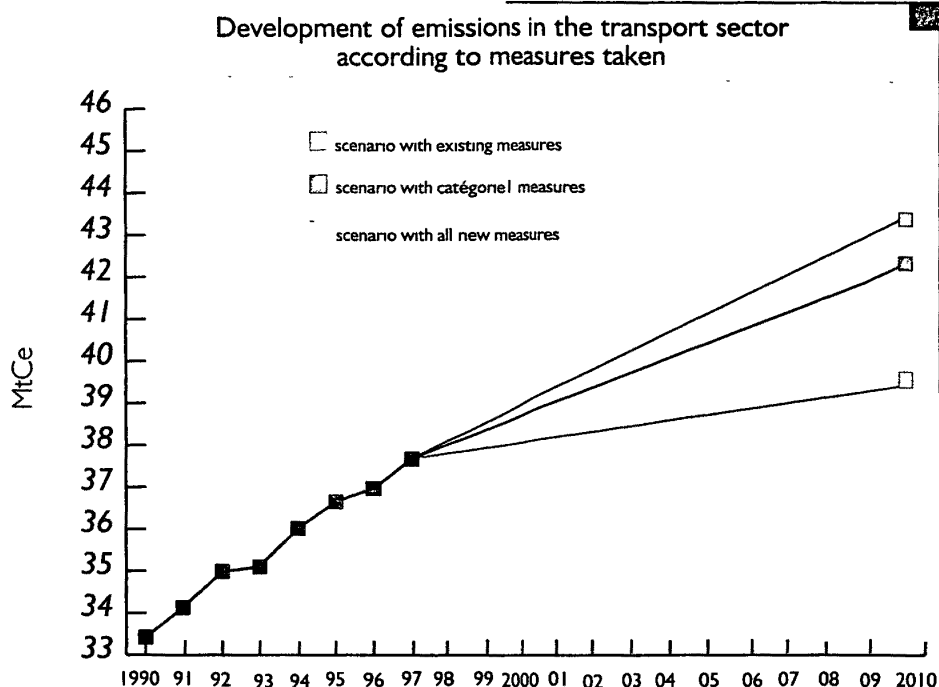
Vk(m): index for road transport of goods; Vk(p): index for journeys in private vehicles; C(m): index for carbon emissions for the road transport of goods; C(p): index of carbon emissions for private vehicles.

The data relating to traffic are those of scenario "B": forecasts carried out for the survey on the outline service plans in the field of transport, forecasts based on hypotheses matching those of the forecasts described here under the name of "scenario with existing measures". As for carbon emissions, these are from the report of the working party put together by the ITFCC.

The trends contained in this programme endeavour to take into account the specific features of the transport field:

- its inertia in the short and medium term leads to implementing quite rapidly and upstream measures comprising fairly long reaction times: hence the interest in taking into account, as in the outline service plans, not only the 2010 objective, but also beyond this horizon (at least that of 2020, adopted for the outline service plans) ;
- it is appropriate from now on to have an ambitious objective, consistent with the general trends of this report and to make provision, as of now, for long term measures that will stabilise emissions in the transport sector over the 2010-2020 period, at a level that can be located at a level of 40 MtC.

4 - THE TRANSPORT SECTOR



- firstly we must intensify the action which has already been taken, technological advances on vehicles, the production conditions in this area; however, the measures in this category remain insufficient;
- we must launch an action on combined demand with a strong emphasis on the service with the strong development of an alternative service to the individual car and to the road transport of goods; only this second category of measures will enable us to attain the objective, but this again poses the question of reaction delays.

2 The existing measures

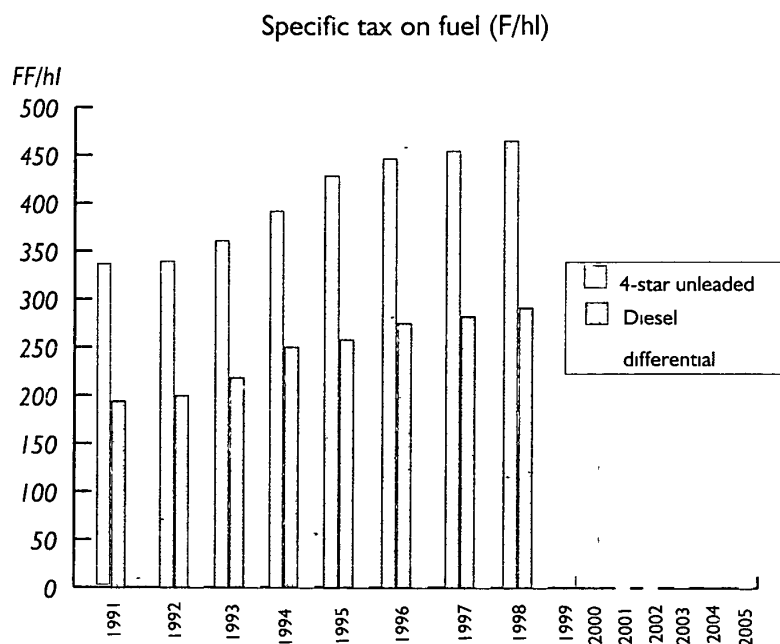
These are still heading for a level of 44 MtC (42.5 for CO₂ alone) in 2010.

2.1. Measures common to passengers and goods

Catching up on diesel taxation

The relative tax advantage accorded to diesel in France is among the highest seen in the European Union. The price variation in IDPP between lead free petrol and diesel rose in 1998 to 1.43 FF/l, counting VAT on the IDPP this is equal to 1.72 FF/l. It has been decided to bring this variation to the level of the European average through an increase of 7ct/litre for 7 years of the IDPP for

diesel as compared to that on petrol, with partial reimbursement in the case of business travellers, with the exception of public passenger transport.



Methods of financing

We must mention at this point the creation of FITTVN, Inter-modal Finance Fund.

Choice of investment in transport

Updating the report "Transport: for a better choice of investments" has begun. M. Marcel Bortoux chairs the working party set up for this purpose.

The work will enable us in particular to better incorporate preoccupations connected with the greenhouse effect in the criteria of investment choices in transport.

Evolution of tax on vehicles

The reform of the system of notional power of light vehicles has enabled road tax to be given a basis for taxation (maximum power and emission of CO₂) which takes into account in a far better way the impact in terms of greenhouse gas emissions from vehicles.



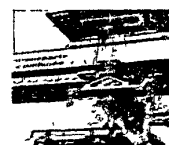
4 - THE TRANSPORT SECTOR

The case of road tolls in urban centres

The last few years have seen the creation of several toll infrastructures in urban centres: the tunnel from Prado-Carénage to Marseilles, the TEO in Lyon and the A14 in the Paris region.

In spite of contrasting results, these developments have created precedents in terms of urban road tolls (on new infrastructures)

The conditions under which these tolls have been implemented do not however allow us to draw overall conclusions: in fact they only concern tolls on new infrastructures, the toll was instituted essentially with the goal of financing planned structural work. The question of the financial contribution of the car in town remains broadly open with regard to both the method of collection and the objectives sought (internalisation of costs, regulation of traffic congestion, reduction of space taken up by cars in towns, etc).



Law on Air Quality and UTP

The law of 30 12.1996 on air quality and the rational use of energy made it compulsory for all towns with over 100,000 inhabitants to produce an urban travel plan. Sixty-five organising authorities are involved. These plans define the principles for the organisation of the transport of passengers and goods, traffic and parking. In October 1999, only the UTP in Lyon was signed. However, a period of six extra months was granted; two-thirds of organising authorities should be in a position to approve their UTPs before the end of the first quarter of 2000.

The scope of these plans (article 14 of the law on air quality and the rational use of energy) particularly covers the reduction of car traffic, the development of communal transport, use of bicycles, travel on foot, road planning, organisation of parking, transport and delivery of goods and lastly incentives for car-sharing and public transport use for staff of companies and community groups. The subject of the development of group transport is a particularly weighty subject in view of the current elements: with road sharing; improvement of journey times and the quality of service.

It is however desirable that the explicit taking into account of the impact of choice of UTPs on greenhouse gas emissions, as well as the monitoring of these factors, from now on constitutes a general rule.

Initiatives for research into vehicles and organising transport

The work of PREDIT has enabled the research initiatives regarding vehicle consumption and the more efficient organisation of transport to be achieved.

Within this framework, the principal action and themes are:

- the improvement of the fuel-engine-depollution cycle;
- work on materials and on lightening vehicles;
- non-conventional propulsion systems;
- the design of low consumption demonstration engines;
- research on mobility.

2.2. Transport of goods

Regulating and controlling working hours

Among the various measures decided on in 1993, the strengthening of sanctions in the event of non-respect of the rules relating to driving hours is notable.

These measures have, in spite of everything, only been put into practice recently and their full effect is not yet known.

Development of intermodal transport of goods

The development of intermodal transport is to be pursued to enable the reduction of the share of transport carried out by road. To this effect, the following action is being taken:

- opening up infrastructures for international transit;
- putting the main freight lines on gauge B+ and developing new platforms;
- aids for carriers to acquire joint transport equipment;
- certain projects for river surveys.

2.3. Transport of passengers

Reduction of specific consumption for new vehicles

The agreement made with European automobile manufacturers of ACEA was incorporated into the scenarios with "existing measures" as soon as it was finalised, and so it is considered, as much in scenario "B" for service outlines as in these forecasts. This agreement envisages the reduction of the specific average consumption of new vehicles made by these manufacturers and sold within the European Community. It marks a significant modulation in terms of the scenario trend for specific consumption to increase, and in this respect, the importance of its impact should be emphasised.

This agreement is accompanied by measures allowing for monitoring compliance with commitments. However, this agreement does not take account of all the developments in vehicles and in particular the development of air



4 - THE TRANSPORT SECTOR

conditioning. It should be noted that the impact in terms of emissions in application of this agreement depends on certain external factors like the evolution in the rate of renewal of the fleet.

Technical control of vehicles

Technical control every two years has been compulsory for all vehicles over 4 years old since 1st January 1995. A bill of 5th July 1994 renders it compulsory to implement repairs in the event of polluting emissions during this technical inspection with effect from:

- 1st October 1994 for petrol vehicles without catalytic converters;
- 1st January 1996 for diesel vehicles;
- 1st January 1997 for petrol vehicles with catalytic converters.



Promotion of electric vehicles and other alternative vehicles

The law on air quality and the rational use of energy took a certain number of measures intended to encourage the development of electric vehicles and other alternative vehicles operating on liquefied petroleum gas or natural gas. Thus, the public administrators have been obliged when renewing their fleet to acquire a proportion of at least 20% of such vehicles. Added to this are various tax measures and incentives: a one-off allowance; reduction or exemption from tax for company cars; discount for purchasing electric vehicles; lowering of the IDPP on LPG/NGT fuel; the option of a reduction on road tax; the option for companies to deduct all or part of the VAT paid on the electricity and gas fuels used by these vehicles; aid to optimise the fleet of vehicles.

Urban travel

Apart from the creation of UTPs covering goods, it should be noted that considerable initiatives to increase group transport with exclusive lanes have been made.

In this respect, there have been many recent achievements and decisions made regarding the underground system (in Paris, line 14, new lines in Lyon and in Lille), tramways (Issy-La Défense, Strasbourg, Nantes, Bordeaux, Orléans, Valenciennes, Lyon), bus lines with exclusive lanes (Trans-Val de Marne, Petite Ceinture).

Regional express travel

The development in the Paris region of the regional express network (lines D and E) has been continued.

¹ The range of evaluation is quite broad, taking account particularly of the difficulty in defining a reference scenario for technological progress, we will take here a median estimate of 2.8 MtC in 2010, which comes from work carried out within the scope of the Second National Communication

On the other hand, we should note the significance of developments operated in the 6 pilot regions in which a new partnership between the communities and the rail operator has been formed.

Development of the TGV network

The drive to construct infrastructures was followed by work on the Mediterranean TGV and the first phase of the TGV East. These achievements and the subsequent additions to them save on journeys using methods that produce far more CO₂: the private car and the plane.

The research and development initiative on TGVs has been sustained within the scope of the PREDIT research programme, with a view to the design of a new generation of TGV train, ensuring greater capacity, increasing the attractiveness with improved comfort and speed and making for greater energy efficiency per passenger kilometre.

Reducing specific emissions from air transport

Increasingly strict requirements in terms of noise enable the progressive withdrawal of planes using old technology to be replaced with planes with a lower specific consumption (average 30% gain)

The struggle against congestion through improving air navigation conditions has also had an extremely positive consequence on consumption: since the setting in place of the CFMU (European unit for air traffic regulation), there is practically no waiting in flight, waiting is on the ground. New progress in terms of air navigation is also going to have extremely positive consequences on the consumption of kerosene by enabling routes and flying heights to be optimised.

Controlling the speed of light vehicles

Decisions have been made to reinforce compliance with the existing speed limits, creating a speeding offence and tightening controls.

We will monitor the effect of these measures on speeds practised and, if necessary, will propose their strengthening or supplementary action (for example information on the average speed practised on the motorway by means of toll tickets)



4 - THE TRANSPORT SECTOR



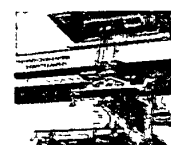
New measures

The new measures are regrouped below into:

- measures concerning vehicles;
- measures for operation;
- action on demand,
- changing the services offered

The first two types comprise technical measures intended to improve the environmental and energy efficiency of the different methods of transport. They also involve decisions on investment.

The other two types of measures apply more upstream. They aim to influence the quantity of demand for transport and the distribution of the modal split. These assume significant economic action through the use of price signals, through the evolution of the urban structure and the organisation of production and through the development of the infrastructure network and more generally of the transport system. These types of measures, evolution of the urban and economic structure and of transport infrastructures, have their full effect in the long term, at a date that far exceeds the first budgetary period.



3.1. Measures concerning vehicles

T.1.1. Follow-up and extension of the ACEA agreement and its agreements with manufacturers outside the Community

The ACEA agreement enables us to count on the lowering to 140 g CO₂/km of the new vehicle fleet in 2008

T.1.1.1. Monitoring tools for the ACEA agreement and related agreements

It will be appropriate on the French level to implement the follow-up tools provided for in this agreement. These tools should enable compliance with the commitments already made to be checked, steady progress towards the 2003 date where an examination of the situation is expressly provided for as well as the negotiation of improved conditions for reinforcing the deadline of 2012, a reinforcement for which the agreement provides the contingency. Obviously, the French authorities will be ready to take any appropriate measure in the event of non-respect of this agreement.

T.1.1.2. Extension to light duty vehicles (LDVs)

The objectives of the ACEA agreement should be extended to LDVs, either by voluntary agreement, or by another provision.

T.1.1.3. Incentive measures for increasing the fleet of light vehicles

In addition to the preceding measures, it is possible to envisage incentive measures for motorists to renew their vehicle more quickly and thus accelerate the gain in consumption attributable to the improvement of engines and to replacement by a less powerful vehicle. These measures should contribute in particular to maintaining the existing variation between the average consumption of the French fleet and that of the European fleet.

These measures will be studied and proposals carried out while endeavouring to estimate carbon gains, economic cost and the impact on the industrial tool.

T.1.2. Alternatives to air conditioning and managing transport subsidiaries

Air conditioning increases CO₂ emissions from the engine and also contributes to the increase in HFC emissions.

Technical proposals will be studied to enable the improvement of climate-controlled comfort in vehicles at European level to be considered without recourse to air conditioning particularly through the selection of comfort glazing and particularly air conditioning when it is present.

In addition, technical proposals will be studied to enable a specific cycle to be established at European level enabling, as a supplement to the current procedure, the impact on emissions for the operation of subsidiaries to be taken into account.

T.1.3. Controlling HFC leakage

(cf refrigerant gas chapter)

T.1.4. Electric and alternative vehicles

Integrating electric and alternative vehicles in the struggle against the greenhouse effect is achieved through the evaluation of CO₂ emission rate per vh.km compared with those of traditional vehicles, taking account of other possible greenhouse gas emissions and also taking account of emissions from the downstream sector.

This evaluation should be based on the current results from these sectors but also on prospects for technical improvement (improved performance for example) and economic improvement.

Historically, the development of electric vehicles and gas vehicles (LPG or CNG) has been promoted essentially for the reason of reducing local pollution (improvement of the quality of ambient air).



4 - THE TRANSPORT SECTOR

With regard to gas vehicles, they have a limited benefit from the point of view of combating the greenhouse effect (CO₂ emissions) while having a certain advantage from the point of view of local air quality (nitrogen oxide and hydrocarbon emissions) and from the point of view of reducing sound pollution (CNG buses in particular).

The situation is very different for electrical vehicles: greenhouse gas emissions resulting from the use of these vehicles are very low. Their number is extremely limited. Their development, whether for purely electric or hybrid vehicles that are partially electrified, supposes an improvement of performances and a reduction in price of the components used.

A few years from now we can expect significant technological advances in each of the sectors concerned. Moreover, it appears likely that by the year 2010 we will see the launch of distribution of vehicles powered by fuel cells.

However, the reference vehicles (petrol and diesel fuel) should themselves reduce their consumption and their greenhouse gases emissions in the course of the coming years (see above).

It is recommended that within the scope of research and development under way on clean alternative vehicles, the reduction of greenhouse gas emissions at an acceptable economic cost should be researched.

A report from the "Interministerial committee for clean vehicles" taking account of the result of several studies and experiments, will act as a basis for public authority decisions on the development of clean alternative vehicles (regulatory action, increased incentives, support for R&D) anticipating an important meeting in 2002.



T.1.5. Reduction of specific emissions from rail transport

In itself, the development of rail transport, leads to emission reductions by substituting for more heavy producing methods (lorries, light vehicles). But it is also possible to reduce the average specific emissions of rail transport for goods and passengers where diesel still represents 1/6 of energy consumption.

For this, three actions will be undertaken to reduce emissions from the rail sector due to the consumption of petroleum products:

T.1.5.1 strengthening the share of transport with electric power, including continuing to electrify the system;

T 1.5.2 replacing diesel engines of the generation currently in service with more advanced equipment,

T 1.5.3 optimising the use of the electrified system particularly through reducing the use, even auxiliary, of diesel power under an overhead cable

T.1.6. Control of N₂O emissions connected to the catalytic converter on vehicles

This question of N₂O emissions is relatively recent and is connected to the development of catalytic converters.

Studies will be undertaken to ensure a more thorough knowledge of these emissions, their correct measurement and the drawing up of solutions which will result in their control.

These questions will be studied on the French level and their effective introduction in to the programme "auto-oil 2" will be requested.

T.1.7. Limiting speeds for light vehicles

Limiting the speed of vehicles is an objective affecting both requirements for road safety and the rational use of energy.

France is particularly committed to this objective, as demonstrated by the recent vote on the law on road safety.

On the level of the reception and equipping of vehicles, the decisions are within the jurisdiction of the community

- for several years now, France has ruled in favour of reducing speeds by manufacturing vehicles so as to avoid too marked a difference between the speed they are able to reach and the maximum speed allowed;
- moreover, in 1999 it undertook steps to obtain international procedures in Geneva for the technical definition of a speed limit – warning able to be fitted in all private cars

France will endeavour to win over its European partners to these proposals

A significant stage could be reached through the adoption of the same speed limits on all European road and motorway networks.



4 - THE TRANSPORT SECTOR

3.2. Operational measures

T.2.1. Regulating transport and control

T.2.1.1. Controlling compliance with speed limits for HGVs

It is proposed to introduce a system adapted to sanctions (fines without criminal penalty) for offences in exceeding speed limits shown on tachographs.

Such a measure should improve the rate of compliance with speed limits.

T.2.1.2. Technical control of HGVs at the roadside

Technical controls at the side of the road will be strengthened.

A certain number of vehicles are in fact correctly adjusted during visits to sites but subsequently these adjustments are no longer satisfied. Moreover, it is necessary to extend measures to control tachograph rigging.

In this respect, it will be necessary to co-ordinate further national policies for control within the European Community to avoid any accusation of discrimination in favour of foreign carriers.



T.2.1.3. Limiting the speed of LDVs

Currently LDVs are subject to the same speed limits as all light vehicles.

It appears that this is the cause of a transfer of HGVs to LDVs, although HGVs have far less consumption per Tkm transported.

The feasibility study and the impact of a speed limit for LDVs will be carried out, by basing it on a detailed analysis of the actual use of these LDVs.

T.2.2. Reducing emissions from air transport

T.2.2.1. Reducing energy consumption on airport platforms

Initiatives to be developed to reduce local pollution are the following.

- *reducing plane taxiing times on the main platforms by improving signalling through guidance systems on the route, by means of optimising the network of traffic routes (rapid exits and new feeder tracks) and improving the efficiency of decicing stations (reducing waiting times and location on the platform);*
- *renewing assistance equipment on stop-offs (increased use of gas and electric engines),*

- *generalisation on the main platforms of a 400 Hz electrical power supply centralised to reduce the use of mobile generators (ground power units) which have poor outputs.*

T.2.2.2. Improving the inter-modality of air/public transport

It can be estimated that, for an internal flight, transfer from private car to public transport (train or bus) to reach the airport can represent a fuel saving in the region of 5 to 10% on the total consumption connected with the passenger journey. Consequently, a 20% transfer from the private car to public transport for access to the main airports would be equivalent to a saving of at least 1 to 2% of energy consumption connected with internal flights serving these airports.

Increasing frequency, improving the services offered (direct trains and advance luggage check-in, in particular) constitute methods to be examined as a priority for better use of the existing infrastructures.

T.2.2.3. Pre-routing and on-forwarding by express train

France possesses two high calibre infrastructures in this field: the TGV high-speed stations at Roissy and Satolas.

It is appropriate to continue to develop agreements between air and rail companies to facilitate pre- and post-conveying particularly with the registration of luggage at the train station.

Such co-operation between operators results in the improvement of services for users but also in energy savings connected with the transfer from the plane or car to the train. This can represent, for an intercontinental journey, a fuel saving of several percent, but which essentially concerns international traffic.

T.2.3. Operation of road infrastructures

T.2.3.1. Managing large interurban routes

On interurban networks, experimental traffic regulation through toll booths has led to real fuel savings in the region of 1.9 to 2.6% at the busiest points. Figures on the effect of regulating speed are not yet available, these however concern peri-urban traffic more. Even in 2010, these situations will be limited and will only correspond at the most to 5% of motorway traffic. The potential gain is therefore in the region of 1%, equal to 10,000 tonnes of carbon. This action would seem to be far more justified by the other improvements that it allows than by energy savings.

4 - THE TRANSPORT SECTOR

In terms of CO₂, we will continue to evaluate in a systematic way the various trials that will be carried out

T.2.3.2. Regulation of traffic lights and progressive signal systems

Here again, we have very few assessments available. Progressive signal systems, which essentially penalise higher speeds, would lead to reductions in average speeds of 10% and probably, when they are correctly used, to equivalent savings in consumption.

If we do not want to produce traffic with these regulation systems, it would appear necessary to also reduce the capacity of roads or to couple them with traffic light regulation using progressive signal systems. Nevertheless, the actual gains would seem to be slight, in the order of 2 to 5%. Moreover, such systems are only effective in the largest built-up areas, but they are indispensable tools for ensuring the dynamic use of the network in compliance with the objectives of the UTP.

An extension of their use will mean a saving of 140,000 tonnes of carbon in 2010 and 150,000 in 2020.

T.2.3.3. Public transport priorities

Integrating priority systems at traffic lights for public transport seem to be of far greater advantage. This in fact leads to a marked improvement in the quality of service, with an increase in commercial speed in the region of 10% and a reduction of unit consumption for buses from 5 to 10%. This last effect is secondary. On the other hand, improving commercial speed leads to the improvement of equivalent passenger occupancy

T.2.3.4. Regulating urban fast lanes

Here again, we do not have data on the effect in terms of unit consumption for systems of the UFL type (SIRIUS, CORALY, MARIUS). Moreover, these systems have been implemented with limited functions that are progressively extended as the equipment is installed. Regulations on access and speed are thus beginning to be tested. In short, we should add that their quasi-motorway operation probably also gives rise to over-consumption in slack periods.



Campaigns of suitable measures will be launched, in order to find out the actual speeds practised (particularly the significance of deceleration and acceleration in busier periods of traffic flow) to be able to assess the real energy impact of systems enabling speeds to be homogenised at levels compatible with the urban environment (especially noise phenomena)

These UFLs represent approximately 15% of motorway traffic. It is reasonable to envisage a saving of 3% on CO₂ emissions, equal to a saving of 50,000 tonnes of carbon in 2010 and 60,000 tonnes in 2020.

T.2.3.5. Information on users

Information systems on users can play a part on two levels. On the one hand, the best information enables the best choice of itinerary; on the other hand it reduces congestion through better traffic distribution. However, a serious evaluation of these measures is not available.

Telematic tools should enable us to develop driving aids (AICC, signalling and speed limit reminders in vehicles, etc) and these will contribute to reducing consumption.

Operation initiatives: global assessment

An extremely cautious costing of operation initiatives leads therefore to a saving in emissions of 510,000 tonnes of carbon. The quasi-totality of these actions are not specially aimed at reducing CO₂ emissions: these at least are measures "with no regrets", justified for safety reasons and other environmental concerns. It seems essential to re-launch specific evaluations on these initiatives, while steering them towards the reduction of consumption and CO₂ emissions and placing their implementation within the scope of UTPs to avoid producing traffic.

These actions will in any event be essential to enable the correct implementation of UTPs and the outline master plan for road operations (SDER). It would be appropriate to increase the government budget by at least 300M.FF per year and to allocate a share to supporting local action.

T.2.4. Facilitating marine navigation

Marine navigation consumes approximately 6 times less fuel than road transport per tonne-kilometre transported. There is therefore a strong incentive to develop the use of this transport mode.

4 - THE TRANSPORT SECTOR

Measures in favour of marine navigation will be studied, using in particular the recent communication from the Commission ⁽³⁾.

3.3. Action on demand

This consists of correcting the adverse effects referred to at the start of the Transport section which contribute either to artificially maintain the increase in mobility, or to split it in an insufficiently rational manner between modes of transport. In both cases, an under-optimum level of demand can be attributed, either to causes internal to the system or to external causes as can be summarised in the following table.



Table of causes of excessive mobility and adverse modal split

	Overall excessive mobility	Adverse modal split
Causes internal to transport	1 <ul style="list-style-type: none">• insufficient consideration of external factors• competitive imbalance	2 <ul style="list-style-type: none">• built-in subsidies• uneven infrastructure options
Causes external to transport	3 <ul style="list-style-type: none">• land planning• modifications in the make-up of demand	4 <ul style="list-style-type: none">• structure of urban growth• just in time , etc

It should be emphasised that demand-side action will only reach full potential after the first budgetary period and it is then a matter of preparing for the subsequent periods, for which we can expect there to be tightened constraints for our country.

Box 4 corresponds to problems in adapting the technical or commercial service offered for each transport mode to the demand; to a large extent it is up to each player to optimise the measures they are implementing. In contrast, all the other cases bring public policies into play.

³ Document COM (1999) 317 final - 29th June 1999 Short distance maritime transport development in Europe a dynamic alternative in a sustainable transport chain

T.3.1. Land planning that does not create constrained and artificial mobility.

T.3.1.1. Controlling the development of urban areas

"There has been a lack of global vision linking urban planning, housing and transport. We should go much further: by firstly updating the rules on urban planning, in order to encourage the rational use of space by initiating new procedures in developing the vast work site of urban renewal."⁴

Numerous studies, particularly the "SESAME" report comparing 40 European towns, have shown evidence of a large correlation between the structure of the urban area, the organisation of group transport and the modal split for journeys.

Following the public debate "Living, travelling, life in towns", a draft bill will be put before Parliament to improve the organisation of urban travel, taking account of the problems of urban sprawl, urban splitting and spatial and social segregation. Its objectives are far broader than reducing greenhouse gas emissions, but they will contribute significantly to this end. Three trends are currently being studied:

- economic neutrality for users between cars and public transport;
- redefining the position of social housing including increased accessibility to public transport;
- reconstruction of the town in the town, with the renewal and regeneration of existing urbanised areas to take priority over new areas for urbanisation.

The bill on urban renewal and solidarity should take into account the CO₂ factor with a view to long-lasting development.

Methods will be fine-tuned to help local authorities (towns, departments and regions) to grade infrastructure projects according to the amount of traffic generated and the action to be taken in order to contain the resulting environmental impact. This approach, essential to the control of mobility, could be turned to good account during programming and planning exercises. The "outlines plans for territorial consistency" will be the favoured way to renovate methods (especially from the point of view of public discussion) and tools for managing urban areas.

⁴ Participation of the Prime Minister in the "Living, travelling life in towns" colloquium at the Cirque d'Hiver on 23rd June 1999



4 - THE TRANSPORT SECTOR

T.3.1.2. Taking account of the impact on transport of urban planning documents and the location of businesses

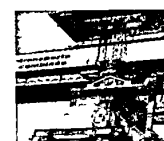
A great deal of the studies in progress on travel plans have begun to take account in a pertinent way of the impact of transport on greenhouse gas emissions, but they have also highlighted the problem of linking transport system planning, urban planning and the location of businesses.

It is therefore necessary to evolve methodological tools enabling local communities to ensure the consistency of development initiatives. These tools should enable the impact on transport to be considered when studying urban plans and decisions on the location of businesses.

For this action, it is necessary to provide methods of study to re-update the various outline plans and to apply a land use policy within the framework of local contracts.

Diagnostic aids will be put in place by the ADEME to assist the decision-makers in their choices for locating businesses. These diagnostic aids will enable the movement of people and goods, energy consumption and polluting emissions from various locations to be compared, for example in urban renewal zones and in the outer suburbs

It is also necessary for tools to be set in place to enable the forecasting, monitoring over time and assessment of results in terms of greenhouse gas emission from the different measures decided in the UTPs. The rules relating to these plans will be developed.



T.3.1.3. Considering the impact on the transport system of waste management

Several studies confirm the significant number of journeys brought about by the collection and processing of waste. It is proposed that optimising these journeys and using the least polluting methods of transport should be taken into account in local and departmental mapping, as well as in public aid (example: connections by rail or waterway should be planned for large installations, to provide a certain flexibility of provisions for the local processing of waste).

T.3.1.4. Participating in the development of combined transport by encouraging shippers to group together

Problems with the quality of combined transport services in terms of combined road-rail transport often stem from the fact that the client base does not present itself to the rail operator in a sufficiently well organised manner.

Structuring demand by encouraging the emergence of groups of shippers would enable a more fruitful dialogue to take place. It would also enable problems to be overcome more easily through availability of a combined transport service to satisfy requirements. A provision comparable to the existing one for road hauliers to move to combined transport should be made to support this action.

T.3.2. A modal split more favourable to controlling CO₂ emissions (box 2 in the table)

This group of measures essentially brings together the re-balancing of transport methods with regard to social costs ⁽⁵⁾.

T.3.2.1. Taxation of kerosene

France has declared itself to be resolutely in favour of the study and rapid implementation, within the scope of ICAO, of a system for taxing aircraft fuel.

However, this international action is not making much progress. The difficulties with this international action are particularly illustrated by the cautious nature of the recent decision of the Conference of Parties in the framework convention on climate change ⁽⁶⁾. This makes strong initiatives at European Union level all the more necessary.

As a result, France is requesting that parallel to this step within the ICAO, the European Union should without delay look into implementing a system of tax or duty on air transport taking account of the actual consumption by aircraft and the characteristic of flights, based on the communication from the Commission dated 1st December 1999 on air transport and the environment.

The study of implementing this system of tax or duty in place should be carried out in parallel with the negotiation of voluntary agreements with airlines and airport operators, made up of real and ambitious objectives and including a provision for compliance with its commitments.

⁵ Here we take our inspiration from the logic in scenario "C" drawn up for service outlines. This scenario includes a reduction of 10% on traveller rail fares, this is a policy aimed more at action on the service itself rather than the demand

⁶ Decision 18/CP.5 dated 4th November 1999 "Emissions - based upon fuel sold to ships and aircraft engaged in international transport"



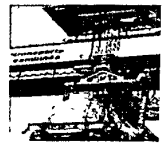
4 - THE TRANSPORT SECTOR

T.3.2.2. Compliance with the work rules in road transport professions

The artificial reduction of the cost of road transport due to the widespread non-respect of social norms is generally recognised, even by the professional organisations themselves within this sector. This results in an imbalance in the competitiveness of other methods for transporting freight and particularly those that are more economical in their use of fossil energy (rail and waterways).

This situation should therefore be rectified: applying a progress contract, taking account of a certain impact of the move to the legal working period of 35 hours per week ⁷⁾. This is the least we can consider here.

The need to pursue efforts for European harmonisation in this field should be emphasised.



T.3.2.3. Variations in tax between different fuels

The principle of a catch-up between petrol and diesel fuel is set out clearly in the "contribution of the French Government to the project on the directive for restructuring the community framework for taxing energy products" (April 1999). This is to say that it is effectively a question of a provision which can only take on its full meaning, effectiveness and competitive equity at a European level.

The Government has decided to reduce this variation between now and the year 2005 to lessen the gap with the average community variation.

⁷ In accordance with certain hypotheses (scenario C) used in preparatory work for the outline service plan for public transport

T.3.2.4. Fiscal treatment of fuel used by public transport

In 1999 the road transport professionals received partial reimbursement equal to the difference between the level of IDPP on diesel fuel in 1998 (re-assessed to take account of price increases) and the level applicable in 1999. This provision does not apply to public transport networks. The increase in IDPP on diesel fuel therefore penalises the bus networks although their use is far more beneficial in preventing the greenhouse effect than that of private cars using petrol.

Consequently, reports from the ITFCC suggest the extension of partial reimbursement of IDPP on diesel fuel to cover public transport as well.

T.3.3. Moderating demand by true costs (box 1 in the table)

T.3.3.1. Internalising the costs of carbon in taxation on fuels

It clearly appears that the measures already cited would still be insufficient to ensure compliance with the 2010 objective. In fact, the combination of measures that it involves will enable a saving in the region of 0.51 MtC in 2010; at this stage, by adding the effect of measures in the first group, a little over 1.5 MtC of avoided emissions can be forecast. This is a low yield with regard to the level of emissions from the sector. Nor does this enable us to head towards stabilising emissions from transport in 2020 ⁽⁸⁾.

⁸ The *raison d'être* for the study can be found in a far more pro-active scenario (such as scenario D of the preparatory work for producing service outlines) involving, if it is taken in its totality, the doubling of IDPP over the 20 years from 2000 to 2020, enabling the avoidance of an additional 2.5 MtC in 2010 and, more specifically, in the order of 7 MtC in 2020. In annual terms, this is a slower rate than that currently applied in the UK (+ 6% per year). However, it is true that such an increase corresponds to a carbon price level, whatever its method of assessment, approximately five times higher in 2010 than that resulting from the forecasts (cf chap. 2).



4 - THE TRANSPORT SECTOR

Comparative table for the taxation of fuel in Europe in 1999

Taxes in euros per 1,000 litres	4-star unleaded	diesel
Germany	501.1	317.0
Austria	414.4	289.7
Belgium	507.2	290.0
Denmark	506.5	307.7
Spain	317.7	269.9
Finland	559.7	304.7
France	589.5	381.5
Greece	318.5	256.6
Ireland	378.7	330.1
Italy	514.8	403.2
Luxembourg	347.3	252.9
The Netherlands	568.8	346.0
Portugal	498.8	295.3
United Kingdom	624.5	638.7
Sweden	486.9	291.1
Average	482.2	331.6

(source Eurostat January 1999 / Energy monitoring agency April 1999)



We have thus gone on to study the application to all fuels of a tax differential based on the retained price of carbon.

In this hypothesis, IDPP remains a tax instrument. It is proposed to qualify this in such a way that it is identified as an instrument in combating the greenhouse effect.

Identifying it in this category would have the advantage of contributing:

- to the readability of the evolution of taxation policy in the field of fuel;
- to the correct understanding of the consistency of environmental taxation policy by establishing the link with the GTPA applied to intermediate energy consumption.

For the purposes of inter-sectoral balance, this is being limited to transport at the level of the price of carbon in 2010, which will be based on the standard price of carbon on this date (*cf. chap. 2, § 3.2*). The gain in avoided carbon will be significant (in the region of 1 MtC in 2010).

Under these conditions, the stabilisation of CO₂ emissions from transport at 40 MtC in 2020 will take place, through a pro-active policy to modulate the supply of infrastructures. It is this hypothesis which is presented below.

T.3.3.2. Fixing a price scale for urban journeys

"The methods of financing transport remain inconsistent: individuals do not pay the price for their behaviour. It is the taxpayer and not the motorist who pays the main contribution towards highway maintenance. In this way, all citizens subsidise the effects of the exponential increase in car traffic. And the resources are lacking to produce and operate public transport networks which are comfortable, fast and efficient for which the users alone are not able to support the cost."

To take greater consideration of this situation in towns, it is proposed to strengthen the measures planned for managing parking in urban journeys. In particular the local communities will be given incentives to use paid parking as a tool to control and limit car traffic. To this end UTPs could form the support for global study of the urban area (zones, tariffs, etc.) and become a more prescriptive tool with regard to local communities. It is also desirable for paid parking and public transport to be managed with consistency and complementarity by the organising authorities.

In this spirit, legislative and regulatory provisions will be made, particularly within the framework of the law (solidarity and urban renewal) to transform the authorities organising transport into authorities organising journeys, able to manage parking as well as urban and even peri-urban public transport in the long term.

Several operations, (particularly those in Strasbourg in which a park-and-ride parking ticket also allows free access to the tramway) have demonstrated the effectiveness of systems charging both for the use of the car and of public transport.

This is why it appears necessary to create the conditions for the continuation and extension of this type of fee for the use of road infrastructures to enable a new resource to be created for future authorities organising urban travel and to create attractive fares for public transport (for example, a travel ticket enabling you to drive on toll roads and giving access to a special tariff for feeder car parks and for group transport).

6 These networks are currently being tested following decisions by the IMCRS (2nd November 1997 and 2nd April 1999)



4 - THE TRANSPORT SECTOR

Implementing such a system, for which the methods are yet to be defined, coupled with action to control urban development (T.3.1.1) and travel by public transport (T.4.4.), would enable an additional saving of over 0.5 MtCe in the urban environment in 2010.

3.4. Action on the supply-side

All the initiatives listed up to now still only represent a modest contribution from the transport sector with regard to the volume of emissions produced. It still remains to ensure the objective of stabilising these emissions at a level of 40 MtCe in 2020.

It should be recalled from the outset that measures intended to adapt services are long term measures that will produce their full effect, particularly through feedback on demand, over subsequent budgetary periods for which it thus forms a preparation.

This aspect is dealt with last so as not to give way to the tendency of believing that all transport problems can be resolved through the planning of infrastructure capacities. However, nor should we make the opposite mistake. The action to alter demand mentioned earlier in this report does not lead to the reduction of emissions only – or even principally – by a reduction of mobility but also by the improved allocation of transport methods. Improving the quality of services (speed, reliability, frequency of public transport) is essential for this improved allocation, but there are requirements for relieving congestion on certain rail routes, the opening up of alternative capacities to road for Alpine and Pyrenean crossings as well as on the main European routes, multi-modal terminals, etc.

Proposals referred to here are mainly centred on freight and on travel in the urban area. With regard to the interurban and regional transport of passengers, it clearly appears that motives initially far-removed from combating the greenhouse effect spontaneously lead the authorities concerned to implement policies (TGV, TER) which will have the end result of furthering the options within this programme. The subjects highlighted are those which require the assertion of a strong political will, since the changes of emphasis they involve are considerable and beyond internal measures in the sector. They constitute a satisfactory service/demand pairing from the point of view of the environment and also call on a more long term view of the organisation of space and flow management.

Regarding freight, this programme is closely hinged around the goods services outline plan, in that this proposes the re-balancing between transport methods that consume a greater or lesser amount of fossil energy, but also takes into consideration the need for greater control of mobility, at least within European territory.



Regarding travel in the urban area, it needs to be relayed through action that will be determined in future town contracts, in accordance with the guidelines put forward in the "Guide for Decision-Makers", an instrument for implementing this programme aimed particularly at facilitating the dialogue between all the partners.

T.4.1. European joint action on organising community space

The European Union is currently organising a study on a community space development programme (CSDP). It highlights the role of transport in this development. It would also be appropriate to emphasise that choices made in terms of developing community space will have an impact on the transport system. The CSDP's study should therefore look into the organisation of European space that is the most cost-saving in terms of transport needs and that most favours the methods least damaging to the environment (combined, maritime, urban group transport, etc.). One example is especially significant in combating the greenhouse effect:

The distribution of industrial activities within the European space has a direct impact on the flow of goods. Therefore, an organisation facilitating as far as possible the use of the least damaging modes of transport should be designed (maritime, river, combined transport). We are expecting underlying growth particularly for international movement and for transit, as shown in the estimate table below.

Evolution of goods traffic and its international share

Billions of Tkm	1997		2010		2020	
Total traffic	235		310		390	
National traffic	153	65%	174	56%	191	49%
International movement	45	49%	71	23%	101	26%
Transit	38	16%	65	21%	98	25%

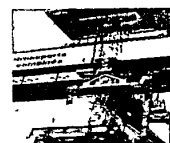


4 - THE TRANSPORT SECTOR

- So, international traffic is located on several very distinct categories of route. It highlights quite specifically rail transport or combined transport.

Organising community space should enable this traffic to be organised by means of a limited number of multi-modal platforms.

It is obvious that this action will contribute in part to the objective for doubling rail freight. However, it is probably possible to go further by acting on both area planning and the creation of completely new services, adapted to the actual needs of companies. The objective should therefore be to have the majority of international traffic go via rail or combined transport.



T.4.2. Other aspects of interurban infrastructure supply

The full carry-over of the means allocated to the main road infrastructures after completion of the programmes in progress up until 2005, to investments in heavy rail by way of new lines would contribute to a significant modification of the share of different methods according to work on the outline service plans. The hypothesis is extreme: it is possible to combine in a less radical way mileage abandoned for road transit and created for rail transit, but the costs increase very rapidly and the limit of 1,000 FF per tonne of carbon avoided is soon reached. Nevertheless, the objectives given in the outline service plans from 2010, a saving in the region of 0.8 MtCe, equal to 10% of emissions from HGVs envisaged for this date.

A certain number of action plans are to be considered:

- encouraging rail crossings through the Alps and the Pyrenees;
- speeding up the work on the loading gauge to enable the rail transit of maritime containers and research into alternative technical solutions;
- finding ways of resolving problem spots by bypassing towns (Lyon freight bypass, improving capacities of the Bordeaux rail junctions);
- encourage the development of rail freight terminals (port services, junctions, *cf. also § T.4.3*)
- create corridors for European freight (*cf. also § T.4.1*) with the European freight administration plans;
- continue with the electrification of lines.

As regards TGVs, for which there tends to be a spontaneous demand, the emphasis will mainly be on consistency with other preoccupations in this programme:

- within the programme for constructing TGV lines, set a premium on the transfer from other modes, especially air, and releasing capacities for freight on the traditional network;

- strive to establish TGV/traditional network interconnections as well as group transport to reduce car traffic brought about by high speed services.

It would be appropriate to systematically evaluate the CO₂ impact of the various projects and to incorporate this data in setting priorities.

In addition, we will also proceed to radically rework forecast models for traffic so as to take account of certain determining factors for the evolution of traffic not considered to date and to incorporate this improved knowledge.

T.4.3. Inter-modal installations for combined transport

The report directed by M. Perrod on 23rd July 1999 gives the trends required for developing combined transport relating to:

- combined transport terminals, developing them and improving their productivity and availability;
- combined transport operators and their working together;
- management of the rail infrastructure, the priority principles to attach to combined transport, capacity investments to be made in order to develop combined transport, integration of combined transport terminals in the service outlines, while distinguishing them clearly from logistical platforms;
- the relationship of the State with the rail operator, drawing up an agreement granting public aid and evaluated ambitious objectives for growth and more generally - the definition of stable principles for the financial intervention of the State;
- the relationships between the main players: recommend the drawing up of contracts between the different players based on commitments in terms of traffic volume and quality.

Such work should also take into account the interface with maritime and river transport.

T.4.4. Accelerating public transport programmes and alternative urban methods

The recommendations in the report on the plan ("2000-2006: what are the priorities for transport infrastructures? 1st July 1999) tend towards intensifying efforts in this field, by having recourse mainly to transport systems which are less costly in terms of investment – particularly tramways in their various forms and advanced bus networks – and should be retained and extended beyond 2006.

Taking into consideration the servicing of sparsely populated urban outer suburbs should also be stepped up using the appropriate means. (All proposals



4 - THE TRANSPORT SECTOR

concerning the urban environment should have synergy: see *summary table at the end of the section*).

Increasing the use of public transport and two-wheeled transport also necessarily take place through planning of the roads, transfer points and parking facilities, this enables improvements in the quality of service to be made, increased safety in the case of two-wheeled transport and, finally, increases the appeal of both transport methods.

3.5. Complementary action: training and information

T.5.1. Training professional drivers

Within the framework of the progress contract for road transport, trials on stepping up the initial and continued training for drivers as well as training for the instructors in-house will be carried out. Similar action will be taken with public passenger transport.

Depending on the result of these trials, decisions will be taken about generalising this action and on the level of subsidy by the State.

T.5.2. Instruction for the driving licence

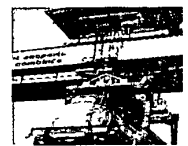
This is a matter of reinforcing initial driver training to teach them cost-saving driving.

We will assess the opportunity to reinforce initial training for the driving test in the area of cost-saving driving, incorporating training for cost-saving driving in post-driving test training ⁽⁷⁾ intended for new drivers (one year from obtaining their licence) and for experienced drivers (10 years of holding a licence) and initiating periodic voluntary courses - possibly to be free of charge.

T.5.3. Corporate responsibilities

Quite considerable potential for reducing emissions in the long term could result from the improved organisation of industrial production and business activities in the urban environment and the improved behaviour of users. However, this potential cannot be harnessed by means of regulatory or economic measures. Genuinely open joint action with the partners concerned is necessary to work out voluntary agreements and charters of good practice.

Company "environment" plans and their environmental assessments should include the affect, on the transport of goods and people, of their choice in terms of production, organisation and location ■



⁷ This training is currently being tested following the decisions of the Interministerial committee on road safety (IMCRS of 2nd November 1997 and of 2nd April 1999)

Annex
Recapitulative of “transport” measures in MtCe

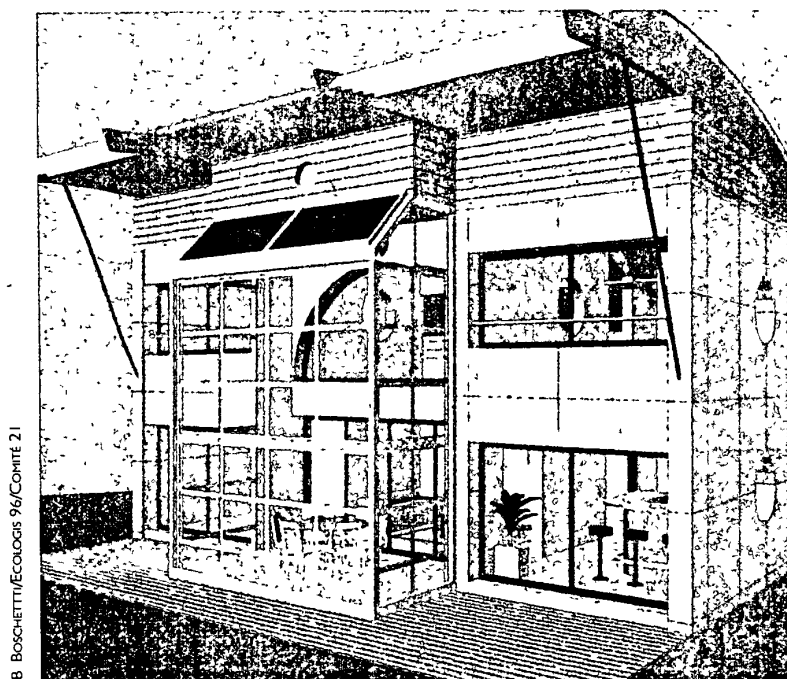
		CO ₂	Urban share
T.1.2	Alternatives to air conditioning	0.05	0.02
T.1.4	Alternative vehicles	0.11	0.10
T.1.5	Rail energy (T1.5.1 to T1.5.3)	0.11	0.0
T.2.1	Rail energy (T2.1.1 to T2.1.3)	0.2	0.0
T.2.2	Emissions connected to air transport (5 measures)	0.05	0.0
T.2.3.1	Management of interurban main roads	0.01	0.0
T.2.3.2	Traffic light regulation	0.1	0.10
T.2.3.3	Collective transport priorities	0.02	0.02
T.2.3.4	UFL regulation	0.05	0.05
Total sum of measures 1st category		0.70	0.29

T.3.2.1	Reduction in rail fares	p.m.	
T.3.2.2	Respect of working regulations	0.15	
T.3.2.3	Taxation variations between fuels	0.30	0.1
		1.15	0.39

T.3.2.1	Kerosene tax	0.1	
T.3.3.1	Carbon tax	1.0	0.3
T.3.3.1 /3.3.2	Control of urban space development Urban costing	0.4	0.4
T.4.1/2	Interurban infrastructure offer	1	
T.4.3	Combined transport (5 actions)	0.2	
T.4.4	TCSP Paris and the provinces	0.15	0.15
		4.0	1.24

The buildings sector

- 1 Emissions in the buildings sector
- 2 The principal existing measures
- 3 New measures



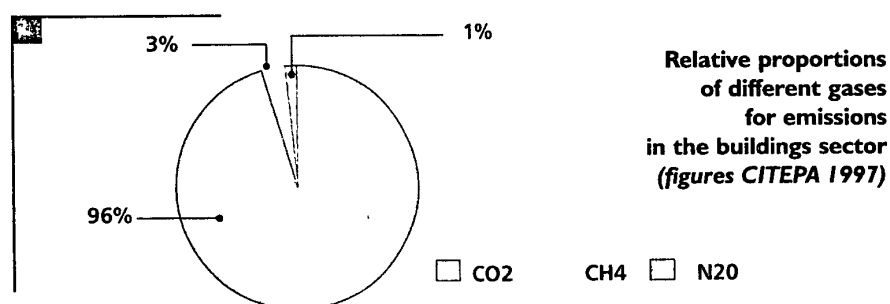
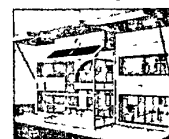


The buildings sector

Emissions in the buildings sector



Here, emissions in the buildings sector means emissions related to heating and domestic hot water production in residential buildings and buildings in the service sector. Electricity specifically related to residential and service uses is dealt with in a specific chapter.

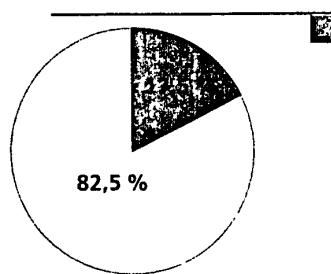
Greenhouse gas emissions in the buildings sector are mainly due to the combustion of fuels for heating and for domestic hot water, which thus constitutes a significant item. The gases produced are mainly CO₂. The share of electric heating, which is significant, does not appear in the graph below, in the absence of an official method applied by the CITEPA for allocating the proportion of CO₂ which stems from this consumption of electricity for heating.



The share of the buildings sector in greenhouse gas emissions in France is high, as shown by the diagram below (which, it should be stated, does not include CO₂ related to electric heating).

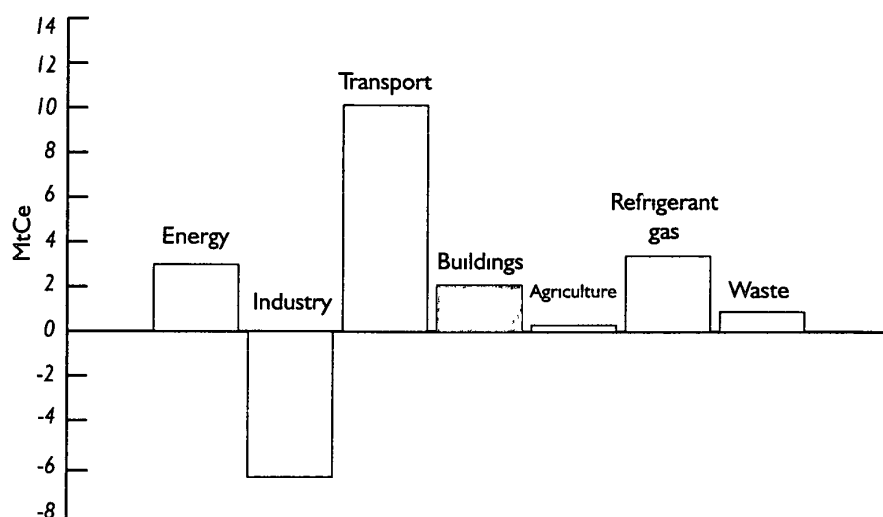
Relative share of the buildings sector in greenhouse gas emissions

 Buildings
 Other sectors



The relative significance expressed as a proportion of the total consumption of energy is greater: around one third of the final energy consumption in France. This consumption is on an upward trend: by around 11% from 1990 to 1996.

**Increase in emissions by sector 1990/2010
in the absence of new measures**



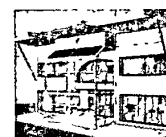
However, taking account of the growth in electric heating, greenhouse gas emissions in the sector have only a slight tendency to increase in spite of the increase in the total surface area of the building stock.

The evaluation of the impact of the measures was based on an evaluation of the technical developments to be mobilised by various actions which mutually reinforced each other (firstly actions on new buildings, secondly actions on existing buildings, information action, regulatory and normative action with manufacturers and construction companies, incentive actions with building owners and finally the introduction of a carbon tax).

5 - THE BUILDINGS SECTOR

Table of buildings measures in MtCe

	Measures	Measures Savings (MtCe/annum) in 2010	
		With category I measures only	With all new measures
B.1.1	Reinforced insulating glazing	0.23	0.23
B.1.2	Insulation of existing buildings	0.20	0.20
B.1.3	Individual boilers	0.15	0.15
B.1.4	High-performance collective boilers	0.04	0.04
B.1.5	Condensation systems	0.04	0.04
B.1.6	Boiler room control	0.07	0.07
B.1.7.1	Collective energy wood	0.10	0.30
B.1.7.2	Individual energy wood	0.10	0.10
B.1.8	Solar power	0.01	0.01
B.1.9	Geothermal energy		0.02
B.1.10	Strengthening of thermal regulations	0.3	0.3
B.1.11/B.2.2	Action on public buildings	0.10	0.20
B.2.1	Effect of ecotax ¹ on the service sector		0.40
B.2.2	Effect of ecotax on domestic sector		0.60
TOTAL		1.34	2.66



The effect of an ecotax applied to the residential sector⁽²⁾ in the context of the application of the draft European directive on the taxation of energy products would therefore result in an additional gain of 0.6 MtC (see chapter 2 § 3.5)

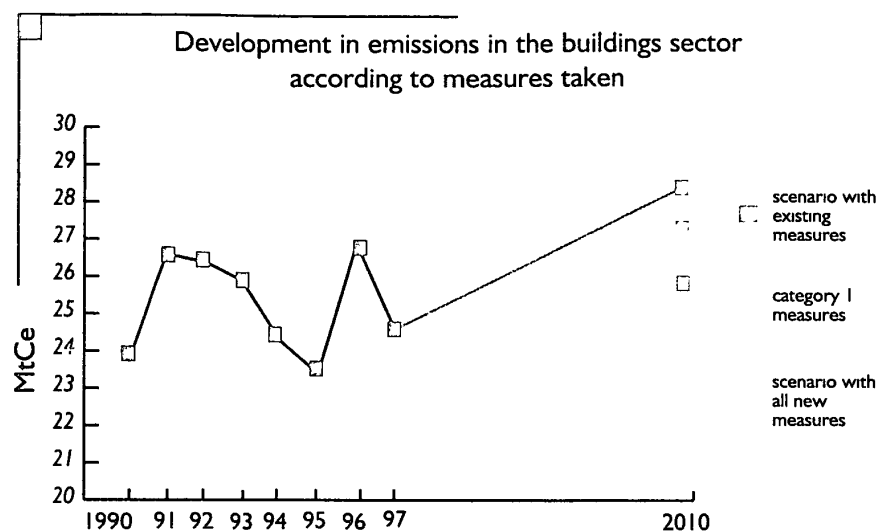
The above table assesses the impact with 10 years of measures. However, it should be noted that certain measures have a long-term impact and

¹ This evaluation is based on the results of the POLES programme, which will result in a reduction in emissions in the service sector of 0.9 MtC in the case of the application of a tax of 500 francs per tC. In order to avoid double counting, only 0.4 MtC is taken

² Just as with the residential sector, the POLES programme gives a reduction of 1.3 MtC, only 0.6 MtC of which is taken

notably everything which affects changes in the building stock. This is the case notably with the programming of the strengthening of thermal regulations.

Changing the degree of penetration of the various developments according to the presence or not of a carbon tax leads to the projections appearing in the following diagram.



The variability from one year to another due to sensitivity to climate conditions, which explains the fairly high fluctuations compared with long-term changes, will of course be noted.

2 The main existing measures

Thermal regulations on new buildings

The existing measures are based first of all on thermal regulations on new buildings. The application of such regulations in France dates from 1975; the regulations have been revised several times since this date. The current regulations were brought into force in 1989, and are characterised notably by different treatments of service and residential buildings, the latter being subject to stricter requirements.

Revision of these regulations has been decided on and is currently under way, with a certain amount of delay compared with initial forecasts. This revision should in particular make it possible to unify requirements for the residential and



5 - THE BUILDINGS SECTOR

service sectors, which could result in an increase of approximately 25% in the level of performance required in the service sector. It will also make it possible to take into account air conditioning and summer comfort as well as lighting in the non-residential sector.

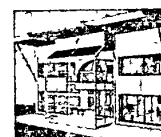
It will be proposed, in the new measures, to programme the development of these regulations towards a progressive raising of standards.

Incentives for work on the control of energy in existing buildings

Various financial incentive measures for improving the existing habitat have assisted in achieving thermal improvement in housing. The share of the public financing which has been devoted to these energy control works can be assessed at 2.5 billion francs for 1992, having been the subject of an evaluation.

These measures comprise:

- fiscal measures in the context of personal income tax, which has been partly replaced by a reduction in VAT as from 1st September 1999;
- exceptional depreciation for investments intended for energy saving;
- subsidy for improving housing;
- subsidies from the NAIH;
- subsidies for improving housing for letting and public sector occupation (PALULOS).



Amongst the new measures, certain changes will be proposed making it possible on the one hand to improve the efficacy of this measure and on the other hand to extend it to take into account service buildings.

Classification of district heating systems

The decree of 5th May 1999 permits the classification of district heating systems. The connection of new buildings becomes obligatory.

Effects of the policy in favour of renewal of the stock

State buildings each year consume 2.25 million tonnes of oil equivalent.

The Prime Minister, in a circular dated 24th January 1991, requested each Ministry to implement an energy saving programme in the buildings placed under its authority. To this effect, high-ranking civil servants responsible for energy have been appointed in the various ministries.

Moreover, the so-called "greening" approach – in full "integration of environmental protection into the activities of administrations" – launched in 1995 at the proposal of the OECD and G7 ministers, integrates an important energy efficiency element.

The procedure consists of developing management and decision-aiding methodologies for the managers of public property. Methodological training and guides are in place or currently being developed.

The new measures provide for the revival and reinforcement of these actions.

Actions for informing users

The Law on Air Quality and the Rational Use of Energy of 30.12.1996 decided on the obligation to provide a standardised estimation of the annual amount of energy consumption costs in housing or premises for service use offered for sale or letting.

Effects of the policy in favour of renewal of the stock

The pro-active policy of the government in favour of the construction of housing should, taking account of demographic changes, result in a substantial increase in the rate of demolition of old buildings which are poor performers on the energy level and their replacement with buildings to current standards. Such a replacement will have an effect of reducing emissions in the sector, the precise level of which will depend on the resulting effects of substituting new housing for old housing.



New measures

3.1. New regulatory and technical control measures

3.1.1 Programmed strengthening of thermal regulations for new buildings

As stated previously, new thermal regulations are currently in the final phase of development. These regulations will be in place after a long introduction time of more than ten years.

In order to avoid to repeat of such a situation, it is necessary now to programme development of these new thermal regulations at regular intervals, at most 5 years, whose structure makes it possible to change the performance levels required. This programming will relate to a period of 15 to 20 years.



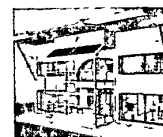
5 - THE BUILDINGS SECTOR

This programming will be updated as required. It should make it possible to achieve ambitious objectives, enabling our country to rejoin the most advanced European countries in this regard.

This programming is required to make it possible to achieve a gain of 0.3 MtC in 2010, by integrating the effect of the complementary measures (labelling policies). In this context, the rapid announcement (before 2001) of an ambitious reinforcement level for the first stage (2005 at the latest) appears to be particularly necessary, of the order of at least 10%. Before the deadline, an evaluation will be carried out based on the labels which anticipated this reinforcement.

The reinforcement of thermal regulations for new buildings has two effects:

- a direct action on the performance of these buildings, an influence which will particularly be felt in the long-term, beyond the first commitment period 2008-2012, because of the relatively low rate of construction compared with the existing stock;
- an indirect action on work in existing buildings by raising the reference standard and particularly by making materials and equipment of increasingly high performance available at a lower price, necessary for new construction because of a rise in requirements.



The programming of the progressive increase in requirements relating to new buildings is a measure which should greatly improve development in the construction sector compared with current practice where renovation is decided on at intervals which are not specified in advance, where the duration required for producing the new regulations and implementing them is subject to delays. In addition, since the time between producing regulations and implementing them is not sufficient to enable the less advanced companies to adapt, it is almost inevitable that the regulations should take into account the difficulties of these companies and should therefore be less ambitious.

A programmed tightening of technical regulations will provide the clarity that will permit construction companies to develop an industrial project as they wish.

This programming requires prospective reflection on the technico-economic changes in the sector.

This progressive tightening of requirements will be facilitated by the existence and effective promotion of high energy performance and solar labels, which already ensure the technico-economic feasibility of a first tightening stage and which should continue to fulfil this very important role during following stages

The preparatory work should begin at the end of the work currently in

progress concerning the new thermal regulations, in the year 2000.

Finally, the possibility of a measure making obligatory a total-cost study for constructing a new building will be studied.

3.1 2 Technical standardisation and regulation of components

Standardisation and regulation of the energy performance of components must respond to the following preoccupations:

- avoiding the use of mediocre components or equipment whose total cost including the operating cost has become too far away from the optimum;
- accelerating the penetration of high-performance components and equipment by triggering the series effect.

With regard to new buildings, the thermal regulations constitute a suitable tool for imposing minimum energy performance on some components, by virtue of safeguard values which prevent compensations from acting beyond a certain limit for certain components.

Thus the new thermal regulations should fulfil this role in favour of the rapid massive spread in the use of so-called low emission glazing

This glazing in fact affords a significant saving compared with "normal" double-glazing, for a sufficiently low additional cost for the return time on investment to be advantageous. This shows the importance attached to the rapid spread of this glazing in new construction and renovation.

With regard to work in existing buildings, this already benefits from the spin-off effect due to the new construction market.

To go further, recourse to standardisation will be developed, which constitutes a suitable tool calling on voluntary and consensual approaches. Emphasis will be placed in particular on the work requested from the AFNOR which should permit the launch of a major standardisation programme relating to techniques and technologies for energy control. This programme covers notably the field of housing and renewable energies.

Recourse to regulations should also be pursued when standardisation work does not make it possible to achieve the objectives required by the authorities or in such cases as it is necessary to strengthen the effects of a standard. Finally, it should be noted that specific regulations already exist for certain particular components, such as boilers.



5 - THE BUILDINGS SECTOR

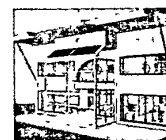
3.1.3 Audits on existing service-sector buildings at the time of sale or letting

It is a question of making an energy audit obligatory when an existing service-sector building is sold or let, above a certain surface area.

3.1.4 Reinforcement of control means and procedures

The credibility of thermal regulations requires reinforcement of compliance with the correct application of these regulations. *Suitable provisions (the development of a quality certification process, monitoring, etc.) should be laid down, taking care to cover all types of operations referred to by the regulations and therefore including notably service-sector buildings and individual housing.*

Monitoring compliance with the regulations applying to high-power boilers should also be reinforced. *The application of these regulations in the residential and service sector will be the subject of follow-up and evaluation. In the light of this evaluation, the extension of the monitoring regulations applying to boilers between 1 and 50 MW will be studied for boilers with a capacity between 500 kW and 1 MW.*



3.2. Voluntary agreements

Voluntary agreements with an industry, often very widely dispersed in the case of building work, can make it possible to bring about changes in certain economic activities in a more flexible and consensual manner.

One example of this would be the preparation of a "construction-environment-timber" inter-industry charter aimed at developing timber use in construction, which allows carbon sequestration beneficial to the greenhouse effect, even if this action cannot, in the current context of international agreement, serve to meet our commitments.

Such a context must also be envisaged through the programmed market removal of certain types of equipment which have become relatively less efficient because of general technical changes, such as for example gas equipment using a pilot light, or privileging more widespread use of efficient solutions, such as low-emission glazing in existing buildings.

3.3. Action on the assets of certain building owners

3.3.1 Action on state buildings

The various measures taken up till now have shown a certain number of limitations which now need to be overcome in order to reduce emissions due to state buildings and obtain a spin-off effect on other public building owners who also manage considerable assets.

The following will therefore be taken:

- *measures for the organisation of services suitable for promoting the taking into account of energy-saving preoccupations, these organisation measures will be supplemented with action to make all those involved more aware;*
- *technical measures with the periodic obligation for audits on contracts for the supply of energy and on the consumption of energy and fluids. These audits will relate both to equipment and to their management. They will be followed obligatorily by a report on the action taken. The promotion of energy-efficient equipment in public purchasing will also be organised;*
- *measures concerning financing: the abandonment, in a transient phase, of certain budgetary divisions allowing specific investments or complementary work on the occasion of work carried out for other reasons, increased recourse to the possibility of the use of leasing as a means of financing certain energy-saving operations.*

These three bodies of measures require the drawing up of a common work method and the co-ordination of efforts and potentials of the different ministries. Three of them will have a particular role to play:

- the Industry Department (of the Ministry of Economy, Finance and Industry), a natural negotiator with regard to energy policy and co-ordinator of the group of high-ranking civil servants responsible for energy;
- the Ministry of Land Planning and the Environment, responsible for the “greening” approach;
- the Ministry of Supplies, which has a remit with regard to building and public construction as well as a strong local presence, able to serve as a local relay.

The ITFCC will submit a proposal to the Prime Minister for organising the different departments concerned and an operational programme for state buildings.



5 - THE BUILDINGS SECTOR

3.3.2 Action on pilot sector buildings

It is a case of mobilising particular categories of building owner with a view to:

- *effecting energy savings in these particular assets;*
- *having a spin-off effect through the exemplary character of the operations performed.*

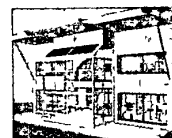
The AIMCC ⁽³⁾ has begun a multicriteria reflection for determining which sectors to adopt as a priority for an action of renewing the building stock covering a broader field than simply energy savings, notably in order to have the maximum chance of success. This reflection is leading to the choice of:

- shopping centres, with, as partners, CNCC (the National Council for Shopping Centres) and EPARECA (Public National Establishment for the Provision and Restructuring of Commercial and Workshop Spaces);
- letting premises (residential and non-residential) belonging to institutional investors, with, as partners, the FFSA (French Federation of Insurance Companies), and the FSIF (Federation of Property Companies).

The other partners would be: the ADEME, the AIMCC, construction and craft companies (CAPEB, FFB).

This procedure should result in:

- *recognition of the commitment of building owners and companies concerned in favour of the environment and combating the greenhouse effect;*
- *facilitating the identification of difficulties currently interfering with management and renovation work, with a view to seeking suitable solutions;*
- *facilitating access to various aids and notably aids to diagnosis generated by the ADEME.*



3.4. Renewable energies

3.4.1 Wood energy

It is first of all necessary to emphasise the importance of the current use of heating wood in France, which makes it the most important renewable energy source at the present time (apart from conventional water-generated electricity). It was assessed at 8.1 million tonnes of oil equivalent in 1997 (*source Observatoire de l'énergie, 1999*).

Two fairly different directions are to be considered according to the sector of use:

- the development of wood energy in collective uses, and district heating systems;
- the maintenance and development of the use in individual housing, which is by far the most important niche today.

3 Association of Industries for Materials, Products, Components and Equipment for Construction

Development of wood energy in collective usages
and district heating systems

The development of the use of wood in these usages requires:

- the continuation or even the reinforcement of investment aid programmes, since choosing a wood boiler results in an increase in investment;
- the setting-up and development of commercial supply networks (which also concerns use in individual housing);
- request for the extension of the application of a reduced VAT rate to the supply of heat energy from wood (including possible subscription to a district heating system) (see § 3.7.2)

Maintenance and development of the use of wood energy
in individual housing

It is necessary to adopt actions centred on heating appliances on the one hand and fuels on the other hand:

- development of research and development for improving wood heating appliances (energy savings, reduction in local pollution);
- development of information on the performance of equipment by means of labelling and promotion of the most efficient appliances;
- development also of standards or labels on wood fuel, affording information on the quality of the product;
- the obligation to provide a flue in new individual housing heated by electricity, in application of the Law on Air Quality and the Rational Use of Energy,
- subsidies for the most efficient heating appliances; a first estimate is an order of magnitude of 50 million francs per annum
- making suitable banking products available.

3.4.2 Thermal solar energy

It is a case of developing the use of solar energy in "continental" France ⁽⁴⁾, where its market is almost zero, unlike overseas territories where it is well developed. The three applications referred to are:

- domestic hot water in individual premises;
- heating and domestic hot water in individual premises;
- collective district hot water (blocks of flats).

It is proposed to open up the market by virtue of a policy of assistance with the object of reducing costs allowing a reduction in subsidies and the development of this type of heating.

⁴ The development of European Energy Networks in Corsica and overseas territories is the subject of a particular section in the chapter "Energy production". This development includes an entire "Solar power" part

5 - THE BUILDINGS SECTOR

The programme presented by the ADEME provides for the following as objectives in 2006:

- 15 to 20,000 solar water heaters per annum;
- 500 to 1,000 heating installations + domestic hot water per annum;
- 10,000 to 15,000 sq. m in blocks of flats per annum.

In parallel, an operation will be launched for the technical and economic follow-up of this programme, and complementary technico-economic studies for determining the types of equipment and the most profitable use as well as the technico-economic conditions allowing their large-scale development.

3.4.3 Geothermal energy

Geothermal energy, in France, is an energy system whose exploitation is based on techniques which are now well mastered and whose potential for exploitable resources remains high.

It is also a system whose impact in terms of reducing polluting emissions – while it remains marginal – is not negligible, particularly in the Paris region. It should be stated that, in 1998, geothermal energy made it possible to save approximately 140,000 tOe and to prevent the emission of approximately 120,000 tC.

However, geothermal energy is encountering several difficulties:

- it is an energy system which remains relatively poorly known;
- this system developed at the start of the 1980s in a particular energy and economic context of high-inflation rate and high fossil fuel energy costs. Changes in this context caused economic and financial problems whose consequences are still being felt, notably at the expiry of subscription contracts;
- it still has a brand image tarnished by technical difficulties whereas these difficulties are now resolved;
- it is a capital-intensive system. The implementation of a complete operation (geothermal production system + network) requires high initial investment which the current energy context does not encourage;
- finally, it is handicapped by competition from other forms of energy.

To summarise, geothermal energy is of significant interest in combating the greenhouse effect in spite of certain difficulties, often transient. To overcome them, this system requires public support which has been lacking for the past six years. If this absence were to persist, it is clear that existing installations would progressively shut down and this energy would purely and simply be abandoned in France.

Two lines of action are to be favoured:

- first of all the maintenance of existing operations;
- then a targeted development of geothermal energy, when the maintenance of the existing operations will be ensured.



For maintaining existing operations, a financial commitment on the part of the authorities is essential. It could be based on:

- *the extension of the long-term guarantee against geothermal risks (cost 20 million francs);*
- *the creation of a fund for writing off the debt, or the setting-up of a national operator.*

3.4.4 District heating systems

On the subject of geothermal energy, but also other energy sources such as the energy recycling of waste, or to a lesser degree wood energy, it is necessary to emphasise the advantage of district heating systems which make it possible to exploit these energy forms which are difficult or impossible to use otherwise, whereas their use is very favourable to combating the greenhouse effect.

From the point of view of the greenhouse effect, there is therefore a certain amount of advantage for district heating systems using new and renewable energies to be maintained and developed.

It should be stated here that there is a need for competition conditions between energies to remain or once again become equitable. The question of the possibility of extending the gas network conditional upon the ratio between profit and investment, must be asked once again.

As with wood, appropriate fiscal measures (the application of the reduced VAT rate) would be of such a nature as to improve the competition position of district heating systems using new and renewable energies, such as geothermal energy, and to reduce the size of subsidies necessary (see § 3 7.2)

With regard to the heat networks using conventional primary energies, the balance sheet must include the fact that housing connected to district heating systems has, like housing with communal heating, a mean unit consumption significantly greater than that of housing with individual heating.

This finding leads to the following conclusions, to be taken up by the ADEME:

- *carrying out an examination on a case by case basis of the possibilities of improving the functioning of existing urban systems with regard to the greenhouse effect (by increasing the share of their supply with energies with a low fossil carbon content, notably by means of a coupling with the waste processing policy), possibilities of extending these systems, and possibilities of reducing unit consumption in the housing connected;*
- *evaluating the economic feasibility of a public policy for developing new district heating systems using, as a priority, energies with a low fossil carbon content*



5 - THE BUILDINGS SECTOR

(geothermal, waste ⁽⁵⁾), taking account of the fact that this option has the advantage of extending the technical potential of cogeneration.

3.5. Property management regulations

3.5.1 The rental sector

Certain works which may give rise to substantial savings in energy, and consequently heating charges, are not being carried out by the owners of rental premises.

However, possibilities already exist in the public housing stock as in the private stock. For the social-housing stock, there is a possibility of concluding framework agreements relating to increases in rent and the case of energy-saving works (with possible exemptions from ceiling rents). In the private letting sector, the law of 06.07.1989 (article 17) permits, in a negotiated context, the possibility of additional clauses to rent contracts including an increase in rents against the carrying out of works affording savings in charges.

Without interfering with the balance in relationships between tenants and landlords, it is necessary to strongly encourage the application of various existing arrangements to allow the implementation of energy-saving works. To this end, the effects of existing provisions will be assessed and the National Commission for consultation on this subject will be informed.



3.5.2 Modification of the distribution of heating charges in co-ownership properties and the collective service sector

For landlords leasing housing in co-ownership, the provisions proposed above concerning charges should obviously apply.

Under these circumstances, all co-owners, lessors and occupiers will have financial incentives to carry out energy-saving works in premises with individual heating, provided that the conditions for allocating the different forms of grant, notably that from the NAIH and PAH, are reviewed in order to favour such works.

On the other hand, for collective heating installations, these provisions would remain inoperative if the distribution of heating charges could not be modified to favour housing which has been the subject of works aimed at energy savings, in the absence of any heat metering device. It is necessary to optimise the work more and to take better account of behaviour.

In this context, it is necessary to assess the current regulations and to propose the adaptations which will be necessary under the authority of the Chancellery

⁵ Biomass, also used in collective boilers (0.5 to 5 MWth), may develop outside district heating systems

3.6. Incentive measures

3.6.1 Programmed operations for thermal improvement to buildings (POTIB)

Since combating the greenhouse effect requires a collective effort, it should be possible to identify an appropriate geographical area so as to enable a maximum number of partners to act together on shared objectives in saving tonnes of oil equivalent and carbon emissions at a local level. This area may be the neighbourhood, the town, the conurbation or a group of towns according to the density of housing and activities, or even a département in areas of low density.

It is proposed to rely on two operating modes:

- *the existing programmed dwelling improvement operations, providing for an energy-saving aspect,*
- *setting up programmed operations for the thermal improvement of buildings aimed specifically at energy-saving for heating, the production of domestic hot water and, if applicable, air conditioning in the case of service-sector buildings.*

The programmed operations for the thermal improvement of buildings would be initiated locally, the building owners being the town or the group of towns concerned and would include, in addition to housing, service-sector buildings. It would be the subject of an agreement between the town or the competent group of towns the NAIH, ADEME, the state and if necessary the département and region for a period of 3 to 5 years. The agreement would specify the scope of the operation, the objectives for tonnes of oil equivalent and carbon emissions saved, the method and conditions for evaluating the results, the amount and terms of the assistance liable to be brought to bear, the ancillary measures and the assignment of the co-ordinating team appointed for the duration of the operations

Monitoring and coordination would be provided by an operational team responsible notably for information to the public and industry, consultancy and assistance to owners and tenants in the administrative, social, financial, technical and architectural fields, and the co-ordination of the ancillary action, notably training of employees, and analysis of the indicators of the result.

3.6.2 Condition for making grants to the property business

The assessment made of these grants has shown that, from the point of view of improvement in energy performance, its efficiency could be improved.

This improvement is possible by developing a label policy on which the aid would be conditional, particularly the use of materials with good energy performance, and encouraging energy saving work when opportune (for example

thermal insulation when the roof is being rebuilt). With regard to PALULOS, the possibilities of a region-specific grant regime will be explored.

3.6.3 Creation of a grants system for service-sector buildings

These buildings do not benefit from a grants system similar to that existing for housing. However, some owners of these buildings have requirements for a return on investment which greatly limits the energy saving work possible.

It is therefore proposed to create a specific system or to extend an existing subsidy system for energy saving works, together with a strict system of conditions for limiting the windfall effect to the maximum possible extent: the performance must attain or at least closely approach the requirements relating to new buildings

With regard to a new system, it is necessary to provide a progressive increase in effectiveness. It is proposed to rapidly reach an annual sum of 100 million francs.



3.6.4 Direct aid for certain items of heating equipment: condensation systems for collective use

These grants are necessary to permit the development of heating systems which avoid or reduce greenhouse gas emissions but which offer owners a rate of return on their investment which is too low to make it worthwhile.

This is often the case with systems using renewable energies, which are dealt with in a specific chapter.

A study of the different heating systems have shown the advantage of condensation boilers for collective use; however, their degree of penetration remains low notably because of a period of return on investment which is often judged to be too long.

It is proposed to create a grant for making this technical solution widespread in the case of collective gas heating. Using qualified professionals would in this case be obligatory. The budgetary costs would be around 20 million francs per annum.

3.6.5 Support for labelling policy

Setting-up a labelling policy allowing change from one regulatory level to another is accompanied with incentives notably with certain categories of building owner.

In order to reinforce and extend these incentive actions, it is proposed to re-establish a system of direct grants in the form of a subsidy to the building owner whilst also applying it to service-sector buildings

Based on the estimates from the ADEME, with a penetration rate of 15% (mean rate estimated over a period of 5 years), the cost of the measure would amount to 100 million francs per annum for housing and 45 million francs for the service sector.

3.7. Fiscal measures

3.7.1 Ecotax

A carbon tax on fuels applied to companies, in accordance with the provisions set out in the *White Paper* ⁽⁶⁾, will have an appreciable effect on the economic data which determine the choices of energy for service-sector buildings used by these companies.

Such a tax should effectively contribute to a reduction in greenhouse gas emissions by.

- *acting as an incentive for reductions in energy consumption (an incentive which should be observed provided that the cost of energy is increased and consumers are sensitive to price variations);*
- *acting as an incentive for the substitution of energies with a high fossil carbon content, by energies with a lower fossil carbon content (an incentive which should be observed as soon as the prices of the different energies are sufficiently differentiated according to their carbon content, to encourage consumers to modify their purchases).*

In particular, the competitive position of energy wood could be very appreciably improved, where this energy has an advantage taking account of the degree of intermittency.

From the point of view of the greenhouse effect, such a tax, in principle very favourable to the reduction of greenhouse gas emissions, should however be designed so as to prevent undesirable effects such as:

- *an increase in the competitiveness of fuel oil compared to gas;*
- *an increase in the market share of electric heating in the service sector.*

Such a tax should also have an economic and psychological effect entirely favourable to the development of globally efficient solutions in the use of fossil energies and from the point of view of combating the greenhouse effect.

The extension of a tax on gas for domestic use is mentioned in the context of the draft directive on the taxation of energy products (*cf. chapter 2 § 3.5*).

⁶ *White Paper* on extension of general taxation on polluting activities to intermediate consumption of energy by companies Company Consultation Document July 1999



3.7.2 Application of the reduced rate of VAT to the sale of heat from new and renewable energies

It has already been decided to apply the reduced rate of VAT to wood intended for domestic heating.

However, this measure is proving insufficient since it scarcely makes it possible to apply it to collective uses: a district heating system or collective boiler with the intervention of an employee.

This is because heat supply services are subject to the normal rate of VAT (20.6%) in application of EU directives. The application of the reduced rate to these services, preferably restricted to supplies of heat produced from renewable energies (wood, geothermal energy, waste incineration), would be able to assist the promotion of these production modes which are economical in terms of carbon emitted. This reduced rate ought to be able to relate to both the fixed part (the subscription) and to the part proportional to the quantity of energy supplied.

France will continue to rigorously support, vis-à-vis the European Commission and its partners, the possibility of extending the provision applicable to supplies of gas and electricity for these services. The agreement of the Commission and obtaining unanimity of the member states to such a measure would be of such a nature as to concretise the European efforts for controlling and reducing greenhouse gas emissions.



3.7.3 Application of the reduced rate of VAT to certain products or services affording savings of energy in buildings

The institution since 15th September 1999 of a reduced rate of VAT for works of improvement, conversion, fitting-out and maintenance of existing housing (to the exclusion of certain major works) will very broadly benefit works for combating the greenhouse effect and in particular:

- all insulation works,
- equipment for producing renewable energy for domestic use, or apparatus intended to be supplied with renewable energy – individual heating appliances.

Large heating appliances in multi-occupied premises are not eligible for a reduced rate of VAT, but benefit from a tax credit at the rate of 15%.

An additional possibility could be negotiated with the Commission and the member states: it would consist of extending the already existing measure and to direct this extension in particular towards savings in energy and combatting the greenhouse effect. More precisely, it would be a question of opening the possibility of applying, in a transient or definitive manner, a reduced rate of VAT for products or services for combating the greenhouse effect.

The following criteria should then make it possible to define this list:

- limit the windfall effect, by applying such a reduced rate only to equipment which is still marginal on the market;
- having a good cost ratio (in terms of loss of fiscal receipts) with respect to the gain (in terms of greenhouse effect),
- presenting a favourable economic balance for the beneficiary.

Such a measure would concern equipment with a high energy performance in the field of heating, lighting and domestic electrical equipment (*cf. chapter 8 § 2.E.2 6*)

It should be noted that this measure requires amendment, with the unanimous agreement of the member states, of the VAT directive, and could constitute one of the features of a common policy for combating the greenhouse effect

3.8. Training and information

3.8.1 Labels and information to the public

The pursuit and reinforcement of a labelling policy constitutes an important element for decision makers in matters marked by a high technical content

The fields in which it appears particularly important to advance are:

- new construction *The existence of labels (high energy performance, solar) anticipating the strict definition of requirements in thermal regulations has an important role to play for assisting the penetration of technical progress in the residential domain and in the service sector before it subsequently becomes general,*
- certain items of equipment or fuel which at the moment do not benefit from sufficient information on performance: *this is a case notably of wood fuel appliances and wood used as a fuel,*
- certification of professional qualifications.

In more general terms than simple labelling, it is necessary to continue to develop information for the public. It is a case of enabling the public to make choices, notably when renewing a heating appliance, or on the occasion of maintenance or improvement work to housing, integrating up-to-date information concerning energy savings and combating the greenhouse effect. It is a case notably of opportunity works which, for a small additional cost when the work is being carried out, make it possible at that time to effect energy savings with satisfactory profitability.



5 - THE BUILDINGS SECTOR

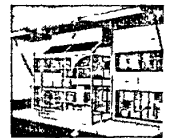
3.8.2 Information on the environmental quality of construction products

At the initiative of contractors in the construction sector grouped together within the AMICC, a communication chart on the environmental qualities, intrinsic and extrinsic, of the construction products has been launched, with in particular the preparation of an AFNOR standard determining the information to be supplied

It should be noted that this information is oriented more towards the construction industry than the general public.

3.9. Continuance of the "High Environmental Quality" initiative

The Ministry of Supply has for ten years been developing actions seeking to integrate environmental preoccupations into the building trade. The HEQ (High Environmental Quality) initiative resulting from this has made it possible to define several targets grouped together in four major themes: ecoconstruction, ecomanagement, comfort and health. Following a call for proposals launched in 1993 by the Architecture Construction Plan (the PCA, which became the PUCA) on the theme of HEQ, thirteen operations were adopted which were the subject, with the support of the STBC, highly committed to this theme, of an appraisal produced in 1999. Four of them relate explicitly to energy management. These achievements all concern the public letting sector, but the entire new dwelling sector should be able to appropriate these concepts. The setting-up of several "eco-colleges" in the regions can also be cited



The Ministry of Housing will extend these experimental actions so as to generalise and secure their continuation through innovation programmes developed by the Regional Supply Directorates and the County Supply Directorates, notably in the context of the Regional Initiative Pilot Sector. Actions for awareness and information directed towards building owners are planned as from next year, in liaison with the ADEME and the Ministry of Culture. They will emphasise the advantage of taking HEQ into account from the programming phase. This will also be the opportunity to better approach the concept of bio-climate construction.

Concerted action with the building trade, the timber industry and the ministries concerned should soon result in a framework agreement supplementing the regulatory provisions and making it possible to satisfy the requirements of the Law on Air Quality concerning Timber in Construction. ■

The agricultural sector, forests and forest products

- 1 Emissions and absorptions in the “agriculture and forest” sector
- 2 The principal existing measures
- 3 New measures



The agricultural sector, forests and forest products

1 Emissions and absorptions “agriculture, forests”

Unlike the other sectors taken into consideration elsewhere in programmes aimed at reducing the emissions of greenhouse gases, the agricultural and forest land base and the products derived from it do not only constitute sources of carbon dioxide, methane and nitrous oxide. It also comprises sinks in which carbon dioxide is absorbed in the process of photosynthesis. The complete carbon cycle, with its reserves of carbon and the various flows of greenhouse gases is given in figure 1. In each of the sub-units shown, in cultivated areas, grassland and above all in forests, stores of carbon can be varied and often increased: the conversion of coppices into high forests enables, in the long term, the average store of carbon per hectare to be doubled. Stores of carbon can also be increased by the afforestation of agricultural land, by transforming cultivated fields into grassland or even by increasing the stocks of wood used in construction, by substituting it for other materials.

The capacity for increasing these carbon stores, however, is not limitless. In order to continue to absorb carbon and capture solar energy in the biomass, we must harvest all or part of the biomass or wood produced, the use of which enables energy and raw fossil materials to be replaced. The use of biomaterials in place of other materials that have a higher energy content and are more pollutant during their production and implementation, in certain cases also enables us to save fossil energy and reduce carbon dioxide emissions.

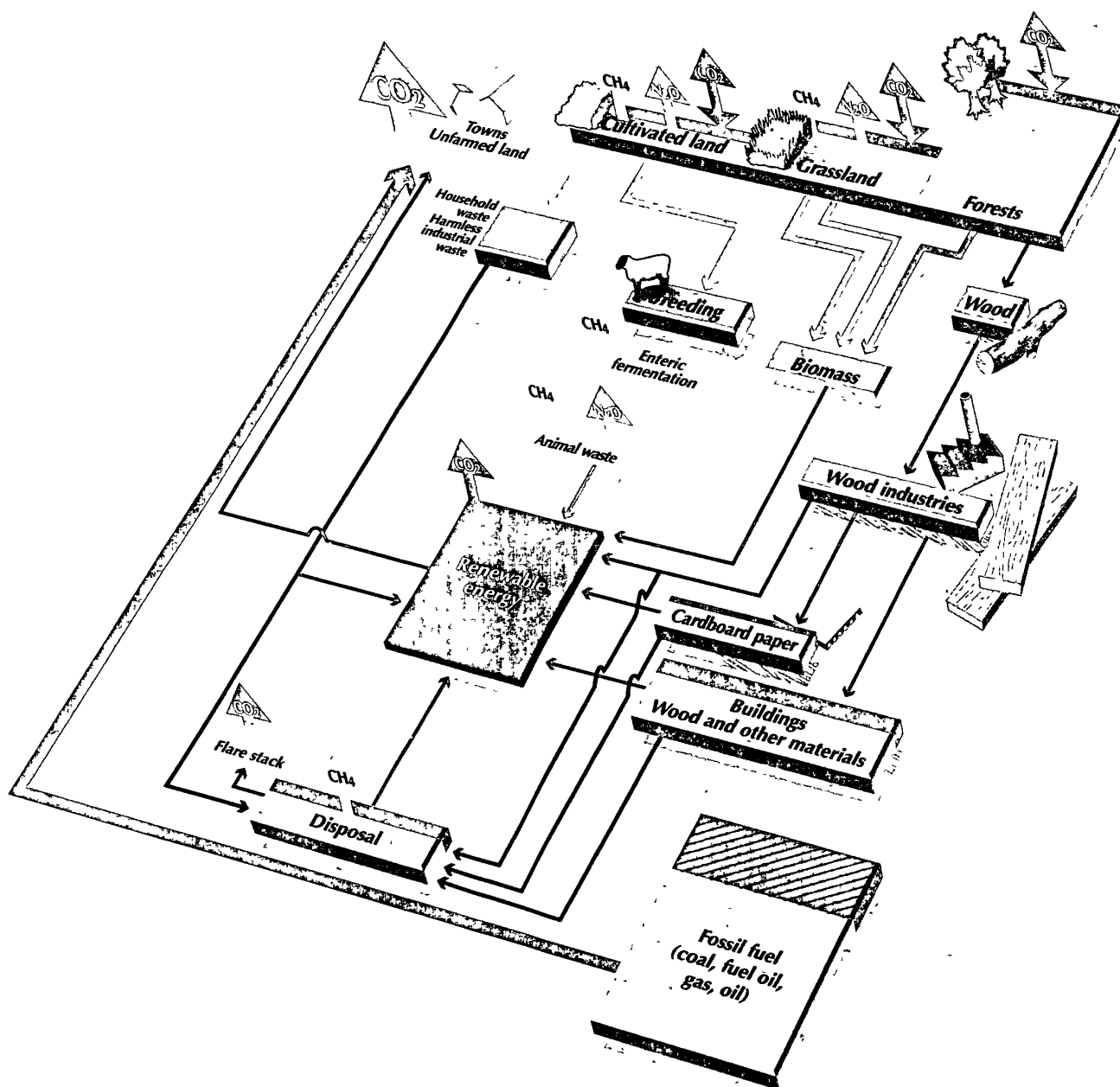
However, at this stage the Kyoto Protocol only takes account of one section of emissions and absorptions from the agricultural and forest sector:

- for the agricultural sector, it is a question of CH₄ and N₂O emissions connected with the process of agricultural production, which represent the main part of emissions, and secondarily emissions of CO₂ connected with the use of fossil fuel energy;
- in terms of forests, the Protocol requires changes in carbon stores to be taken into account, during the 2008/2012 period, resulting solely from the activities of afforestation, reforestation and deforestation since 1990.

Emissions and absorptions of CO₂ connected to changes in use or management of agricultural land, or regarding evolutions in the forest prior to 1990, are not within the scope of the Protocol; in the case of France, limiting the field of application of the Protocol to the three preceding activities results in excluding the essential factor in store variations in the forest sector. The Conference of Parties to the Convention should rule on the possible inclusion of new activities within the scope of the Protocol by the end of 2000.



The complete carbon cycle



De-storage of fossil carbon



Variation of carbon stores in the rural land base

Carbon stores



Fuel



Wood

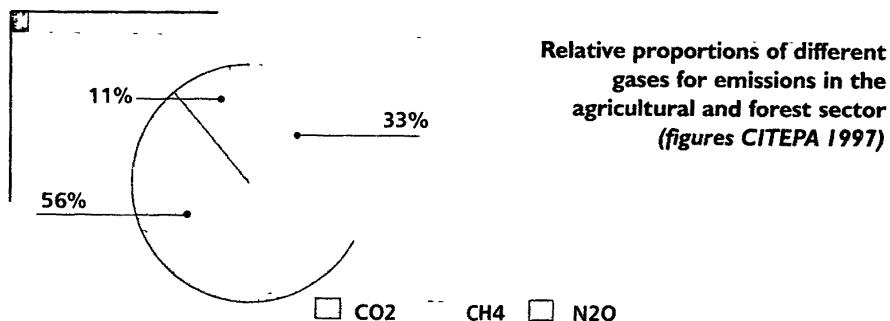


Products for disposal



Biomass

6 - THE AGRICULTURAL SECTOR, FORESTS AND FOREST PRODUCTS



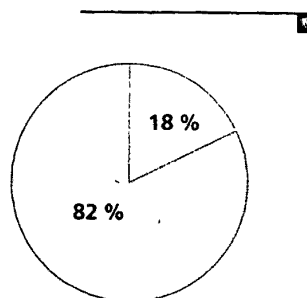
The share of the "agriculture, forest" sector in greenhouse gas emissions in France is significant as the diagram below shows. Thus, agriculture emits almost 18% of greenhouse gas emissions in France although it represents less than 3% of the GDP.

In 1997, the "changing use of land and forests" category shows a net absorption of greenhouse gases corresponding to approximately 10% of the emissions from other sectors; on the other hand, the methods of accounting provided for in the Protocol at this stage result in net emissions for the forest sector of between 0 and 1 MtC/year⁽¹⁾. It is this level of emissions that is reproduced in the chart below.



Relative share of the agriculture and forest sector in greenhouse gas emissions

- ☐ Agriculture
- ☐ Other sectors
- ☐ Forests (0%)

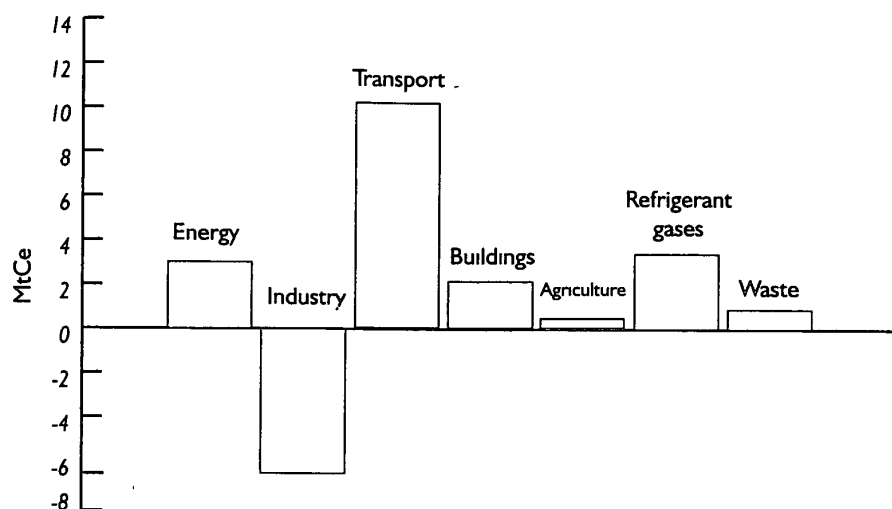


Emissions from agriculture are relatively stable over the 1990/1997 period, and the projections made to date reckon on a continuation of this tendency through to the year 2010.

¹ An exact calculation cannot be made until precise definitions of the activities of afforestation, reforestation and deforestation have been decided on by the Conference of Parties

The net balance on the forest sector as defined currently in the Kyoto Protocol, for the initial period of commitment, should remain close to zero by the year 2010.

Increase of emissions per sector for 1990/2010
in the absence of new measures



2 The main existing measures

2.1 Agricultural sector

The French programme for the tackling climate change only contains a few voluntary actions for the control of emissions in the agricultural sector, the determining factors for these emissions not being clearly known when it was drawn up. It did however describe the impact, on greenhouse gas emissions, of certain developments in agricultural policy: continuation of the intensification of dairy production, the relative extensification of beef production, increase of soilless production and development of the policy on the storage of manure, limiting the use of nitrogenous fertilisers (compulsory fallowing, combating water pollution by nitrates).

In parallel, a research and development programme has been established to improve our knowledge of the sector and to be in a position, in the future, to intervene in an effective way (AGRIGES programme with available credit incentives in the region of 2.5MFF/year for the 1992/1998 period).



6 - THE AGRICULTURAL SECTOR, FORESTS AND FOREST PRODUCTS

2.2. Forest sector

The initiatives in this sector are hinged around three main lines:

- increasing carbon storage in the forest, by means of relaunching the policy for the afforestation of agricultural land (doubling the annual rate of assisted afforestation to reach a level of 30,000 ha/year): the necessary budgetary resources for achieving this objective have not been released;
- increasing carbon storage in forest products, through expanding the use of timber in construction (promotion initiatives, research and development initiatives, financing from the public budget for "exemplary achievements") ;
- increasing the use of energy wood, particularly for group heating within the scope of the "energy wood and local development" Plan.



The new measures

3.1. The agricultural sector

In spite of research work launched in 1993, knowledge in this sector is still incomplete and we are not in a position to put forward a range of actions for reduction covering all sources of emissions

A.1.1. Reducing emissions of CH₄ in cattle breeding

In the sector of cattle breeding, there is no viable technical option likely to reduce emissions of CH₄ connected with the enteric fermentation of ruminants. However, technical solutions exist for limiting emissions of CH₄ and N₂O connected with the management of animal waste from intensive cattle breeding, which represents in the region of 0.9 Mt carbon equivalent/year in 2010.

The programme for controlling (local) pollution of agricultural origin (PCPAO – cattle breeding part), set in place in 1994, aimed at improving production conditions in intensive cattle rearing, particularly in terms of nitrogen pollution, led to an increase in CH₄ emissions; this programme is in an evaluation phase, with a view to possible redirecting; it is proposed that, in the future, the concern relating to the greenhouse effect will be fully integrated in public provisions for the management of animal waste.

The MAP (French Ministry of Agriculture and Fisheries) will produce an inventory of technologies enabling the control of these emissions, and, if need be, will rely on the relevant research organisations (INRA, Cemagref, IFP, etc.) to undertake research and development work. Specific recommendations aimed at reducing these emissions should have been made by 2002 at the latest.



A.1.2. Reduction of nitrous oxide emissions (N₂O) from land

In the sector of plant production, it is appropriate to give special weight to action on nitrous oxide emissions by controlling the spreading of nitrogenous fertilisers.

The Government is tending towards setting in place a charge on surpluses of mineral and organic nitrogen, established on the material assessment per farm, in order to protect water from pollution by nitrates. This measure would also have the advantage of reducing emissions of nitrous oxide. It would be finalised in conjunction with all the interested parties.

Works aimed at measuring the impact, on the use of nitrogen fertilisers, of a charge on nitrogen surpluses, are under way; experience abroad seems to indicate that imposing a charge on surpluses will have a more pronounced impact, in terms of reducing pollution, than a tax on the use of nitrogenous fertilisers.

A.1.3. Integrating concerns relating to the greenhouse effect in agricultural policy

The Interministerial Commission on Climate Change has decided “that we will take pains to integrate concerns relating to the greenhouse effect in agricultural policy”; if it is not realistic, at this stage, to want to reopen the agreement obtained at EU level, it is timely to use at best the degree of flexibility left to the member states as regards the methods of allocating grants to the beef cattle breeding sector, in order to integrate the “preventing climate change” dimension.

Preliminary analyses show that the organisation of the beef cattle breeding sector (particularly its level of intensification) has a strong impact in terms of emissions and absorptions of greenhouse gases, through a series of quite complex relationships.

This point will be dealt with in-depth as a priority by the Ministry of Agriculture and Fisheries (MAP), both in the technical and economic dimension, so that the “preventing climate change” dimension can be fully taken into account in the process of drawing up a national provision for supporting beef cattle breeding.



6 - THE AGRICULTURAL SECTOR, FORESTS AND FOREST PRODUCTS

A.1.4. Action for improving knowledge

The research initiatives in this sector must be strengthened, particularly due to a considerable increase in public incentive credits. This concerns the following fields:

- substituting the biomass for products of fossil origin, particularly biofuels ⁽²⁾, raw materials for the chemical industry and biofuels of the future.
- the options for reducing CH₄ emissions from the enteric fermentation of ruminants: taking account of the volumes of emissions involved, this field should constitute one of the strongest thrusts of INRA in the field of cattle rearing;
- the determining factors for N₂O emissions from land, to go beyond an action on the single level of nitrogenous fertilisers;
- emissions and absorptions of CO₂ from land (simplified work on the land, better management of surface debris, recycling of household waste compost, sludge from waste treatment plants, etc), including the implementation of long duration experiments;

However, estimates of greenhouse gases from agriculture are extremely difficult to establish and remain of fairly poor quality; they are often obtained by using standards by default, only imperfectly corresponding to the situation in the countries taken individually, and in France in particular.

A scientific research project will be led by the MAP to improve the quality of estimates of greenhouse gas emissions from agriculture, by establishing technical references that better correspond to the French situation. The quality of the basic statistical information will also be assessed.



2 The energy use in particular of the biomass in high energy consumption industrial sectors, such as IAA, cement and construction materials, chemistry, etc

3.2. The sector of forests and wood

As regards forestry activities already taken into account in the Protocol, it is proposed to undertake the following action:

A.2.1 Confirm an increase in aid for the afforestation of agricultural land, so as to reach an annual rate of 30,000 ha/year from now to the year 2002.

This proposal has already been made several times, but the corresponding release of the necessary resources has not been followed up until now. Consistent with government objectives and the main lines of French forestry strategy, the budget takes into account the fight against the greenhouse effect and goes up on average from 30M FF for recent years to 46M FF for 2000, which should, coupled with European aid, allow for the financing of the reforestation of approximately 8,000 ha/year to which should be added a surface area of approximately 10,000 ha/year of area wooded without funding.

Meeting the objective of 30,000 ha/year in 2006 involves releasing supplementary credits, according to a regular progression, to reach a level of 135M FF per year (75M FF for financing reforestation and 60M FF for compensatory grants for lost revenue).

The majority of this afforestation will be created in the western half of France, in sparsely wooded areas, and will integrate environmental concerns. A consequence of this afforestation will also be to create a better balance in the long term between the stand age classes entering production. The opportunity to implement afforestation with higher productivity will also be considered, and from now we will be concerned with the options for reclaiming the timber thus produced.

In tandem, it is appropriate to control even reduce clearing, including – if the need arises and taking account of the final decisions likely to be made to implement the Kyoto Protocol – by means of increasing or reintroducing tax on carbon emissions and the value of the tonne of carbon emitted.

A 2.2. Studies, research and experiments in certain fields

Among the subjects to be studied, the following deserve specific mention.

- methods for planting on agricultural land that has already reverted to fallow land,
- the chance to develop trees outside of forests,
- the improvement of estimates of changes of carbon stores connected to the different changes in the allocation of plots of land,
- motivation and options for reducing deforestation



6 - THE AGRICULTURAL SECTOR, FORESTS AND FOREST PRODUCTS

A.2.3 Action within the scope of international negotiations

In the negotiations under way aimed at supplementing the list of forestry activities taken into account by the Protocol, France will endeavour to get included silvicultural operations which are beneficial from the global environment point of view and contribute to the long-lasting management of the French forest and the expansion of wood-related industry, since their effects in terms of carbon storage are measurable with sufficient accuracy.

From now on, we will study in detail, from an environmental, economic and technical point of view, two new activities in the sense of the Protocol:

- the conversion of coppices into high forests and enrichment particularly with suitable species able to produce and store more wood;
- strengthening forest fire protection.

A.2.4. Increasing the use of timber as a substitute for products with a high fossil carbon content (construction materials, vectors of fossil energy);

This option enables CO₂ emissions connected with the use of fossil energy to be reduced and carbon storage outside the forest to be built up. We will also strive to have this dimension taken into account within the scope of the Kyoto Protocol.



Regarding consumable wood, Mr Jean-Louis Bianco's report and the planned forest bill aim to revitalise the "forest-timber" sector which will be beneficial for the evolution of the climate. It has particularly been recommended that the harvests of workable timber should be increased by 6 million m³ per year; it is therefore necessary to considerably expand the use of this timber and its processing. Implementation of the suggested programme in the report would also generate jobs, especially in rural areas due to the development of silvicultural operations also enabling the long term improvement of the forestry heritage, in industries, the services connected with the development of boiler rooms and construction.

The law of 30.12.1996 on air and the rational use of energy, rules that an order fixes the conditions under which certain new constructions should comprise a minimum quantity of wood materials before 1st January 2000. Within this scope, on the one hand, negotiations are under way targeting achievements under the control of the State or its public establishments, territorial communities or their public establishments; these should reach a conclusion as soon as possible. On the other hand, professional organisations in the wood construction industry are preparing a proposal for a national framework agreement "Wood,

Construction, Environment" to promote the modern, high performance use of wood material. An increase of 25% in market share for wood in construction is envisaged by the year 2010.

Thus the penetration of timber alone in the structures of new buildings to a level equal to 25% would allow savings of between 0.1 and 0.15 million tonnes of carbon in France, if we assume that the non-use of substituted materials would result in a concomitant reduction of their production on national territory. To this should be added the gains that can be obtained in carbon storage in other fields, by substituting wood for other materials (windows, flooring, interior decoration, etc).

To more precisely quantify these gains, more in-depth studies have to be conducted to specify the useable coefficients in varied situations. If within the scope of the Kyoto Protocol the sequestration of carbon in products with a long life came to be taken into account, the resulting increases in carbon stores could also be rendered effective for this policy. The increases in stores should therefore be quantified to this end.

It is important to accompany this build-up of wood production that will allow savings on energy, produce more waste and extend carbon storage. Aids to promote the use of consumable wood, including on the level of innovation, should be provided particularly for organisations wishing to expand the use of wood.

An effective instruction programme on wood energy and consumable wood should be initiated in educational establishments dealing with these matters, particularly in architectural colleges.

The expansion of the energy use of wood is dealt with in the "buildings" (heating of premises) and "energy" (production of electricity) sections.

However, let us note here that in order to maintain, even encourage the consumption of wood in individual housing, not only must more high-tech equipment be encouraged, but we must also better understand the factors which determine the supply of firewood in rural areas and consumer demand. This supply must also be better structured.

The INRA and the ADEME in conjunction with the CEREN together with other potential partners, should study the determining factors in the evolution of wood consumption, that is to say the use of wood in rural areas ⁽⁴⁾, the evolution of consumer demand and the prospects for the improvement of heat generators.

The INSEE must take pains to ensure that the periodic censuses enable us to continue to monitor the evolution of wood heating in rural areas

⁴ This supply varies with the number of multiple jobholding farmers and with the evolution of the tractor fleet for farmers in semi-retirement, etc



6 - THE AGRICULTURAL SECTOR, FORESTS AND FOREST PRODUCTS

The ADEME in conjunction with the NFO and the regions, departments and local districts should help each of these levels to better structure and better determine the potential offers from the different categories of wood during the forthcoming decades

3.3. Other integrated research to be developed

Initially the research has principally been analysed and targeted on measuring emissions or absorptions of greenhouse gases in the agricultural and forestry sectors.

If in certain fields we can envisage reducing greenhouse gas emissions without modifying the types of production, it is timely to recall that in general, after detailed analytical approaches, we must revert to systemic approaches including other sectors, such as energy and forests, to determine the real options for reducing greenhouse gas emissions, all gases included and on a national scale.

It is today necessary for the INRA and the Cemagref to develop in parallel more systemic studies so as to specify the global effect of the various agricultural practices, more or less intensive, diverse production systems and agricultural policies on global warming.

Life-cycle analysis of products incorporating the dimension of land use, transport and the potential ways of evolving agrarian systems should be employed, particularly by the INRA, to better inform policy-makers; the options and methods for taking into account the production and harvesting of wood and various other biomasses by farmers within the scope of land operation agreements should also be studied.

Considering other environmental constraints, this should enable the desirable developments at various levels to be more clearly identified: at the level of agricultural practices, farms, land planning, agricultural policies and lastly of entities "forests – wood – energy – industries – food and agriculture – chemical industries – and other society requirements.

Work aimed at quantifying variations in the flow of greenhouse gas stores must be undertaken. Requirements in terms of monitoring stations must be specified with the MAP and the MATE. After consultation with their management, it would be appropriate to decide how to share the responsibilities in this field between the INRA and the Cemagref



ADDENDUM

The effect of the storms in December 1999 on the national programme for the fight against climate change

The storms from 26th and 27th – 28th December 1999 laid waste between 300,000 and 500,000 hectares of forest and blew down almost three years normal harvests. This exceptional situation requires the redeployment over the next few years of human and financial resources towards wood promotion and the re-formation of ruined stands, but it does not put at issue the objectives set before the storms. The contribution of forests and by-products in the programme for reducing greenhouse gas emissions remains a considerable one.

However, certain restructuring is necessary or desirable in the four fields in which forests and the wood industry can contribute to reducing these emissions, recapped below and detailed in the sections entitled "Agriculture, forests and by-products", "Building" and "Energy Production";

- substituting "wood energy" for fossil fuels,
- increasing carbon stores in forests,
- increasing carbon stores in constructions,
- energy savings produced by implementing consumable wood in the place of other materials.

Energy reclamation from forestry products

In order to significantly reduce greenhouse gas emissions from 2008, it has been planned to encourage the installation of new automatic wood-burning boiler rooms in community housing and industry and to expand efficient wood-fuelled heating in individual housing. This build-up should be steadily managed. Taking into consideration the abundance of wood after the storm, of which only part will be able to find outlets in the wood industries, it is envisaged to accelerate the programme initially planned. This will enable part of the surplus wood to be turned to account and allow us to better fulfil our commitments for the reduction of emissions for the first commitment period 2008-2012.

The following action is planned:

- the State, with the support of the regions, should double its action plan in 2000 and 2001 to encourage investment programmes in heating: 200 new boiler rooms instead of the 100 planned will be programmed from the year 2000;



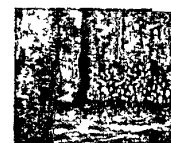
6 - THE AGRICULTURAL SECTOR, FORESTS AND FOREST PRODUCTS

- approaching the European Commission to obtain, as soon as possible, a modification of annex H of the 6th VAT directive (setting the list of products likely to enjoy a lower rate) to favour subscriptions to heating networks and sales of heating produced from the biomass at a reduced rate of 5.5%, which will improve the competitiveness of wood energy;
- to encourage the development of wood-fuelled heating in the place of electrical heating in rural areas with low density populations;
- researching additional outlets for wood surpluses to be perpetuated by means of investments or conversions at acceptable costs; for example, in boiler rooms or electrical power stations able to consume wood waste with other fuels.

This programme could be added to at a later stage.

Increasing the carbon stores in forests

The national plan for French forests decided following the double storm and announced on 12th January 2000, makes provisions for a plan that could subsequently be added to. The various aids for the forest sector include in particular aid for the re-formation of 300,000 ha of forests in ten years. The redeployment of financial and human resources will initially result in the lowering of the level of afforestation of agricultural land, probably less than 10,000 ha/year, to the benefit of forest re-formation. This level of annual afforestation should then increase to reach approximately 20,000 ha per year in 2006. Beyond this, the increased drive for the afforestation of agricultural land will depend on the forest situation and particularly the significance of natural regeneration that will have been obtained and which cannot be assessed at present. The human, technical and financial resources necessary to progress to an annual rate of agricultural land afforestation of 30,000 ha after 2006 will be reassessed in 2005.



The development and use of consumable wood

Since the effect of the storm was to abruptly make available several tens of millions of m³ of wood in undressed timber useable in construction, without as such long-lasting effects on the production potential of the French forest, there is no cause to profoundly challenge the trends of the national programme aimed at increasing the use of consumable wood. At the current stage, the performance of this programme should be accelerated in order to really enhance the value of workable timber.

Effect on the commitments and negotiations connected with the Kyoto Protocol

The first commitment period of the Kyoto Protocol begins in 2008. However, from 2005 States must show evidence of progress accomplished. This will particularly be the case in the field of wood energy development and sink protection since it will favour forest re-formation and their protection against attacks from parasites. The reduction of carbon stores in forests following the felling of trees by the storms was not accounted for by the Kyoto Protocol because it does not result from direct human action. The accounting rules for carbon store variations connected to direct human action will, however, only be laid down by the end of November 2000. For the first commitment period, the Protocol will in all likelihood ignore the variations in stores in over 90% of French forests. France will then strongly insist on negotiations so that the drive to reconstitute stands destroyed by the storms can be considered in the same capacity as the afforestation and regeneration of forests after harvesting. □

The waste sector

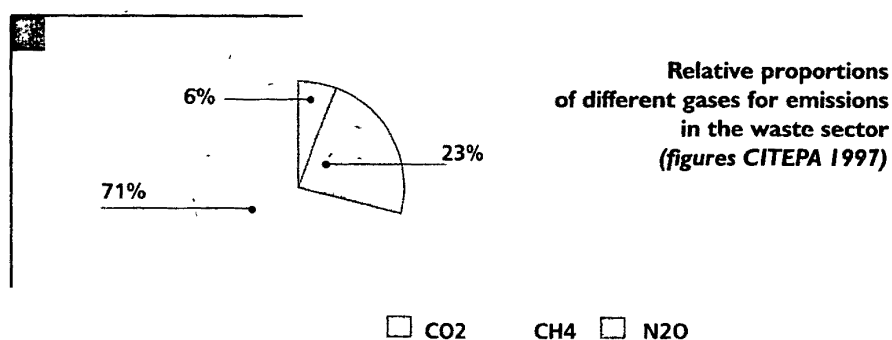
- 1 Emissions in the waste sector
- 2 The principal existing measures
- 3 New measures



The waste sector

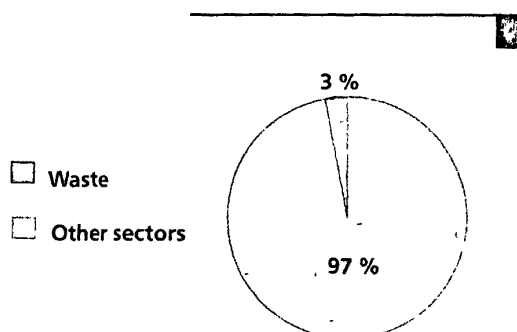
1 Emissions in the waste sector

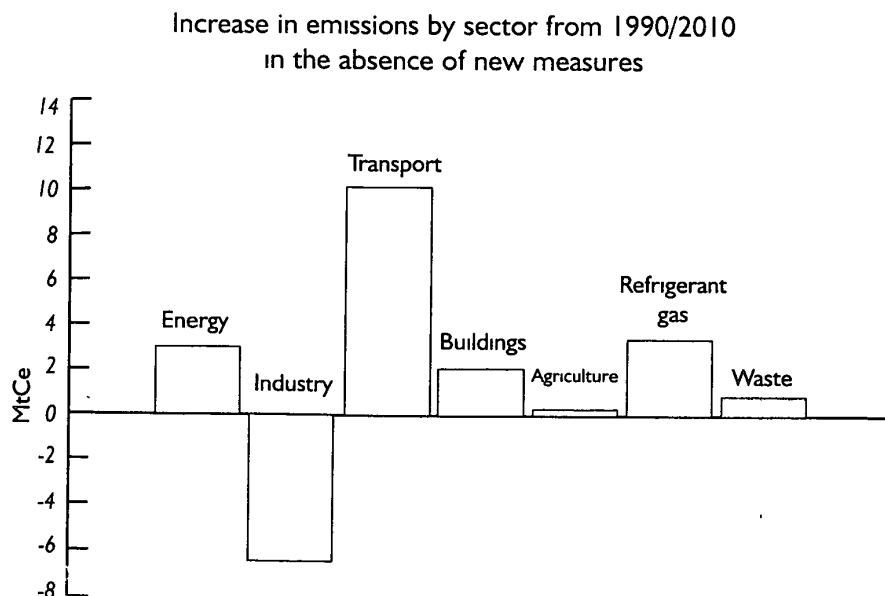
Greenhouse gas emissions in the waste sector have mainly two origins: methane emissions resulting from anaerobic fermentation processes on landfill sites and emissions of CO₂ due to the incineration of waste of fossil origin (mainly plastics materials).



The share of the waste sector in greenhouse gas emissions in France is relatively low, as shown in the diagram below.

Relative share of the waste sector in greenhouse gas emissions





Emissions in the waste sector dropped by 20% between 1990 and 1997 and it is forecast that in 2010 they will be situated at 25% below the 1990 level under the effect of the measures detailed below. Compared with the "with existing measures" scenario, a drop of 1.3 MtC/year in 2010 would be recorded.

2 The principal existing measures

The French Second National Communication was based on a strict application of the "waste" law of 1992, i.e. a prohibition on the dumping of decomposable waste as from 2002. This change was possible because of a significant development in incineration. Moreover, it provided for high investment in biogas capture, which should concern 80% of sites in 2010. In these circumstances, as in parallel a significant increase in the production of waste and its "plastics" content was predicted, a reduction in CH₄ emissions in discharges was more than compensated for by the increase in fossil CO₂ emissions related to incineration. The total emissions in the sector thus increased from 3.2 MtC/year in 1990 to 4.1 MtC/year in 2010, whilst CO₂ emissions avoided by virtue of recycling the heat produced by incinerators increased from 0.06 to 1 MtC/year over the same period.



7 - THE WASTE SECTOR



The new measures

The new programme is based on a reorientation of the French policy on waste as defined in 1998:

- a strong intent to control the production of waste;
- intent to develop the recycling of organic matter;
- a "new interpretation" of the concept of "ultimate waste", leading to the maintenance of the system of landfill in a rural environment, but with the capturing of biogas becoming more widespread.

The main assumptions stemming from this are summarised below:

- stabilisation of the level of waste production;
- recycling of half the waste in faecal or organic form;
- remaining quantities managed half by incineration and half by dumping in 2010;
- landfill sites totally equipped with capture systems in 2000 ⁽¹⁾ with a recovery level increasing from 60% to 80% as from 2000.

Under these circumstances, the emission levels will be as follows, in 2010 and 2020:

Table

MtC equivalent/year	2010	2020
Landfill	1.5	1.3
Incineration	1.2	1.4
Energy substitutions	-0.8	-0.9
Balance	1.9	1.8



The capture of methane from landfill will avoid CH₄ emissions to the extent of 4.1 MtC/year in 2010 and 2.6 MtC/year in 2020.

In addition, it is proposed to go more thoroughly into the following points:

- analysis of energy recycling in the context of the different areas and particularly the possibility of developing recycling of the energy produced, in the form of heat. It should be noted that the total balance sheet in terms of greenhouse gas emissions from incineration depends critically on the type of energy recycling;

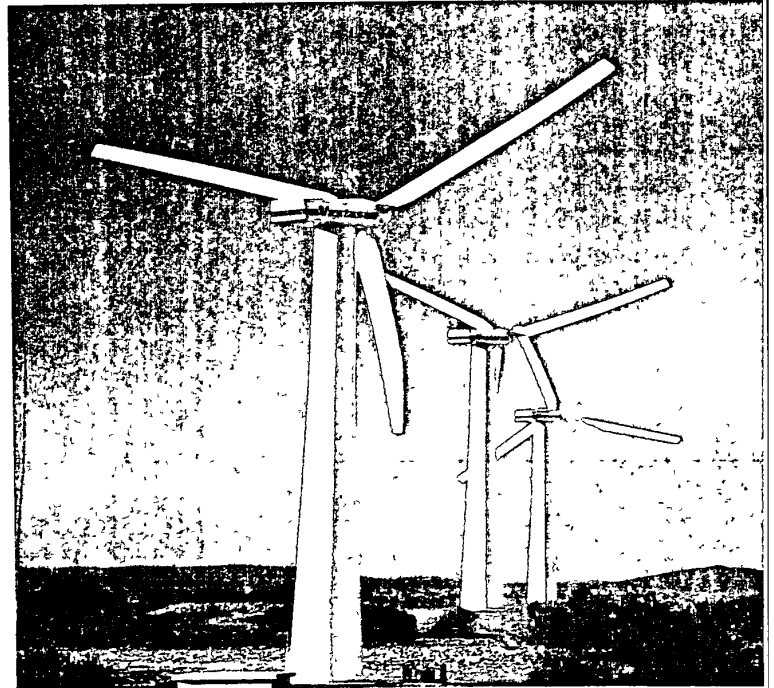
¹ In 1997, 57% of the waste dumped was in sites provided with capture equipment

○ ○ ○ NATIONAL PROGRAMME FOR TACKLING CLIMATE CHANGE

- assessment of the efficacy of capture systems (including the implementation of a campaign for measuring CH₄ emissions on landfill, for the purpose of acquiring the necessary technical references) and pursuing research on equipment, and the design of systems and operating conditions making it possible to improve capture (exploring the possibilities of achieving and exceeding the 80% recovery rate);
- assessing the advantage of biological pretreatment which would permit reduction in methane emissions in landfill in operation, i.e. before the capture system is in place;
- controlling biochemical reactions in landfill;
- agronomic recycling of organic waste: studying the quality level which can be achieved by such a system (economic and environmental conditions, acceptability at the local level). □

The energy production sector

- 1 Emissions in the energy production sector
- 2 The principal existing measures
- 3 New measures

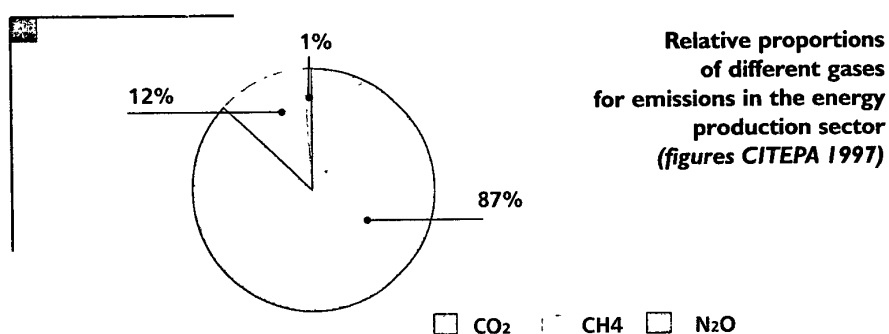


The energy production sector

1 Emissions in the energy production sector

Emissions in the energy sector here means emissions connected to electricity and heat production, as well as fugitive methane emissions from coal mines and leaks in the natural gas network. Refining is not included.

The gases produced are in the large majority CO₂ connected with the production of thermal electricity and heat. But the contribution of fugitive emissions is not insignificant.

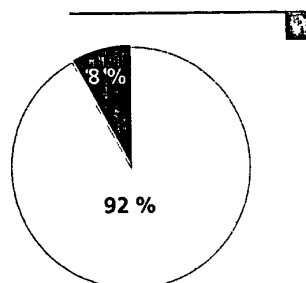


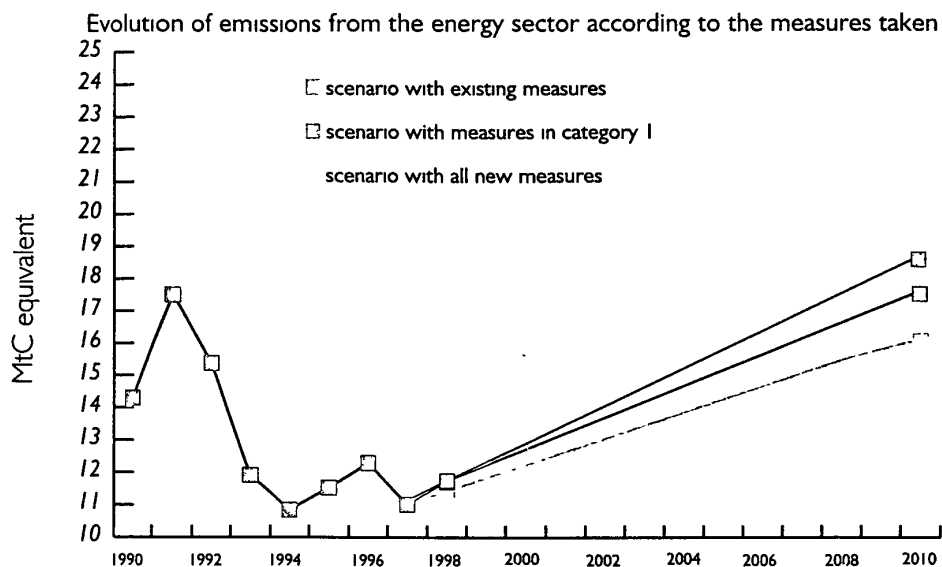
The share of the energy sector in greenhouse gas emissions in France is quite low as the diagram below shows. This is obviously linked to the significant share of electricity of nuclear and hydraulic energy.



Relative share of the energy production sector in greenhouse gas emissions (figures CITEPA 1997)

■ Energy
□ Other sectors

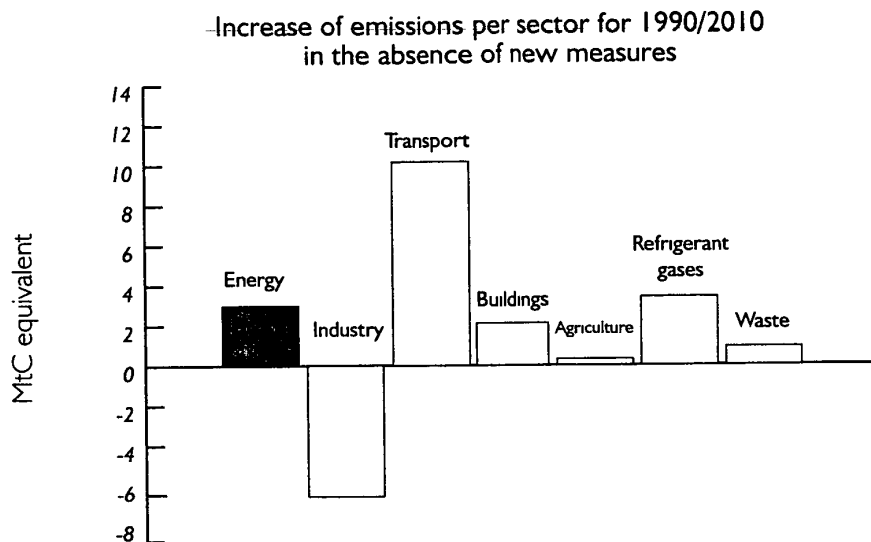




The production of greenhouse effect gases proves to be quite sharply variable from one year to another. These fluctuations can be explained by the variations in availability of the nuclear stock and by climate fluctuations that affect both supply (level of production of hydraulic origin) and demand (energy requirements for heating premises). However, the general trend is upwards due to the growth in demand for electricity and the decreasing share of nuclear-generated power in total production, which, in 2010, should be reduced to base load production.

The impact of the new measures detailed in section 3 is set out in the table below.

Measures	Savings (MtC/year) in 2010
Directive on energy-saving equipment	0.35
Reduction of VAT on energy-saving products	0.25
Development of wind-generated energy	0.4
Replacement of the existing thermal energy base	1.5
Overseas Departments/Territories and Corsica Programme	0.13
TOTAL	2.63



2 The principal existing measures

Forecasts "with existing measures" have been established to be consistent with the work of the Energy Group 2010/2020, particularly its industrial policy scenario (S2). These indicate that emissions from the electricity sector should rise from 10.6 in 1990 to 11.6 MtC/year in 2010, the share of traditional thermal electricity rising from 11.5% in 1990 to 14% in 2010.

These incorporate a series of measures already taken concerning:

1. investments in nuclear power stations programmed for the 1990-2000 period;
2. developing co-generation : an objective of 4 GW is posted for the 1995-2010 period; the development of wind energy, within the scope of the "Wind energy 2005" plan, the aim of which is to install a production capacity of between 250 and 500 MW by the year 2005;
3. reducing the peaks in the load curve, through the distribution of the TEMPO tariff and MDE initiatives within the scope of the ADEME/EDF agreement;
4. doubling the incineration capacity for household waste and everyday industrial waste;
5. correcting the adverse effects of tariff standardisation regarding French overseas departments and territories and Corsica and sparsely populated metropolitan rural areas, particularly by establishing a specific MDE/ENR sum from FACE (annual budget of 100M FF. since 1995);



6. European legislation on the energy performance of household electrical equipment Two European directives deal with the energy efficiency of household electrical equipment. Since 1992 it has been compulsory for a label showing, for a given type of appliance, its classification on a scale of energy efficiency from A to G to be affixed to appliances at their place of sale. This obligation is governed by directive (92/75/CEE). Directive (96/57/CEE) has prohibited, since 1996, the sale of fridges and freezers with low energy efficiency (categories F and G). These two directives have been respectively transposed into French law by the orders of 07.07.1994 and 31.03.1998.

③ New measures

E.1. Agreements negotiated with the industries concerned regarding certain emissions specific to the energy production sector:

E.1.1 Fugitive CH₄ emissions from gas networks

Replacing cast iron pipes and other pipes with joints with PET/steel pipes will be continued in order to reduce the leakage rate from the French gas distribution network. This action is also motivated by safety considerations and the normal renewal of networks.

E.1.2. Consumption of electricity connected to the nuclear fuel cycle and losses from electrical power cables

In 1997, the nuclear fuel cycle consumed in the region of 17 TWh of electricity (3.5% of national production); however, technical solutions exist for significantly reducing this consumption and their implementation conditions will be studied.

Losses in the networks rose to 28.5 TWh in 1997, equal to 6% of national production; the administrations concerned will examine, with the network administrator, actions likely to reduce the level in the future.

E.2. Action on electricity demand

The specific uses of electricity regarding the use of domestic electrical appliances, electronic and computer equipment, ventilation and lighting systems and pumps and motors. The reference scenario foresees a strong increase in electricity consumption connected with these specific uses in the residential and service sectors.



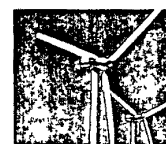
8 - THE ENERGY PRODUCTION SECTOR

Greenhouse gas emissions connected with these uses are carbon dioxide (CO₂) emissions resulting from electricity production in power stations (for emissions of fluorinated gases present in refrigeration equipment, see *chapter 9* ("Refrigerant gases")) Emissions of CO₂ in the sector are today relatively low, taking account of the low proportion of fossil fuels in the electricity production stock. However, they could increase beyond 2010 in the absence of measures to control the demand for electricity. In this respect, improvements in the energy performance of equipment which can be made between now and 2010 together with measures for controlling the demand for electricity will prefigure consumption during the decade 2010-2020.

The market for the appliances concerned is very largely European. Measures enabling the pool of electricity savings to be harnessed rely in a large part on the improvement of the technological options for equipment on a European level. In addition, the effective distribution on a national scale of materials and equipment providing good energy performance will be greatly facilitated by specific action in State buildings, relayed by action on a territorial level. The majority of measures decided on a national level in buildings form an integral part of a series of provisions with a broader spectrum, described in *chapter 5* ("Buildings").

E. 2.1. Promoting European legislation to improve the energy efficiency of electrical appliances offered for sale

Equipment connected with the specific use of electricity comes from a broadly European market. These are numerous and varied and the configuration of the stock of appliances is constantly evolving due to the emergence of new uses and new technologies. In addition, the energy cost in relation to the overall cost can be extremely variable from one piece of equipment to another: predominant in the case of engines, it is very low for computers.



Numerous gains in electricity consumption can be achieved by way of very slight additional investment costs which will quickly be compensated for by the energy savings obtained. Thus these investments are not made spontaneously because contractors and households do not know the cost of using these appliances, and therefore base their choice of an item of equipment on its purchase price.

France would like existing European legislation on the energy performance of household electrical equipment (*cf chapter 8 § 2.7.*) to be added to.

France will ask the European Union to draw up a regulation relating to the energy efficiency of electrical appliances used by households and businesses.

France will endeavour to have a "new approach" directive adopted similar to the "low voltage" and "electromagnetic compatibility" directives, which would set the essential requirements for energy efficiency.

In parallel, a series of European standards should be progressively drawn up on a mandate from the Commission. The conformity of an electrical appliance with the standard concerning it would be, according to the principles of the new approach, one of the methods of certifying this appliance's conformity with the regulations

A study of the energy consumption of different families of electrical appliance would enable the priorities for the standardisation programme to be set.

E.2.2. Information and training to promote high-performance appliances

1. Training the professionals

Initiatives for raising awareness and training will be undertaken with the main players in the chain of distribution and installation of electrical equipment.

Sellers of electrical household appliances, office and computer equipment and lighting will be advised of the institutional action taken to improve the technological feature of appliances, so that they are in a position to explain to their customers the meaning of the information given on the energy label and notices concerning energy efficiency and also the impact on the greenhouse effect. This bringing up to speed will be carried out through on-the-job training. The purpose of this action is also to familiarise buyers with the concept of overall cost so that this becomes a direct factor in their selection criteria.

Engineers in the sectors concerned and more specifically installers and repairers of heating and ventilation subsidiaries, refrigeration engineers and electricians should have been advised of the risks of greenhouse gases to the global environment and of the importance in this respect of the technical improvements programmed on the equipment, particularly to avoid refrigerant gas and methane leakage. One of the principle objectives is to allow them to be able to take account of the consequences of their work on improving energy efficiency and also reducing greenhouse gas emissions at their level of intervention – which may be one-off – but also at the level of the whole of the installation on which they are operating.



8 - THE ENERGY PRODUCTION SECTOR

2. Information for users

To increase general public awareness of the importance of controlling electricity use in the fight against the greenhouse effect, information campaigns will be implemented to explain in particular the role of energy labelling for electrical household appliances and labelling on electronic and computer equipment and also the importance of reducing the consumption of appliances on standby, etc.

E.2.3. Introducing requirements into the thermal regulations relating to equipment connected to specific uses of electricity

The energy efficiency of electrical equipment in new buildings for residential and tertiary use is the aim here. The uses concerned are principally: engines and pumps in all types of buildings, lighting for all tertiary premises and communal parts of group housing buildings.

A new energy regulation is in the process of being drawn up (cf. "Buildings" chapter). Reducing electricity consumption connected to specific usage will be carried out either by raising the performance requirements for electrical equipment within the scope of this new regulation, or by a future stage. The intended improvements only slightly increase the overall cost of buildings and should be introduced without delay.

E.2.4. Action on the property of certain building owners

These initiatives target State buildings and certain pilot sectors and are described in detail in the "Buildings" chapter.

In State buildings, organisation measures in services and in increasing manager awareness will enable the promotion of public purchases of energy-saving equipment and the optimisation of management of installations and the programming of works. The materials concerned will be pumps and engines, lighting (energy-saving bulbs, ballasts with high energy output) and office automation equipment.

These measures will be complemented by promoting awareness with all agents concerned. In fact, a strong potential for reducing consumption rests in the adoption of energy-wise behaviour.

E.2.5. Work in existing buildings

During renovation work on lighting, pumps and engines (ventilation, lifts, heating accelerators, etc), the contractor should provide a detailed description of



the installation carried out. On completion of the work, this document should remain available, with a view to future improvements, and for the information of future occupants.

Incentives to carry out work at a sound level of performance will be made in the form of aid for financing studies to help in decision-making and the creation of a certain number of model operations.

The forecast for energy consumption provided within the scope of the Law on Air Quality will include consumption by electrical appliances. For the service sector, an energy survey should be supplied for any letting or sales transaction. This should incorporate the specific consumption of electricity listed below.

E.2.6. Fiscal measures

1. Ecotax: see section 2 § 3.1
2. Lower rate of VAT

A supplementary option to the provisions relating to applying a lower rate of VAT on work in existing housing could be negotiated with the Commission and member states: it would consist of extending the existing measure and giving this extension a strong orientation towards energy savings and combating the greenhouse effect. More specifically, it would be a matter of opening up the option of applying, in a temporary or permanent way, a lower rate of VAT for products or services that help to control the greenhouse effect (see section 5 § 3 7.3)

With regard to the classification introduced by the "energy label" (European directive 92/75/CEE), electrical domestic appliances in category A could be affected and also high-performance lighting units.

E.3. Substituting traditional power stations with gas combined cycles (GCC) and co-generation

In the reference scenario, one part of the electrical demand up to the year 2010 will be met through the traditional thermal base, power stations using coal and heavy fuel oil, constructed, for the most part, before 1980. These units would produce in the region of 7.5 MtC/year by the year 2010. Their complete replacement by advanced units supplied by natural gas (gas combined cycle and co-generation) would enable a reduction of CO₂ emissions estimated at 4 MtC/year to be made. This swing would be facilitated by the lifting of the constraint attached to the flow of a minimum national production of coal by the year 2005.

The environmental performances of a combined gas cycle and advanced co-generation using a gas turbine are comparable, with nevertheless an advantage of 10 to 20% in favour of co-generation. However, on the one hand, the development of co-generation is dependent on the existence of heat demand, and on the other hand, in the French context, is characterised by the significant position of the nuclear industry, its full impact in terms of reducing CO₂ emissions is only obtained if the installations operate at half base capacity (whereas today the majority of industrial co-generation plants operate at full capacity and displace nuclear-generated electricity).

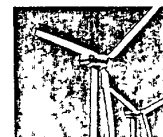
In future adjustments to the law on electricity, it would be appropriate to allow for the "governing" of co-generation installations, thus enabling their impact in terms of reducing CO₂ emissions from the electrical sector to be optimised.

Preliminary economic evaluations show that the swing from coal and from heavy fuel oil to natural gas could be brought about with a value of fossil carbon of between 500 and 1500 FF/tC. A tax level of 500 FF/tC would justify substitution between energies leading to a saving of 1.5 MtC/year (on a technical accumulation of 4 MtC/year). This question however, deserves supplementary investigation, taking greater account of the diversity of the existing base, both in terms of economic and environmental performance.

In consequence, for the electrical sector, it is proposed to aim at an objective of CO₂ emissions of 9.1 MtC/year by the year 2010, corresponding to a gain of 2.5 MtC/year in relation to the "without new measures" scenario (this gain is made up of 0.6 MtC/year obtained using measures to control the demand for electricity and 1.9 MtC/year obtained by making substitutions within the production base: co-generation, GCC, wind energy electricity, see below).

This measure would supplement the energy GTPA (general tax on polluting activities) applying to electricity consumption (cf. chapter 2 § 3), the main objective of which is the long term control of demand for electricity.

In addition, it is proposed that provision for the exchange of credits for emissions which could be stopped for energy intensive industries should be extended to the electrical sector.



E.4. Developing renewable energy

E. 4.1. Increased support for the production of wind energy electricity

The wind energy industry is growing strongly on a world-wide level (it is believed that between now and the end of the next century, wind energy could occupy a place comparable with that of hydraulic energy) and its cost of production, forecast to drop sharply between now and the year 2020, could make it economically viable by this date.

Within the scope of the "Wind energy 2005" programme, it has been decided to put in place a production capacity of 325 MW. The reference scenario provides for the installation, in France, of 1,300 MW of power installed between now and 2010, for a production of 3.5 TW/year (0.6% of total production), resulting in a reduction of emissions of probably 0.2 to 0.5 MtC/year.

Increased support for this industry is fully justified within the scope of a precautionary policy targeting the year 2010 and beyond : in the event of the discontinuation or levelling out of nuclear production, wind energy would offer considerable prospects for CO₂ savings in 2020 by displacing production based on fossil energy ⁽¹⁾.

It is therefore proposed to aim for an objective of 3000 MW of power installed by 2010, this is more than double the stock initially envisaged in the reference scenario. The impact of this action in terms of reducing emissions is estimated at 0.4 MtC/year in 2010.

Specific instruments are desirable to develop industries that are still very young, like the wind energy sector. At the moment, France makes use of a tender procedure for proposals (Wind energy 2005 programme, biogas programme, etc); this instrument has the advantage of enabling projects closest to profitability to be selected, without allocating an excessive allowance to the more economical projects. However, in the context of opening up the electricity market, implementing the tender procedure for proposals may prove to be more difficult. It could be replaced with the instrument of "green certificates" ⁽²⁾, which also allows a criterion of economic efficiency to be satisfied. Its implementation on a European level would be particularly worthwhile: certain studies seem to indicate that France would have particularly attractive sites available for producing electricity of renewable origin, and could therefore become an important supplier of green electricity intended for the European market.

Once an in-depth report on this instrument, particularly concerning the practical methods for implementation has been completed, France will look into putting in place "green certificates" ⁽³⁾ on a European scale to encourage the development of electricity production from renewable sources

1 The "Energy 2010/2020 group has settled on a level of production of 17.5 TWh/year in 2020 in its "socio-environmental" scenario, this would correspond to avoided CO₂ emissions of approximately 2 MtC/year in relation to a GCC reference

2 This instrument consists of imposing a requirement for all electrical operators to hold "green certificates" corresponding to a fixed percentage of electricity sales, these green certificates are created when a facility producing electricity from renewable sources is set up, electrical operators are authorised to buy or sell green certificates. This enables the least expensive technical solutions to be selected, whatever their geographical location, and thus guarantees a minimum amount of electricity production from renewable sources – at the lowest cost

3 We will examine, in particular, the following points

- the exact definition of the concept of "green electricity" which production channels should be chosen?
- the level of constraint in terms of the share of green electricity can we anticipate different rates according to the different member states?
- the link between transfers of certificates and physical movements of electricity

E.4.2. Developing wood energy

E.4.2.1 Heat production

This point is dealt with in the "Buildings" and "Agriculture and Forests" sections (cf. chapters 5 and 6).

In addition, studies ⁽⁴⁾ have been launched to establish the comparative "greenhouse effect" assessment for the electrical and gas sectors in heating buildings. If they have not been able to agree on this point, these studies do, on the other hand, confirm the significance from the point of view of controlling the greenhouse effect, of the development of wood/electricity dual-energy (compared to electricity-only heating), wood being used during peak periods and therefore essentially substituting electricity with a high fossil carbon content.

In consequence, the EDF (French National Electricity Board) will endeavour to ensure the distribution of high-performance wood-fuelled installations, in combination with electrical heating, within the scope of the "Tempo" tariff.

E.4.2.2 Electricity production

Using the biomass to produce electricity is a long term strategic channel, which will enable CO₂ emissions to be significantly reduced in the future.

At the Government's request, the EDF is preparing a tender exercise for the supply of electricity produced from the biomass for a capacity of 10 MW, in order to enable the creation of one or two experimental installations.

In addition, the ADEME and EDF will finance research and development programmes in this field, in particular:

- on biomass/coal co-combustion, in new units of the LFC type, or units of crushed coal combined with herbaceous biomass (with, as another positive outcome, the reduction of SO₂ emissions) ;
- combined cycle with prior gasification of the biomass.

The cost of these options should be specified within the scope of this study.



⁴ These studies conclude that the level of development of electrical heating would only have a slight effect on CO₂ emissions by the year 2010 and, in the longer term, the conclusions would depend strongly on the evolution of the electrical base (position of the nuclear sector) and the maintenance of an "energy over-consumption" for housing heated with gas compared to housing heated with electricity (today there is a factor of 2). In addition, the overall saving on electrical heating appears fragile and also depends to a considerable extent on the variations in consumption with the gas heating option.

E.5 The heating networks

See section 4 ("Buildings")

E 6 The "Overseas Departments and Territories and Corsica" programme

Electricity in Overseas Departments and Territories and Corsica being for the most part produced by diesel generators, developing renewable energy in these regions is especially worthwhile to the extent that it would result in the immediate lowering of CO₂ emissions connected with energy production.

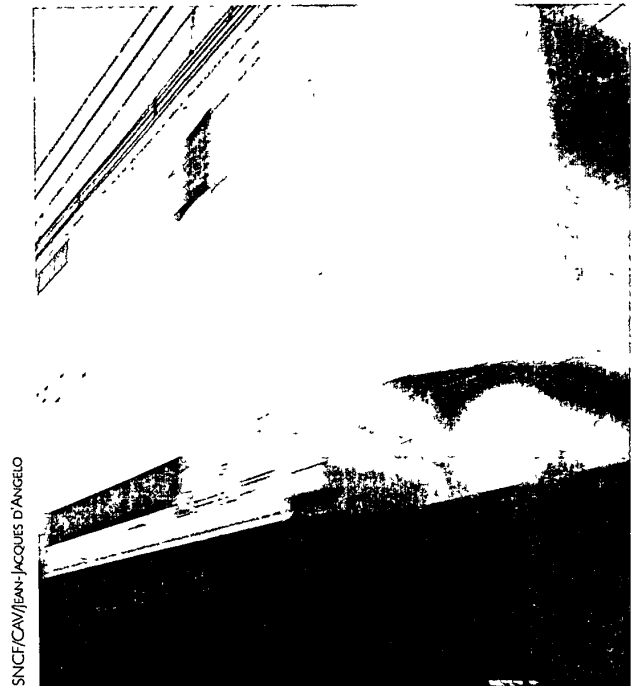
The objectives set by the ADEME for the year 2010 include

- *the installation of 80,000 sq m of new solar energy collectors for producing domestic hot water;*
- *the electrification of 500 isolated sites;*
- *the additional production of 600 GWh/year of electricity from renewable sources (wind energy 100 MW, geothermal 50 MW, small hydraulic 20 MW) ,*
- ***the development of wood energy to the level of 10,000 tOe/year.***

The potential for this programme in reducing emissions is as much as 0.13 MtC/year by 2010. □

The refrigerant gas sector

- 1 Gas emissions
- 2 The existing measures
- 3 New measures



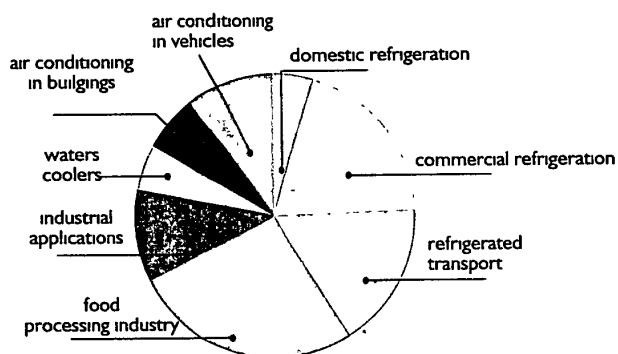
SNCF/CAV/Jean-Jacques D'ANGELO

The refrigerant gas sector

1 Refrigerant gas emissions

The use of refrigerant gases constitutes a subject which cuts across many sectors: buildings (heat pumps, air conditioning); specific electrical applications (domestic and commercial refrigeration); industry; transport (refrigerated transport, air conditioning in cars or other vehicles) or even agriculture. Considering the similarity in uses and frequent similarity in the measures to be taken, it has been judged preferable to group together all these applications in the same chapter.

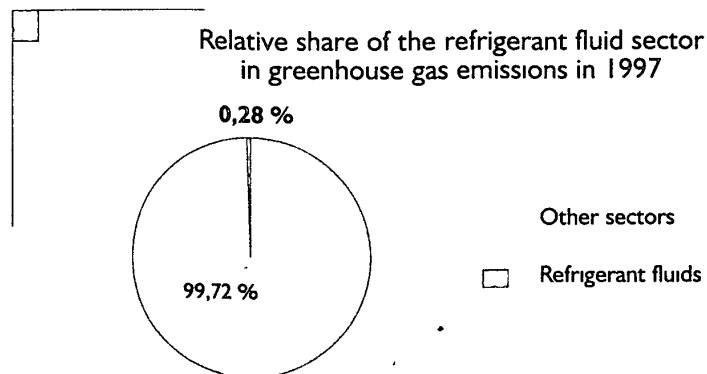
Relative shares of the different refrigerant HFC emission sectors



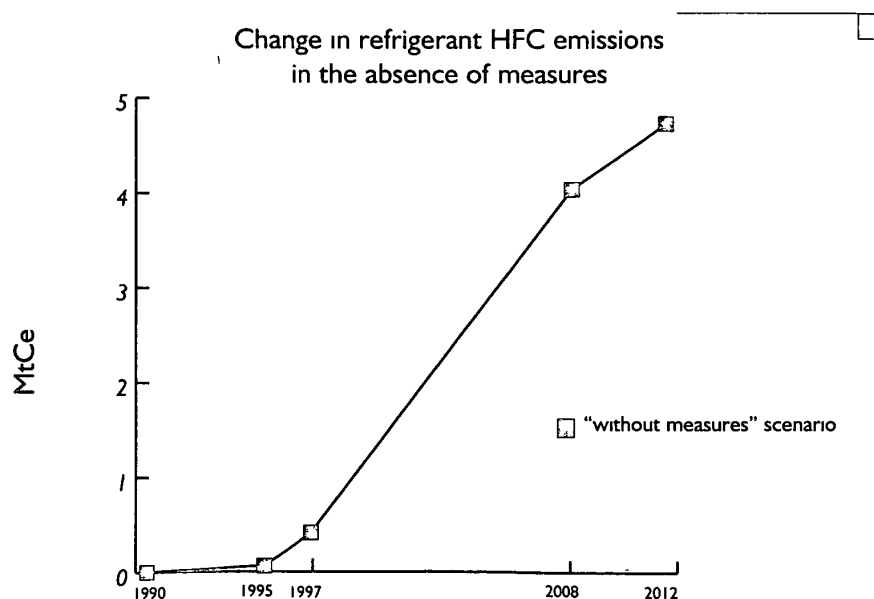
The refrigerant gases which have a high total warming capacity are CFCs, HCFCs and HFCs. The other gases used, ammonia and hydrocarbons, do not pose the same problems.

However, the Kyoto Protocol excludes from its scope the gases to which the Montreal Protocol relates. The result is therefore that HFCs, gases forming part of the fixed quota for the budgetary period, are increasing rapidly in order to replace other gases which do not fall within the quota.

The proportion of the refrigerant fluid sector to which the Kyoto Protocol relates (HFCs) is very small in France for the moment compared with all the greenhouse gas emissions (but increasing rapidly).



Due to their impact on the ozone layer, CFCs and then HCFCs are to be replaced in these uses by HFCs, in accordance with the 1987 Montreal Protocol relating to substances depleting the ozone layer. The consequence of this is that HFC emissions are greatly increasing, as shown by the following diagram and its "without measures" scenario.

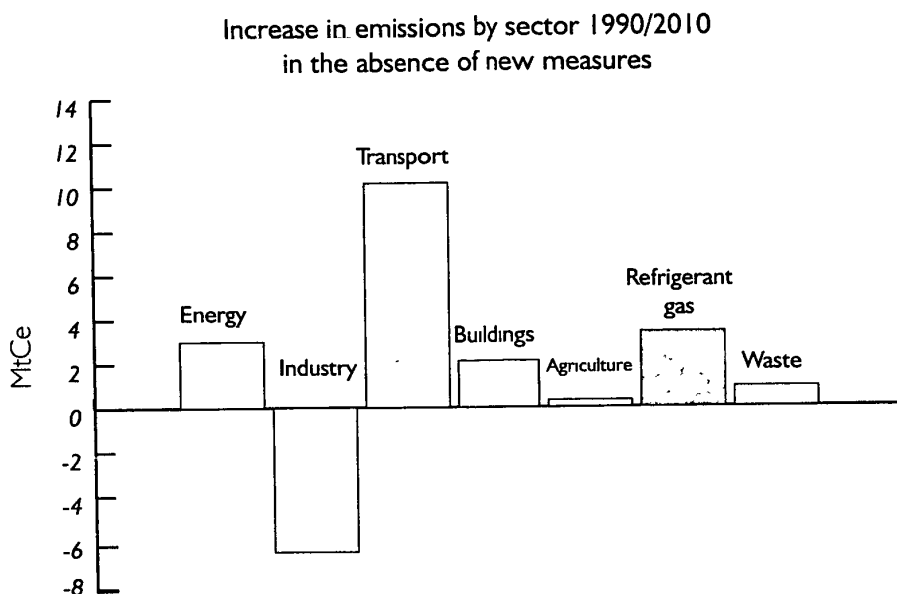


(source "without measures" scenario ENM Energy Centre Paris, June 1998)

However, in this sector, it is hoped to be able to set up measures for strongly changing this trend, at low cost per tonne of carbon equivalent (order of magnitude: 100 FF/tCe).



9 - THE REFRIGERANT GAS SECTOR



2 The existing measures

Reducing refrigerant gas emissions with a view to combating the greenhouse effect is a subject which is still new.

It is, however, important to note the decree of 07.12.1992, which imposes several obligations on the qualification of companies, and on recovery for equipment whose fluid load is greater than 2 kg.

3 New measures

F3.1. Reinforcement of controls

It is a case of reinforcing controls on effective compliance with obligations laid down by the decree of 07.07.12.1992 as amended (required qualification, compliance with obligations with regard to tightness). The evaluation concerns all the sectors to which the decree of 07.12.1992 currently relates, that is to say those where the fluid load is greater than 2kg.

This measure is very firmly called for by the industries grouped together within the AFCE. the lack of relevant work units in devolved services compared with the quantity of checks necessary means that only a few checks can be made occasionally. The regulatory measures – which result largely from industry proposals – are in fact applied by only part of this industry.



Resolving the control problem appears to be the essential requirement with regard to reducing HFC emissions in the refrigeration field, given that the regulatory framework for encouraging the limitation of emissions is in place.

Instructions will be given to local state services to carry out spot checks.

The opportunity to entrust controls to a private inspection body will be examined. The number of controls could be provided for in a sufficiently modest fashion to avoid excessive cost and to be dissuasive whilst avoiding excessively harsh consequences for fluid users (small shops) and insufficiently qualified installation companies.

The objective would be to check 20% of the companies concerned each year, that is to say approximately 500 companies, at an estimated cost of 12 million francs per year, and a saving assessed at 0.1 MtCe/year in 2012.

F3.2 Obligatory control of air conditioning equipment in motor vehicles

The technical and economic conditions for setting-up controls on the tightness of air conditioning installations will be studied.

F3.3. Standardisation

It is a question of producing standards for leakage detection equipment, the methods of detecting these leaks and the components of refrigeration appliances and air conditioning equipment in motor vehicles.

Producing these standards satisfies a request from industry. Certain standards are already in progress. They are also necessary for applying European regulations relating to the protection of the ozone layer. Just like any action helping to reduce fluid leaks in equipment, this measure affords a saving in expenditure on fluids for the user.

The cost of the work for producing the standards is a total of 500,000 FF. for 10 standards to be produced in 5 years. The cost of the environmental effectiveness will therefore be minimal.

The average cost of leakage detection appliances is 5,000 FF. cushioned by the decrease in expenditure on purchasing fluids and the decrease in the energy consumption of the systems.

Standardisation work at European level could be carried out to have effect by 2010 but it is preferable to pursue the work of producing standards already partly undertaken at French level



9 - THE REFRIGERANT GAS SECTOR

F.3.4. Actions in favour of fluid recovery

With regard to motor vehicle air conditioning, the proposed directive relating to vehicles out of use includes the obligation to remove, collect and separately store fluids from the air conditioning circuit. Vehicle recycling plants should therefore be equipped with installations for recovering these fluids.

Current studies concerning the different measures to be put in place to develop a system for recovering used fluids will be pursued actively with a view to proposing concrete action.

F.3.5. Training and qualification of companies working on refrigeration and air conditioning equipment

Companies working on refrigeration equipment

It is necessary to reinforce the qualification conditions required in order to be able to work on equipment containing refrigeration fluids

The decree of 07.12.1992 obliges companies doing this work to obtain approval from state services at the department level. *This approval could be made conditional upon a certification of the company by a body following an audit for assessing the qualifications of its staff for handling the equipment, the audit being renewed periodically and creating a situation for possible withdrawal of approval. The decree of 07.12.1992 would therefore be amended accordingly.*

This measure will also be beneficial for limiting leaks into the atmosphere related to other refrigeration fluids (HCFC, hydrocarbons, ammonia).

As with any action helping to reduce leakages of fluids from equipment, this measure affords a saving in expenditure on fluids for the user.

A complementary measure would be the prohibition on selling fluids to unqualified companies and persons, as in the Netherlands and United States.

This evaluation concerns all sectors to which the decree of 07.12.1992 currently relates, that is to say those where the fluid load is greater than 2kg. Taking emissions apart from the end of life in these sectors and assuming, in agreement with the industry professionals (AFCE), that qualification represents between 20 and 30% of the potential reduction, the evaluated potential would thus be around 0.2 to 0.4 Mt carbon equivalent per year in 2012.



Motor vehicle air conditioning

This is a question of measures aimed at operator qualifications and controlling good practise to limit leakage during maintenance operations

- certification of garage operators and refrigeration engineers working on equipment by a body which could be created by the industry. Approximately 10,000 people would have to be certified in total;
- qualification and maintenance quality control. The objective would be a check on 200 companies per annum out of a total of approximately 700.

F.3.6. Fiscal measures

The total warming capacity of fluorinated gases being high, a level of taxation consistent with a carbon value of 500 FF/tC would result in a tax of around 180 FF/kg for the less radiative fluorinated gases (for example HFC 134a). This level of tax would be very difficult to implement in the short term, considering the price of the gas (35 to 50 FF/kg) because of its economic impact and risks of fraud.

In this context, the imposition of a tax will be envisaged at a much lower rate (order of magnitude 10 francs/kg), increasing subsequently and compensating at least from its inception for the budgetary cost of the preventive measures in this sector.

Such a tax would give an economic and psychological signal in favour of:

- substitution of other products when possible (notably hydrocarbons), which would constitute an important movement for the future;
- recovery, if there is a possibility of a tax rebate for when these gases are recovered, notably at the end of equipment life;
- reduction in the quantities used (unit loads of the equipment);
- substitution of HFCs with lower global warming capacity, if the tax is modulated according to this warming capacity.

A certain number of conditions of application are still to be studied, in particular exports and imports of gases and equipment containing gas and application terms to other activities (aerosols, foam manufacture, etc.).

A tax on fluorinated gases will be studied with a view to combating the greenhouse effect. Amongst the conditions of application, the possibility of taxation at the factory gate and the opportunity of joint implementation at the European level will be considered



9 - THE REFRIGERANT GAS SECTOR

F3.7. Research and development

It is a question of taking the necessary research and development action to achieve four types of objective:

- improving knowledge of emissions;
- improving equipment,
- improving the confinement of installations;
- developing equipment which requires as small a fluid load as possible;
- changing towards other fluids and other processes;
- seeking a low or zero warming capacity for fluids, processes for synthesising new fluids, studying possibilities of using mixtures, adaptations of technologies;
- development of alternative technologies: absorption, solid sorption;
- developing tools for fluid recovery, regeneration and re-use.

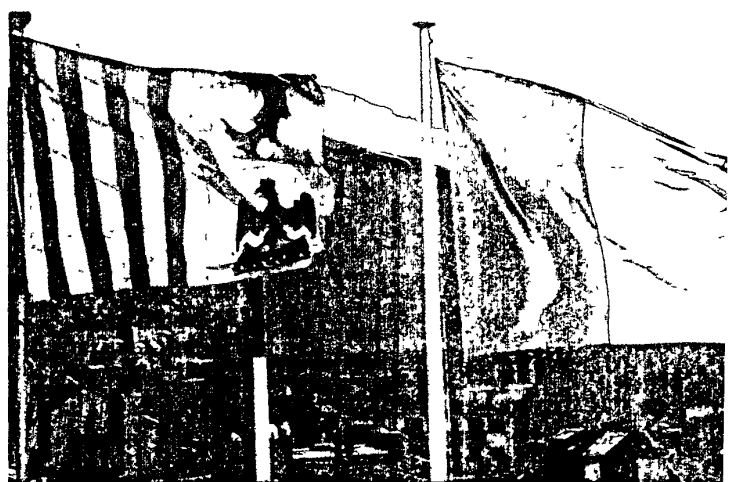
It is necessary to emphasise the efficacy of the introduction of techniques for reducing the load. In the somewhat longer term, the development of techniques using substances with a very low warming capacity constitutes a potential which is also very important. ■



The various territorial levels

- 1 Europe
- 2 Territorial anchoring
- 3 Local districts and major cities

F. PAUWEL





The various territorial levels

1 Europe

The measures put forward in this report cannot be fully effective if means are not implemented to maximise their environmental and economic efficiency. Henceforth it is not possible to achieve this if the following requirements are not integrated at European level:

- Drawing up and implementing joint or co-ordinated policies and measures in order to prevent creating or increasing competitive distortions or, on the contrary, to reduce those distortions currently observed.
- The functioning of the single market must not be hindered and, consequently, one must avoid national instructions relating to some products, particularly those for which the market is at least European.
- Co-ordination at European level of policies and measures in fields whose scale exceeds the national context, such as in the field of long-distance passenger, goods or energy transport. One should mention here the development of trans-European networks and the inter-operation of combined transport systems.

A recent communication by the Commission to the Council and Parliament referred most strongly to the need to take vigorous action in order to take up a position on an emissions guideline which will meet the demands of Kyoto without, however, going a great deal further in terms of joint policies and measures and new co-ordination. We consider that, as far as both the Council and the Commission are concerned, it is urgent to ensure real interoperability of policy making.

The transport sector is one of the most heavily involved sectors. Technical progress in vehicles towards improved energy performance was commenced within the European context (agreement with ACEA). It continues within this context, particularly in terms of negotiations with Japanese and Korean manufacturers. Some possibilities which are opening up, such as twin-fuel type engines for heavy goods vehicles, can only be implemented at European level.

This is also the case in terms of the development of railway links and the inter-operability of combined transport systems. One should also be looking ahead to an increase in transport in – and towards – countries currently applying to join the European Community.



Choices to be made for organisation of community space (Community Space Development Plan – CSDP) will have a considerable impact on international and cross-border travel requirements. It will be necessary to look at various scenarios and to choose community space organisations which minimise the need for travel and give priority to those means of transport which are most environmentally-friendly (particularly rail, sea and river transport).

Finally, harmonisation of labour law in the road transport sector is also a major dossier and good progress here should mean fairer competition with railways, thus contributing to improving modal distribution.


The realm of taxation is also of considerable importance at European level. A draft directive on the taxation of energy products is currently being negotiated.

One may mention here, of course, taxation on kerosene. However, one must underline the need to increase taxation on diesel fuel, including for professional use, which means a similar move on the part of other European countries. The delay and lack of ambition inherent to the draft directive on energy products taxation are particularly harmful here. There is definitely a need for European policy consideration and negotiation on the development and responsibility for transport requirements in the most reticent countries, partly because they see themselves as being the most dependent on road transport (mainly Spain).

The possibility is being considered, and will be negotiated at European level, of applying either temporarily or permanently, a reduced rate of VAT on the sale of heat produced by renewable energy sources (wood, geothermal). France will support the extension of the reduced VAT rate which can be levied on electricity and gas to subscriptions to renewable energy sources and sales of heat.

In the industrial field, the guaranteed maintenance of fair competition conditions makes a certain degree of harmonisation necessary in terms of the taxation of carbon and energy, or else conditions for allocating tradable permits, where these measures are taken at a level sufficient to ensure that they have a significant effect on production costs (and thereby a truly motivating effect in the reduction of emissions). Electricity poses similar problems, insofar as this sector is increasingly opening up to competition and a great deal of international trading is involved.

Improving the efficiency of electricity use involves a whole range of equipment and appliances (lighting, domestic electric appliances, office equipment, audio-visual equipment) for which the market is at the very least European. The European Community has in fact already taken certain measures, such as the directive (96/57/EEC) on refrigerators and freezers (which, since 1996, has banned the sale of lowenergy-efficient appliances). Thus, the natural, efficient framework for improvement of the energy performance of electrical equipment is European and, in this respect, a directive is being put forward.



10 - THE VARIOUS TERRITORIAL LEVELS

In terms of the fight against fluoride gas emissions, efforts towards standardisation should be carried out at European level. Similarly, introduction of a tax on these gases at an incentive level will be simpler and more harmonious at European level.

With regard to forestry, one should note the possibility of benefiting from European funds, in the context of the regulations governing wooded areas on agricultural land.

Joint or co-ordinated policies and measures which will be taken within the European Union will constitute an important contribution to integration of environmental concerns in both sectorial and multi-sectorial European policies.

This integration process is currently in progress. At the European summit meeting of heads of State and Government held in Cardiff on 15th and 16th June 1998, the Councils of ministers of Transport, Energy and Agriculture were invited to define their own strategies in order to integrate sustainable environmental and developmental concerns into their respective political fields. At the European summit meeting held in Vienna on 11th and 12th December 1998, heads of State and Government extended this process to include development, domestic market and industrial sectors. They also underlined the importance of inter-sectorial problems such as climate change and the environmental scope of employment and enlargement.

The inset below refers to all the programme's measures, to be proposed at European level.

Measures to be proposed at European level

Industry

Integration of the problems faced by intensive energy consumption industries in terms of taxation has led to a recommendation to implement a tax reduction system based on the setting of annual emission objectives.

These systems should be harmonised at European level.

Energy production/specific electricity

Proposal for a new directive to regulate the energy efficiency of appliances.

Specific electricity/buildings

Opening up of the possibility of applying, on either a temporary or permanent basis, a reduced VAT rate on products and services which combat the greenhouse effect. This sort of measure could involve heating equipment (regulation devices or high-efficiency boilers), insulating materials or electrical appliances.



Buildings

Application of the reduced VAT rate to the sale of heat produced by wood or renewable energy sources or waste products, including on subscription rates to heating networks.

Implementation of the taxation directive on energy products would also have a favourable impact on consumption in the building sector, including the residential sector.

Transport

◦ Action on vehicles

Extension of ACEA agreement to lightweight utility vehicles.

Integration into the auto oil 2 programme of control of N₂O emissions.

Limit by manufacture the speed of heavy vehicles.

◦ Action on taxation

Permit an increase of excise on fuels (particularly diesel fuel) by means of improved harmonisation of national policies in this field.

Resolutely strengthen the action taken by the European Union in ICAO with a view to rapid implementation of a taxation system on aeroplane fuel.

In parallel to this action, consider at European level complementary systems of duty and taxation systems on air transport, taking account of real consumption levels of planes and the various characteristics of flight.

◦ Action on the organisation of transport and networks

Encourage the development of coastal trade, particularly from one side to the other of the Pyrenees.

*Improved co-ordination of national HGV control policies (working hours, etc.).
Development of rail infrastructure. Implementation of a European development plan on freight. Creation of freight corridors. Action to encourage rail crossing of the Alps and the Pyrenees.*

Refrigerant gases (HFC)

Study of the possibility of a European framework for taxation.



2 Territorial anchoring

Greenhouse gas emissions depend to a great extent on decisions made by all those involved in land planning: the State and the regions, departments, local districts (*pays*), towns and major cities. Territorial anchoring is one of the conditions for the success of the national policy to fight the greenhouse effect.

This is why the new State-Regional plan contracts, for the period 2000-2006 integrate for the very first time and in an explicit way, a concern for the greenhouse effect. The same will be true for future contracts with towns and major cities and local districts.

This is also why the fight against the greenhouse effect involves providing information and creating awareness amongst all local decision-makers. These people must specifically be in a position to assess the consequences of the choices they make regarding the volume of greenhouse gas emissions and on its medium and long-term development. With this aim, the ITFCC has published, together with the DATAR and ADEME the "Guide for Decision-Makers" which is an initial tool for local decision-makers.

1. The regions

State priorities in the new negotiations of State-Regional plan contracts (SRPC) are employment and sustainable development and, within the latter, the greenhouse effect. This priority is also confirmed in the circular from Mrs Dominique Voynet dated 27th August 1999 addressed to regional Prefects and concerning the preparation of future SRPCs (see *inset*).

Integration of the concern regarding the greenhouse effect into negotiations on future SRPCs will be a first exercise in State-Regional co-responsibility in terms of the control of greenhouse gas emissions and decision-making concerning the principle of precaution.

Negotiations will take ten application sectors into account, including four that are the most strategic in terms of structural impact and sustainable development, which are considered as priorities by the State. They will therefore constitute a block of obligatory contracting.

These are:

- land and town planning: land planning will have to be readjusted, urban spread must be contained and public real estate control reactivated.
- transport: the major turnaround from road transport to more energy-saving, less greenhouse gas-producing means of transport is an important innovation in forthcoming SRPCs.



Circular dated 27th August 1999
from the Minister of Land Planning and the Environment
to Regional Prefects relating to the preparation of future
State-Regional plan contracts and the integration of the greenhouse effect

Commitments made after the Kyoto negotiations and after division of the required effort within the European Union have given France a quantified objective for the stabilisation of greenhouse gas emissions for the period 2008-2012 compared with the reference year, 1990. These commitments are ambitious since, if no new measures are taken, one may estimate at 10% the spontaneous increase of our emissions over the same period.

At a meeting held on 27th November 1998, chaired by the Prime Minister, the Interministerial Commission on Climate Change was an opportunity for the Government to remind those present that the objectives targeted by France and the means to meet the obligations made under the terms of the Kyoto Protocol fall within the framework of its priority policies for employment and sustainable development, which it intends to put into effect via State-Regional plan contracts.

Specifically, it concluded, "Territorial anchoring of the national policy is one of the conditions for its efficiency. In liaison with the MATE and ADEME, the ITFCC will look at the means to integrate policies and measures to fight the greenhouse effect within the scope of the jurisdictions of regions and major cities, which are now one of the priority fields for State-Region contracts. The three bodies will put forward proposals for taking these policies into account in future plan contracts."

At the CIADT held on 15th December 1998, the Government again underlined the fact that "by their pluri-annual and Interministerial nature, SRPCs are a first class tool for implementing France's commitments, particularly in terms of controlling the greenhouse effect".

These orientations have been taken up in the joint instructions which have been sent to you, within the context of negotiation mandates.

Already, in liaison with the ADEME and the DATAR, the ITFCC has "published the "Guide for Decision-Makers" a copy of which you will find attached hereto: this document is a preliminary tool which will enable local decision-makers to easily understand the consequences of their choices in terms of volumes of greenhouse gas emissions and their development over the medium and long term.

To assist you with the implementation of these recommendations, I have decided to place at your disposal:



10 - THE VARIOUS TERRITORIAL LEVELS

- training of negotiators in the regions
- technical partnership during negotiation
- running of regional conferences on "The Greenhouse Effect and the Plan contract", open to all partners interested in contracting (State, territorial authorities, voluntary sector) which you may consider it opportune to organise, with the support of the ADEME.

I have entrusted the task of implementing this mechanism to the ITFCC, which will contact your services and work alongside you for this purpose in the near future.

- energy efficiency and renewable energies: the renewable energies programmes implemented by the ADEME will be written into each contract, along with adaptations to take account of local characteristics. Energy efficiency will specifically be applied to the case of heating networks and cogeneration⁽¹⁾.
- information, awareness campaigns and training: these activities will valorise innovation, changes in behaviour patterns and exemplary actions developed by participatory democracy and the mobilisation of those working in the field (elected representatives, companies, users, associations, voluntary sector).

From amongst the other six contractual application sectors, regions will select three sectors which they consider priority in terms of their specific contribution to the reduction of greenhouse gas emissions:

- residential and service sector
- waste products and waste water
- industry
- agriculture and forests
- North-South co-operation
- compliance, research, assessment.

Contracting will affect as a minimum a limited number of actions, chosen from each of the sectors for their impact on the reduction of greenhouse gas emissions. On these bases, it will come to bear as a priority on exemplary operations acting as benchmarks for those involved in the regions.

In order to train local decision-makers for future negotiations with the State, regional "Greenhouse effect and Plan Contract" conferences, open to all those involved in contracting (States, territorial authorities, voluntary sector), will be organised and run with the support of the ADEME.



¹ Contracts involving both the regions and the ADEME have mobilised almost 3 billion francs over the plan contract period in these two fields

In the setting up of plan contracts, the State has ensured that the greenhouse effect has been taken into account in coherence with the method of dealing with the greenhouse effect in the planning exercise of the joint services schedules.

The experience gained from drawing up and assessing 2000-2006 SRPCs will, of course, be taken into account for ensuing plan contracts, the coverage period of which is included in that of the national plan.



Local district and major cities

These two territorial entities were established by the law on land planning and sustainable development dated 29.06.1999. They may draw up contracts with the State. However, these contracts will not come into play before 2001. Before then, the regional conferences referred to above will have created awareness and will have trained the negotiators of these future contracts in the matter of the greenhouse effect.

Moreover, the draft law prepared further to the work done on "Living, travelling, life in towns" will offer cities and inter-municipality bodies new tools to control urbanisation and the implementation of urban travel plans to reduce forced mobility and encourage the use of public transport, walking and cycling. □

Cross-cutting measures

- 1 Information and training
- 2 Research and development
- 3 North-South co-operation





Cross-cutting measures

1 Information and training

The fight against the greenhouse effect can be effective only if the question of climate change is well known and understood by most citizens, and particularly by territorial decision-makers and citizens. Indeed, integration of the phenomenon into public and private decision-making, and a medium term change in the behaviour patterns of all concerned is what is being sought. This cannot be done without a major effort in terms of informing citizens and the training of professionals and decision-makers concerned.

Information

Further to the Earth Summit in Rio in 1992 and to the Kyoto Conference in 1997, which were widely reported in the press, citizens are becoming increasingly familiar with the matter of climate change. Of course, media coverage should be encouraged of subjects such as the state of scientific knowledge of the influence of human activities on the climate, policies made by States to fight against global warming, the state of international negotiations on the implementation of co-ordinated policies, etc. However, it is also of fundamental importance for everyone to have direct access to up-dated information on these themes. This will be the case in the near future thanks to the set up of an Internet site by the ITFCC. <http://www.effet-de-serre.gouv.fr>. This site will be also linked to the "climate" site kept by the National Centre for Scientific Research. These sites will be used by students in schools and high schools (lycées). Lycée students will be studying the greenhouse effect during their sixth year ("seconde"). Moreover, it is important to maintain direct contact between the general public and greenhouse effect specialists, as is done during special scientific events, for example.

Symposiums will enable the general public to understand what could be the actual effects of global warming on national territory: the first, to be held in Chamonix, will deal with the possible consequences of the greenhouse effect on the Alps mountain range. This action will have the aim specifically of making those involved in tourism in the region aware of the problem. A second symposium will present the dangers linked to a rise in sea levels due to climate change in coastal areas. This event will lead people to consider how flood risk can be prevented in these zones, and otherwise what means of adapting to the new situation are possible.



The fight against the greenhouse effect must be integrated into decisions and investment choices made by territorial authorities. Thus, the will to reduce GHG emissions must be integrated when a municipality makes choices relating to: heating methods for public buildings and flats, means of transport, town planning, construction and fitting-out of buildings (public authorities, educational, sports and cultural facilities, council housing), the development of some types of renewable energies, urban heating, street lighting, waste management, etc. It is particularly crucial in view of the greenhouse effect to aim to minimise road journeys made necessary by residential and working areas being far apart. This requires adequate choices to be made in the development of major towns and cities.

For this purpose, the ITFCC has published the "Guide for Decision-Makers" which is an operational tool for decision-makers to assist them in quantifying the effects of their decisions in terms of greenhouse gas emissions. This document has been widely distributed to regional prefects and councils and is available to local authorities on request from the ITFCC.

In future State-regional plan contracts, information, awareness and information campaigns will constitute one of the four priority application themes in the fight against the greenhouse effect. Within this context, regional conferences for all partners involved in contracting (State, local authorities, non-trading companies), will be organised to help them take the greenhouse effect into account in their future contract negotiations with the State.

Training

Adaptation of training is required within the various branches of activity to ensure that choices made by professionals will be steered, amongst other things, by the objective of reducing greenhouse gas emissions. This type of approach will ensure that the various technical operators are prepared to be able to apply and adapt as best possible within their sector the measures taken in the national programme for the fight against the greenhouse effect and also to encourage initiatives. Training to be undertaken will depend, case by case, on functions carried out. However, and this is true as much for town planners, architects, long-term building designers in design offices, heating and thermal experts, as for electricians and refrigeration equipment fitters and maintenance workers, it is important that everyone involved:

- knows of the various greenhouse gases and their various global warming potential,



II - CROSS-CUTTING MEASURES

- is informed of the technical performances of equipment and networks in terms of the reduction of greenhouse gas emissions,
- is aware of the importance of energy saving as a means of reducing CO₂ emissions, particularly in the long term,
- becomes used to reasoning in terms of the greenhouse effect – as is the case for the energy efficiency of a building – not on the scale of a particular item of equipment which may be efficient – but in terms of a complete installation, or even, for town planners, of a wider functional scope

These questions should be taught during initial training and in-service training sessions. Thus, the ideas of global analysis and global cost should, little by little, take their rightful place firstly as tools for reasoning, and then for help with decision-making in the long-term.

2 Research and development

There is in France a large-scale capacity for research into the greenhouse effect, its origins and its consequences. This is a cross-cutting, pluri-disciplinary matter, involving a great many organisations. Very often the greenhouse effect is not the principle motive behind this research and development. Therefore, in terms of efficiency, one must permanently ensure that this question is taken into account in the definition of research programmes which may concern it.

One should underline here, in terms of the IPCC (Inter-governmental Panel on Climate Change) that the work done by this body is the expression of the scientific basis on which decisions then taken within the context of the Climate Convention are based. France's participation should be developed, in order to ensure that our scientific concerns are duly taken into account, within the context of the drawing up and approval of assessment reports and special reports. A mechanism guaranteeing the motivation of institutional and research bodies on this topic would be worth setting up in order to ensure presence at all levels, comparable to that of other leading developed countries.

The research effort in France into scientific aspects, social-economic impacts and implications of climate change linked to an increase in the greenhouse effect is integrated at European level into the "Environment and sustainable development" programmes (key actions "planetary change") of the 5th CRDP (Community Research and Development Programme). Within this context, the accent is placed, as in the IPCC programme mentioned later, on the necessary development of methods and tools to assess prevention and adaptation strategies likely to be implemented with a concern for efficiency, fairness and transparency



(used for "post-Kyoto" negotiations). Moreover, large scale means are devoted to the observation and study of climate variability and its impacts in Europe.

Activities in France can be classified into two groups: fundamental and finalised research, for which reference will be made to the work undertaken by the IPCC (Inter-governmental Panel on Climate Change) and technological research/development.

Fundamental and finalised research

1. – Scientifiques aspects of climate change, including research into the physical mechanisms of climate, climate observation networks, the assessment of greenhouse gas emissions, scenarios of emissions of these gases for the future and climate forecasting, particularly at regional level. The international capacity of French scientific research in these areas should be maintained and reinforced, taking particular account of the following aspects:

- systematic observations of the state of the climate are based, first and foremost, on operational bodies, mainly Météo-France, in terms of the atmosphere and the oceans. These observations cannot in practice be dissociated from information required elsewhere for weather forecasting. However, their specificity in the climate field could be worth reinforcing in certain cases.
- knowledge of long-term climate cannot be improved without improved surveillance of other aspects of the climate mechanism, which work in parallel to the atmosphere: oceans, ice-caps, biosphere, etc. Specific research observation experiments, in the atmosphere, the oceans and continental blocks are of major importance for the understanding of physical mechanisms, a great many of which remain very poorly understood.
- inventories of greenhouse gas emissions are drawn up by the CITEPA, under contract from the Ministry of Land Planning and the Environment. Over the coming years, this aspect will require constant improvement, justifying major research efforts (already planned within the context of the IPCC programme), with international co-ordination.

2 – Scientific and technical analysis of the impacts of climate change. The development of an ability to forecast impacts based on the data supplied by climate forecasting tools would be extremely useful to reduce vulnerability, meaning that adaptation measures could be implemented. These would require better knowledge of the vulnerability of ecosystems, hydrological systems, coastal systems, the production of foodstuffs, human infrastructures and the effects of climate change on health and on the supply and demand of energy.



II - CROSS-CUTTING MEASURES

3 – Social-economic aspects of climate change, including principally questions of fairness, social-economic effects of climate changes, assessment of intervention strategies, integrated assessment models and the economic assessment of instruments to fight the greenhouse effects.

These second and third major categories of questions are the object of a research programme into the Management and Impact of Climate Change (MICC), at French continental level, implemented under the aegis of the Ministry of Land Planning and the Environment. In view of the questions which will be asked in the coming years, a certain number of directions must be taken:

- integrated approaches, taking into account flows of all gases, their harmfulness, their development possibilities, society's needs and expectations in their regard.
- work to better quantify flow variations, and also stocks, of greenhouse gases.
- extension of the fairness concept, particularly as applied to policies and measures.
- synergies and antinomies between development priorities in countries in the southern hemisphere and the raft of conventions inherited from the Rio conference.

More substantially, development methods which minimise the harmful effects of global warming should be studied. These will be particularly aimed at territories and town-planning, where knowledge tools must be developed around the following questions:

- the use of land, specifically in liaison with carbon sinks
- public transport policies
- organisation of energy production and distribution methods, with a view to optimising energy combination (nuclear, fossil fuels, wind power, hydraulic power, etc.) in the long term. This type of study is worth undertaking within the context of a programme at European level.



- policies to finance housing and their effects on where housing development and urban expansion take place (e.g. housing with subsidised and zero-rated loans).
- real estate policies, urban development and localisation of housing, town planning documents (development plans and land occupation plans), building permits and sustainable development, supermarkets, commercial town planning and urban expansion.
- localisation of public services and spatial organisation of the town (almost all major public services have been more or less decentralised from the town centre to the suburbs over the last thirty years).
- impact of parking regulations and prices on urban traffic, car use and travel.
- urban styles and sustainable development. What lessons can be learned, for French towns, from the short-distance town concept developed in Germany and the Netherlands? How can one deepen and conceptualise the idea of winning the town back? How can one foresee the behaviour patterns of populations with regard to new living conditions?

Technological research and development

Much of technological research, development and demonstration should integrate the necessity of the fight against the greenhouse effect, in partnership with economic players in the various sectors. The greenhouse effect component should therefore be integrated into the definition and management of corresponding projects

In the field of engineering sciences and technology, the concern to reduce greenhouse gas emissions must be present at several levels.

A - In terms of the production of material goods, it is important to implement discreet, clean processes, which minimise input of raw materials and energy: engineering sciences and chemical engineering are at the heart of these questions. This involves energy transformations (refineries, co-generation plants, etc.) for which improved yield is being researched, low carbon content energies, new motorizations and industrial processes using economic bases (for the production of cement, paper, steel, aluminium, etc.) putting recycling within the production chain to good use.

B - In terms of the use of material goods: greenhouse gas emissions are mainly produced by the use of industrial products (cars, boilers, pumps, domestic electrical appliances, etc.) Emissions reduction must be sought in two directions:



II - CROSS-CUTTING MEASURES

1. Technological improvements

Engineering sciences must contribute to the development of low greenhouse gas emission products: low direct or indirect CO₂ emissions, therefore energy savings and also low emission in terms of other greenhouse gases (N₂O, HFCs, SF₆, etc.). The range of products and systems targeted is vast and includes specifically electric and electronic equipment used in the home and in the services industry, vehicles with the development of alternative motorization systems (fuel batteries, hybrid engines, etc.), air-conditioning systems, etc. Improvement of the economic efficiency of renewable energy networks and energy saving equipment must occur in parallel. This is in fact a near-indispensable condition for their development.

2. Progress in terms of management, organisation and regulation

Methods of organising, managing and regulating systems comprising numerous material elements (vehicles, domestic appliances, etc.) have a major influence on the type and quantities of energy consumed, and therefore of greenhouse gas emitted. It is therefore necessary to regulate and optimise the functioning of systems, and particularly of networks. This is the case for transport networks. Moreover, good management of the electricity generation plant involves management of the electricity-load curve and therefore regulation over time and in volume terms of electricity demand. Also of major importance is energy optimisation of the complete product life cycle. Recycling of used products means recycling of raw materials or energy recuperation.

3 North-South co-operation

For countries in the southern hemisphere, whether in terms of attenuation of the impacts of climate change or adaptation to these impacts, one cannot treat the climate problem independently from that of development. This is the reason why France insists that the international debate does not only discuss the first question, in isolation from the second. Over and above action which could be beneficial for the climate, one must, therefore, give priority to policies and measures which will trigger significant modifications over the long term, both for development and for the limitation of greenhouse gas emissions. This means taking account simultaneously, and in an integrated manner, of economic, social and environmental aspects, based on a chart of action to be undertaken in the short and medium term, which will necessarily vary depending on the country.



However, it is important that priority should be given here to sustainable development policies which simultaneously mean, in stages and in terms of a reference scenario, that on the one hand greenhouse gas emissions are limited (and in certain sectors reduced) and, on the other hand, vulnerability to climate change and variability is reduced.

1. The challenge

Limitation of greenhouse gas emissions

Although emissions per inhabitant in industrialised countries are set to remain, no doubt for many more years, higher than those in most developing countries, total greenhouse gas emissions in developing countries risk, nonetheless if current trends continue, exceeding those in industrialised countries, over the next two or three decades.

Whence the necessity for a joint, yet differentiated, effort by all countries on the planet to preserve the climate. It is therefore important that developing countries should also adopt, as far as possible and with the help of the most developed countries, development paths with lower greenhouse gas emissions per unit of gross domestic product. The adoption of more energy saving development methods will have beneficial effects not only on the climate but also on economic development: it will mean that imported fossil energy consumption and investments in electricity generation will both be reduced.

Although changes in land use and particularly deforestation have been reduced during the twentieth century in industrialised countries, in developing countries and particularly in Latin America and Africa, greenhouse gas emissions resulting from these changes exceed those attributable to other sectors, particularly industry. A more efficient use of land and water would mean a reduction in the need for new land and therefore generally better preservation of the forests and their bio-diversity, land and the areas required for food security and the implementation of more sustainable management of rural areas.

Vulnerability and abilities to adapt to climate change observed in various countries

In spite of the efforts made to limit and reduce greenhouse gas emissions, it is possible that climate changes and measures taken to fight these changes, will affect certain countries more than others, whereas vulnerabilities and abilities of countries to adapt to such changes are not all the same.



II - CROSS-CUTTING MEASURES

In this respect, the Climate Convention refers to the fact that full account must be taken of the specific requirements of the special position of developing countries, and more particularly the most vulnerable amongst them, i.e. mainly:

(1) low-altitude, island countries, low-altitude coastal and delta countries where the saline content of underground water also risks increasing;

(2) countries with large arid and semi-arid areas or those subject to drought and desertification, such as those targeted by the Convention on Desertification. Also concerned here are countries with barely diversified economies for which the low income per inhabitant amongst the poorest populations depends to a large extent on agricultural products or fossil energy sources.

2. Action taken

After the Rio conference, France implemented various actions aimed at obtaining better knowledge of climate developments and the advance of desertification. Such action also aimed to encourage in developing countries those development paths for which the emissions of greenhouse gases were the lowest.

a) Scientific knowledge of climate change and its consequences

France continues its support of the French research bodies such as Météo-France, the IRD, CNRS and CIRAD, whose work contributes specifically to increased scientific knowledge of climate change, desertification and coastal areas.

b) Acquisition and distribution of knowledge for sustainable development

In 1994, departments responsible for co-operation requested an assessment study, along with proposals on strategic directions for assistance with development in the energy sector. In the energy sector, they took strategic directions which integrate the need to develop the production sector and the essential needs of populations, whilst including concerns linked to sustainable development, particularly the greenhouse effect. Over and above the increase in energy efficiency in the use of fossil fuels, it has been shown that we must also take a greater interest in rural areas and non-network energy sources.



Indeed, despite the rapid development of urbanisation, large rural populations will remain, particularly in sub-Saharan Africa. Network extensions will remain expensive in these areas, in view of the very low population density and low unitary consumption. Projects aimed at developing villages should not, however, be limited to promoting electrification for lighting purposes, they should also encourage the development of fixed unit motorization.

To promote Sustainable Development and to increase food safety, as recommended in article 2 of the Climate Convention, it has also been shown that efforts should be made to reinforce controls on water and double-green agricultural practices should be developed, i.e. which also respect the sustainability of agricultural ecosystems. To reduce the vulnerability of Sahelian countries to climate changes, experiments have also been started with new practices (ecologically intensive agricultural-forestry, ecological agriculture).

France is promoting research and applications useful to sustainable development through bodies such as the CIRAD, IRD, CNRS and the INRA. It is also supporting various networks, particularly in Latin America, Asia, sub-Saharan Africa and the Mediterranean region.

This is the case in Africa for the RABEDE (African Network of Bio-resources and Energies for Development and the Environment) and the REC (Ecodev Co-operation), led by ENDA Third-World with the support of various French partners and aimed at encouraging the development of local abilities, technology transfers and integrated development programmes. The "African Bulletin on bio-resources, energy, development and the environment" which they publish makes a contribution to greater awareness of these concerns, particularly in French-speaking Africa. Moreover, France has also supported the World Bank's ESMAP programme (Energy Sector Management Assistance Programme).

c) Projects

France supports financing mechanisms which contribute, via projects, to the fight against the greenhouse effect in Southern hemisphere countries: the Global Environment Facility (GEF) and the French Fund for the World Environment (FFWE).

The international community decided at the end of the eighties to grant additional finance to public aid for development so that developing countries and countries in transition could integrate world environmental protection into their projects. To this end, the Montreal Fund for the Ozone layer and Global Environment Facility (GEF) were set up at multi-lateral level and the French Fund for the World Environment was set up in France.



11 - CROSS-CUTTING MEASURES

The Global Environment Facility (GEF)

This multilateral fund, set up in 1990 on a pilot basis and restructured in 1994, has been chosen as the financial mechanism for the Convention on Climate Change and the Convention on Biological Diversity. Granted a budget of 2.7 billion dollars over a 3-year period, in 1998, the GEF devotes 37% of its resources to climate change. Since its creation, around 880 million dollars have thus been allocated to this field, based on a range of various instruments.

- 75% of resources are used to finance investment or technical assistance projects divided into three operational programmes
- 10% of resources are used to finance activities to reinforce capacities (including the cost of national programmes to fight the greenhouse effect)
- 15% of resources are used to finance projects which do not come under the three operational programmes but which have a very strong impact in terms of GHG emissions (so-called short-term projects).

The French Fund for Global Environment Facility (FFWE))

This Fund, set up by France in 1994, is an Interministerial, bilateral instrument in addition to Public Development Aid and the French contribution to the GEF. Granted a budget of 440 million francs over 4 years in 1994, the FFWE was re-founded, with the same budget over the same 4-year period in 1999.

The FFWE was set up in order to:

- encourage awareness of the world environment in French bilateral aid packages
- offer an approach more suited to the specific characteristics of sub-Saharan Africa
- develop French influence in the GEF.

The FFWE runs – or takes part in – about thirty “greenhouse effect” projects, the majority of which are located in Africa. In this portfolio of projects, the accent has been put on decentralised rural electrification and energy efficiency in housing. A particular effort is being developed in transport. The FFWE offers additional finance to projects which are exemplary from the point of view of integration of climate changes, representing 45% of its resources.

The FFWE secretariat is also responsible for the French programme for the joint implementation pilot phase.



The joint implementation pilot phase

Even before the drafting of the Kyoto Protocol, the implementation of a "project" type mechanism in the form of a joint application pilot phase had been decided. This was created by a decision made by the first Conference of Parties to the Climate Convention, held in 1995 in Berlin. At the time it was a matter, for countries so wishing, of testing in practice the principle according to which a country could benefit from greenhouse gas emissions reductions linked to a project which it had financed in another country. Projects had to meet a certain number of criteria, as listed in this decision, but could not give rise to "emission credits" during the pilot phase.

The French programme of the "Activities Implemented Jointly" pilot phase began in the summer of 1996 and includes three major groups of activities:

- approval of the projects presented, granted by an Interministerial Committee which supervises the general programme, chaired by the Chairman of the Interministerial Task-Force on Climate Change
- definition of criteria and methodologies
- awareness and involvement of partners, both public and private.

There are currently ten projects which have been approved by the French and two have also been officially approved by the host-country and therefore figure on the list of "Activities Implemented Jointly" drawn up by the Climate Convention Secretariat.

The projects involve the following sectors: decentralised rural electrification (sub-Saharan Africa, Asia), energy production (Indian ocean, sub-Saharan Africa, north Africa), energy efficiency in buildings (Middle East), production of energy saving materials (north Africa), industrial modernisation (eastern Europe) and geothermal heating (eastern Europe).

The priorities of the French programme were redefined in the autumn of 1998: projects in sectors not – or insufficiently – covered by the pilot phase were examined: transport, urban development, industry and housing. Regions under-represented in all projects submitted to the Climate Convention Secretariat were mobilised, particularly sub-Saharan Africa.

At the fifth Conference of Parties, held in Bonn in November 1999 it was decided that the pilot phase of "Activities Implemented Jointly" would be pursued for at least another year.



II - CROSS-CUTTING MEASURES

At this point, the French experience allows us to draw a few conclusions. The learning function of the pilot phase programme has proved slow in being translated into actual programmes but it should prove to be extremely efficient and useful in preparing for implementation of the Kyoto mechanisms, the rules and functioning modalities of which should be set at the sixth Conference of Parties.

It confirms the importance and role of the projects as actual vehicles for reinforcing human, technical, organisational and institutional capacities

3. Recommendations and prospects

a) Orientations

It should be noted that the pilot phase of "Activities Implemented Jointly" concerned both countries with in economies transition and developing countries. However, although for countries with transition economies (article 6), the Kyoto Protocol underlines mainly the additional reduction of greenhouse gas emissions engendered by the projects, for developing countries (article 12), projects falling under the Clean Development Mechanism must meet the ultimate objective of the Climate Convention, i.e. stabilisation of greenhouse gas concentrations in the atmosphere at a non-hazardous level and continuation of sustainable development and food production. The promotion of sustainable development is therefore as important as emission limitation. The positions of agriculture, agricultural-forestry and the fight against desertification should therefore, alongside support for development methods which use less energy resources, be more visible than in the past.

This was also underlined by the workshop on focal points for the climate of French-speaking countries organised in Abidjan in March 1999 with the support of France's Foreign Minister. The latter meant closer analysis of relations between sustainable development and climate change. Participants took into consideration countries' priorities on the one hand, i.e. food safety, energy safety, quality of life and housing, growth and employment and financial resources. And, on the other, they considered sectors where emissions could be reduced or avoided: energy supply, creations of infrastructures for more energy-saving developments, carbon sequestration in trees and land in agricultural-forestry systems, the fight against the deterioration of land fertility and against desertification, or even waste management to improve the quality of life in towns. The growth of these two types of concerns has led to identification of areas which are important both in terms of development and of stabilisation of greenhouse gas concentrations in the atmosphere. It has also shown that these areas, linked particularly to priorities such as food safety and carbon sequestration were, until now, insufficiently taken



into account. Similarly, awareness of projects in the field of infrastructures which could lead to major long-term reductions has been only barely investigated, to date.

At the seminar on technology transfers organised by the Climate Convention secretariat in Arusha, Tanzania in August 1999, with France's support, the priorities of the African continent were also expressed: food safety, water safety, the fight against desertification and energy resources safety. The other two seminars on this same theme which will be held under the aegis of the Climate Convention secretariat in 2000, will mean, through a similar approach, identification of the priorities of Latin American and Asian countries.

**Synergies in Africa between development priorities (on the left)
and areas where it is possible to reduce or even avoid greenhouse
gas emissions during development**

Carbon challenge Development challenge	Energy offer	Infra-structure	Capital goods	Manufacture of energy saving products	Sequestration	Was'e management
Food safety	*	***	*****	*****	*****	***
Energy safety	*****	*****	*****	*****	***	*****
Quality of life and housing	*****	*****	*****	*	*	*
Growth and sustainable jobs	*****	**	***	*****	***	***
Financial resources. safety and stability	***	*	*	***	*	*

b) Capacity-building and technology transfers

Capacity-building in developing countries is one of the key points to the success of the sustainable development programmes planned here. It affects involvement of negotiators and countries in the process of the fight against climate change, the setting up of national programmes, policies and measures and technology transfers.



II - CROSS-CUTTING MEASURES

It therefore remains for organisational and financial means to be specified for projects to come to fruition which are considered as priorities by developing countries and which are also useful in the fight against climate change. Although it is certainly unrealistic to seek to attempt to define a group of criteria which would enable every country and in all circumstances to define action to be chosen or rejected, it would appear possible, on the other hand, by means of appropriate dialogue, to begin to build a vision for the future and to specify priority sectors for the promotion of sustainable development in various groups of countries with similar situations and problems.

Within the context of French-speaking countries, France will continue to take action to ensure that negotiators from French-speaking developing countries can take advantage of training in terms of negotiation, information and a framework for discussions, considerations and confrontation of differing points of view. It was in this spirit that France supported, during 1999, the Abidjan workshop referred to above and various meetings preceding the negotiation sessions. It will also contribute to the holding of the next French-speaking workshop intended mainly for negotiators and planned for Morocco in the spring of 2000.

It is, moreover, essential to support the efforts of focal points aimed at integrating the greenhouse effect concern within national sectorial policies.

To ensure that the technologies concerned are indeed suitable for the development of countries in the southern hemisphere, considerations and technology transfers must be undertaken in a specific, targeted manner by focal points responsible for climate matters with the ministries and specialists in the various fields involved. This is why it is indispensable to contribute to the support of the technical networks working in the countries involved (the RABEDE, REC, etc.). In the field of energy, the ADEME will continue to provide its support. In other fields, experts in agriculture, forestry, equipment and other specialities will have to be involved, where required.

c) Reducing the vulnerability of the most threatened countries and particularly the least advanced countries

The Climate Convention explicitly acknowledges the poorest countries greater vulnerability to climate change and the fact that the priority of these countries, in addition to adaptation to these changes, remains economic and social development as well as eradication of poverty. Action to be undertaken must therefore be integrated into development policies and not added to them.



d) Finance

- Traditional financing for development

The French government will continue both to encourage sustainable development and, for reasons of fairness, to support action undertaken in the field of traditional co-operation, particularly with the least advanced countries.

- Support for the various networks

The French government will also continue its support for the existing technical networks and for French-speaking countries. To this end, it will continue to deploy significant means, according to its usual procedures.

- The GEF and the FFWE

Introduction of the project-type Kyoto mechanisms (JI and CDM, *cf. chapter 1 3*) will necessarily have effects on the balance and organisation of finance plans.

The first development which one may expect is positioning by the GEF and mechanisms (CDM-JI) on the projects best suited to their respective functioning method:

- The GEF, financed by public funds and whose activities do not result in emissions credits, has the aim of concentrating on projects which have a real and significant impact in terms of climate change but for which this impact is:
 - either indirect
 - or difficult to measure
 - or impossible to assign.
- The Clean Development Mechanism and Joint Implementation have the aim of concentrating on projects which directly generate savings in terms of greenhouse gases which are measurable and can be directly assigned to them.

A second possible and desirable development is that the GEF plays a greater role with developing countries for setting up sectorial policies (policies and measures), by means of partnerships directed towards an objective of convergence of greenhouse gas emissions. Going beyond the project approach is an orientation which has already been started, with, in particular, the partnership launched with the World Bank on renewable energy sources. This orientation could be encouraged and extended to other sectors in the form of programmes established in partnership with the countries, where the latter make commitments on a certain number of objectives and means.



II - CROSS-CUTTING MEASURES

The government will continue to contribute to the GEF. Moreover, it has repeated for a second four-year phase from 1999 to 2002 its contribution in the form of the French Fund for the World Environment.

- The Clean Development Mechanism and Public Development Aid

The Clean Development Mechanism is today the principle finance mechanism for developing countries within the context of the Kyoto Protocol. However, even when emissions reductions are measurable for projects planned within this framework, the lever effects of the finance which certified emissions credits will generate will no doubt be insufficient to access the largest sources of emissions reductions, particularly in the field of infrastructures and agriculture. This is why, and despite all the attention which must be given to priority implementation of the Clean Development Mechanism, the developments and branching ⁽¹⁾ required for exploitation of these sources can only be obtained by searching for synergy and complementarity between Public Development Aid and the Clean Development Mechanism. The route for reorientation of the financial mechanisms detailed above is to be envisaged with this aim, on condition that the risk of the PDA perceived by developing countries depleting is efficiently prevented.

e) Prospects

Although major directions to be taken to reduce greenhouse gas emissions and to facilitate adaptation would appear to be clear, specific actions remain, however, to be defined by the countries involved. This will require, as developing countries insistently requested during the fifth Conference of Parties, major reinforcement of institutional, technical and human capacities, particularly in order to encourage transfers of technologies adapted to suit requirements, and adaptation to climate change. Several workshops for the purpose of specifying these points have been scheduled between now and the end of 2000, with a view to decision-taking at the sixth Conference of Parties. This will also be an opportunity for specifying the respective roles and financial contributions of the various institutions involved (the GEF, United Nations agencies, bilateral agencies, etc.) in the implementation of these decisions.

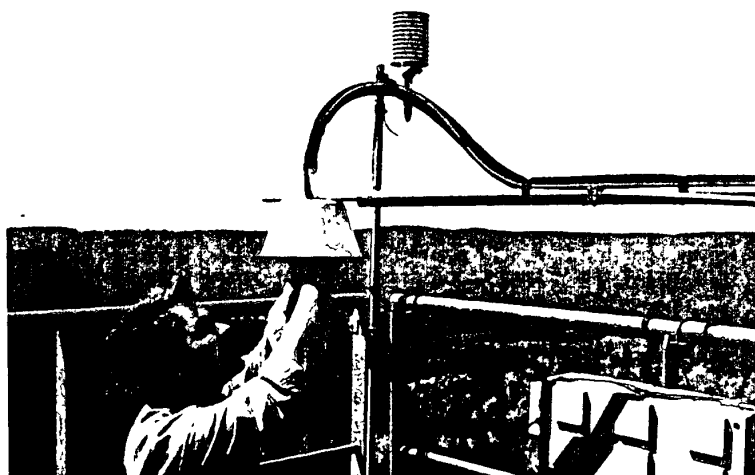
¹ In practice transition from a "business as usual" type project to a project leading to a reduction in greenhouse gas emissions may involve, particularly in the field of transport, the mobilisation of very different players. Also investments may be drastically increased when the choice is made for a "clean" project and one cannot therefore think in terms of incremental cost



The sixth Conference of Parties should also set the rules for the Clean Development Mechanism which is currently the main joint action between the North and the South planned to reduce greenhouse gas emissions, whilst seeking to encourage development. France is convinced that this mechanism will help to redirect the development of countries in the southern hemisphere and to improve their integration into the joint effort of fighting against climate change. This is why, over and above efforts deployed at national level, France will ensure that fairness is integrated into the establishment of the rules for the CDM. It will also actively mobilise both private and institutional players likely to contribute to its success. ☐

Managing the fight against the greenhouse effect

- 1 Tools for monitoring emissions and measures
- 2 Assessment of measures and development of emissions
- 3 Steering and adapting the national plan





Managing the fight against the greenhouse effect

1 Tools for monitoring emissions and measures

1.1 Monitoring emissions and their deciding factors

The first item of data required is knowledge of emissions. Overall knowledge is already available thanks particularly to inventories drawn up by the CITEPA. These inventories are supplied using the IPCC format and transmitted every year to the authorities of the Climate Change Convention. However, this is in fact an area which is constantly evolving and even at this overall level, research work is required, particularly in the field of land use and changes in land use.

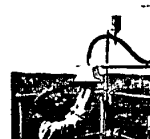
Other data requires knowledge of how emissions are created. There is vast scope here: development of the vehicles fleet, development in building stock, development of unitary consumption levels, development of use and even overall economic development and demographic developments. It goes without saying that knowledge of these determining factors is a preliminary requirement to formation of models to reconstitute these emissions and project them into the future.

1.2 Monitoring the application of measures

Another category of tools to assess measures will be based on general progress and on the degree to which measures are applied.

The first level is simple feed-back on progress made with administrative work (preparation of texts, etc.). It would appear nonetheless necessary to improve this process and to make it official, in view of the vast spectrum of measures and the large number of people involved.

A second level is the degree of measure penetration (for example what improvement is observed in terms of complying with speed limits, how far has an efficient technique penetrated the market). For all measures which are important from the point of view of the expected impact, specific monitoring is to be implemented.



2 Assessment of measures and development of emissions

2.1 Assessment of measures and modelling of their impact

Data collected regarding progress in measure application enables comparison between speeds at which measures are implemented and the degree of penetration against forecasts. The latter can then be up-dated and any corrective measures which may prove necessary can be taken.

More exact assessment will be necessary, at least for some measures: assessment of actual costs and efficiency in terms of the greenhouse effect. Other assessment aspects could then also be taken into account (other environmental effects, overall social and economic impact).

Over and above assessment itself, one will have to go as far as modelling emissions from the various sectors, and thus calculate emissions using various basic data. One should note that different sectors have very different problems, particularly with regard to basic data on which to calculate developments.

2.2 Development forecasts

One must first remember that emissions development does not depend solely on implementation of the measures and on their greater or lesser efficiency, particularly compared with what had been supposed, but also on development in the economy and particularly on greater or lesser growth. Since, in addition, some types of measures can have an influence on the major macroeconomic variables, models must be available which make this loop.

Moreover, good modelling is required of the various sectors and of the impact of measures in these sectors. Particularly, one must be able to model the effect of technical and statutory measures. This is required due to the very nature of the measures that this programme entails, which include both measures of a technical and statutory type and incentive and taxation measures.

Finally, the difficult question must be put as to integration of the various models, taking account of world development and particularly the international market for negotiable permits. One must be able to obtain a coherent whole.



3 Steering and adapting the national plan

3.1 Adaptation tools

These monitoring, assessment, modelling and forecasting tools must allow one to specify at any given time the situation in our country compared with the trajectory which will enable us to achieve our objectives. However, over and above observation of a certain situation, one must have tools for action available.

This means having available adjustment measures which can be used, where necessary, to gain additional emissions reductions. Efforts over a limited time in terms of accelerated renewal of some fleets may perhaps be used for this purpose: the "Balladur measure" for cars, but also in other sectors such as boilers. In fact, the spectrum of measures which can be used for this purpose is very wide: increase in budgetary allowances used for such action against the greenhouse effect, variation in taxation levels.

3.2 Continuity and legibility

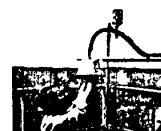
Continuity, clarity and predictability of public policies are essential factors in environmental efficiency and in the lowering of overall implementation costs.

Moreover, anticipation of measures by those involved may also mean environmental savings, before effective implementation of the measures themselves.

These principles are already applied in other European countries on a vastly bigger scale than in ours: one may mention, in extremely varied sectors, the scheduled increase of duties on fuel in the United Kingdom and the increased severity of thermal regulations for buildings scheduled over fourteen years in the Netherlands.

This stated scheduling of measures is an extremely powerful tool which means one can overcome certain obstacles which will surely arise otherwise. Thus, very often, the profession concerned is not ready (or very often the least dynamic fringe of a profession). One can thus be obliged, in terms of regulations for immediate application or application in the near future, to scale down to the performance levels achieved by the least efficient among them. Long-term scheduling should mean that this type of difficulty is overcome to a great extent.

One must also consider the challenge of announcing a programme, which makes the mechanism into a rigid measure, and the need for a certain degree of flexibility in order to adapt measures to difficulties encountered and to developments in the economic climate. ■





Annexes

**Recapitulation of the measures
in the national programme on
the greenhouse effect in MtCe**

Acronyms/Abbreviations

Graphs and tables

Bibliographic references

Recapitulative of the measures in the national programme for the fight against climate change in MtCe
(million tonnes carbon equivalent)

	1 st CATEGORY	CARBON TAX	LONG TERM	TOTAL MEASURES
INDUSTRY				
I 1 CO ₂ Energy targeted measures (ADEME + RCGF credits)	0 12			0 12
I 2 1 N ₂ O (regulation)	0 5			0 5
I 2 2 à I 2 7 PFC SF ₆	0 5			0 5
I 3 Energy consumption taxation	0	2		2
I 4 2 N ₂ O (taxation)	0	0 3		0 3
TOTAL	1.12	2.3		3.42
TRANSPORT				
T 1 2 Air conditioning (voir F 3 2 - F 3 3 - F6)	0 05			0 05
T 1 4 Alternative vehicles	0 11			0 11
T 1 5 Rail energy	0 11			0 11
T 2 1 Regulation/control	0 2			0 2
T 2 2 Emissions connected to air transport	0 05			0 05
T 2 3 1 Management of interurban main roads	0 01			0 01
T 2 3 2 Traffic light regulation	0 1			0 1
T 2 3 3 Collective transport priorities	0 02			0 02
T 2 3 4 UFL regulation	0 05			0 05
* Total of 1 st category measures	0 7			0 7
T 3 2 1 Reduction in rail fares	0			
T 3 2 2 Respect of working regulations	0 15			0 15
T 3 2 3 Taxation variations between fuels	0 3			0 3
	0 45			0 45
T 3 2 2 Kerosene tax	0	0 1		0 1
T 3 3 1 Carbon tax	0	1		1
T 3 1 1 Control of urban space development				
Urban costing	0		0 4	0 4
T 4 1/2 Interurban infrastructure offer	0		1	1
T 4 3 Combined transport	0		0 2	0 2
T 4 4 TCSP Paris and the provinces	0		0 15	0 15
TOTAL	1.15	1.1	1.75	4
BUILDINGS				
B 1 1 Reinforced insulating glazing	0 23			0 23
B 1 2 Insulation of existing buildings	0 2			0 2
B 1 3 Individual boilers	0 15			0 15
B 1 4 High-performance collective boilers	0 04			0 04

• • • NATIONAL PROGRAMME FOR TACKLING CLIMATE CHANGE

B.1.5	Condensation systems	0.04			0.04
B.1.6	Boiler room control	0.07			0.07
B.1.7.1	Collective energy wood	0.1	0.2		0.3
B.1.7.2	Individual energy wood	0.1			0.1
B.1.8	Solar power	0.01			0.01
B.1.9	Geothermal energy			0.02	0.02
B.1.10	Strengthening thermal regulations	0.3			0.3
B.1.11/2.2	Action on public buildings	0.1		0.1	0.2
B.2.1	Additional effect of ecotax on service sector	0	0.4		0.4
B.2.2	Additional effect of ecotax on domestic sector		0.6		0.6
	TOTAL	1.34	1.2	0.12	2.66
AGRICULTURE					
A.1.1	Reduction of CH ₄ emissions in cattle breeding	0.25			0.25
A.1.2	Reduction of N ₂ O emissions from land	0.15	0.2		0.35
A.2.1	Net afforestation	0.15			0.15
	TOTAL	0.55	0.2	0	0.75
WASTE					
D.1	Household waste and DIP	1.1			1.1
ENERGY					
E.2.1	European directive on energy-saving equipment	0.35			0.35
E.2.6.2	Reduction of VAT on energy-saving products	0.25			0.25
E.3.3	Management of state buildings and collective lettings				0
E.3.4	Electricity savings in new buildings				0
E.3.5	Electricity savings in old buildings				0
E.3.6	Ecotax effect on electricity demand				0
	TOTAL	0.6			0.6
E.3	Replacement of the existing thermal energy base gas combined cycle and co-generation			0.4	0.4
E.6	Overseas territories REn programme	0.13			0.13
	TOTAL production	0.13	1.5	0.4	2.03
	TOTAL electrical sector	0.73	1.5	0.4	2.63
REFRIGERANT GASES					
F.3.1	Reinforcement of controls in large installations	0.2			0.2
F.3.2/3.5.1	Motor vehicle A/C action (obligatory control and qualification)	0.2			0.2
F.3.3	Standardisation	0.3			0.3
F.3.4	Fluid recovery at end of life	0.2			0.2
F.3.5.2	Training and qualification of companies /refrigeration equipment	0.15			0.15
F.3.6	Total taxation effect		0.4		0.4
	TOTAL	1.05	0.4	0	1.45
OVERALL TOTAL		7.04	6.7	2.27	16.01



Acronyms/Abbreviations

ACEA: European Motor Vehicle Manufacturer Association
ADEME: French Agency for the Efficiency Environment and Energy

AFCE: French Coolant and Air Conditioning Environmental Alliance

AFD: French Development Agency

AFNOR: French Standardisation Agency

AIMCC: Association of Industries for Materials, Products, Components and Equipment for Construction

ASA: European Bilateral Agreements for Aviation

CAE: Economic Analysis Committee

CDP: Clean Development Mechanism (MDP in French)

CEA: Atomic Energy Commission

CEMAGREF: Agricultural and Environmental Research Centre

CEREN: Centre for Economic Energy Study and Research

CIRAD: International Centre for Co-operation

on Agronomic Research and Research Development.

CIRED: International Research Centre

for the Environment and Development

CITEPA: Inter-professional Technical Centre

for the Study of Atmospheric Pollution

CNG: Compressed Natural Gas (GNV in French)

CRDP: Community Research

and Development Programme

CSDP: Community Space Development Programme (SDEC in French)

DATAR: French Agency for Regional and Economic Development

DRE: Regional Supply Directorate

DRIRE: Regional Directorate for Industry, Research and the Environment

FACE: French Sinking Fund for Electrification Charges

FFWE: French Fund for the Global Environment Facility (FFEM in French)

FITTVN: Inter-modal Finance Fund

GDP: Gross Domestic Product (PIB in French)

GEF: Global Environment Facility (FEM in French)

GHG: Greenhouse Gas (GES in French)

GTPA: General Tax on Polluting Activities (TGAP in French)

HEP: High Energy Performance (HPE in French)

HEQ: High Environmental Quality (HQE in French)

HGV: Heavy Goods Vehicle (PL in French)

ICAO: International Civil Aviation Organisation (OACI in French)

ICE: International Conseil Energie (Energy Council)

ICCC: Interministerial Commission on Climate Change (CIES in French)

IDNGC: Inland Duty on Natural Gas Consumption (TICGN in French)

IDPP: Inland Duty on Petroleum Products (TIPP in French)

IEEP: Institute of Energy Economy and Policy (IEPE in French)

IFP: French Petrol Institute

IMCGHE: Interministerial Commission on the Greenhouse Effect (CIES in French)

IMCRS: Interministerial Committee on Road Safety

INRA: National Institute for Agronomic Research

INSEE: French equivalent of the Central Statistical Office

IPCC: Inter-governmental Panel on Climate Change (GIEC in French)

IRD: Development Research Institute

ITFCC: Interministerial Task-Force on Climate Change (MIES in French)

Jl: Joint Implementation (MOC in French)

LDV: Light Duty Vehicle (VUL in French)

LPG: Liquefied Petrol Gas (GPL in French)

MAP: Ministry of Agriculture and Fisheries

MATE: Ministry of Land Planning and the Environment

MEFI: Ministry of the Economy, Finances and Industry

METL: Ministry of Supply, Transport and Housing

MICC: Management and Impact of Climate Change (GICC in French)

NAIH: National Agency for the Improvement of Housing (ANAH in French)

NEL: Negotiable Emissions Licence (PEN in French)

NF: French Standardisation

NFO: National Forest Office (ONF in French)

OECD: Organisation for Economic Co-operation and Development (OCDE in French)

PAH: Programme for Housing Improvement

PALULOS: Subsidies for Improvements

to Housing for Collective and Social Use

PCPAO: French Programme for Controlling (Local) Pollution of Agricultural Origin (PMPOA in French)

PDA: Public Development Aid (ADP in French)

POTIB: Programmed Operations for the Thermal Improvement of Buildings (OPATB in French)

PREDIT: French National Programme for Research and Innovation of Terrestrial Transport

RCGF: Regional Consulting Grant Funds (FRAC in French)

REn: Renewable Energy (EnR in French)

SDER: Outline Master plan for Road Operations

SRPC: State-Regional Plan Contract (CPER in French)

STBC: Scientific and Technical Building Committee (CSTB in French)

UFL: Urban Fast Lanes (VRU in French)

UNFCCC: United Nations Framework Convention on Climate Change (CCNUCC in French)

UTP: Urban Travel Plans (PDU in French)

Chemical and physical symbols and units

CO₂ carbon dioxide

CFC chlorofluorocarbon

CH₄ methane

HFC hydrofluorocarbon

N₂O nitrous oxide

O₃ ozone

PFC perfluorocarbon

SF₆ sulphur hexafluoride

TWh Tera Watt/hour

GWh Giga Watt/hour (10⁹)

MtCe million tonnes carbon equivalent

MtOe million tonnes petrol equivalent

tC carbon tonne (1 tC = 3,7 tonnes CO₂)



Graphs and tables

• Commitment made in Kyoto by industrialised countries	p 17
Distribution of commitments within the European bubble	p 18
The three Kyoto mechanisms	p 19
Energy consumption and CO ₂ emissions by sector of activity in France in 1997	p 21
Developments in emissions in France of six gases (1990/2000)	p 23
Carbon emissions in tonnes per inhabitant (TC/ha) (1980/2100)	p 24
GHG emissions in France and forecast according to the scenarios (1970/2010)	p 30
French emissions per sector and per gas (1990)	p 32
• Reference forecast per sector and per gas in 2010	p 32
Gas reductions obtained with 1 st category measures	p 35
Gas reductions obtained as a result of carbon taxation measures	p 45
Summary of renewable energies	p 46
• Increase in emissions per sector from 1990/2010 in the absence of new measures	
• Industry	p 53
• Transport	p 66
• Buildings	p 100
• Agriculture and forests	p 128
• Waste	p 142
• Energy	p 149
• Refrigerant gas	p 163
• Relative proportions of the different gases for emissions in the industry sector	p 51
Relative share of the industry sector in the greenhouse gas emissions	p 52
Emissions in industry (CO ₂ energy) and volume of manufacturing production	p 52
Forecast of emissions in industry according to existing measures (1990/2020)	p 54
• Relative proportions of different gases for emissions on the transport sector	p 65
Relative share of the transport sector in greenhouse gas emissions	p 65
Development of CO ₂ emissions in continental France between 1980 and 1998 (comparison transport and other sectors)	p 66
Forecast for the evolution of road traffic and emissions (1990/2010)	p 68
Development of emissions in the transport sector according to measures taken	p 69
Specific tax on fuel (1991/2005)	p 70
Causes of excessive mobility and adverse model split	p 83
Comparative table for the taxation of fuel in Europe in 1999	p 89
Evolution of goods traffic and its international share	p 92
Recapitulative of "transport" measures in MtCe	p 96
• Relative proportions of different gases for emissions in the buildings sector	p 99
Relative share of the buildings sector in greenhouse gas emissions	p 99
Buildings measures in MtCe	p 101
Development in emissions in the buildings sector according to measures taken	p 102
• The complete carbon cycle	p 125
Relative proportions of different gases for emissions in the agricultural and forest sector	p 127
Relative share of the agriculture and forest sector in greenhouse gas emissions	p 127
• Relative proportions of different gases for emissions in the waste sector	p 141
Relative share of the waste sector in greenhouse gas emissions	p 141
Gas reductions obtained through the waste policy	p 143
• Relative proportions of different gases for emissions in the energy production sector	p 147
Relative share of the energy production sector in greenhouse gas emissions	p 147
Impact of the new measures in the energy production sector	p 148
Development of emissions in the energy production sector according to measures taken	p 148
• Relative share of the different refrigerant HFC emissions sectors	p 161
Relative share of the refrigerant fluid sector in GHG emissions	p 162
Development of refrigerant HFC emissions in the absence of measures	p 162
• Measures to be proposed at European level	p 173



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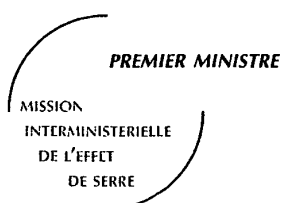
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Considering the options: climate targets for all countries[☆]

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Climate Policy

Climate Policy aims to address the broad spectrum of policy issues raised by the prospect of changes in the global climate, and by the need for mitigation of, and adaptation to, climate change. It seeks to provide a forum for the communication of research, analysis, review, and discussion concerning any issue related to the UN Framework Convention on Climate Change, the Kyoto Protocol, and the negotiation of associated policy instruments. A primary aim of the journal is to make complex, policy-related analysis of climate change issues accessible to a wide policy audience, and to facilitate debate between the diverse constituencies now involved in the development of climate policy.

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Considering the options: climate targets for all countries[☆]

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Abstract

This paper assesses five options for targets that could be taken by all countries to meet the ultimate objective of the climate change convention: fixed, binding targets, dynamic targets; non-binding targets; sectoral targets; policies and measures. Each is evaluated according to criteria of environmental effectiveness, cost-effectiveness, contribution to economic growth and sustainable development, and equity. While fixed, binding targets continue to be viable for industrialised countries, they do not seem suitable for many developing countries in the near future. Dynamic targets could alleviate developing countries' concerns about constraining their development as well as broader concerns about possible introduction of "hot air" in a world trading regime; they could also be considered for some or all industrialised countries. Non-binding targets could be politically appealing to developing countries, alleviate fears about development and/or hot air, but might only allow conditional participation in emissions trading by developing countries. Sectoral targets could offer a pragmatic first step — although their cost-effectiveness might be questioned. Finally, targets based on commitments to implement specific policies and measures might drive mitigation action and be part of negotiated packages including financial and technological co-operation. All these options may coexist in the future. © OECD/IEA 2001. Published by Elsevier Science Ltd. All rights reserved.

Keywords Climate change, Targets, Developing countries

1. Introduction

Achieving the ultimate objective of the convention will eventually require limiting emissions of all greenhouse gases at a global level well below that set by the current Kyoto protocol. In so doing, it seems desirable to preserve some of the elements of the current agreement — elements that provide for flexibility in meeting targets, and reduce costs. However, while cost effectiveness issues may be critical, it will also be imperative that matters of equity be addressed: most developing countries have indicated that their

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priorities lie with continued economic growth, and that they have a “right” to increase emissions to meet development needs. Any future agreement that does not acknowledge — and seek to formally address — this concern is unlikely to meet with political success in an international forum.

In this paper, we propose and describe a series of options for next steps, focusing on broader engagement of developing countries. To do so, we develop a framework for assessing next steps over the medium and longer term to meet the ultimate objective of the convention, and evaluate each of these options according to this framework. The options evaluated are the following:

1. “fixed binding targets” (in which new countries assume emission targets based on absolute national emissions; targets are enumerated in a manner identical to that used by Annex-I/B countries);
2. “dynamic targets” (in which the targets are expressed relative to actual economic growth rather than as absolute emission levels);
3. “non-binding targets” (targets in which there are no binding consequences if emissions goals are not reached);
4. “sectoral targets” (targets that apply to a sector only rather than to national totals; such targets could be fixed or dynamic and binding or non-binding); and
5. “policies and measures” (in which commitments are in the form of specific agreed actions to reduce emissions rather than in the form of agreed emissions reductions; under such agreements, the actual level of emissions would be left unspecified).

2. Framework for assessment

We consider the following four criteria (and the linkages between them) to be the most critical in evaluating future emission reduction options. They are as follows:

- environmental effectiveness;
- cost-effectiveness;
- contribution to economic growth and sustainable development; and
- equity.

2.1. *Environmental effectiveness*

Determining environmental effectiveness is fundamentally a question of the magnitude of global GHG emissions reductions. A number of factors may affect the environmental effectiveness of a policy; perhaps the most important is in the way options may influence target levels (and thus, ultimately, emissions reductions). Elements of an approach that promote cost-effectiveness (e.g. through emissions trading) may allow more stringent targets to be adopted — increasing environmental benefits. Conversely, global environmental effectiveness may be diminished if the targets allow for introducing large amount of so-called “hot air” in the trading system.

Another aspect of environmental effectiveness relates to “leakage” (in which reductions in one country might be offset by increases in other countries, e.g. through the relocation of industrial activities). The leakage concern may be partially offset by a global agreement. The options may also differ with respect to the environmental certainty they can provide. Thus, one structure might prescribe precisely the value of total global emissions, while another might define emissions as a function of another variable (e.g. GDP), while a third may prescribe policy actions, but not emissions levels. In choosing between options, it is

critical to weigh the relative merits of short-term emission certainty against the incentives for long-term action.

2.2. *Cost-effectiveness*

A cost-effectiveness criterion evaluates the magnitude of global and national costs for emissions limitation and reduction. Under a more cost-effective regime, deeper GHG emission reductions may be obtained from identical expenditures (in both present and future commitment periods). In this context, it is important to distinguish between national costs (for both developed and developing countries) and global costs (i.e. for the entire agreement). In as much as individual parties must ratify any agreement, national cost consideration will be critical; in as much as total aggregate costs will affect the extent of global reductions, total costs are also critical. It should be noted, however, that there might be a trade-off between technology development and short run cost-effectiveness: the lower the cost of an option, the lower its immediate technology development incentives may be.

Developing country participation could lower the aggregate cost of achieving the objective of the Convention. However, using the Kyoto mechanisms, additional benefits could be generated as well — for example, in the building of new infrastructure and more efficient power generating facilities. Thus, while it has been suggested that this might allow the industrialised countries to pick “low-hanging fruits” (and might deprive the developing countries of such low-cost emission reductions if they subsequently face emissions limits), early action can have significant and long-term local and global benefits (providing more economic and environmentally sound infrastructure and technology development).

Cost effectiveness criteria may include a number of sub-elements. One of the most important is “co-benefits”. These are the benefits to other policy areas from climate change mitigation, and the benefits to climate change mitigation of other, unrelated policy actions.

2.3. *Contribution to economic growth and sustainable development*

The UN framework convention on climate change states that the parties “should co-operate to promote a supportive and open international economic system that would lead to sustainable economic growth and development in all parties, particularly developing country parties, thus, enabling them better to address the problems of climate change”.

It is clear that economic growth and sustainable development issues are critical concerns of all countries — but, in particular, of developing countries. Their main concern in accepting quantitative emission limitation or reduction objectives has been that these may constrain their economic growth — and they have insisted that this concern be fully taken into account when considering next steps. In considering sustainable development, some account must be taken of differing national circumstances. Industrial mixes, energy uses, geography, level of development and national institutions and culture are all critical factors in developing an acceptable policy. An effective approach must accommodate a wide range of such circumstances.

Climate change mitigation may bring ancillary benefits of a diverse nature. Capital inflows may accrue to developing countries from mitigation actions — through the development of renewable energy industries, clean technology production, and the selling of certified emission reductions under the clean development mechanism.

2.4. Equity

The UN framework convention on climate change is explicit on the issue of equity, stating: “The parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common, but differentiated responsibilities and respective capabilities (. . .)”.

There are many approaches to equity — and each may generate very different outcomes. Proposals focus variously on short-term as well as long-term distribution of abatement costs and/or emissions rights, historic versus future “responsibility” and capacity for mitigation as a factor in determining action. Notwithstanding these differences, an essential point at the core of any next step is the importance of giving full consideration to the need and willingness of all countries to participate in climate change mitigation strategies that do not impede their economic development or prevent them from making substantial progress towards eradicating poverty.

2.5. Interlinkages

The criteria listed above are very much interlinked. For example, an approach that reduces the cost of acting (e.g. cost-effectiveness) may not yield the desired near term environmental benefits (i.e. environmental effectiveness). Thus, expanding the current protocol structure (with its fixed binding targets) may appear to be the most environmentally effective alternative. However, developing countries have rejected this approach on the grounds of equity, and without their engagement, it is clearly less cost-effective or environmentally effective. If developing countries were to take on such targets, the need to fully encompass developing country equity and sustainable development concerns could yield a target with a very limited (if any) environmental benefit.

3. Options for future targets

This section describes and analyses five options:

1. fixed, binding targets;
2. dynamic targets;
3. non-binding targets;
4. sectoral targets; and
5. policies and measures.

Each option is then assessed according to the criteria listed in the previous section.

3.1. Fixed, binding targets

3.1.1. Description of the option

This option might best be defined as the incorporation of developing countries into Annex-I/Annex-B. It has most commonly been referred to as “voluntary commitments” during the negotiating process. As such, it also implies a full access to the global trading regime. To date, almost no non-Annex-I parties have embraced this alternative: only Kazakhstan has indicated its intent to pursue this alternative.

3.1.1.1. Parameters. Parameters that might be considered in this option include country ranking, timing, thresholds, and stringency of commitments; each is discussed below. These parameters might be developed individually, or in the framework of burden-sharing of a specified global emission or concentration target. It should be noted that these kinds of parameters might also apply to other options as well.

3.1.1.2. Ranking. The Convention basically recognises two groups of countries as far as commitments are concerned: Annex-I with limitation or reduction commitments, and non-Annex-I — with no such commitments. However, there is a continuum in countries' situations, and a different grouping (or groupings) of countries might have been constituted. For example, Claussen and McNeilly (1998) take three criteria — standard of living, historical responsibility and opportunity — to rank countries in three groups. The first group “must act now”, the second group “should act now, but differently”, while the third group “could act now”. While their first group includes some non-Annex-I countries it does not include all Annex-I countries.

3.1.1.3. Timing. Although, it is conceivable that a common calendar could be agreed for the for adoption of fixed, binding targets by all non-Annex-I countries, as with the Montreal protocol, the idea of thresholds, and therefore, staggered entry into force of commitments, might be more appealing. Thresholds could rest upon criteria such as OECD membership, per capita GDP, per capita GHG emissions (current or cumulative), carbon intensity, costs of reducing emissions, or others (see UNFCCC, 1996).

3.1.1.4. Stringency. Procedures have been suggested for negotiating legally binding absolute targets for non-Annex-I countries. It is usually recognised that targets would be “growth targets” (Hargrave and Helme, 1997): a developing country commitment would likely be set at some level above the country's current emission level. This is already the case of some Annex-I countries in the Kyoto protocol, and some others through the European joint-fulfilment agreement, even though their emissions are, on aggregate, capped at 5.2% below their 1990 levels. Many of these procedures use the same set of parameters as for timing to compute targets (see, e.g. Jacoby et al., 1999).

3.1.1.5. Burden sharing. An important subset of proposals tries to draw countries' commitments from a global objective for emissions, concentrations or even climate change, largely in an effort to promote equity. This is notably the case of the Brazilian proposal and of proposals drawn from it (Brazil, 1997; Berk and den Elzen, 1998), and of the framework for “contraction and convergence” advocated by the Global Commons Institute (1998). Other analyses try to look at a plausible compromise between baseline emission profile and baseline population profile to share a global emissions path considered compatible with the ultimate objective of the Convention (e.g. Bartsch and Müller, 2000). Finally, another subset of proposals focuses the equity discussion on different distributions of the abatement costs (e.g. ABARE, 1995; Lecocq et al., 1999).

3.1.2. Assessment of the option

Assuming full compliance, this option seems to provide the highest possible level of environmental certainty, as well as good protection against leakage. It gives countries full flexibility to reach their targets using whatever policies and measures are appropriate to their national circumstances, potentially maximising cost-effectiveness. By broadening the market for emissions trading, in particular, to countries, where the marginal cost of emission reductions is lower than in industrialised countries, this option would

be able to improve the cost-effectiveness of global action, as well as provide revenue streams to offset some of the mitigation costs in developing countries. Other potential benefits could include technology transfers and various ancillary benefits. Finally, there could be considerable differentiation of targets amongst countries in order to accommodate equity concerns.

However, it may be that the only way to address developing countries' concerns about this option is to fix the targets at such a high level that it would not have a real effect on emissions (i.e. the most probable environmental outcome from developing country commitments would be a "BAU target"). In addition, setting a "lax" target could also allow the introduction of large amounts of hot air into the international trading regime.

For example, let us suppose that a developing country expects its GDP will grow at 10% each year. Such an affirmation will be difficult to contest, for even if it appears hardly feasible, it also appears very much desirable. The GHG target then would be derived from these projected economic growth and related emissions level. Should this country realise an 8% average yearly economic growth during this 15 years, the difference in GDP amounts at the end of the period will be very large — and if actual emissions were closely linked to the GDP growth, the amount of surplus allowances at the end of the commitment period would be roughly equal to current emissions of that country.

Moreover, developing countries have rejected this approach over concerns that setting targets could lead to economic growth constraints. Clearly, this concern could be exacerbated if more stringent targets were set to more fully ensure environmental integrity. It is likely to be extremely difficult to manage this inherent contradiction in an equitable manner.

3.2. *Dynamic targets*

3.2.1. *Description of the option*

In this option, developing country emissions would not be capped in absolute terms. Instead, emissions would be allowed to rise above current levels, but countries would limit their level as a function of some pre-agreed variable. Numerous variables could be envisioned (e.g. population, exports, etc.), although economic growth represents a variable of primary focus for developing country planners. Using this approach, objectives would be computed according to economic growth (as measured ex-post) and the commitment would be expressed in terms of GHG-intensity. One country has already offered a commitment of this form is Argentina.

Although, conceivably an agreement establishing a uniform methodology for setting dynamic targets, it is more likely that the final decision would rest upon a negotiating process of a political nature. Each country will present specific features (e.g. national circumstances or political constraints), that could not be addressed in a single formula or framework. However, an agreement on some basic principles could guide the negotiation of individual dynamic targets.

A number of approaches could be followed in setting the stringency of dynamic targets. It might be possible to set targets so they represented some deviation from business-as-usual — for example, the magnitude of the deviation could represent reductions that could be achieved through "no regret" options. For most developing countries the assigned amount should increase, but at a lower rate than the GDP itself. However, different stages of development and the variety of countries' national situations would require different adjustments to the general principle of indexing assigned amounts.

Argentina provides an interesting example of such a dynamic target (Argentine Republic, 1999). Argentina's target is based on emissions/square root of GDP index, implying a positive relationship

not only between allowed emissions and GDP, but also between the level of effort and the GDP. This criterion was chosen to help account for the large agriculture and livestock sector — from which emissions are relatively independent of the growth rate of the general economy. For developing countries already at a higher stage of development and showing a declining curve of energy intensity, the level of effort might increase with the GDP and the “autonomous energy efficiency improvement” should be taken into account in target setting. Such a target would reflect the fact that higher economic growth would provide more low-cost opportunities for emission reductions, accelerate the formation or replacement of fixed capital, and justify tightening of the targets as GDP increases.

A number of factors would benefit from additional analyses: for example, whether GDP is counted according to power-purchase parities or exchange rates; whether, if the targets cannot be expressed in GHG-intensity, energy intensity may provide a proxy; how energy intensity is counted (e.g. whether it includes non-commercial energies). Deriving values for these variables is not, however, a certain science; dynamic targets would not remove all uncertainties on future emission patterns. The potentials of no-regret measures, the autonomous rate of energy efficiency improvement, the rate of decarbonisation (if any) of energy production and use, will remain uncertain and sometimes even controversial. Thus, considerable scope for negotiation remains.

While analysts have suggested that emissions trading would be an important incentive for developing countries to consider taking targets, it has also been suggested that the uncertainty of actual assigned amounts under a dynamic target approach could make trading difficult (Baumert et al., 1999). Assuming the calculated link between economic growth and emissions holds, this is not likely to be a problem; the uncertainties on both will essentially compensate. In fact, the uncertainty regarding the available or required units of assigned amounts (the difference between the assigned amount and actual emissions), would likely be reduced, not increased, by dynamic targets in comparison to fixed targets.

Questions might also be raised as to how the clean development mechanism (CDM) could operate under such a regime. Unless precluded by an international agreement, in a country with a dynamic target, the CDM would basically act as joint implementation (JI) now does among Annex-I countries: certified emission reductions sold in the CDM framework could be deducted from the country's assigned amount.

3.2.2. Assessment of the option

This option does not provide the same level of certainty on emissions as fixed, binding targets. However, because of the ability to tie critical variables into targets, the overall stringency of such an agreement might be significantly increased — dramatically improving the overall environmental effectiveness. Furthermore, if global emissions are considered in the context of international trading, a dynamic target, by virtue of higher accuracy, could significantly reduce the granting of “hot air”, improving the environmental benefits when compared to a fixed target system. However, a possible rebound effect (possibly stimulated by emissions trading), as well as questions of the accuracy of the measurement of the economic indicator data, could limit environmental effectiveness.

This approach leaves full flexibility to countries regarding the domestic policies that would be undertaken to meet their commitments. By largely removing the uncertainty related to meeting the target that is associated with the economic growth, this option could alleviate fears of introducing undue constraints on developing countries. In doing so, this option might bring additional countries to the table. Then, through the use of emissions trading, this option would be able to improve the cost-effectiveness of global action and provide a large revenue stream to developing countries through emissions trading. It could probably

do so on a much wider range than the CDM, because it embraces all emission sources and the results of policies and measures in all sectors of an economy.

As with fixed targets, most equity concerns could be dealt with through differentiation of dynamic targets. However, this option may be more robust and perceived as more equitable over time because unexpected recession or higher-than-expected growth will not change the difficulty of reaching the targets.

3.3. *Non-binding targets*

3.3.1. *Description of the option*

A number of ideas might be introduced for non-binding targets. For example, the UNFCCC itself represented one form. In this structure, the Annex-I parties agreed to a non-binding, hortatory goal of keeping emissions at or below 1990 levels through the end of the decade. As with the convention, the determination of the level for such non-binding targets would likely be a matter for negotiation.

Perhaps, a more intriguing option for non-binding targets would utilise the benefits of the Kyoto mechanisms; the remainder of this section focuses on this alternative. Under such a non-binding regime, an “emission budget” could be allocated to a developing country, which would then be allowed to sell the surplus if its actual emissions are less than the budget. However, the party would be under no obligation to buy permits or to face non-compliance procedures if its actual emissions are above the budget. Naturally, emissions trading with this option would necessitate that other countries have a binding commitment. (Philibert, 2000).

Negotiating a non-binding agreement of this sort would create a new circumstance: the negotiation would be over the size of potential gains, not of potential losses. However, if the uncertainty relative to the economic growth were large, negotiators would have to balance the risk of creating large amounts of hot air with a weak target against that of leaving the country out of the trading regime.

The non-binding character of this target may make it possible to set the level of the target at a more stringent level than might have been the case with binding, fixed targets — particularly, as it vitiates concerns about economic development. As with the other options, the establishment of the target level may be set with full consideration of the potential for “win-win” or “no-cost” mitigation measures.

Choosing the stringency of the target might be undertaken using the kinds of approaches proposed for options A or B above — in fact, the non-binding target could be of either a fixed or dynamic nature.

In many ways, issues of compatibility with the Kyoto mechanisms are similar for the non-binding target and the fixed and dynamic target options discussed above. However, some critical differences do emerge. Perhaps most important is the potential for non-binding targets to threaten the environmental integrity of the trading system. For example, if a country could sell part of its emission budget while its actual emissions exceed its budget (diminished by the selling), the “value” of permits would become meaningless. In fact, in the extreme case, a country could even sell its entire budget and, thus, inundate the market while keeping its emission level unchanged. As targets under this scenario are by definition non-binding, countries taking this path would not be “out of compliance”. A number of different options may be considered in order to maintain the environmental integrity of a trading system including entities with a non-binding target or “emission budget”.

One possibility is to require that as soon as a country with an emission budget starts to sell allowances it face a real limit on its emissions. Another possibility is to allow countries with emission budgets to trade only after the end of the commitment period that is, after the existence of an actual surplus of allowances has been demonstrated. A third possibility is to require countries to buy back the allowances sold if the

budget is exceeded. If a country has an emission budget of 100 million tonnes and sells 10 million tonnes, and if its emissions then exceed 90 million tonnes, the country should buy back the surplus of up to 10 million tonnes — but not beyond the amount it has sold.

In a country with a non-binding target, the CDM would basically act as JI in Annex-I countries: certified emission reductions sold in the CDM framework would be deducted from the country's assigned amount, as would emission reduction units in the current JI framework. Emissions trading under non-binding targets shows considerable similarities to the CDM. Both are non-binding: if a project under the CDM drives more emissions than the agreed baseline, rather than less, neither the host country nor the investor would have to compensate for this increase. Both are presumably relative to a baseline ("what would have happened otherwise"). This suggests that one could negotiate non-binding targets under the existing negotiated framework for the CDM. The Kyoto protocol makes clear that this mechanism is based on project activities, but the exact meaning of this wording has not been specified as yet. Taking a non-binding target would be very similar to undertaking a countrywide, "unilaterally-funded", CDM project. There would be two advantages in taking the "CDM way" to negotiate non-binding targets. The first is to build on existing provisions on the Kyoto protocol with no need for having it amended. The second is to allow trading under non-binding targets to start immediately after the COP decision.

One possible downside of this approach is that it may make progressively tightening the targets (as developing countries reach some threshold level, e.g. in per capita emissions or GDP level) more difficult, by taking roots in the "baseline" approach of the CDM.

3.3.2. *Assessment of the option*

In as much as non-binding targets encourage additional countries to join the agreement — and to take action — this option may offer considerable potential environmental effectiveness advantages. It would probably help reduce the possible amount of hot air by comparison to fixed targets. However, it provides a low certainty on emission reductions (and if the non-binding aim were expressed as a fixed target, also a lower certainty about "hot air").

The option of a non-binding target may seem superior to that of a dynamic target in providing an answer to the risk of leakage or the growth rebound effect. Increases in developing countries' emissions due to leakage will reduce the amount that could be traded. However, this would be true as long as leakage is not sufficient to push emissions above the countries' target and make them ineffective. In other words, non-binding targets might better deal with the leakage problem if it is small, while being less efficient if it is large.

By broadening the market for emissions trading, in particular to countries where the marginal cost of emission reductions is thought to be lower than in industrialised countries, this option may have the potential to improve the cost-effectiveness of the global action. However, this may be limited by the fact that not necessarily all countries taking a non-binding target will participate in emissions trading.

The non-binding character of the option may offer the advantage of a higher certainty that the economic growth will not be constrained — depending on the sub-option chosen to maintain the integrity of the system.

It might also be worth considering the value of establishing a hybrid form — creating a "non-binding dynamic target" to seek to combine the advantages of the two options. Such targets would combine a very low risk on economic growth with higher chances to enter emissions trading (and little risks of hot air).

By providing developing countries, the possibility of some "gain" with no risk of some "loss", this option may be more equitable from a developing country's perspective. However, it is not clear that other

stakeholders would find this outcome “equitable” as well. However, one may argue that this option, as applied to non Annex-I countries, is very similar to the framework of commitments and mechanisms (the CDM) that has been agreed upon at Kyoto.

3.4. Sectoral targets

3.4.1. Description of the option

Under this option, quantitative targets could be established in one or several sectors of a country, rather than at a country-level. These targets could have different forms, as is the case for country-level targets. They could be dynamic or fixed, and binding or non-binding. In the non-binding cases (whether dynamic or fixed), establishing these targets would be essentially equivalent to establishing baselines for sector-wide CDM projects.

There may be a number of different reasons to support sectoral targets:

- the uncertainties regarding the monitoring of emissions in some sectors (methane and nitrous oxide from agriculture and livestock, e.g. or CO₂ removal from forestry) make these less certain than for CO₂, suggesting a more focused approach could be valid. However, such an approach might also limit the incentive to improve monitoring of the sectors with no targets;
- the uncertainties — and potential inability to control emissions — in some sectors (e.g. transport) could lead countries to conclude they did not want these sectors to be part of their commitment regime;
- an interest in distinguishing between the “productive” sectors and sectors more related to consumption. For example, a country may be willing to take on a commitment in its power sector and/or its energy intensive industries, while refusing to broaden this approach to the consumption sectors. Such a decision might be taken for political reasons, or for reasons of social welfare supports; a sectoral approach might be considered as a means to complement the CDM (pertinent to “projects” in the narrow sense) and thus, focus on sectors with numerous and dispersed emission sources for which centralised individual projects may not apply. Policies and measures applied in such sectors could then be rewarded through emissions trading at a sector level. In this context, the parties of the UNFCCC may feel more comfortable in broadening the scope of CDM projects to sector-wide non-binding targets, rather than to countries, at least in a first step.

The analytical work currently undertaken on the definition of multi-project baselines for CDM project activities (see OECD/IEA, 2000) could be of a great help in setting appropriate sectoral targets. Such target levels could apply to a great number of countries in the short term — and it might be expected that sectoral targets (like options 1, 2 and 3 above) may be progressively tightened as countries reach thresholds in their economic development.

If targets were to be binding, they could be dynamic and could be related to the economic output of the sectors. Alternatively, other indicators could be considered for establishing dynamic targets — and might be particularly suited to sectors more closely related to consumption, such as emissions per square meter in the housing and commercial sectors, or emissions per km-travelled and tonnes-km in the transport sectors. The details of setting targets would clearly vary from sector to sector. Thus, to take the example of transport, a dynamic target might be established that required an improvement in the ratio of emissions per km travelled by road, or alternatively, for the travel sector as a whole, thus giving an incentive for mass transit systems as well as for road travel.

In sectors with a higher level of aggregation of sources, the sectoral target approach might still allow the respective entities to participate directly in emissions trading. Alternatively, if the sectoral target is non-binding, reductions in the sector could be considered as a CDM-project in which the certified emission reductions would result from a set of policies and measures (that could even include the establishment of a domestic tradable permit scheme).

In sectors with numerous and dispersed emissions sources, apart from instituting an “upstream” trading regime, it may be difficult to allow individual sources to participate in emissions trading. It is possible that the State would participate in trading on behalf of the sector, and would derive any revenues from it. As with any regime in which domestic emissions are not readily verified, the international community may have less confidence in such a system unless clear national monitoring and verification arrangements are in place.

3.4.2. Assessment of the option

Inasmuch as sectoral targets might be easier for new countries to accept, they offer the possibility of increased environmental effectiveness over a BAU scenario. In addition, sectoral targets may not entail the risk of bringing large amounts of hot air in the international trading regime, as in many cases, projections of sectoral trends may be more accurate than full national trend analyses. The risk of “hot air” might also be diminished if these targets were non-binding and/or dynamic.

Unlike a national target (in which inter-sectoral leakage is fully accounted), sectoral targets may be open to inter-sectoral leakage — which may not be counted in a target. In addition, unless all countries adopted an identical target, international leakage could still be a problem. A more specific concern could be that of leakage under sectoral dynamic targets. The relative protection against leakage that country-level dynamic targets would offer is essentially based on the fact that leakage would take place for energy-intensive industries that have a higher carbon intensity than the country’s economy as a whole. The increase of economic output of these industries would presumably not be sufficient to make the country-level target ineffective. This may not be true with a sectoral dynamic target, where the pertinent criteria may be the carbon intensity of the sector, not that of the whole country. However, if all countries adopted a sectoral target, this concern could be completely offset.

In face of uncertainties on abatement cost curves, it would probably be less cost-effective to take numerous sectoral targets rather than one single country target. However, if a sectoral target is taken while other sectors are not covered, perhaps as a first step, then this problem would be much less significant. In addition, like other options allowing emissions trading, sectoral targets using flexible mechanisms would bring revenue streams to developing countries and help increase the cost-effectiveness of the international framework for global action, although to a lesser extent than national targets.

Sectoral targets might allow a country to select the area in which it needed financial or technical assistance — and condition its acceptance of a target on the receipt of support to meet needs identified in this sector. Finally, sectoral targets may offer a wide enough scope in their design to satisfy equity concerns, as decisions on which sectors to target, and the range of binding or non-binding, or fixed or dynamic targets within sectors offer substantial national flexibility.

3.5. Policies and measures

3.5.1. Description of the option

Under this option, future mitigation commitments may be based on agreements to implement specific mitigation actions rather than on quantified emissions limits.

An existing obligation in the UNFCCC commits all Parties (including developing country parties) to undertake policies and measures that help mitigate climate change. Identifying specific policy requirements may be a logical extension from existing commitments. Recent studies have pointed to a large number of relevant policy actions being taken in developing countries (e.g. Goldemberg and Reid, 1998). Many of these policies have been taken for reasons independent of climate change — but, have nonetheless had significant emissions reduction benefits.

The option could take different forms. One alternative could be the adoption of specific policies and measures by many developing countries at the same time, perhaps through the negotiating process within the UN framework on climate change. A rationale for some kind of international co-ordination could be to help resolve concerns about international trade and competitiveness. Another rationale could be to establish a link between these qualitative commitments and the strengthening of further commitments by industrialised countries. It might also be noted that limited implementation of the existing Annex-I commitments could discourage any non-Annex-I action.

Alternatively (or simultaneously), the adoption of such commitments could be linked to a strengthening of the commitments by Annex-II countries regarding the financial mechanism of the convention and/or the financing of technology transfers and capacity building efforts. The recent agreement between India and the USA may provide a harbinger of such a process (see Bowles, 2000).

The “policy and measures” approach does not seem consistent with any formulation of emissions trading. However, as with other approaches, it might be possible to combine policies and measures with the CDM, i.e. the CDM project could be the policy or measure itself. Such an approach could constitute a transition towards a trading regime with flexible and/or non-binding targets. This possibility has been further explored in the previous section.

However, there may also be some disincentives created in such linkages. For example, broad policy actions might eliminate the value of specific CDM projects, and while they might provide greater global environmental benefits, these may be difficult to quantify. However, the net result could be a reduction in international financial flows through the CDM itself. As an example, a country might choose to reduce its energy subsidies — and a CDM project, that might look additional in a country with high energy subsidies may look like a business-as-usual project if these subsidies were removed.

A number of possible areas might be explored for setting policy targets. These could include energy subsidy removal, fiscal reform, carbon taxes, domestic energy consumption limits, research and development and others. A number of these are discussed below.

3.5.1.1. Energy subsidy removal. One example of policies already undertaken in a number of developing countries that has climate-related ancillary benefits is subsidy removal. Work within the IEA and the OECD has examined the implications of subsidy removals in the energy sector and concluded that considerable CO₂ emissions reductions would accrue from such policies (e.g. for a sample of eight developing countries, energy subsidy removal could lead to an average of 15% reductions in CO₂ emissions from business as usual; IEA, 1999). In addition to its emissions benefits, subsidy removal has the added attraction of increasing government revenues — although, such removals are likely to run counter to some specific interest groups and is thus, usually a politically difficult exercise.

Although, a frequent justification for subsidising energy consumption in developing countries is the belief that such instruments ensure better access to energy services (in particular to the poor), they often prove to have adverse effects. For example, indirect subsidies in electricity with prices can deprive

companies of the resources needed to expand the electric grid or invest in producing capacities — which in turn might benefit more people.

Efforts to remove subsidies in energy-intensive industries may benefit from some kind of international agreement, particularly if there is a potential for a price discrepancy to result from such removals vis-à-vis a trading partner. Moreover, one may believe that commitments to reduce energy subsidies in producing internationally traded commodities could by themselves be an answer to some concerns expressed within Annex-I countries.

However, there is an unanswered question as to whether subsidy removal would be made easier with an international agreement promoting such a change. Evidence from the IEA suggests not: although, the member countries have promoted subsidy reform for nearly 25 years, a number of member countries still retain energy subsidies and do not have open markets. It may thus, be unrealistic to expect such a change from the UNFCCC process.

3.5.1.2. Fiscal reforms and carbon taxes. Much of the discussion on subsidies also applies to other fiscal measures, e.g. the establishment of carbon taxes. There is no particular reason for developing countries not to consider carbon taxes as some industrialised countries do, especially to the extent that a “double dividend” arising from the reduction of other taxes or charges can be identified.

As with subsidies, the question remains regarding the help an international commitment could bring to such a process. It seems clear that in most domestic circumstances, such a commitment will not necessarily help, unless the agreement were to be adopted at a global level. This is exemplified in the case of carbon-intensive industries, which have largely been exempted in most carbon tax schemes to allay concerns about competitiveness in a world with uneven tax penalties.

3.5.1.3. Others. Apart from the fiscal and price measures affecting production in energy-intensive sectors, other measures affecting energy consumption (or other GHGs such as HFCs) may have substantial merit — for example, those in internationally traded goods such as appliances, or cars and trucks. Developing world-wide standards (perhaps in the form of “voluntary agreements” with companies) may be appropriate in some cases, and may be more readily adopted than unilateral commitments from developing countries. Willingness to adopt common approaches may be justified by a desire to avoid trade barriers or distortions.

If qualitative commitments were taken by developing countries (either in common or in isolation) through collective or individual agreements with industrialised countries, then the range of possible policies and measures increases considerably. Such actions could include policies and measures to promote energy efficiency, as well as R&D and information and education policies designed to affect longer-term GHG emissions.

3.5.2. Assessment of the option

Mitigation commitments without targets may not provide the level of emissions certainty that parties desire — and that may be necessary to guarantee sufficient action to control atmospheric concentrations of greenhouse gases. However, it seems likely that policy actions would induce some emission reductions, and as such, provide environmental benefits. In as much as countries might fear emissions trading would be in “hot air”, this approach, by essentially eliminating the trading alternative, might be considered environmentally sound. However, the economic benefits of trading are also precluded and the limited resources will pay for a lesser level of emissions reductions.

It is likely to be extremely difficult to determine the difference between a policy approach and the no-policy, business-as-usual action. This may make it difficult to both negotiate a meaningful agreement, and to evaluate implementation and compliance.

As individual policies that might be taken differ widely, it is hardly possible to make a global assessment of their cost-effectiveness. However, common policies may not apply equally to all countries as national circumstances may dictate their relative effectiveness. It is unlikely, e.g. that national or international agreements on policies and measures would be as efficient as a global target implemented through a global tax.

While some policies and measures may provide multiple benefits, others may entail costs that are not necessarily predictable or even apparent. However, the absence of a quantitative limit on emissions would be perceived as insurance that economic growth is not threatened.

Intra-sectoral debate, as well as disagreements between countries that adopt policies versus countries that refuse to adopt policy agreements may dominate perceptions of equity. With respect to the former, e.g. subsidy removal may be perceived as undermining financial transfers that had been established in name of equity. Justifying it by international agreement may aggravate that perception even if the real effects in terms of equal access to energy might at the end of the day turn out to be positive. Ultimately, the equity issue may be more significantly affected by the stringency of the policy (i.e. by the magnitude of the change required) and by the support (both financial and technical) provided from developed country parties to assist with meeting the commitment than by the form of the option.

4. Discussion

Fixed, binding targets might still be considered for Annex-I countries and for these countries currently not listed in Annex-I, but that have many characteristics of Annex-I countries (close GDP per capita and/or emissions per capita levels, and perhaps an economic growth that is relatively predictable). Although, there might only be a few such countries (see, e.g. Claussen and McNeilly, 1998), and their aggregate emissions only represent a small part of the global amount, these countries do not currently show much enthusiasm for binding, fixed targets. In the long run however, as countries develop, the option may become more acceptable.

Dynamic targets might be of a great interest for many developing countries, especially the “newly-industrialised”. However, its application to countries in early stages of development and/or with large share of non-commercial energies in their energy balance, and/or with GDP measurement under question, might be problematic. It could also be usefully considered for some industrialised countries, especially those in transition, which lack economic predictability. Dynamic targets for this group could help support the environmental integrity of the protocol. Furthermore, while fixed targets are currently the choice for industrialised countries for the first commitment period, it is not clear that this choice would continue to be optimal. There might be a trade-off here between the environmental certainty provided by fixed targets and the potential for more stringent dynamic targets, which remove concerns associated with uncertain economic growth.

Non-binding targets may have the advantage that they would be relatively less dependent than dynamic targets on the accuracy of measuring GDP and actual growth. The higher certainty that the economic growth will not be constrained might be rather appealing to developing countries, although this option may provide a lower certainty that the target will be effective as well as a lower certainty that emissions trading will happen.

Sectoral targets might be a pragmatic first step towards more comprehensive action. However, there may be a (legitimate) fear that such a limited approach would foster delay, rather than accelerate, comprehensive action. Furthermore, unless a full range of sectors was selected, this approach might engender only a limited environmental impact.

There is no doubt that it will be very useful to exchange views and experiences among countries on policies and measures to abate greenhouse gas emissions. The question remains to identify the policies and measures that could best be implemented through an international commitment — if indeed they exist. It has been suggested that this might be the case for subsidy removal in the energy-intensive industry sector. Many other policies and measures could as well be established in exchange for the strengthening of commitments by industrialised countries. However, it is more probable that policies and measures could be adopted by developing countries in exchange for further financing by industrialised countries of investments, technology transfers and capacity building, at a country level or at a more global level through the negotiating process.

A separate issue may be raised regarding differentiation of stringency or burden-sharing within any given option. Up to now, the differentiation of commitments in the convention and the protocol has followed a few simple lines:

- only Annex-I countries have quantified emission reduction and limitation objectives;
- these binding and fixed commitments are differentiated quantitatively;
- non-Annex-I countries have no quantitative commitments;
- Countries as Annex-II have additional other commitments regarding financing, technology transfer to non-Annex-I countries.

The inclusion of the entire set of options considered in this paper could lead to a more diversified picture for future commitment periods, with the creation of new groups or sub-groups within the negotiated framework. Possible consequences could be the following:

- some Annex-I countries could have dynamic targets rather than fixed targets;
- some non-Annex-I countries could have fixed, binding targets
- other non-Annex-I countries could have non-binding and/or dynamic targets;
- all these commitments would be differentiated quantitatively;
- selected non-Annex-I countries could have sectoral targets and/or commitments on policies and measures;
- some other non-Annex-I countries would still have no target of any kind. Of course, they could host CDM.

Alternatively, the picture could be simpler: a single common choice might be made for all future commitments. Given the reluctance of countries to take on fixed binding commitments and the perception that non-binding or limited policy approaches would be insufficient to meet the environmental goals, perhaps the most robust single approach would be for all countries to have dynamic targets. Of course, as noted in the discussion above, to accommodate the equity and development concerns of countries, there would presumably be considerable differentiation among country targets.

The placement of a country in one or another of these categories, or the movement of a country from one category to another (including that of binding and fixed commitments), when their economies become further developed, could be entirely left to the negotiating process, as could the issue of the stringency of the different targets. Alternatively, the negotiating process could define some rules that would assign

the countries to specific categories as well as help define the targets. In both cases, the existing analysis on the differentiation of commitments, including different burden sharing possibilities, could usefully be taken forward by considering how the options considered here could affect the outcomes of these analysis.

A separate question may also be raised with regard to timing. For second and subsequent commitment periods, commitments of different types and levels could be decided simultaneously for all countries. Clearly there will be costs from taking action. However, the benefits from the action undertaken by all and benefits from the action undertaken by all, the fact that a growing number of countries are taking action is by itself both an incentive and a justification for each country to take deeper commitments. Moreover, by reducing the costs of abatement, the establishment of a world-wide trading regime could encourage industrialised countries to strengthen their commitments in the subsequent periods (relative to the commitments they could take in the absence of this regime). While difficult, it may also be possible for targets for non-Annex-I countries to be adopted in time for the first commitment period.

A different trade-off may exist between the economic objectives of encouraging developing countries to take targets and the environmental benefits. For example, if weak targets for some developing country were adopted, this could substantially reduce the cost of implementing Annex-B commitments, but could reduce the environmental effectiveness of the protocol.

One of the most significant concerns over target setting for developing countries is that of “hot air”. However, if a global cap is agreed, and a “burden-sharing” regime adopted, then allowing “tropical hot air” would no longer be a way to reduce costs; it would rather imply a deeper reduction of the assigned amounts of industrialised countries. Rather than “hot air”, it would be the equivalent of agreed financial transfers. Of course, while recognising that some level of “excess” financial transfers may be needed to gain acceptance, it is unlikely they would constitute a starting point in the negotiations for donor countries.

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Climate Policy

GENERAL GUIDE FOR AUTHORS (PLEASE SEE FURTHER AT [HTTP://WWW.CLIMATEPOLICY.COM](http://www.climatepolicy.com))

Contributions to Climate Policy are invited from individuals or organisations including academic, industrial and government researchers, industrial and non-governmental lobby organisations, and policy-makers at the national, regional or global level

Research published in Climate Policy is expected to be accessible and relevant to those involved in the development of national and international policy. Papers should be written in clear and concise English, and demonstrate awareness of previous policy debates and the structures of the UNFCCC and its associated processes where relevant. Climate Policy welcomes papers that involve scientific and economic modeling, but it is fundamentally an interdisciplinary and policy-oriented journal: such papers must therefore demonstrate policy relevant conclusions and clearly spell out key structural or numerical assumptions that determine these conclusions, where possible using models that have been previously published in appropriate peer-reviewed specialist journals.

Rapid turnaround can be important for policy relevant research. The Editors reserve the right to prioritise articles that would particularly benefit from rapid publication.

Submissions

Submissions may take any of the following forms

Articles

Review articles (up to 10,000 words) subject to triple peer review. Review Articles should present a survey and synthesis of the state of knowledge and key issues in a particular area of relevance to climate policy, including scientific, economic, environmental, institutional, political, social or ethical issues.

Research articles (approximately 4000–8000 words) and research letters (1000–3000) subject to double peer review. These must comprise original, unpublished work of a high academic quality. They should present detailed analyses, or syntheses of any policy-relevant aspects of climate change, including scientific, economic, environmental, institutional, political, social or ethical issues.

Viewpoints (approximately 1000–3000 words) subject to peer review. These will address topical aspects of climate policy in shorter format. The intention will be to publish these pieces with short lead times in order to communicate analyses and arguments with immediate relevance to on-going negotiations.

Communications

Communications are subject to editorial review and may include:

Perspectives (up to 3000 words) providing original insights or proposals on broader policy issues and options.

Opinions (up to 1000 words) from invited prominent figures in government, business or NGO communications.

A Forum section for responses to previous work published in the journal.

A Reports section with notification and brief summaries of work published or reported on elsewhere.

Reviews

Reviews (up to 1000 words) subject to editorial review. The journal will aim to have all major publications relevant to climate policy reviewed by internationally renowned authors. The reviews section may also cover meetings, websites, etc at the discretion of the Reviews editor.

Three copies (the original and two copies) must be submitted to:

The Editors,
Environmental Policy and Management Group
T.H. Huxley School of Environment
Earth Science and Engineering
RSM Building
Prince Consort Road
South Kensington
London
United Kingdom
SW7 2BP
e-mail: climatepolicy@ic.ac.uk

General Note

Authors are responsible for ensuring that all manuscripts (whether original or revised) are accurately typed before final submission. Manuscripts will be returned to the author with a set of instructions if they are not submitted according to our style. Contributions are normally received with the understanding that they comprise original, unpublished material and are not being submitted for publication elsewhere. Translated material, which has not been published in English, will also be considered. All articles are refereed to ensure both accuracy and relevance, and amendments to the script may thus be

required before final acceptance. On acceptance contributions are subject to editorial amendment to suit house style, but authors will receive proofs for approval before publication.

TEXT PREPARATION ON DISK

Elsevier Science encourages submissions to the journal on disk/in electronic format. The electronic version on disk should only be sent with the final accepted version of the paper to the Editor. The hard copy and electronic files must match exactly. Please contact the editorial office for full guidelines on disk submission.

For assistance on how to prepare your artwork for electronic submission visit <http://www.elsevier.nl/locate/authorartwork>

PRESENTATION OF MANUSCRIPTS

Manuscripts must be typed in journal style on one side only of International Standard Size A4 paper, with a left-hand margin of 40 mm. The main text should be double-spaced and the abstract, footnotes and references triple-spaced. Number every sheet.

Arrangement of papers

- 1 Short title (up to 40 characters including spaces), subtitle (if desired), author's name, affiliation, full postal address and telephone and fax numbers. Respective affiliations and addresses of co-authors should be clearly indicated.
 - 2 Self-contained abstract of up to 150 to 200 words outlining in a single paragraph the aims, scope and conclusions of the paper, acknowledgements (if any), article title abbreviated appropriately for use as a running headline.
 - 3 Three keywords.
 - 4 Main body of text, suitably divided under headings.
 - 5 References.
 - 6 Appendices.
 - 7 Tables (each on separate sheet).
 - 8 Captions to illustrations (on a separate sheet).
 - 9 Illustrations (each on a separate sheet containing no text).
- Each sheet must carry the abbreviated title of the article and the journal name. The text should be organized under appropriate section headings which, ideally, should not be more than 600 words apart. All headings should be placed on the left-hand side of the text, with a double line space above and below. All measurements should be given in metric (SI) units. Authors are urged to write as concisely as possible, but not at the expense of clarity. Descriptive or explanatory passages, necessary as information but which tend to break up the flow of text, should be put into appendices. Where possible, however, appendices should be avoided.

REFERENCES AND NOTES

Authors' names (no initials) and dates (and specific pages, only in the case of quotations) are given in the main body of the text, e.g. (Baumol and Oates, 1988, p. 121). References are listed alphabetically at the end of the paper, double spaced and conform to current journal style.

For journals: Eden, R.J. 'World energy to 2050: outline scenarios for energy and electricity' *Energy Policy* 1983, 21(3); 231–237.

For books: Baumal, W.J., Oates, W.E. (1988) *The Theory of Environmental Policy*. Cambridge, Cambridge University Press.

For chapters of edited books: Sinyak, Y. (1992) 'Models and projections of energy use in the Soviet Union' in: Sterner, T. (ed) *International Energy Economics*. London, Chapman & Hall.

For grey literature: Barker, T.S., Baylis, S., Lewney, R. (1991) 'Can Britain meet the Toronto CO₂ target?' paper presented to Energy, the Environment and Economic Policy conference, Cambridge, 1–2 July 1991.

Other publications: Where there is doubt include all the bibliographical details. Footnotes, where unavoidable, should be indicated in the text by superior Arabic numerals which run consecutively through the paper. They should be grouped together in a section at the end of the text in numerical order and double spaced.

TABLES

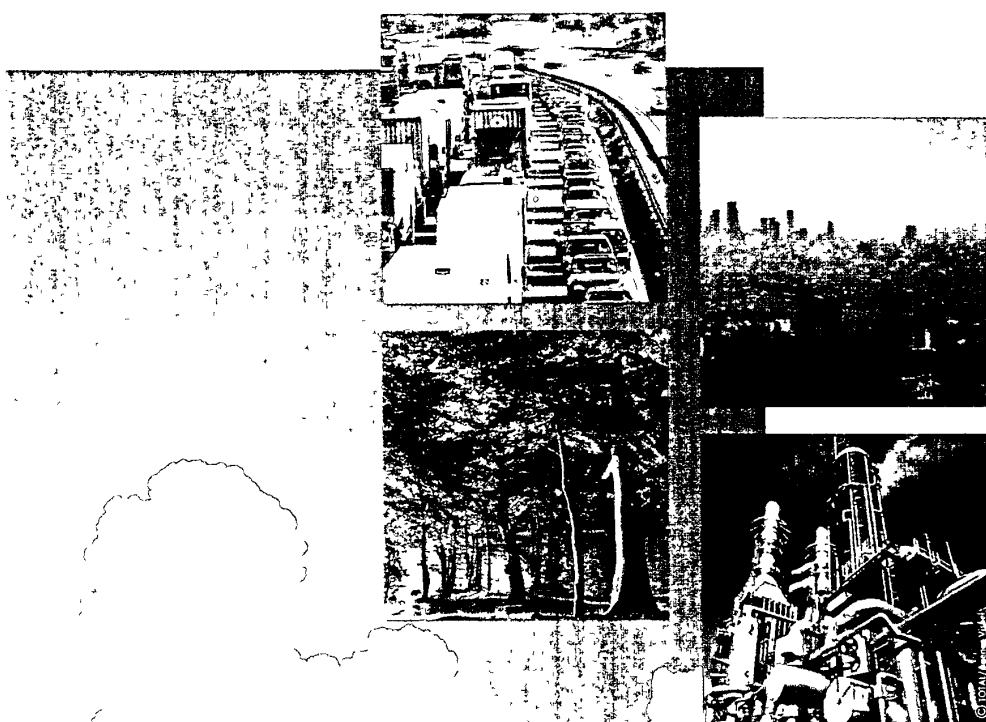
Tables should be numbered consecutively in Arabic numerals and given a suitable caption. Notes and references within tables should be included with the tables, separately from the main text. Notes should be referred to by superscript letters. All table columns should have an explanatory heading. Tables should not repeat data available elsewhere in the article, e.g. in an illustration.

ILLUSTRATIONS

All graphs, diagrams and other drawings should be referred to as Figures, which should be numbered consecutively in Arabic numerals and placed on separate sheets at the end of the manuscript. Their position should be indicated in the text. All illustrations must have captions, which should be typed on a separate sheet. Illustrations should be provided in a form suitable for reproduction without retouching: that is, they should be camera-ready. Three copies of the illustrations should be provided: the original, a clean photocopy, and a photocopy with labels marked up as appropriate, in black ink. Further information on artwork submission can be accessed at <http://www.elsevier.nl/homepage/sab/artwork/index.html>.

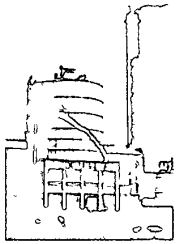
附錄三： 國際能源總署 Cedric Philibert 先生論文
Considering the options: climate targets for all countries

Pollution Atmosphérique



**Etudes
Information
Documentation
Conseils**

Une information adaptée et objective...



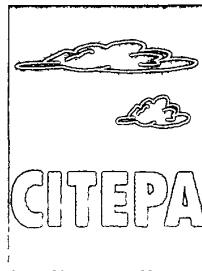
Depuis 1961, le CITEPA rassemble des industriels désireux d'assumer leurs responsabilités en matière de pollution atmosphérique en les invitant à jouer la carte de la concertation et de l'objectivité autour d'une idée simple : se donner les moyens de réduire les émissions dans un contexte technique, économique et réglementaire réaliste et évolutif.

Vous êtes

- Un industriel
- Un organisme public
- Une collectivité territoriale
- Une fédération professionnelle
- Une chambre syndicale
- Un bureau d'études
- Un centre de recherche
- Un organisme international

Nous sommes

- Une association loi 1901
- Une équipe d'une quinzaine de personnes dont 8 ingénieurs d'études
- Des spécialistes des sources d'émissions, des mécanismes de formation et de transformation des polluants, des techniques de réduction des émissions et de leur ratio coût / efficacité
- Le Centre National de Référence pour les émissions dans l'air



Vous recherchez

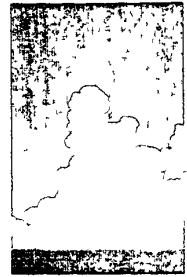
- Des informations pertinentes sur les rejets atmosphériques
- Un avis d'expert sur la réduction des émissions, la dispersion atmosphérique
- Les coûts associés à une réduction des émissions
- L'impact de réglementations futures
- Une étude prospective sur les émissions de votre activité ou sur un sujet émergent

Nos moyens

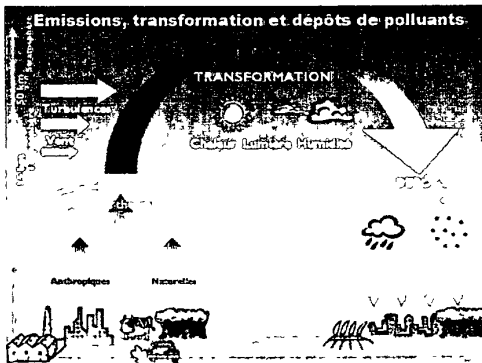
- Un centre de documentation de 15000 références
- Des méthodes de travail reconnues
- Une diffusion régulière d'informations (publications, journées d'études)
- Des bases de données sur les émissions
- Des méthodes et des outils sur les inventaires d'émissions
- Une veille réglementaire et technologique
- Des contacts étroits avec le monde industriel, médical et de la recherche
- Des outils informatisés développés en interne
- Un site internet

L'activité associative

Aujourd'hui, le CITEPA regroupe 200 adhérents : industriels, fédérations et syndicats professionnels, producteurs d'énergie, constructeurs automobiles, éco-industries, bureaux d'études et laboratoires, constituant ainsi un véritable réseau interprofessionnel où circule une information pertinente et d'actualité sur les évolutions réglementaires et technologiques en matière de pollution atmosphérique.



Le CITEPA s'appuie sur un échange d'informations extrêmement souple avec ou entre nos adhérents ainsi que sur une relation de confiance avec l'Administration et les organismes publics.

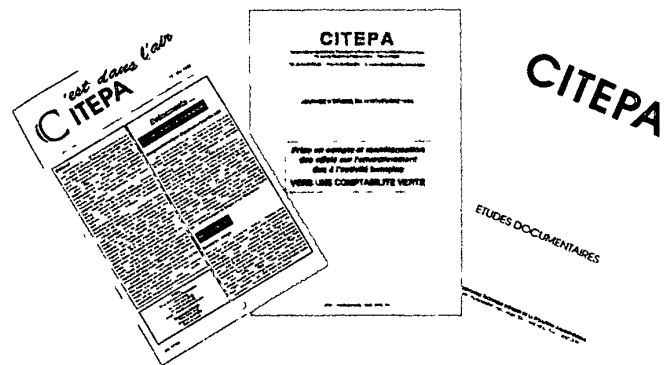


Le fonds documentaire

Le CITEPA dispose de l'un des fonds documentaires les plus importants de France sur la pollution atmosphérique : plus de 15000 références, 2000 ouvrages et 30 revues spécialisées consultés régulièrement par nos adhérents.

Des informations adaptées aux besoins de chacun

Le CITEPA informe ses adhérents par des publications régulières (Etudes Documentaires, C'est dans l'Air, monographies reprenant des travaux d'études). Cette information concerne aussi bien la réglementation que des résultats de recherches ou d'études sur les sources de pollution, les techniques de réduction des émissions, les coûts correspondants, la dispersion atmosphérique, les effets sur l'environnement ou les stratégies de réduction.



Les journées d'études

Le CITEPA organise des journées d'études sur des thèmes particuliers d'actualité relatifs à la pollution atmosphérique. Ce rendez-vous rassemble des acteurs du monde industriel, scientifique, économique et politique. Il constitue un moment privilégié pour connaître, discuter et faire valoir son point de vue sur des thèmes comme les "Métaux lourds et composés organiques persistants", "Les poussières", "La comptabilité verte", "La pollution photochimique"...



Parce qu'il est nécessaire d'intégrer et d'anticiper de plus en plus de paramètres complexes d'ordre technique, économique et réglementaire avant d'apporter une réponse en matière de protection de l'environnement, le CITEPA réalise des études sous contrat pour des organismes publics ou privés afin de leur donner des éléments de réflexion et de proposer des solutions adaptées à leurs problèmes.

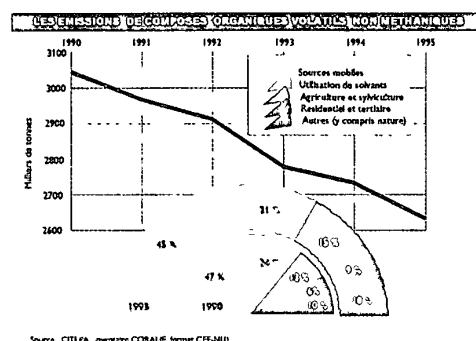
Emissions dans l'air

Nous réalisons au niveau national les inventaires d'émissions d'une trentaine de substances pour couvrir la demande nationale et internationale (Ministère de l'Environnement, Mission Interministérielle de l'Effet de Serre, Commission des Communautés Européennes, Agence Européenne de l'Environnement, ..).

D'autres inventaires d'émissions spécifiques sont élaborés à la demande, tels que :

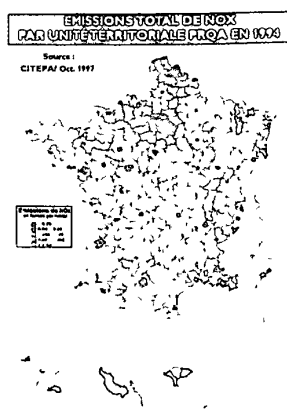
- Inventaires régionaux (dans le cadre des Plans Régionaux pour la Qualité de l'Air)
- Inventaires prospectifs comme les émissions du transport routier en 2020 ou PACA (1994-2002)
- Inventaires à haute résolution spatiale et temporelle (km² et horaire)

Le CITEPA participe également à l'organisation de campagnes de mesures et propose des solutions d'autosurveillance aux industriels



Aspects techniques, économiques et stratégiques

Nos équipes évaluent la viabilité technico-économique des actions réglementaires. Elles exercent aussi leurs compétences sur des études prospectives et d'impact. Elles interviennent principalement sur les problèmes d'effet de serre, de photochimie, d'acidification et de pollution à l'échelle locale. Le Forum Pollution Transfrontière en est une illustration.



Une assise internationale

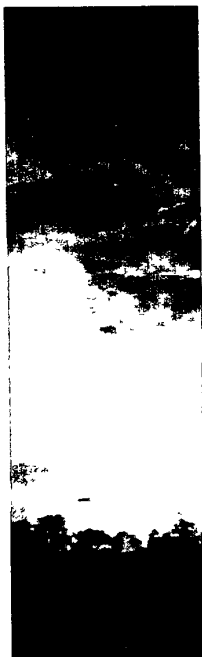
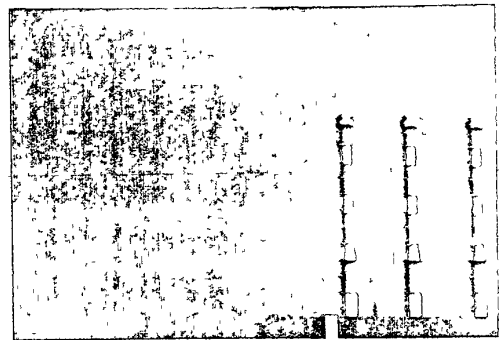
Membre du Centre Thématique Européen des émissions dans l'air, le CITEPA participe à des travaux dans l'Union Européenne et dans les pays de l'Est ; il s'enrichit de nombreux contacts avec des ministères, des instituts et des laboratoires étrangers.

Nous intervenons également dans de nombreuses réunions internationales, par exemple pour la mise au point des méthodologies liées aux inventaires d'émissions.

...un réseau de compétences, un pôle de concertation

Un conseil d'administration représentatif du tissu industriel français

AMORCE, APPA, CETIAT, CDF, COPACEL, CPDP, EDF, FCSIV,
FG3E, GDF, GAPAVE, GIFAM, MEDEF, PSA PEUGEOT
CITROEN, RENAULT, SNET, SFIC, UNICLIMA, UFIP, UIC



Nos partenaires

Monde industriel

FÉDÉRATIONS PROFESSIONNELLES, CHAMBRES SYNDICALES, ENTREPRISES

Administrations Françaises

MINISTÈRE DE L'ENVIRONNEMENT, MINISTÈRE DE L'ÉQUIPEMENT ET DES
TRANSPORTS, MINISTÈRE DE L'INDUSTRIE, OBSERVATOIRE DE L'ÉNERGIE,
ADEME, IFEN, DRIRE,

Associations

APPA, AFITE, EPE, .

Instances Européennes

DGI (PROGRAMME PHARE) - DGXI - DGXII (EFOM-JOUM) - DGXVII, AGENCE
EUROPÉENNE DE L'ENVIRONNEMENT, EUROSTAT, JRC (ISPRA, SEVILLE), .

Organisations internationales

IFARE, IIASA, UIAPPA, CEE-NU, OMS, FAO, PNUE, ..

Quelques unes de nos références

ADEME, AEA TECHNOLOGY (UK), AED (EPS), AGENCE EUROPÉENNE DE L'ENVIRONNEMENT (DK),
AIF SERVICES, AIR LIQUIDE, AIRFOBER, AIRPARIF, AMORCE, ANVAR, BASF PEINTURES ET ENCRE,
BCEOM, BETURE ENVIRONNEMENT, BIOCHALEUR, CCI, CDF, CENTRALE SIDÉRURGIQUE DE RICHEMONT, CERTU, CETE,
CLEAN TECHNOLOGY CENTER (IRL), COFIROUTE, COGEMA, CREDES, CRITT CHIMIE ENVIRONNEMENT,
CONSEILS RÉGIONAUX, DDE, DGAC, DISTRICT DE L'AGGLOMÉRATION DIJONNAISE, DORSCH CONSULT (D),
DRIRE, ECOMER, EDF, ERM (UK), FORMEQUIP, FOULD SPRINGER, GALVAZINC ASSOCIATION, GDF,
IFEN, IFP, IFU (D), IIASA (AUT), INRA, IPI ENVIRONNEMENT INDUSTRIEL, MINISTÈRE DE L'ENVIRONNEMENT,
MINISTÈRE DE L'ÉQUIPEMENT ET DES TRANSPORTS, MINISTÈRE DE L'INDUSTRIE, PLASTURGIE SERVICES,
OBSERVATOIRE DE L'ÉNERGIE, POLDEN—INSAVALOR SA, RIGIFOIL, ROMANN ET COMPAGNIE,
SAINT-GOBAIN EMBALLAGE, SAVERGLASS, SCMC, SICOS, SNID, SNPA, SNPAA, SOGELERG, SOLAR TURBINES
INCORPORATED (USA), SOLUNOR, SOPLARIL, SUCRERIE DE BOURBON, SUPAIRE, UFIP, UIC, UNION ROUTIÈRE DE FRANCE

CITEPA is a technical centre with a no profit organisation statute founded in 1961. It gathers about 200 industrialists keen to assume their responsibilities in the field of air pollution.

Activities deal with different issues :

A no profit activity

This association structure with a strong technical character allows a very flexible flow of information and advice with or between members and a dialogue with the Administration. CITEPA proposes the following services :

Documentation centre (about 15 000 references)

Regular information for members through monthly and quarterly papers

Annual meeting day

Participation in working groups, workshops, congresses in France and abroad

A technical centre

CITEPA carries out studies under contracts with industrialists or administrations. Main subjects are :

Emission inventories (greenhouse effect, photochemical pollution, acidification, contamination...)

Emission reduction techniques and related costs

Assessment of economical impact of new policies

Evolution of pollutant emissions and costs according to scenarios

Assistance to the formulation of new industrial or traffic projects

Environmental impact study



Centre Interprofessionnel Technique d'Etudes de la Pollution Atmosphérique

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e-mail : infos@citepa.org
www.citepa.org

Métro : Bonne Nouvelle (lignes n° 8 ou 9)

Ouverture de la documentation : du lundi au vendredi de 9 h à 12 h et de 14 h à 17 h (sur rendez-vous)