Framework Convention on Climate Change

Distr.
GENERAL

FCCC/IDR.3/FRA
27 May 2003

ENGLISH ONLY

# FRANCE

Report on the in-depth review of the third national communication of France

Review team:

Faouzi Senhaji (Morocco)
Libasse Ba (Senegal)
Nicole North (Switzerland)
Jan Corfee-Morlot (OECD)
Sergey Kononov (UNFCCC secretariat, coordinator)

# I. INTRODUCTION AND NATIONAL CIRCUMSTANCES RELEVANT TO GREENHOUSE GAS EMISSIONS AND REMOVALS

## A. Introduction

1. France ratified the United Nations Framework Convention on Climate Change (UNFCCC) on 25 March 1994. The Kyoto Protocol to the Convention was signed on 29 April 1998 and ratified, with the other members of the European Community (EC), on 31 May 2002. The first national communication (NC1) of France was received by the UNFCCC secretariat in 1995 and the second (NC2) in 1997. This **third national communication (NC3) was received on 30 November 2001**.

2. NC3 was prepared in about 15 months under the responsibility of the Inter-ministerial Task Force on Climate Change (MIES – Mission interministérielle de l'effet de serre). MIES coordinated the preparation of NC3 by concerned ministries and agencies.[1]

3. Non-governmental organizations (NGOs), either environmental or business, did not take part in the preparation of NC3. However, business NGOs were involved in the preparation of the French National Programme to Combat Climate Change (PNLCC – Programme national de lutte contre le changement climatique) that is a key input to NC3. Both environmental and business NGOs received the final version of NC3 and participate in the process of PNLCC monitoring.

4. The in-depth review of NC3 was carried out from April to July 2002 and included a visit by the review team to Paris from 13 to 17 May 2002. The team consisted of Mr. F. Senhaji (Morocco), Mr. L. Ba (Senegal), Ms. N. North (Switzerland), Ms. J. Corfee-Morlot (Organisation for Economic Co-operation and Development – OECD) and Mr. S. Kononov (UNFCCC secretariat, coordinator). During the visit, the team met French experts who participated in the preparation of NC3 and representatives of business and environmental NGOs.

## B. National circumstances

5. France is located in the west of Europe between the Atlantic Ocean and the Mediterranean Sea. By surface area, it is the largest country in the EC. In addition to the mainland part, there are French territories and departments overseas, the DOM–TOMs (Départements–Territoires Outre Mer): New Caledonia, Wallis and Futuna, French Polynesia and some other ocean and Antarctic territories.

6. France is a presidential republic with an elected parliament and a government appointed by the President. The parliament holds legislative power and the government proposes laws and ordinances. Central administration plays a key role in France but since the early 1980s authority has been increasingly delegated to local levels. The administrative status in DOM–TOMs varies from territory to territory; local parliaments and administrations may take specific decisions relating to climate change, particularly with respect to adaptation measures.

7. Because of the size of the territory and the two mountain barriers in the east and south (the Alps and the Pyrenees), the climate varies across the country. Three types of climate are distinguished:

---

[1] The following organizations took part in the preparation of the NC3: Agence de l'environnement et de la maîtrise de l'énergie (ADEME), Agence française de développement (AFD), Centre interprofessionnel technique d'études de la pollution atmosphérique (CITEPA), Commissariat général au plan (CGP), ENERDATA, l'Institut forestier national (IFN), Institut français de l'environnement (IFEN), Meteo-France, Ministère de l'agriculture et de la pêche (MAP), Ministère de l'aménagement du territoire et de l'environnement (MATE), Ministère de l'économie, des finances et de l'industrie (MINEFI), Ministère de l'équipement, des transports et du logement (METL), Ministère de la recherche (MR), Ministère des affaires étrangères et ministère délégué à la coopération et à la francophonie (MAE), Office national des forêts (ONF).

oceanic (the west coast), continental (central and eastern France) and mediterranean (the south-eastern part). Farmland covers about 60 per cent of the land area; forests about 30 per cent. Between 1992 and 2000 the forest area increased by 3.5 per cent and the agricultural land area decreased by 2.3 per cent.

8. In 1999, the population of mainland France was 58.7 million; the total population, including DOM–TOMs, was 60.8 million. France is a highly industrialized country, with the gross domestic product (GDP) per capita[2] of about US$ 28,000 (1999). In 1999 services accounted for the highest share of GDP (71 per cent) followed by industry (26 per cent).[3] Between 1990 and 1999, GDP grew by 15 per cent, substantially faster than the population; greenhouse gas (GHG) emissions remained stable (table 1).

**Table 1. Main macro-economic indicators and GHG emissions for France**

| | 1990 | 1999 | Change[a] (%) |
|---|---|---|---|
| Population (millions) | 58.55 | 60.80 | 3.8 |
| Gross domestic product – GDP (billions of US$ of 1995) | 1473 | 1698 | 15.3 |
| Total primary energy supply – TPES (Mtoe[b]) | 227.6 | 255.0 | 12.0 |
| Electricity consumption (TWh) | 302.0 | 374.5 | 24.0 |
| GHG emissions[c] (Tg[d] $CO_2$ equivalent) | 546 | 545 | –0.2 |
| GHG emissions per capita (Mg $CO_2$ equivalent) | 9.32 | 8.96 | –3.9 |
| GHG emissions per GDP unit (kg $CO_2$ equivalent per US$ of 1995) | 0.371 | 0.321 | –13.5 |

*Note*: The population data are from "Inventaire des émissions de gaz à effet de serre en France", Report of CITEPA/492, December 2001. Data for GDP, TPES and electricity are from "Energy balances of OECD countries, 1998-1999", OECD/IEA, Paris, 2001. GHG emission data are from NC3.

[a] The change is calculated as: [(1999 – 1990)/1990] x 100.

[b] Millions of tonnes of oil equivalent.

[c] Without accounting for land-use change and forestry (LUCF).

[d] One teragram (Tg) is equal to 1,000 gigagrams (Gg) or one million tonnes.

9. Since the 1970s, a large nuclear programme has been implemented in France, with the main objective of increasing energy supply security. As a result, the share of energy supply covered by domestic sources increased from some 20 per cent in the 1970s to about 50 per cent in the 1990s. In 2001, there were 59 operating nuclear units with an installed capacity of 63 GW(e). Ten new nuclear units started operation during the 1990s but no new construction is expected for the coming decade.

10. Figures 1 and 2 show that the share of nuclear energy in energy and electricity supply is high. From 1990 to 1999, the share of gas increased while the share of oil and especially of coal decreased, the latter being a result of coal plant closures in the 1990s. Use of renewable energy sources grew in the 1990s although, with the exception of hydro, the growth was less pronounced than that for gas. In 1999 France produced more electricity by hydro power than any other country in the EC.

11. Implementation of the nuclear programme had a considerable impact on GHG emissions. $CO_2$ emissions from fuel combustion in France in 1999 were 6.0 t $CO_2$/capita while the average for member countries of the OECD was 11.0 t $CO_2$/capita.[4] The GHG emissions per GDP unit continued to decline in the 1990s notwithstanding their relatively low level (table 1).

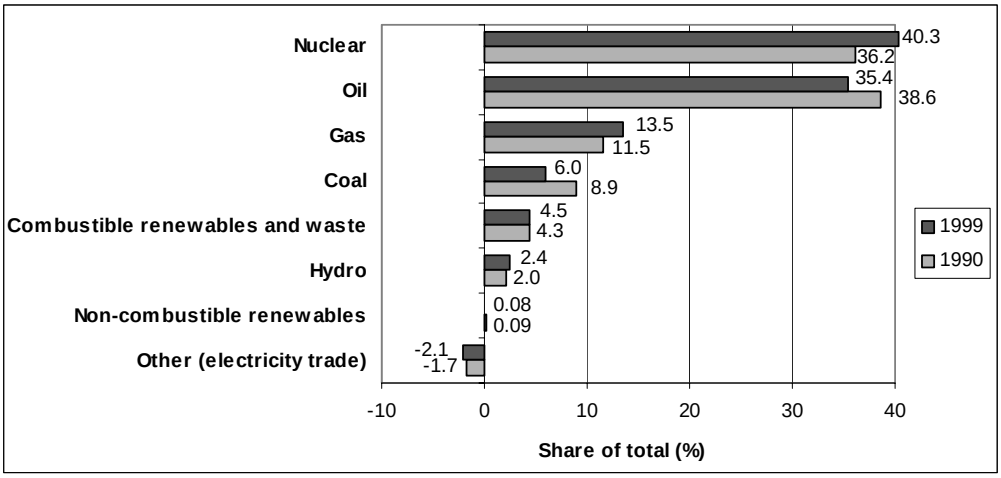
---

[2] "Key World Energy Statistics from the IEA**:** 2001 edition", OECD/IEA, Paris, 2001.

[3] World Bank data at www.worldbank.org/data

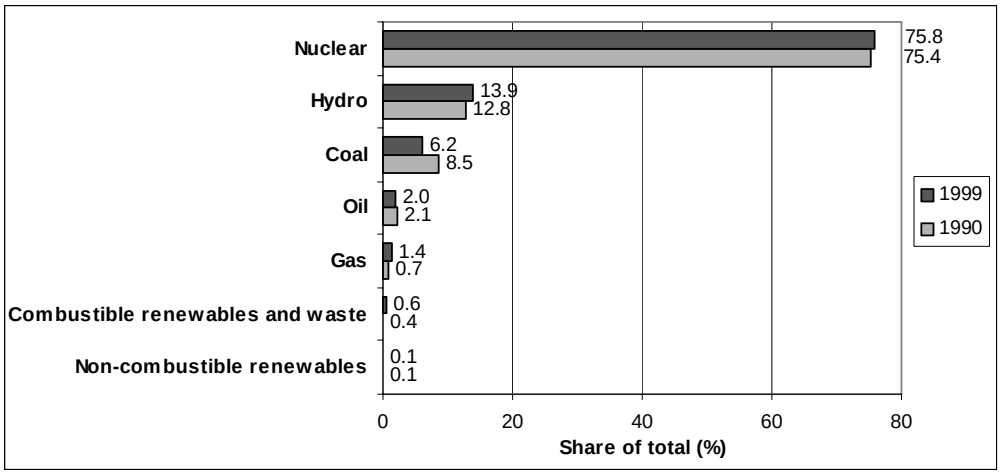
[4] "Key World Energy Statistics from the IEA**:** 2001 edition", OECD/IEA, Paris, 2001.

**Figure 1. Structure of primary energy supply in France**




*Source*: "Energy balances of OECD countries, 1998–1999", OECD/IEA, Paris, 2001.
*Note*: The sum of shares may not be exactly 100 per cent because of rounding. The negative number for electricity trade means, in accordance with the conventions of IEA statistics, that the country exports more electricity than it imports.

**Figure 2. Structure of electricity supply in France**




*Source*: "Energy balances of OECD countries, 1998–1999", OECD/IEA, Paris, 2001.
*Note*: The sum of shares may not be exactly 100 per cent because of rounding.

## C. Relevant general, energy, and environmental policies

12. The general goals of the **French energy policy** are security of energy supply, reduction of environmental impacts (including mitigation of climate change), and low-cost energy supply. Law No. 2001-153 (2001) defined the prevention of climate change as a national priority. Following the opening for signature of the Kyoto Protocol in 1997, the government put additional emphasis on energy use efficiency and renewable energy sources.

13. The **French climate change abatement strategy** was launched in the early 1990s, consistent with the obligation of Annex I Parties to the UNFCCC and the EC commitment to stabilize $CO_2$ emissions at 1990 levels by 2000. Under the Kyoto Protocol the EC is committed to an 8 per cent reduction in GHG emissions in the first commitment period of 2008–2012. Within the EC burden-sharing agreement under Article 4 of the Kyoto Protocol, France made a commitment to stabilize its GHG emissions at the 1990 level in the first commitment period.

14. **Climate-related policies** are coordinated by MIES. Early in the 1990s, MIES facilitated the development of national programmes in order to meet the UNFCCC stabilization objective by 2000. In 1998, MIES was placed under the Office of Prime Minister, which considerably reinforced its role. Under the responsibility of MIES, a National Programme to Combat Climate Change (Programme national de lutte contre le changement climatique – PNLCC) was developed. The Inter-ministerial Committee on Climate Change, which includes the ministers involved in the climate policy and is chaired by Prime Minister, approved the PNLCC on 19 January 2000. In accordance with the French commitment under the Kyoto Protocol and the EC burden-sharing agreement, PNLCC defines measures to achieve GHG stabilization at the 1990 level by 2010. Domestic action is to play the key role and the international flexibility mechanisms are seen as a possible complement.

## II. GREENHOUSE GAS INVENTORY INFORMATION

### A. Inventory preparation

15. The French GHG inventory was prepared, based on the CORINAIR methodology,[5] by the Centre interprofessionnel technique d'études de la pollution atmosphérique (CITEPA). The inventory covers the period from 1990 to 1999 and includes $CO_2$, $CH_4$, $N_2O$, PFCs, HFCs, $SF_6$ and GHG sinks (the NC2 inventory did not include PFCs, HFCs, $SF_6$). Some data are given for 1990, 1998 and 1999 only. Emissions from biomass and international bunker fuels[6] are presented. The analysis of emission trends in NC3 appeared limited. The French experts indicated that more UNFCCC guidance on the presentation of inventory data in national communications might be useful.

16. According to CITEPA experts, the overall expert-defined uncertainty of GHG estimates is 13.4 per cent, $CO_2$ emissions being most certain (less than 5 per cent uncertainty). Uncertainty estimates for the other gases were not available in NC3 or in the French 2002 inventory report.[7] Emission estimates for DOM–TOMs are considered less reliable, but the share of DOM–TOMs in the total GHGs is only 2 per cent. The review team suggested that the uncertainties be given more attention in the future in the context of assessing the efficiency of policies and measures. The French experts plan to advance uncertainty analysis in the future.[8]

17. The inventories are reviewed every year, with backward recalculations to 1990 if necessary. The review team noted that changes in the 1990 emissions occurred between NC2 and NC3: +2.1 per cent for $CO_2$ (without LUCF), +3.0 per cent for $CH_4$, +70 per cent for $N_2O$, and +94 per cent for the sinks. The principal reasons for the changes are retroactive updates of the energy balance, new statistics for biomass consumption and forestry, use of a new methodology (for $N_2O$ emissions from agriculture) and changes in the data for road transportation.

### B. Overall emission trends

18. GHG emissions from 1990 to 1999 are shown in table 2. The energy sector is the key contributor to the GHG total (about 73 per cent in 1999), $CO_2$ being the largest component (74 per cent). **The emissions have been stable during 1990s** (NC3 contains only data through 1999, but the latest inventory submission confirms GHG stabilization: the GHG total in 2000 is 1.7 per cent lower than in 1990). The stabilization was reached due to sizeable decreases in $CH_4$ and $N_2O$ emissions that

---

[5] NC3 mentions a note on inventory methodology in the annex but there is no such note in the NC3.

[6] Transportation between the mainland France and DOM–TOMs is counted as domestic, but there is some inaccuracy as it is difficult to account correctly for flights bound for DOM–TOMs but with a stopover in another country.

[7] "Inventaire des émissions de gaz à effet de serre en France", Report CITEPA/492, December 2001.

[8] Report on the Individual Review of the Greenhouse Gas Inventory of France Submitted in the Year 2001, UNFCCC document FCCC/WEB/IRI(2)/2001/FRA.

outweighed an increase in $CO_2$ and HFC emissions. GHG removals through LUCF amount to some 11 per cent of the emissions, but this number will decrease in the future as a result of 1999 storms which led to the loss of many trees in France.[9]

**Table 2. GHG emissions, by gas, 1990–1999**

| | Tg $CO_2$ equivalent | | | | | | | | | | Change[a] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1990** | **1991** | **1992** | **1993** | **1994** | **1995** | **1996** | **1997** | **1998** | **1999** | **(%)** |
| $CO_2$ | 386 | 409 | 201 | 380 | 376 | 382 | 396 | 390 | 411 | 405 | 4.9 |
| $CH_4$ | 63 | 64 | 65 | 65 | 65 | 66 | 65 | 60 | 60 | 58 | –7.9 |
| $N_2O$ | 89 | 89 | 86 | 82 | 83 | 85 | 86 | 87 | 79 | 73 | –18.0 |
| HFCs+PFCs+$SF_6$ | 7.6 | 6.2 | 5.4 | 4.8 | 4.5 | 4.9 | 6.0 | 7.0 | 7.9 | 9.1 | 19.7 |
| GHG without LUCF | 546 | 568 | 557 | 532 | 529 | 538 | 553 | 544 | 558 | 545 | –0.2 |
| LUCF | –52 | –49 | –54 | –58 | –60 | –57 | –59 | –61 | –60 | –62 | 19.2 |
| GHG with LUCF | 494 | 519 | 503 | 474 | 469 | 481 | 494 | 483 | 498 | 483 | –2.2 |

[a] The change is calculated as: [(1999 – 1990)/1990] x 100.

## C. Key emission sources and sectoral trends

19. Four key sources account for about 50 per cent of the total GHG emissions: road transportation (23.7 per cent – the largest source), the residential sector (10.8 per cent), agricultural soils (9.3 per cent), and public electricity and heat production (7.5 per cent). Table 3 shows GHG emissions by major sectors in the 1990–1999 period.[10]

**Table 3. GHG emissions by sector and sub–sector**

| | Tg $CO_2$ equivalent | | | | | | | | | | Change[a] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1990** | **1991** | **1992** | **1993** | **1994** | **1995** | **1996** | **1997** | **1998** | **1999** | **(%)** |
| 1. Energy | 374.2 | 400.8 | 394.0 | 373.5 | 367.9 | 374.0 | 388.9 | 381.7 | 402.7 | 397.5 | 6.2 |
| A1. Energy industries | 66.1 | 78.1 | 70.4 | 56.8 | 53.1 | 55.8 | 60.2 | 56.6 | 69.2 | 62.1 | –6.1 |
| A2. Manufacturing and construction | 77.7 | 78.8 | 76.4 | 71.6 | 75.0 | 74.2 | 75.0 | 76.1 | 77.9 | 78.1 | 0.5 |
| A3. Transport | 120.8 | 123.5 | 128.1 | 128.3 | 129.8 | 132.1 | 133.9 | 136.6 | 139.0 | 142.3 | 17.8 |
| A4. Other | 98.8 | 109.4 | 108.3 | 105.7 | 99.0 | 101.5 | 110.2 | 103.3 | 107.6 | 106.4 | 7.7 |
| B. Fugitive emissions | 10.8 | 11.0 | 10.8 | 11.2 | 11.0 | 10.4 | 9.5 | 9.1 | 9.0 | 8.6 | –20.4 |
| 2. Industrial processes | 56.7 | 53.5 | 49.4 | 45.2 | 47.1 | 49.0 | 48.2 | 49.7 | 42.5 | 37.5 | –33.9 |
| 3. Solvents | 2.4 | 2.4 | 2.3 | 2.2 | 2.2 | 2.2 | 2.2 | 2.2 | 2.3 | 2.2 | –8.3 |
| 4. Agriculture | 90.4 | 89.0 | 86.7 | 85.0 | 85.5 | 86.1 | 86.9 | 87.3 | 86.9 | 86.5 | –4.3 |
| 5. LUCF | –52.0 | –48.8 | –53.6 | –58.2 | –59.8 | –57.5 | –59.5 | –60.4 | –60.3 | –61.3 | 17.9 |
| 6. Waste | 21.8 | 23.1 | 24.4 | 25.3 | 26.2 | 27.1 | 26.9 | 22.9 | 22.5 | 20.8 | –4.6 |

[a] The change is calculated as: [(1999 – 1990)/1990] x 100.

20. The review team found that the following trends were particularly important: decreases in $CH_4$ and $N_2O$ emissions from 1995 to 1999; increase in energy-related $CO_2$ emissions from 1990 to 1999, emission increases in DOM–TOMs from 1990 to 1999; and increase of HFCs from 1990 to 1999.

21. ***Decreases in $CH_4$ and $N_2O$ emissions***. Table 4 shows that the largest part of $CH_4$ reduction was achieved in agriculture and waste management. Reduction in the emissions from enteric fermentation accounts for almost all the reduction in the agriculture sector, indicating that the reason is a decrease in the number of cattle between 1990 and 1999. A decrease in the $CH_4$ emissions from waste means a reversal of the growing $CH_4$ emissions in the beginning of the 1990s (table 2). Thus, a new waste management policy that was put in place later in the 1990s (increase in capturing $CH_4$ releases from landfills, increase in the share of incinerated wastes) seems to have started yielding positive results.

[9] GHG removals decreased in 2000 as a result of the 1999 storm but the trend observed from 1990 to 1999 will continue in the future. The GHG removals are increasing but the starting level in 2000 is under the level of 1999.

[10] As NC3 does not contain complete sectoral data for some years, tables 3 and 4 are based on the corresponding version of the GHG inventory.

**Table 4. Trends in $CH_4$ and $N_2O$ emissions**

| | Tg $CO_2$ equivalent | | Change[a] | Tg $CO_2$ equivalent | | Change[a] |
|---|---|---|---|---|---|---|
| | 1990 | 1999 | (%) | 1990 | 1999 | (%) |
| | ***$CH_4$ emissions*** | | | ***$N_2O$ emissions*** | | |
| Industry | the emissions are insignificant | | | 27.77 | 11.09 | –60.1 |
| Agriculture | 34.26 | 32.23 | –5.9 | 56.15 | 54.26 | –3.4 |
| Waste | 18.74 | 17.45 | –6.9 | the emissions are insignificant | | |
| Total (without LUCF) | 63.21 | 57.54 | –9.0 | 88.73 | 72.53 | –18.3 |

[a] The change is calculated as: [(1999 – 1990)/1990] x 100.

22. For $N_2O$, the largest part of the reduction was achieved in industry (in the chemical branch). These reductions were prompted by the adoption, in 1993, of a new regulation on the maximum $N_2O$ emission per tonne of nitric acid (in effect since February 1998). The reduction in industry outweighed some increase in the $N_2O$ emissions from the use of catalytic converters in cars. **Reductions in $N_2O$ emissions played a key role in the overall stabilization of GHG emissions in the 1990s**.

23. ***Increase in $CO_2$ emissions from fuel combustion***. From 1990 to 1999, $CO_2$ emissions from transportation increased from 119 to 139 Tg $CO_2$. $CO_2$ emissions from energy production and combustion in industries remained stable. Emissions from heating in dwellings increased by almost 8 per cent. Thus, it was the trend in the transportation emissions that led to the increase for the $CO_2$ total shown in table 2.

24. GHG emissions from energy industries (line A1 in table 3), which are mostly $CO_2$ emissions, fluctuated between 53.1 and 78.1 Tg $CO_2$ equivalent in the 1990s, but the 1999 emissions were about 6 per cent lower than the 1990 ones. This decrease is notable because within the same period the consumption of electricity in France increased by 24 per cent (table 1). It shows the achieved **"decoupling" of emissions from the amount of the electricity generated**. Commissioning of new nuclear units in France contributed substantially to the decoupling; electricity generation by nuclear units increased by 26 per cent from 1990 to 1999.[11]

25. ***Emission increases in DOM–TOMs.*** Between 1990 and 1999, GHG emissions in DOM–TOMs grew from 10 to 13 Tg $CO_2$ equivalent reflecting, most probably, growth in energy-related emissions. The DOM–TOM share in GHG emissions increased from 1.8 per cent in 1990 to 2.4 per cent in 1999.

26. ***Increase in the emissions of HFCs.*** Emissions of HFCs, PFCs and $SF_6$ (taken together) increased considerably between 1990 and 1999 (table 5), although their share in the total GHG emissions is still small (1.7 per cent in 1999). The increase is due to a rapid growth in HFCs (table 5) driven by increased use of HFCs in refrigeration and air conditioning (including air-conditioned cars) to replace substances that affect the ozone layer. This growth largely outweighed the effect of regulatory measures on HFCs in the early 1990s. Emissions of PFCs declined considerably, mostly due to technological progress in the aluminium industry. $SF_6$ emissions, which depend on the volume of magnesium production and fabrication of electric devices, changed only slightly.

**Table 5. Trends in the emissions of HFCs, PFCs and $SF_6$**

| | Tg $CO_2$ equivalent | | Change[a] |
|---|---|---|---|
| | 1990 | 1999 | (%) |
| HFCs | 2.25 | 4.81 | 113.8 |
| PFCs | 3.19 | 1.91 | –40.1 |
| $SF_6$ | 2.19 | 2.41 | 10.0 |

[a] The change is calculated as: [(1999 – 1990)/1990] x 100.

[11] "Energy balances of OECD countries, 1998–1999", OECD/IEA, Paris, 2001.

## III. POLICIES AND MEASURES

27. The review team was impressed by the improvement in the presentation of policies and measures in NC3 compared to NC2. Policies and measures on $CO_2$, $CH_4$, $N_2O$, HFCs, PFCs and $SF_6$ are comprehensively described by sector (although not always by gas). Nevertheless, the team also found a number of weaknesses. For example, the effects of the measures that were adopted before 1998 have not been recalculated since NC2. The effects of the reinforced or new measures are estimated for 2010 only. For some measures, the effects are not estimated. The identification of the most innovative, promising, or replicable measures among some 150 was not easy for the team.

28. The team experienced some confusion about the status of individual policies and measures because several undefined terms are used in NC3 to characterize progress, such as "in force", "under way", "achieved", "initiated", "enforced", "applied", "adopted", "planned" "launched", "suspended", and "proposed". The UNFCCC guidelines suggest only three categories – implemented, adopted and planned. French experts indicated difficulties in describing the exact status of implementation with only three categories.

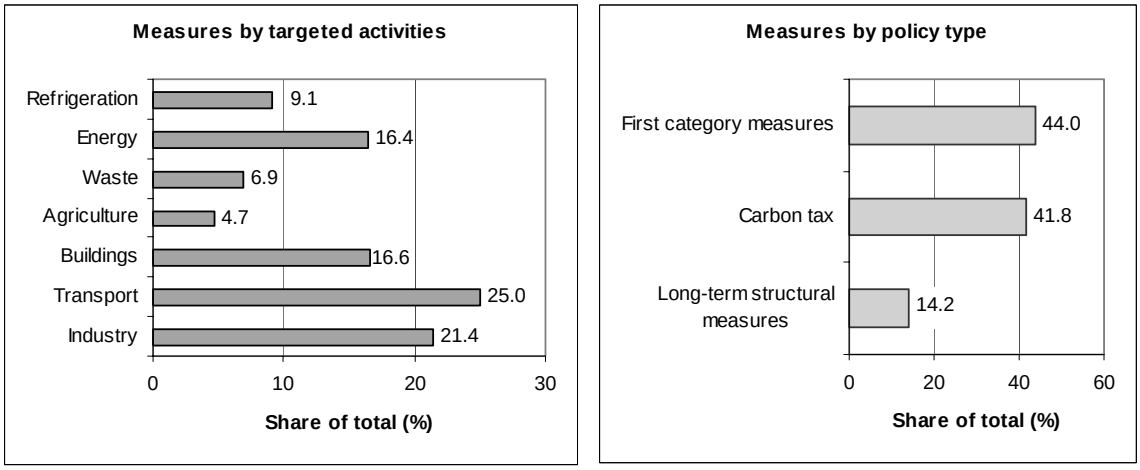
29. Following the adoption of the Kyoto Protocol in 1997, France elaborated a **National Programme to Combat Climate Change** (Programme national de lutte contre le changement climatique – PNLCC). In January 2000, the Inter-ministerial Committee on Climate Change under Prime Minister's leadership formally adopted PNLCC. In accordance with the French commitment under the Kyoto Protocol and the EC burden-sharing agreement, the PNLCC defines measures to achieve GHG stabilization at the 1990 level by 2010. The policies and measures presented in NC3 are based on the PNLCC.

30. The Inter-ministerial Task Force on Climate Change (MIES – Mission interministérielle de l'effet de serre) is responsible for the identification and monitoring of the measures under the PNLCC. MIES also organizes annual conferences where PNLCC implementation is reviewed. The first conference took place in 2001 and the second one in November 2002.

31. The PNLCC determined that under a reference scenario, which assumes implementation of existing GHG mitigation measures without introduction of new measures, the French GHG emissions in 2010 would exceed the French Kyoto Protocol target by about 58.7 Tg $CO_2$ equivalent. To meet the Kyoto target, additional measures are needed. The PNLCC identifies about 100 the so-called **"first category" measures** that were selected due to their low (or negative) net cost or their effectiveness. These measures would achieve about 44 per cent of the reduction target (figure 3).

32. The main part of the remaining reduction is expected to be obtained by using **fiscal instruments**, especially carbon taxation (figure 3). The PNLCC specifies that a tax rate of FF 500–600, or 76–91 euro (€), per tonne of carbon would allow more than half of the reductions to be achieved domestically (the rest would be then achieved using the Kyoto flexibility mechanisms). To achieve all emission reductions domestically, the tax would need to be FF 1300 (€200) per tonne of carbon. Carbon taxation would mean that the existing general tax on polluting activities (TGAP) would be extended to the industry and residential/tertiary sectors. In the transport sector, fuels would be taxed under the Inland Duty on Natural Gas and Oil Products (TIPP). At present, the introduction of such taxes is suspended by the government because of low public acceptance and lack of political support.

**Figure 3. Contribution of various measures to the overall objective of the PNLCC**




33. Finally, the PNLCC stipulates **long-term structural measures** relating to the modal structure of transport, energy use in buildings and the development of renewables.

34. The review team considered the PNLCC a comprehensive, well-targeted programme. It covers all sectors and contains sets of evaluated sectoral emission reductions, leading to the overall reduction target. The key challenge now is in PNLCC implementation. Therefore, a comprehensive follow-up of the programme is of the utmost importance. Progress reports on existing measures have not been made available to the review team but progress is monitored. The implementing agencies or ministries responsible for the individual measures report periodically to MIES on the status of the measures. Work to identify the most relevant indicators of progress has been initiated. Special follow-up sheets for every measure ("fiches de suivi") are under development in MIES.

35. Little information is provided in NC3 on the costs of individual or combined policies and measures. The French experts indicated that they faced problems in the definition of costs and in the overall cost assessment. In the view of the French experts, the UNFCCC guidelines could be more specific about the types of the costs and the methods to assess them.

36. NC2 described some policies and measures which may lead to greater levels of GHG emissions than would otherwise occur, but NC3 does not. There is also limited information on policies and measures not longer in place compared to policies and measures described in NC2.

37. The impact of energy sector deregulation on the level of GHG emissions is not discussed in NC3. Some liberalization has already been introduced in the energy sector following EC directives, but the government still controls a large part of energy supply industries, in particular the electricity and gas sectors. Gaz de France has exclusive rights over imports, exports, transportation and distribution of natural gas. A new Electricity Act of February 2000 opens the French electricity market for competition following the requirements of the EC electricity directive of 1996. But the state-owned Electricité de France still enjoys a dominant position and a large advantage regarding rights over imports, exports and transmission of electricity.

38. The sectoral analysis of policies and measures below is structured[12] as follows: energy production and transformation (about 13 per cent of the total emissions in 1999), residential and

[12] This structure, used in the NC3, is slightly different from the one specified in the UNFCCC reporting guidelines.

commercial sector (20 per cent), transport (26 per cent), industry (21 per cent [13]), agriculture (16 per cent), land use and forestry (removals of about 11 per cent of emissions), and waste (4 per cent).

## A. Energy production and transformation

39. Because nuclear and hydro energy account for a large share of energy production in France, the contribution of energy production to GHG emissions is fairly low (13 per cent). The gases emitted are mostly $CO_2$ (87 per cent) and $CH_4$ (12 per cent). The key policies and measures are shown in table 6.

**Table 6. Key measures in energy production and transformation (Tg $CO_2$ equivalent per year)**

| Existing measures[a] | Estimated GHG reductions by 2010[b] | Supplementary measures[a] | Estimated GHG reductions by 2010[b] |
|---|---|---|---|
| Operation of nuclear plants | 46 | Replacement of coal- and oil-fired plants with gas-fired plants | 5 |
| Development of cogeneration | 3.7 | The wood energy plan | 1.1 |
| Development of wind energy | 4.4 | Reduced VAT on improvements in insulation in existing buildings | 0.9 |
| Peak load management | 1.8–2.9 | Replacement of diesel generators in DOM–TOMs with renewables | 0.45 |
| Reduction of gas leaks | 0.6 | | |
| Development of wood energy | 0.2 | | |

[a] As noted, the NC3 uses a different terminology than the UNFCCC guidelines. The meaning of "existing measures" in the NC3 is close to the combination of "implemented" and "adopted measures" as defined in the UNFCCC guidelines. "Supplementary" measures are close to "planned" measures.

[b] The estimated emission reductions are the reductions in annual GHG emissions in comparison with the PLNCC reference scenario; these estimates are made for the year 2010.

40. France's electricity supply is dominated by **nuclear power** (figure 2). Accordingly, the impact of nuclear operation on GHG emissions is the largest, although the nuclear programme was implemented for reasons other than GHG mitigation. Investments in nuclear operation continue, but no new nuclear capacity is expected for the next 10 years. At the moment France assumes a 40-year lifetime for nuclear units, which means that nuclear retirements would commence around 2020. The possibility of earlier shutdowns is not considered in NC3 although, as the discussion with NGOs during the country visit indicated, there is opposition to nuclear operation.

41. Since the end of 1997 **cogeneration** plants have benefited from fiscal support that made it possible to commission about 4 GW. The Electricity Law of 10 February 2000 and corresponding decrees, which include the obligation to purchase energy from small cogenerators, will enable further development of cogeneration. The evaluated GHG mitigation effect by 2010 is 3.7 Tg $CO_2$ equivalent per year.

42. The **replacement of old power plants using fuel oil and coal** by advanced combined cycle gas turbines could (technically) reduce $CO_2$ emissions by 14.7 Tg $CO_2$ equivalent per year. Of this technical potential, the introduction of a tax of €21 per tonne of $CO_2$ equivalent is estimated to provide a reduction of 5 Tg $CO_2$ equivalent per year. The introduction of a carbon tax under the PNLCC is, however, suspended. But as such plants were built mostly in 1960–1975, they are likely to be decommissioned by 2010 in any case, especially when two new EC directives – on integrated pollution prevention and control (IPPC) and on national emission thresholds – are adopted.

43. France is one of the leading producers of **energy from renewable sources**. In the year 2000, France ranked first in the EC and third among OECD members (after the US and Canada) by the amount of primary energy produced by renewable energy sources (including hydro energy). France ranked sixth among OECD members (after Canada, the US, Norway, Japan and Sweden) in 2000 by the amount of electricity produced from renewables.[14] Since 1998, the combination of an income tax rebate and a

[13] For consistency with the NC3, this share has been calculated including fuel combustion in industries.

[14] "Renewables information (2002 edition)", OECD/IEA, Paris, 2002; "Energy balances of OECD countries, 1999–2000", OECD/IEA, Paris, 2002.

reduced VAT decreased the price for renewable energy production equipment by 15 per cent. Companies investing in renewables benefit from exceptional depreciation over one year. The European Draft Directive for the Development of Electricity Produced from Renewable Resources was adopted under the French Presidency of the European Union in December 2000. The new Electricity Law of February 2000 stipulating mandatory purchase of electricity produced from renewables by Electricité de France and other distributors of electricity will also support renewable energies.

44. **Wind energy** offers considerable prospects for $CO_2$ savings, in particular by 2020 as an alternative to fossil fuels or nuclear energy. The EOLE 2005 programme was launched in 1996 with the target to install 250–500 MW of wind power capacity by 2005. Two competitive calls for bids by 2000 were more successful than anticipated (55 projects making up 361 MW of power). Therefore, a new target, 5000 MW for 2010, was set as a reinforcement of an existing measure under the PNLCC. The tariffs are conducive to the purchase of electricity from wind energy. The effect of the new target is estimated at 1.8 Tg $CO_2$ equivalent per year by 2010, in addition to the 2.6 Tg $CO_2$ equivalent per year from the initial target.

45. France has been encouraging the use of **wood** for heating in multi-tenant housing since 1994, via its Plan bois énergie développement locale (PBEDL). As a reinforcement under the PNLCC, PBEDL aims to maintain domestic consumption of wood, to improve the energy yield and environmental efficiency of individual fuel burners by 10 per cent, and to have 1,000 new collective or industrial wood boilers in place by 2006. By the end of 2000, 142 new collective and service-sector heating units had already been installed. The introduction of this technology is encouraged by capital subsidies of up to 30 per cent from the state via the Agency for the Environment and Energy Management (Agence de l'environnement et de la maîtrise de l'énergie – ADEME); additional funding can be obtained from regional and/or European funds. EC regulations also play an important role, and the planned reduction of VAT on wood should further encourage its use. The implementation of the PBEDL would save 1.1 Tg $CO_2$ equivalent per year by 2010.

46. The existing **renewable energies** programme in the DOM–TOMs and Corsica has been reinforced and its objectives expanded under the PNLCC. The objectives now specify the installation of 80,000 $m^2$ of solar panels, the electrification of 500 isolated sites, the additional production of 600 GWh/year of electricity from renewable sources,[15] the production of 10–20 MW of thermal energy to be installed from cogeneration/biomass gasification and the further development of wood energy, all by 2006. These actions are estimated to save 0.45 Tg $CO_2$ equivalent per year by 2010.

47. **Management of energy use** is an essential pillar of the country's energy policy. The Government decided to reinforce energy management after the adoption of the Kyoto Protocol and substantially increased the financial and human resources available to ADEME, the agency in charge of the implementation of the energy efficiency policy.[16] ADEME is also responsible for the implementation of a large share of the "first category" measures under the PNLCC.

48. One of the measures to reduce **peak electricity demand** is a system developed by Electricité de France whereby electricity prices increase sharply at times of peak load. The Electricité de France objective of having one thousand such customer accounts in place by 2000 was not met, so the projected

---

[15] Comprising 100 MW from wind energy, 50 MW from geothermal energy, 20 MW from small hydro power plants, and 5–10 MW from cogeneration/biomass gasification.

[16] In 1999, a budget increase of €76 million and the possibility to hire 100 additional employees for enhancing the energy efficiency and renewable energy policy were provided. In 2001, another budget increase of €46 million and 100 additional employees were provided for the national programme on energy efficiency. An amount of €50 million from other ADEME activities should be added to these numbers. As a result, the budget of ADEME for energy increased almost ten-fold (from about €20 million in 1998 to €200 million in 2000).

effects of this measure are likely to be smaller than the 1.8 to 2.9 Tg $CO_2$ equivalent per year by 2010 presented in the NC3.

49. **Fugitive $CH_4$ emissions** from the gas network are low but leaks do occur. The renovation of the gas network by Gaz de France is estimated to save 0.64 Tg $CO_2$ equivalent per year by 2010.

## B. Residential and commercial sector

50. The share of the residential and commercial sector in GHG emissions is about 20 per cent. Nearly all GHG emissions come from combustion of fuels for space and water heating. Key GHG mitigation measures are shown in table 7.

**Table 7. Key measures in the residential and commercial sector (Tg $CO_2$ equivalent per year)**

| Existing measures[a] | Estimated GHG reductions by 2010[b] | Supplementary measures[a] | Estimated GHG reductions by 2010[b] |
|---|---|---|---|
| Financial incentives for upgrading existing buildings | 3.7 | Effect of energy tax in housing | 2.2 |
| Use of wood in construction | 2.6 | Effect of energy tax in services | 1.4 |
| Thermal regulation for new buildings | 1.5 | Improved electric devices (European regulation) | 1.3 |
| Improvements in public buildings | 0.7 | Regulations on thermal isolation in existing (recent) buildings | 1.1 |
| | | Technical standardization | 0.85 |

[a] As noted, the NC3 uses a different terminology than the UNFCCC guidelines. The meaning of "existing measures" in the NC3 is close to the combination of "implemented" and "adopted measures" as defined in the UNFCCC guidelines. "Supplementary" measures are close to "planned" measures.

[b] The estimated emission reductions are the reductions in annual GHG emissions in comparison with the PLNCC reference scenario; these estimates are made for the year 2010.

51. Since the first oil crisis in 1973–1974, France has implemented various policies for energy management in buildings. For **new residential housing**, mandatory heat insulation requirements were first applied in 1975 and then gradually strengthened to cover thermal efficiency, heating equipment and hot water. This halved the average specific energy consumption in new houses. As reinforcement under the PNLCC, a new thermal regulation entered into force in 2001. It specifies an increase of 15 per cent in energy efficiency for residential houses as compared to the previous 1989 regulation and a 40 per cent increase for non-residential buildings. The implementation will be monitored every five years and the target will be increased by 10 per cent every five years. The estimated effect amounts to 1.5 Tg $CO_2$ equivalent per year by 2010.

52. With the introduction of the new thermal regulation, technical standardization work, support for a labelling policy, and life cycle analyses were undertaken in order to improve the technical quality of available building products. Improvement of **technical standardization** (for example, new norms for the design of windows) and enhanced regulations on building components are estimated to save 0.85 Tg $CO_2$ equivalent per year by 2010.

53. About three quarters of residential houses and two thirds of heated service sector premises were built before the first thermal regulations came into force in 1975. Various policies to encourage energy efficiency investments in **existing buildings** have resulted in a 10–20 per cent reduction in heat consumption. In 1999 the government lowered the VAT rate for all works of improvement and renovation in recent (up to 2 years old) existing housing units or buildings. A new tax rebate was introduced to support installation of equipment subject to a normal VAT rate for renovation of existing housing buildings. For main residence of all ages this tax rebate was extended to support the use of insulation materials, renewable energy and monitoring equipment. For enterprises, a special depreciation rule for a twelve-month period for energy saving equipment was allowed.

54. The intention to promote the **use of timber in construction** and thus to enhance carbon storage gave rise to the "Construction–Environment–Timber Charter" signed by professionals and the government. Its objective is to increase the use of timber in construction by 25 per cent by 2010.

55. Work to formulate regulations on **energy efficiency of household electrical appliances** started in 1992 at the European level. These regulations, developed as EC directives, are integrated into French law. They shall raise consumer awareness on energy consumption and help remove least efficient appliances from the market. During its presidency of the EC, France made the development of a framework directive on energy efficiency standards one of the priorities. It is estimated that the promotion of such European regulations would save 1.3 Tg $CO_2$ equivalent per year by 2010.

56. The promotion of **solar-powered water heaters** in the DOM–TOMs was launched in 1996. The aim was to install 20,000 subsidized solar water heaters in five years. The target had already been exceeded by 1999. For mainland France, HELIOS 2006 was designed as a large-scale version of the programme in the DOM–TOMs. The aim is to install 15,000 solar-powered water heaters and 500 direct solar platforms per year by 2006, leading to a saving of 0.04 Tg $CO_2$ equivalent per year by 2010. The implementation of HELIOS 2006 started in 2000 and by end of 2001, 185 pre-feasibility studies had been carried out and 690 solar-powered water heaters had been installed.

## C. Transport

57. The transport sector accounts for some 26 per cent of GHG emissions, with road transport being the largest emission source. Control of the emission growth in the transport sector is therefore the PNLCC's greatest challenge. Key mitigation measures are shown in table 8.

**Table 8. Key measures in transport (Tg $CO_2$ equivalent per year)**

| Existing measures[a] | Estimated GHG reductions by 2010[b] | Supplementary measures[a] | Estimated GHG reductions by 2010[b] |
|---|---|---|---|
| Agreement with the European Automobile Manufacturers Association (ACEA) and other voluntary agreements | 10.3 | Internalization of carbon cost | 3.7 |
| | | Intercity infrastructure | 3.7 |
| | | Recovery of the diesel tax | 2.7 |
| | | Local traffic infrastructures | 1.5 |
| Inspections for light trucks | 3.1 | Speed control for heavy trucks | 0.8 |
| Modal shift in freight transport | 3.3 | Modal shift in transport | 0.7 |
| Development of urban transport | 2.6 | Development of public transport | 0.55 |
| Inspections for heavy trucks | 1.5 | Use of alternative vehicles | 0.4 |
| Use of alternative vehicles | 1.1 | Use of electricity in rail transport | 0.4 |
| Use of high-speed trains | 0.6 | | |

[a] As noted, the NC3 uses a different terminology than the UNFCCC guidelines. The meaning of "existing measures" in the NC3 is close to the combination of "implemented" and "adopted measures" as defined in the UNFCCC guidelines. "Supplementary" measures are close to "planned" measures.

[b] The estimated emission reductions are the reductions in annual GHG emissions in comparison with the PLNCC reference scenario; these estimates are made for the year 2010.

58. France advocates **harmonization within the EC** in preference to isolated domestic policies, especially regarding carbon taxation. In September 2000, a considerable increase in oil price resulted in the implementation of a "floating" Inland Duty on Oil Products (TIPP) and the suspension of the annual increase of €0.01 in the tax on diesel fuel. At the end of 2000 the government decided to suspend the **introduction of carbon taxation**. In response to public pressure, the annual tax on car owners (vignette), a measure existing since the 1950s, was also removed in 2000. This creates uncertainty about the implementation of fiscal measures that account for a large part of planned emission reductions.

59. The earlier voluntary programme with French car manufacturers was replaced by an agreement between the EC and the European Automobile Manufacturers Association (ACEA) signed in 1998. $CO_2$

emissions from new cars shall decrease from about 186 g/km in 1995 to 140 g/km by 2008.[17] The **ACEA agreement** should reduce $CO_2$ emissions in France by 10 Tg $CO_2$ equivalent per year by 2010.

60. To promote structural changes in transport, the 1996 law on air and rational energy use made it compulsory for cities with a population of more than 100,000 to draft **urban transport plans** (UTPs). By mid-2001 about 40 such UTPs had been approved – more than a half of those required. ADEME finances preliminary studies for UTPs and the government releases €76 million per year to support implementation of UTPs. Another €76 million have been set aside for tramway projects. The effect of such measures is estimated as 2.6 Tg $CO_2$ equivalent per year by 2010.

61. The increase in inter-city passenger road traffic (4.6 per cent per year), and the strong growth in national air traffic (6–7 per cent per year since 1995) and even more so in international traffic, led to reinforced action in **regional public transport**. The first high-speed train line (TGV) was opened in 1981. By 1991, a plan for 4,700 km of new TGV lines was prepared (1,260 km were operational by 1995). By 2010, the diversion of air and road passengers to high-speed trains should save about 0.6 Mt $CO_2$ annually.

62. **Freight transport** by road (in tonne-km) increased by 34 per cent between 1985 and 2000, and it is estimated to double between 1996 and 2020, unless measures are taken. In the absence of a concerted EC action, the Ministry of Transport is developing a plan to double freight transport between 2001 and 2010. As an experiment, a rail expressway will be built between Lyon and Turin in 2002, with a complete service from 2005. Freight transport by water is encouraged. It had been decreasing from 1985 to 1997, but has increased by about 30 per cent from 1997 to 2000.

63. Fiscal and other measures were implemented to promote **electricity-powered and other alternative vehicles** under the 1996 Law on Air. But the objectives were not reached by 2000. PNLCC reinforces research and development on such vehicles (the estimated effect is 1.5 Tg $CO_2$ equivalent per year by 2010).

64. The NC3 notes that in 2000, for the first time since 1974, a slight decrease in $CO_2$ emissions from transport was observed in comparison with 1999. The review team attempted to analyse the key drivers for transport emissions (table 9).

65. Table 9 shows (lines 2 and 3) that both the passenger and the freight transport increased in 2000. However, a notable shift from gasoline to diesel fuel occurred in 1990–2000, for both passenger and freight transport (lines 4–12). As specific emissions (per passenger-km or tonne-km) of diesel-fuelled cars are lower, this shift might be one of the reasons behind the emission decrease from 1999 to 2000. Some increase in the fuel efficiency of cars also must have contributed to the shown emission decrease. The expert team felt that further analysis of the reasons might provide useful feedback for relevant policy-making. The role of the difference in taxation between gasoline and diesel fuel could be investigated as well as implications for the non-$CO_2$ pollutants (such as particulate emissions).

[17] "$CO_2$ Emissions from Cars: the EU Implementing the Kyoto Protocol", document 14 CR-17-98-540-EN-C, Office for Official Publications of the European Communities, L-2985 Luxembourg (1998).

**Table 9. Drivers for $CO_2$ emissions from road transport**

| Parameter | | 1990 | 1999 | 2000 | Change[a] (%) |
|---|---|---|---|---|---|
| 1 | **$CO_2$ from road transport (Tg)** | 111.4 | 128.8 | 128.5 | –0.3 |
| 2 | Road transport (billion passenger-km) | 585.6 | 699.6 | 705.2 | 0.8 |
| 3 | Freight transport by road (billion tonne-km) | 138.1 | 182.5 | 184.7 | 1.2 |
| 4 | Number of private gasoline cars (million) | 19.8 | 18.2 | 18.2 | –0.3 |
| 5 | Number of private diesel cars (million) | 3.5 | 8.9 | 9.6 | 7.7 |
| 6 | Number of gasoline light duty trucks (million) | 2.3 | 1.4 | 1.3 | –4.2 |
| 7 | Number of diesel light duty trucks (million) | 1.9 | 3.6 | 3.8 | 5.0 |
| 8 | Number of heavy duty trucks (million) | 0.5 | 0.6 | 0.6 | 0.8 |
| | **Fuel consumption for road transport (1000 TJ)** | | | | |
| 9 | Gasoline | | 645.5 | 615.2 | –4.7 |
| 10 | Diesel fuel | | 1085.3 | 1108.2 | 2.1 |
| | **$CO_2$ emissions from road transport by fuel (Tg)** | | | | |
| 11 | Gasoline | | 46.7 | 44.5 | –4.7 |
| 12 | Diesel fuel | | 81.4 | 83.2 | 2.2 |

[a] The change is calculated as: [(2000 – 1999)/1999] x 100.

## D. Industry

66. Industry accounts for some 21 per cent of GHG emissions. The largest share is $CO_2$ (76 per cent), but $N_2O$ is also important (20 per cent). Key mitigation measures are shown in table 10.

**Table 10. Key measures in industry (Tg $CO_2$ equivalent per year)**

| Existing measures[a] | Estimated GHG reductions by 2010[b] | Supplementary measures[a] | Estimated GHG reductions by 2010[b] |
|---|---|---|---|
| Voluntary agreements on $CO_2$, HFCs, PFCs, $SF_6$ | 4.4 | Energy tax | 7.3 |
| Regulation of $N_2O$ emissions | 22.9 | Various HFC measures | 5.2 |
| Energy efficiency grants from ADEME | 0.4 | Reinforced $N_2O$ regulation | 1.8 |
| | | Regulation of PFCs in aluminium industry | 1.8 |
| | | Reinforced $N_2O$ tax | 1.0 |

[a] As noted, the NC3 uses a different terminology than the UNFCCC guidelines. The meaning of "existing measures" in the NC3 is close to the combination of "implemented" and "adopted measures" as defined in the UNFCCC guidelines. "Supplementary" measures are close to "planned" measures.

[b] The estimated emission reductions are the reductions in annual GHG emissions in comparison with the PLNCC reference scenario; these estimates are made for the year 2010.

67. The emissions come mostly from a small number of energy-intensive industries. As a result of numerous improvements, industry succeeded in **decoupling the GHG emissions from the production output**. From 1990 to 1998, the industrial value-added output increased by 16 per cent while emissions fell by 10 per cent. Given the progress already achieved and the potential impact of further measures on competitiveness, the government put emphasis on harmonized EC policies.

68. During 1996–1997, five companies/sectors (aluminium, steel, lime, cement and glass) signed **voluntary agreements** to reduce their $CO_2$ emissions per unit of production by 5–19 per cent by 2000, compared to 1990 levels. In addition, an aluminium producer voluntarily agreed to reduce its emissions of carbon tetrafluoride, a PFC, by 73 per cent over this period. The voluntary targets have been mostly met. However, as the effectiveness of such agreements for reducing emissions appears not quite satisfactory, new similar agreements are not foreseen under the PNLCC.[18]

69. The PNLCC proposed an energy tax for the industry sector. But, as already noted, the government was forced to suspend the implementation of fiscal measures. In view of the upcoming market of tradable permits in 2005, the government is now encouraging industrial players to sign agreements in order to take part in experiments at the national level, starting possibly in 2003.

[18] Exceptions are possible if there are annual reduction objectives, an inspection plan and non-compliance sanctions.

70. Regulations are in place to reduce **emissions of $N_2O$, especially from chemical industry**. These emissions are currently also subject to a tax under the General Tax on Polluting Activities (TGAP), amounting to €0.125 per tonne $CO_2$ equivalent. These measures have led to emissions being reduced from 27.8 Tg $CO_2$ equivalent in 1990 to 11 Tg $CO_2$ equivalent in 1999, which played the key role in the overall stabilization of GHG emissions in France in the 1990s. In order to achieve further reduction of 1 Tg $CO_2$ equivalent, the corresponding TGAP should be increased. The cost is estimated at €1.1 per tonne of $CO_2$ equivalent avoided.

71. With regard to **HFCs, PFCs and $SF_6$** (4 per cent of industrial GHG emissions), a new strategy has been defined which requires annual declaration of all polluting emissions from classified installations. The requirement was established by the European Registry of Pollutant Emissions. Recommended measures include voluntary agreements and regulations for limiting $SF_6$ used in magnesium foundries, PFCs used in the production of first fusion aluminium, $SF_6$ and PFCs used in electrical equipment, and HFCs used in aerosols. Such measures should reduce emissions by about 7 Tg $CO_2$ equivalent per year by 2010.

## E. Agriculture

72. Agriculture accounts for about 16 per cent of GHG emissions. The key gases are $CH_4$ and $N_2O$. $N_2O$ emissions from agricultural soils account for about 9 per cent of the total GHG emissions.[19]

73. The main sources of **$CH_4$ emissions** in agriculture are enteric fermentation of ruminant livestock and anaerobic fermentation of animal manure. The French experts noted the emphasis being placed on research in the area because knowledge about these emissions is limited. However, technical solutions do exist to limit $CH_4$ and $N_2O$ emissions from the handling of manure. The Ministry of Agriculture and Fishing plans to review such technologies and come up with policy recommendations in 2002. The estimated effect is 0.9 Tg $CO_2$ equivalent per year by 2010.

74. The use of fertilizers leading to **$N_2O$ emissions** is mainly controlled through regulation, information, and increasing awareness. Biological farming without fertilization is not considered a policy option. For the future, the PNLCC is considering introducing a tax to discourage excessive application of fertilizers, together with promoting research on options to reduce $N_2O$ emissions from soils. The expected effect of these measures is 1.3 Tg $CO_2$ equivalent per year by 2010.

75. The review team had the general impression that, despite the large share of agricultural emissions, only a few measures on GHG mitigation are being applied in agriculture. Nevertheless, GHG emissions from agriculture decreased by 4.3 per cent between 1990 and 1999. This may have been due to the decrease in agricultural land (–2.4 per cent) and cattle numbers (–7.2 per cent) in the 1990s. The agricultural policy of the EC played a role in GHG reductions, in particular with respect to a reduction of cattle numbers and an increase of fallows (which involves a decrease in the use of synthetic fertilizers).

## F. Land use and forestry

76. In 1999, removals by sinks amounted to some 11 per cent of the GHG emissions. According to NC3, the sinks have increased by 19 per cent between 1990 and 1999, but the 1999 data need to be revised because storms in 1999 had a severe impact on forests.

77. Before 1999, there existed a project to promote (through grants) afforestation to reach an annual rate of 30,000 ha by 2006. The 1999 storms led to a reconsideration of this policy. A new National Plan for French Forests stipulates measures to replenish the damaged 300,000 ha of forest over 10 years.

---

[19] According to the analysis of key emission sources in the GHG inventory (see section II), $N_2O$ emissions from agricultural soils are the third largest single GHG emission in France.

Therefore, the funds for afforestation were reduced in favour of forest restoration and the planned afforestation rate was reconsidered to 20,000 ha per year by 2006. The initial target of 30,000 ha per year remains a long-term objective (to be re-evaluated in 2005).

### G. Waste

78. The share of waste in the total GHG emissions is small at about 4 per cent. These emissions increased between 1991 and 1996 but have been decreasing since 1996, resulting in the emissions in 1999 being almost 5 per cent lower than in 1990 (table 3). This trend is a result of two major policy measures: the law on wastes of 13 July 1992 and the decree of 9 September 1997.

79. The law of 1992 aimed to prevent the production of waste and to ban the discharge of biodegradable waste in landfills from 2002 on. Following the adoption of the law, several incineration facilities were commissioned. Uncontrolled landfill sites were closed. Technical criteria for $CH_4$ emissions recovery were set up and the decree of 1997 facilitated substantial increases in methane capture from landfill sites. Because of the growing amount of the wastes generated, the amount of the wastes landfilled remained at the same level in the 1990s, but the $CH_4$ emissions decreased substantially due to the measures taken.

80. For the future, it is considered important to put effort on the upstream of the waste treatment system (prevention, recycling, etc.), to reduce the rate of anaerobic degradation of waste and to promote energy recovery from landfill gas and waste incineration. Therefore, the PNLCC encourages recycling and specifies new regulatory measures. For example, the capture of methane in waste dumps shall be increased from 60 per cent (the target of 2000) to 80 per cent in order to mitigate 4.1 Tg $CO_2$ equivalent per year by 2010.

## IV. PROJECTIONS AND THE TOTAL EFFECT OF POLICIES AND MEASURES

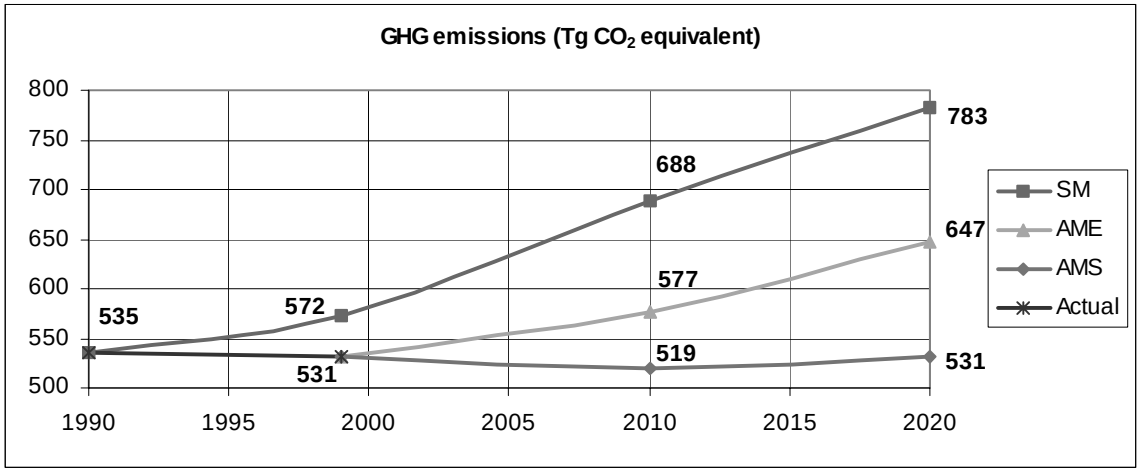
81. NC3 contains a complete set of projections for all GHGs to 2020, which represents a major improvement in comparison with NC2 (where only $CO_2$, $CH_4$ and $N_2O$ were projected). The NC3 projections were developed by two specialized organizations: ENERDATA prepared energy demand projections, energy supply balances, and initial estimates of $CO_2$ emissions from the energy sector; and CITEPA finalized the estimates of $CO_2$ emissions from energy and calculated all other emissions. The structure of emission sources and the GHGs covered in the projections are the same as in the GHG inventory, i.e., emissions of $CO_2$, $CH_4$, $N_2O$, HFCs, PFCs, and $SF_6$ are projected, for each gas specifically. Energy demand was projected with MEDEE – a bottom-up model that takes as input assumptions about main economic and social parameters as well as expected technological development. Economic assumptions used in MEDEE are supported by calculations from the DIVA macro-economic model. In projecting energy supply, ENERDATA used contributions prepared by Electricité de France to the earlier energy projections exercise in 1998. For waste, agriculture and forestry the projections rely on expert opinion.

### A. Scenario definitions and key assumptions

82. The projections, prepared for 2010 and 2020 outline three scenarios: no policies (“sans mesures“ – SM); with existing measures (“avec mesures existants“ – AME); and with additional measures (“avec mesures supplémentaires“ – AMS) (figure 4). The scenarios differ, first of all in the type and number of included GHG mitigation measures; SM is an imaginary scenario assuming that no GHG mitigation measures had been implemented since 1990; the AME scenario includes the measures implemented since 1990 (this scenario is consistent with the actual development in 1990–1999; the 1999 emissions are as in the 1999 GHG inventory); the third scenario (AMS) includes supplementary measures for GHG mitigation formulated in PNLCC. The base year for modelling is 1990.

83. Most of the other key assumptions are common for the three scenarios, such as the average GDP growth of 2.3 per cent per year and population growth from the assumed 59.4 million in 2000 (for the mainland France) to 63.5 million in 2020. The price of crude oil is assumed to remain stable but the price of imported gas would increase by about 40 per cent from 2000 to 2010. The French nuclear power units are assumed to operate for at least 40 years, so that nuclear generation remains constant until 2020.

**Figure 4. Projections of the total GHG emissions (without LUCF) by scenario**




*Note*: NC3 projections were made for mainland France only. Therefore, this figure and figures 5 and 6 do not take into account GHG emissions in DOM–TOMs. As a result, the 1990 and 1999 emissions differ from the inventory data that include DOM-TOMs. The French experts estimate that the emissions from DOM–TOMs would be about 17 Tg $CO_2$ equivalent per year by 2010.

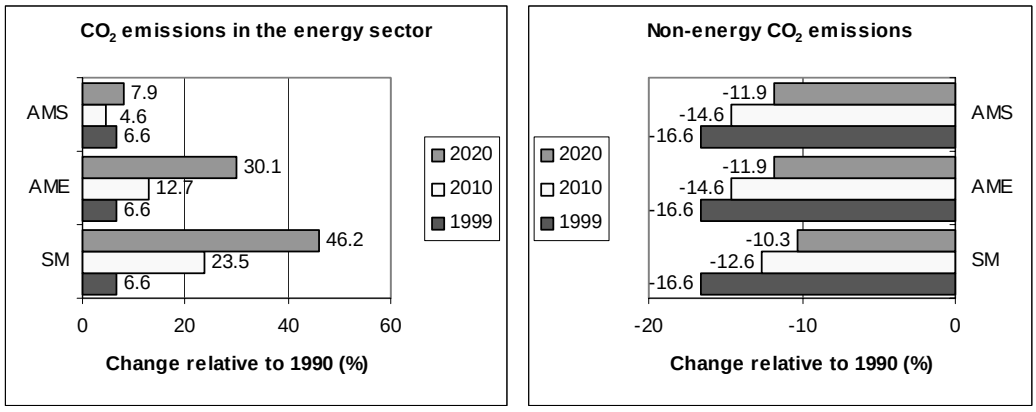
## B. Projected emission trends

84. The existing mitigation measures have slowed emission growth in the past few years (figure 4). However, without new measures GHG emissions in 2010 would exceed the 1990 level by almost 8 per cent. Stabilization requires considerable additional policy action that is reflected in the difference between AME and AMS.

85. The SM (no measures) scenario demonstrates extraordinarily high emissions growth compared to historical trends. The large difference between the SM and AME scenarios shows the estimated emission reductions from the mitigation measures implemented from 1990 to 1999. The difference between AME and AMS shows the estimated aggregated impact of the additional policy measures identified in PNLCC.

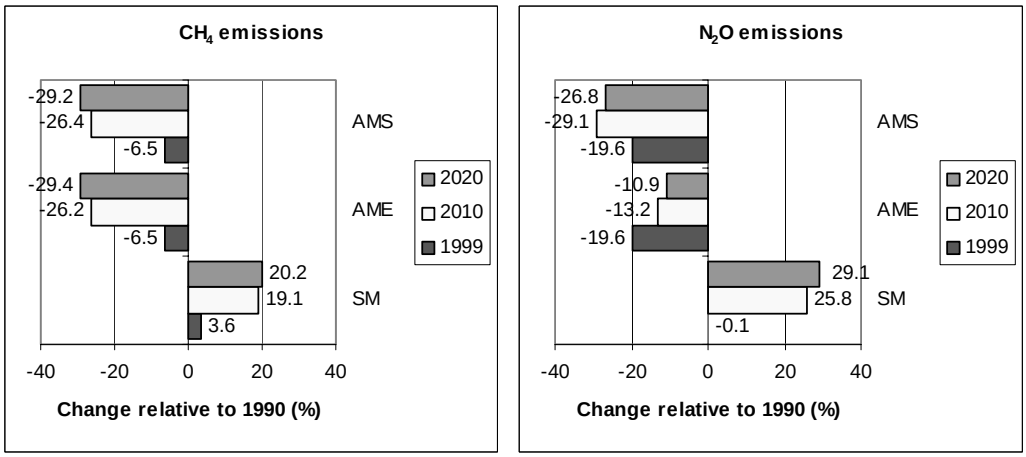
86. **$CO_2$ emissions from the energy sector** have increased by about 7 per cent in the past nine years, and under the AME scenario growth is expected to accelerate (figure 5).

**Figure 5. Projections of $CO_2$ emissions**




87. **$CO_2$ process (or non-energy) emissions**, in contrast, have fallen drastically since 1990, mostly due to closings of cement production plants. This decline is projected to continue from 1999 to 2010.

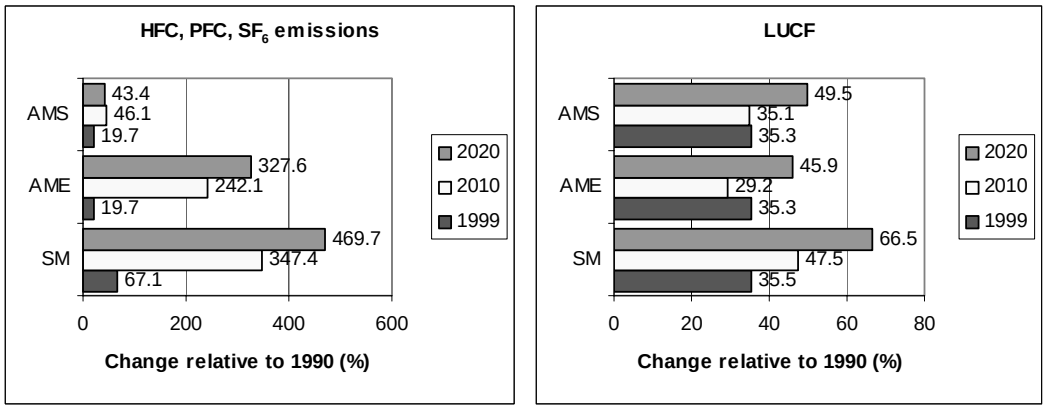
**Figure 6. Projections of $CH_4$ and $N_2O$ emissions**




88. The **$CH_4$ and $N_2O$ emissions** also declined between 1990 and 1999 due to implemented voluntary agreements with industries, more stringent $N_2O$ regulations, changes in the waste policy, and a decline in livestock numbers in France. As figure 6 shows, $CH_4$ emissions would continue to decrease similarly for both AME and AMS, indicating that supplementary measures in PNLCC deal only marginally with this gas. For $N_2O$, the emissions would start increasing (AME), unless the PNLCC supplementary measures are implemented (AMS).

89. Considerable growth in **HFCs, PFCs, and $SF_6$ emissions** (figure 7) could be alleviated by supplementary measures (in AMS), but not stopped. For **LUCF**, the projections for 2010 reflect the policy of promoting afforestation, which results in increasing sinks.

**Figure 7. Projections for HFC, PFC, $SF_6$ emissions and removals by LUCF**




## C. Effects of policies and measures

90. The NC3 makes an evaluation of GHG reductions based on projection results. The review team made an additional comparison of the efficiency of the implemented and planned measures (table 11).

91. Table 11 shows a remarkable change in the direction of GHG mitigation. Whereas practically all reductions in 1990–1999 were achieved with $CH_4$ and $N_2O$ from industry and waste, new mitigation measures deal increasingly with $CO_2$ emissions from the energy sector (including transport).

**Table 11. Achieved and projected mitigation effects**

| | | Differences in annual emissions between scenarios (Tg $CO_2$ equivalent) | | |
|---|---|---|---|---|
| **Sector / sub-sector** | **Gas** | **1999/97 to 1990 (AME vs. SM)** | **2010 to 1999/97 (AMS vs. AME)** | **2020 to 1999/97 (AMS vs. AME)** |
| Energy / transport | $CO_2$ | 0 | 7 | 28 |
| Energy / non-transport | $CO_2$ | 0 | 11 | 35 |
| | $CH_4$ | 0 | –1 | –1 |
| | $N_2O$ | 0 | 1 | 1 |
| Industries | $N_2O$ | 17.3 | 11.3 | 11.4 |
| | HFCs, PFCs, $SF_6$ | 3.6 | 15.0 | 21.6 |
| Agriculture | $CH_4$ | 0 | 0.9 | 0 |
| | $N_2O$ | 0 | 1.8 | 1.8 |
| Waste | $CH_4$ | 6.4 | 0 | 0 |
| **Total GHG[a]:** | | **27.3** | **47.0** | **97.8** |

*Note*: The table is based not only on NC3 data but also on information obtained during the country visit.

[a] The GHG total is not quite consistent for two reasons. First, for the energy sector the available information allows comparison only with 1997 and not with 1999. Second, this table does not cover some emissions (because of the lack of detailed information in NC3). Nevertheless, the shown trends are considered credible.

92. Industry would contribute about 50 per cent to the reductions between 1999 and 2010. For the period from 1999 to 2020, two thirds of the reductions are in the energy sector (one third in transport). The small effects in agriculture and waste management, shown in table 11, mean that there are only a few new policy measures in addition to those already in force.

## D. Overall evaluation of the projections

93. The projections in NC3 show a considerable improvement over NC2. Comprehensive coverage of the GHGs (only $CO_2$, $CH_4$, and $N_2O$ were covered in NC2) and a more sophisticated assessment of the future trends, with the addition of a second "with policy" scenario, are to be noted in particular. The French GHG projections are built on a solid understanding of the technical potential for change in various energy end-use sectors. Importantly, the projections are consistent with the inventories and are prepared to serve as a tool to validate the overall effect of mitigation measures.

94. At the same time, the team identified the following elements that may require improvement in the future: projection of energy supply, assessment of the cost-effectiveness of GHG mitigation measures, analysis of nuclear alternatives, preparation of emission projections for DOM–TOMs, interaction between energy prices and energy demand, and estimates of emissions from agriculture and waste.

95. ***Projection of energy supply***. The NC3 describes the model used for the projection of energy demand (MEDEE) but the models used for the projection of energy supply are not described. During the country visit, the French experts explained the approach used for the supply side. Importantly, an optimal electricity generation mix was taken from a study made by the main electricity supplier, Electricité de France. The demand not covered by Electricité de France is assumed to be covered by other generators as evaluated by CITEPA. The review team questioned this approach in that the main supplier's view may not reflect adequately the development of alternative generators in a liberalized power market.

96. ***Cost-effectiveness of GHG mitigation measures***. Information is missing on the projected macro-economic costs of scenarios and on the cost-effectiveness of the various packages of GHG mitigation measures. It is thus not possible to see where GHG mitigation could be provided at lowest cost.

97. ***Analysis of nuclear alternatives***. In NC3, the French nuclear units are assumed to operate for at least 40 years. The review team noted that this assumption was not the only one possible. As the French experts indicated during the review visit, studies show that the impact of assumptions on nuclear lifetime on GHG emissions may be considerable (13–25 Tg $CO_2$ equivalent per year by 2020).

98. ***Emission projections for DOM–TOMs***. For mainland France, the projections were prepared on the basis of extensive modelling. The emissions in DOM–TOMs were estimated less rigorously.

99. ***Interaction between energy prices and energy demand.*** MEDEE is a comprehensive bottom-up model. But models of that type may not contain sufficient means to account for some feedbacks. An impact of, for example, a decreasing electricity price (e.g., due to deregulation) on electricity demand cannot be modelled. It is also unclear how the assumed technical improvements correspond to changes in the cost of energy, or to the amount of emissions, or to policy actions.[20] To capture such impacts, top-down econometric demand models could be used in addition to MEDEE.

100. ***Emissions from agriculture and waste.*** The review team had the impression that emissions from agriculture and wastes were estimated only roughly, mainly because the key drivers (such as the type and amount of waste) had to be assumed largely by expert judgement. The French experts indicated that they were considering gathering data and building new modelling tools for these sectors.

101. Improvements could also be achieved by extending the summary of key assumptions for the scenarios and by paying more attention to the drivers behind the projected trends, in addition to describing the trends. Sensitivity analysis for changes in key parameters could be considered. Information on emissions from the international marine and air bunkers is missing in the NC3.

102. ***Comparison with the previous projections*** (from the NC2) was not provided in the NC3, although the UNFCCC guidelines require it (paragraph 45). The review team compared these projections and found that the scenario "without measures" had not changed much, which confirms consistency between the NC2 and the NC3 in this respect. The actual development from 1990 to 1999 was slightly different than the "with measures" scenario in the NC2: the NC2 projected a small decrease instead of the actual stabilization.

---

[20] Some assessment of such factors is made in MEDEE with the "budgetary coefficients".

103. The review team noted that the French Government had recently reviewed its progress in GHG modelling, formulated its own recommendations for improving GHG projections and planned to implement these recommendations in the next national communication.[21] Some of these recommendations are similar to the findings of the in-depth review team.

## V. VULNERABILITY ASSESSMENT, CLIMATE CHANGE IMPACTS AND ADAPTATION MEASURES

104. The coverage of issues of vulnerability and adaptation (VA) in NC3 corresponds to the UNFCCC guidelines and is much more comprehensive than in NC2. VA assessment is under the responsibility of the Ministry of Territorial Development and the Environment (MATE) and Meteo-France.

105. The storms of 1999 highlighted France's **vulnerability to natural disasters**. Most vulnerable are DOM–TOMs (vulnerable to storms and floods), the coastal area in the south (storms and floods), the northern part of France (storms), and the mountains (snow avalanches and decreases in snow availability). Given the particular vulnerability of DOM–TOMs, the team expressed the view that special consideration of their VA might be useful in the future.

106. The NC3 shows results of **climate change modelling** for France in the 20th century. The average minimum daily temperatures in France increased by about 1ºC (uniformly over the French territory). The maximum daily temperatures increased by 0.6ºC. This increase is especially pronounced in the south. However, the available studies do not yet allow a quantitative link to be established in France between climate change and related impacts such as increased floods and decreased snow availability.

107. **Socio-economic impacts of climate change** are not known well. The exceptions are estimates of economic damage resulting from the recent storms (done by insurance companies) and evaluation of economic consequences of decrease in the amount of snow at medium altitude skiing stations.

108. France does not have a special programme for **adaptation to climate change**. Developing such a programme is apparently considered to be premature, given the absence of sufficient knowledge to separate the effects of climate change from events occurring naturally. But France has laws and related plans dealing with natural disasters. For example, about 5,000 sites in France are identified as "vulnerable zones"; 3,000 of them already have procedures in place taking into account a high probability of natural disasters. In DOM–TOMs, there are procedures to measure cyclone activities, flooding and earth slides, notably in French Guyana and Polynesia.

109. **Cooperation with non-Annex I Parties** is not covered in the VA chapter of NC3. During the review visit French experts mentioned programmes in the Institute for Research and Development and a project on water resources in West African countries. The review team commented that there were also national VA studies in these countries described in their national communications.

## VI. FINANCIAL RESOURCES AND TRANSFER OF TECHNOLOGY

110. The chapter on technology transfer in NC3 is more comprehensive than the one in NC2. However, the review team noticed that the "new and additional financial resources…" (article 4.3 of the UNFCCC) were not mentioned. The French experts clarified that French contributions to the Global Environmental Facility (GEF) and the French Global Environmental Facility (see below) are additional climate-related funding. Technology transfer and capacity-building are not considered explicitly, although the review team understood that they were part of the projects implemented with the funding described in NC3.

---

[21] Giraud, Pierre-Noël, N. J. Fleury, A.A. Le Kama and C. Vilmart "Effet de serre: modélisation économique et décision publique", Commissariat Général du Plan, Rapport du groupe présidé par Pierre-Noël Giraud, Paris, 2002.

111. French development assistance is administered by the French Development Agency and other organizations such as the French Global Environmental Facility (FFEM – Fond français pour l'environnement mondial), the Center for International Co-operation in Agricultural Research (CIRAD) and Research Institute for Development.

112. In 2000, France ranked as the fifth largest aid donor in the world. As a proportion to GDP, the **French Official Development Assistance** (ODA) decreased from 0.55 per cent in 1995 (€8.4 billion) to 0.32 per cent in 2000 (€4.5 billion). The decline was due to a decrease in trade agreements with some developing countries, the official assistance being linked to these agreements. France is de-linking the ODA and trade agreements, which is expected to increase the funding for aid relative to GDP. France remains committed to achieving 0.7 per cent of GDP for ODA in the future.

113. France contributed US$ 144 million to the **Global Environment Facility** (GEF) for its second replenishment (1999 to 2002). This is in line with the previous French contributions to the GEF (US$ 150 million for the pilot phase from 1991 to 1994 and US$ 143 million for the first replenishment).

114. **FFEM** was created in 1994 to complement GEF efforts and better accommodate French priorities in environmental aid. FFEM was provided with €67 million in 1995–1998 and replenished with €67 million for 1999–2002. Forty-eight of 100 current FFEM projects are related to climate change. Developing countries, particularly in Africa, are the main recipients of FFEM aid.

115. The NC3 provides one example of an international climate-related project of FFEM involving Brazil, Indonesia, Laos, Madagascar, Mali, Tunisia and Zimbabwe. The project, managed by CIRAD, aims at promoting ecological farming and carbon sequestration. The team appreciated it as a good project, but did not find enough information on the transferred technology, impacts on the net emissions, or the success factors. Examples of other projects could have made the provision of aid more transparent.

116. France allocated €1.53 billion in 1995 and €1.39 billion in 2000 to **multilateral development institutions**, mainly through the European Commission (€959 million), and the World Bank and regional development banks (€371 million). The contributions were stable from 1997 to 2000.

117. In 1998, **bilateral aid with relevance to climate change** amounted to US$ 70 million, the major part of the funds going to African countries. Of this amount, US$ 3.24 million (4.6 per cent) was provided to least-developed countries. Bilateral assistance projects seem to be mostly sectoral, with the energy sector receiving about 80 per cent of the funding.

118. For **scientific cooperation**, the NC3 describes mostly the French institutions that have taken action overseas. Climate change is an important and growing part of scientific cooperation. However, the kind of scientific cooperation and the related capacity-building are not shown in NC3.

119. In contrast with the NC2, **cooperation with countries with economies in transition** (EIT) is not discussed in the NC3. Such cooperation exists, as funding for the European Bank for Reconstruction and Development (EBRD) and the FFEM funding portfolio indicate, but the projects do not relate to energy or GHG emissions.

## VII. RESEARCH AND SYSTEMATIC OBSERVATION

120. The review team noted remarkable progress in the reporting on research and systematic observation compared to the NC2. The NC3 contains a comprehensive description of climate-related research in many organizations.

121. France has a **National Research Programme on Climate Dynamics**, which is an umbrella programme of 10 organizations including the Ministry of Research, Ministry of Environment and

Meteo-France. Another national programme, "Management and impacts of climate change", set up in 1999, provides support to PNLCC and to French participation in international negotiations on climate change. This programme links physical and human sciences in three temporal horizons, including the "post-Kyoto" period: 2010, 2030 and 2100. ADEME has a programme of **technological research on climate change**. It covers five topics: the carbon content of energy,[22] energy efficiency and demand management, GHGs in industries, $CO_2$ sequestration, and GHGs in agriculture and wastes. The review team noted the recent creation of a national observatory on the effects of global warming with the objective of facilitating coordination and information exchange in climate-related research.

122. Much of the climate research conducted in France involves close **cooperation at the European and international level**. However, the NC3 does not mention the French contribution to the IPCC, nor research and observation capacity-building in developing countries, although these are known to exist.

123. France supports a sophisticated and well-maintained **climate-observing network** (covering earth, atmosphere and ocean). French scientists participate in international collaboration in climate observation and modelling. The French contribution to observation is detailed in the first French report on the **Global Climate Observing System** (GCOS) recently submitted to the UNFCCC secretariat.

## VIII. EDUCATION, TRAINING AND PUBLIC AWARENESS

124. The NC2 did not have a chapter on education, training and public awareness. The NC3 showed a considerable improvement in reporting: it follows the UNFCCC guidelines and covers the subject comprehensively. Increasing public awareness in climate change is considered in France as an important part of climate-related policies.

125. Public awareness of climate change increased in France over the 1990s, in particular after the adoption of the Kyoto Protocol in 1997. The considerable economic damage from the storms in 1999 drew public attention to the possibility of severe economic consequences of climate change. An opinion poll in 1998 confirmed that climate change was acknowledged as a problem of national priority.

126. Raising the level of public awareness of climate change issues is an important part of MIES activities. There is cooperation with such agencies as ADEME and, to some extent, with NGOs. The work of MIES is well organized although the review team noticed some weaknesses that might be due to lack of resources. Different groups with their specific requirements are targeted: general public, territorial and business decision-makers, NGOs, and mass media.

127. At the level of the **general public**, MIES receives about 10 requests per day for climate-related information and responds by sending printed materials or with other assistance. The MIES web site, opened in 2000, helps to increase the availability of information (it records about 400 site hits per day). The review team considered this work important and suggested that MIES disseminate its programmes and public awareness materials more intensively in the French provinces (to local authorities and the general public) and in French-speaking countries.

128. For **territorial decision-makers** MIES organized a regional working group to contribute to PNLCC. The publication of a "Mémento de décideurs" with guidelines for actions at the regional level can be noted. For **business decision-makers**, meetings and information exchange are organized.

129. There is information exchange between MIES and NGOs, both **environmental NGOs** such as RAC (Réseau action climat), and **business NGOs** such as the French Association of Enterprises for the Environment. NGOs are active in raising public awareness – for example, two public information

[22] This topic covers projects aiming to promote use of fuels with lower carbon content (for example, by replacing coal with natural gas) and use of non-carbon energy sources (such as wind or solar energy).

campaigns were organized by RAC in 2000. The review team believes that cooperation of MIES with the NGOs could be strengthened (NGOs were not involved in the preparation of the NC3).

130. Climate change receives considerable attention from the **mass media**. However, an opinion poll in 2000 showed that the French public considers the quality of climate-related information insufficient. Work in this respect, such as presentation of findings of the Third Assessment Report of the IPCC or explanation of the Marrakech Accords in simple terms, could be intensified.

131. **Education programmes** in primary and secondary education cover, to some extent, the subject of climate change. But the review team noted that there were no programmes at the university level, although some initiatives exist. Training programmes in energy efficiency and environmental awareness, like those undertaken by ADEME, could be extended.

## IX. CONCLUSIONS

132. **The NC3 is a considerable improvement in comparison with the NC2**. It follows the UNFCCC guidelines and is, in general, well prepared. The most notable improvements are: full coverage of GHG gases in the inventories and the projections, comprehensive representation of policies and measures, three projected emission scenarios (instead of two in the NC2), and a new chapter on education, training and public awareness.

133. The review team identified some **areas for further improvement**: methodology of the modelling of energy supply, evaluation and reporting of the costs of GHG mitigation measures, coverage of issues relating to DOM–TOMs, and some others. The French experts indicated that additional UNFCCC guidance on the presentation of GHG inventories and on the evaluation and reporting of mitigation costs might be useful.

134. The French GHG emissions were stable during 1990s; the total GHG emissions in 2000 were 1.7 per cent lower than in 1990. Thus, according to information in the NC3 and the 2001 inventory submission, **by the year 2000, France has succeeded in returning its GHG emissions to their 1990 level as stipulated in Articles 4.2a and 4.2b of the UNFCCC**. The objective was met due to sizeable decreases in $CH_4$ and $N_2O$ emissions that outweighed some increase in $CO_2$ and HFC emissions. The emission decreases were most pronounced in industry (reductions in $N_2O$ emissions in the chemical industry in particular); road transport is the key contributor to emission increases. Increased electricity generation by nuclear units helped contain the growth of $CO_2$ emissions.

135. Organizational support of the climate change policy in France was considerably strengthened when MIES was placed under the authority of Prime Minister in 1998. MIES played a notable role in the achievement of GHG stabilization in the 1990s.

136. In 2000, the French Government approved a comprehensive **national programme to combat climate change:** Programme national de lutte contre le changement climatique (PNLCC). It identifies measures to stabilize, through domestic action, GHG emissions between 2008 and 2012 at the 1990 level, in accordance with the French commitment under the Kyoto Protocol and the EC burden-sharing agreement. The review team appreciated the comprehensiveness of the PNLCC and emphasized the importance of close follow-up of its implementation.

137. A qualitative change in the direction of GHG mitigation is envisaged in the PNLCC. Whereas practically all reductions of GHG emissions in the 1990s were achieved with $CH_4$ and $N_2O$, new mitigation measures deal increasingly with $CO_2$ emissions, including those from road transport.

138. NC3 projections show that **the existing GHG mitigation measures might not be sufficient to meet the Kyoto Protocol target**. Supplementary measures identified in the PNLCC, including

economic instruments and structural measures, may be required. The review team noted a delay in the implementation of some measures, in particular those of fiscal nature (the energy and carbon taxes).

139. The overseas parts of France (the so-called DOM–TOMs) account for a small portion of GHG emissions (about 2 per cent), but their emissions are growing faster than in the French mainland. Moreover, these territories are particularly vulnerable to the impacts of climate change. Climate-related problems of DOM–TOMs could be analysed in more detail in the future.

140. The storms of 1999 highlighted France's vulnerability to natural disasters. Most vulnerable are DOM–TOMs, the coastal area in the south, the northern part of France, and the mountains. France does not have a programme for adaptation to climate change but has procedures to deal with natural disasters.

141. Official development assistance by France decreased between 1995 and 2000: the NC2 reported the amount of foreign aid as 0.55 per cent of GDP (for 1995) and the NC3 reports 0.32 per cent (for 2000), which is higher than the OECD average of 0.22 per cent. There is an intention to increase the aid, with 0.7 per cent of GDP being the long-term objective.

142. Public awareness of climate change has increased in France during the 1990s, in particular after the adoption of the Kyoto Protocol in 1997. An opinion poll of 1998 confirmed that climate change is acknowledged as a problem of national priority.

- - - - -