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Report on the in-depth review of the second national communication
of the United States of America

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I. INTRODUCTION AND NATIONAL CIRCUMSTANCES

1. The secretariat received the second national communication of the United States of America under the UNFCCC on 11 August 1997. An in-depth review of the national communication was carried out between April and October 1998, including a visit from 20 to 24 April, 1998. The review team consisted of Dr. Carlos Gay (Mexico), Dr. Tamas Palvolgyi (Hungary), Mr. Elwyn Evans (United Kingdom of Great Britain and Northern Ireland), Ms. Jan Corfee-Morlot (Organisation for Economic Co-operation and Development), Mr. Robert Hornung (Consultant) and Dr. Katia Simeonova (UNFCCC secretariat, coordinator).
2. The climate policy of the United States was developed through a cooperative inter-agency process involving more than 20 agencies within the federal Government as well as several offices in the Executive Office of the President. This process was coordinated by the White House Task Force on Climate Change and key participants include the Department of State, Department of Energy (DOE), and the Environmental Protection Agency (EPA). The main documents, which outlined the climate change policy in the United States were *The Climate Change Action Plan* (CCAP), 1993 detailing the initial response to climate change, and subsequent first *U.S. Climate Action Report* (CAR1) and second *U.S. Climate Action Report* (CAR2) representing the formal United States communication under the UNFCCC.
3. The review team noted that the political and institutional systems of the United States made climate change policy-making complex and difficult. While the President's Administration cooperative inter-agency process can identify and develop actions to reduce greenhouse gas (GHG) emissions, funding for implementation often must be approved by the Congress. This process is further complicated by the fact that no single Congressional committee has oversight of the CCAP. Rather, responsibility is distributed among a large number of committees with diverse and competing policy mandates. Moreover, state and local governments control a number of policy levers that are important in efforts to reduce GHG emissions.
4. The Department of State was responsible for coordinating the production of both CAR1 and CAR2. Once comprehensive drafts had been prepared, the Department of State sent them to more than 30 government agencies and organizations for review. This review process generated significant discussion about a number of issues, including: the GHG emissions projection to be included in the submission, estimates of the effects of policies and measures, and text concerning future actions and approaches to climate change. Once agreement was reached, the CAR2 was passed to outside stakeholders for review and the final version was placed on the Internet.
5. The review team noted that the revised projections in the CAR2 indicated a more rapid growth of GHG emissions than had previously been thought as a result of both changes in the baseline emission trend and smaller effect of CCAP than initially expected. Changes in the baseline emissions were driven by higher than expected economic growth and lower than expected energy prices. Indeed, the United States' economy grew at an average annual rate of 3 per cent between 1960 and 1993. In 1993, however, economic expansion was consolidated,

producing moderate but sustainable growth of 2.5 to 3 percent per year over the mid-1990s. This growth in the economy, and the CAR2 projections of economic growth through the year 2000, were both higher than presented in the CAR1. Energy prices did not increase at the rate envisioned in the CAR1, and the CAR2 has projected that the growth rate in future energy prices will be significantly lower than previously estimated. The review team noted that lower levels of energy taxation in the United States already resulted in energy prices that were significantly lower than those found in virtually all other industrialized countries. Moreover, the CAR2 noted that gasoline prices actually fell in real terms between 1990 and 1994, and were therefore significantly below the price levels of the late 1970s and early 1980s.

6. As to the effect of CCAP, the team noted that it was smaller than expected primarily because the Congress provided only approximately 50 per cent of the funds requested by the Administration for the implementation of CCAP in 1995, 1996 and 1997. During the visit, the review team learned that this trend continued in fiscal year 1998, when the Congress provided funds equivalent to only 64 per cent of the Administration's request.

7. While the United States had never considered the stabilization "aim" in the UNFCCC to be a binding commitment, the Administration had established a domestic goal of stabilizing GHG emissions at 1990 levels by the year 2000. The review team noted that the United States indicated in the CAR2 that it will not succeed in its efforts to return its GHG emissions to 1990 levels by the year 2000. During the visit, the team was informed that climate change remained a priority of the Clinton Administration and that new efforts would be focused on the post-2000 period. It was also noted by the team that after the submission of CAR2 the Administration has proposed a number of initiatives targeted at GHG emissions reduction that reflect this new focus.

8. Up to now, the United States has relied heavily on voluntary instruments to reduce GHG emissions. While the proposed new initiatives do not alter this focus, they seek to enhance and facilitate voluntary action through the use of increased spending for research and development and the provision of financial incentives. The review team noted, however, that most of these initiatives have yet to be approved by the Congress. In addition, the United States has clearly indicated that the Kyoto Protocol's flexibility mechanisms, which are also voluntary in nature, will make a key contribution in the future to the United States' efforts to meet its international climate protection commitments in a cost-effective manner.

9. In the course of the in-depth review, the United States provided the review team with more detail on the contents of the CAR2 and helped to address concerns and questions raised by the team during the visit. Much had changed, however, since the CAR2 was completed, and the United States also provided the team with updated GHG emissions inventories, projections, and estimates of the effects of some measures, as well as information on the new initiatives launched by the Administration since July 1997.

II. INVENTORIES OF ANTHROPOGENIC EMISSIONS AND REMOVALS

10. The CAR2 presents an inventory for the period 1990-1995 with comprehensive coverage of sources and sinks and reflects extremely high quality data collection and input. With a few exceptions, the presentation of information is transparent and consistent with the 1995 Intergovernmental Panel on Climate Change (IPCC) reporting guidelines. While the United States generally respected the IPCC Guidelines in this area, the CAR2 was not accompanied by a document providing the detail required to fully assess or reconstruct the inventory. However, this information was provided to the review team in the course of its visit.

11. The EPA and the Energy Information Administration (EIA) coordinated the development of the United States' GHG inventory. A number of other government agencies (e.g. Department of Agriculture, Forest Service, Department of Transport) also contributed to inventory development. Drafts of the inventory were circulated amongst government agencies and stakeholders for comment and review before being finalized.

12. Most of the GHG inventory was calculated through the use of activity data drawn from official government statistics and emission factors developed within the United States in almost all cases. There was also direct on-site measurement of GHG emissions to assess both the level of emissions and emission factors. In a few cases, (e.g., hydrofluorocarbons(HFCs)) activity data were drawn directly from key industrial sources of emissions.

13. Base year (1990) inventory data presented in the CAR2 differed from those presented in the CAR1 as a result of improved emission factors, new global warming potential (GWP) values, and the inclusion of new emission sources. The United States believed that these changes produced a more accurate and comprehensive inventory. While the differences in base year data were small overall (about a 1 per cent increase in the CAR2), the changes were more significant for specific emission sources. In particular, estimates of methane (CH₄) emissions from pipelines nearly doubled as a result of a multi-year study conducted jointly by the EPA and the Gas Research Institute.

14. The methodologies used to estimate GHG emissions in the CAR2 respected the 1995 IPCC Guidelines. Energy-related emissions were calculated with an approach very close to the IPCC tier 1 method, although a more elaborate classification of fuels was used to reflect the specific circumstances of the United States. Emissions produced from transportation were calculated using a model with an approach similar to the IPCC tier 3 approach, with emissions allocated in a very detailed manner by vehicle type and transportation mode. Finally, for most other sources, the relevant IPCC methodology was used.

15. Bunker fuels were only referenced in a small footnote in the CAR2 that indicated that emissions from the combustion of these fuels were estimated to be 22 million metric tonnes of carbon equivalent (MMTCE) in 1995, 1.5 per cent of total energy-related carbon emissions. In the course of its visit, the review team learned that the United States, like many other countries, did not have a good statistical basis for calculating bunker fuel because energy data collection did not distinguish between foreign and domestic customers.

16. Although the GHG emissions inventory presented in the CAR2 was generally consistent with the IPCC Guidelines, the review team noted that the following changes would ensure complete consistency with the guidelines: energy-related carbon dioxide (CO₂) emissions should be calculated on the basis of both IPCC reference approach and United States methodologies for more years than just the base year to allow for comparison; GHGs with a high GWP should be estimated on the basis of both actual emissions and potential emissions to facilitate comparison (the review team was informed that corporate confidentiality concerns make reporting of potential emissions difficult in the United States); and complete worksheets on energy, agriculture and, land-use change and forestry should be provided to fully document the inventory assumptions and the methods used.

17. Uncertainty of the inventory estimates in the CAR2 was assessed through a ranking of high, medium and low. Although it was difficult to quantify uncertainties, the United States noted that it was increasingly important to develop a methodology that would allow this. According to the United States, factors determining the level of certainty of its inventory estimates vary from source to source, with the quality of the activity data and emission factors used as the basis for calculations being of primary importance.

18. The United States made available to the team an updated inventory for the period 1990-1996 that conforms to the 1996 Revised IPCC Guidelines and contained a number of important revisions to historical estimates. Indeed, base year emissions were estimated to be 1,632.7 MMTCE, 3.2 per cent higher than the figure presented in the CAR2. There were two key factors responsible for the revision. Firstly, organic nitrogen sources were considered for the first time in the estimation of nitrous oxide (N₂O) emissions from agricultural soils, which resulted in almost a tripling of the emissions estimate from this source (from 17.4 to 62.4 MMTCE in 1990) and secondly, better emission factors for N₂O emissions from vehicles with catalytic converters led to nearly doubling of estimates of emissions from this source (from 8.3 to 12.2 MMTCE in 1990).

19. The updated inventory also provided revised estimates of carbon sequestration associated with land-use change and forestry by incorporating estimates of soil carbon fluxes (changes in forest floor and soil) for the first time. New estimates for the base year of a carbon sink of 311 MMTCE were more than double the estimate of 125 MMTCE presented in the CAR2. As a result, this inventory estimated net GHG emissions in the United States in 1990 to be 1,343.1 MMTCE, a figure about 8 per cent below the figure presented in the CAR2.

20. The review team noted that the United States constructed its new land-use change and forestry inventory using a change in "stock" method that estimates emissions on an annual average basis, with the average value applied to the years between surveys. More over, since the most recent timber survey was from 1992 and the most recent wood product and landfilled wood survey was from 1990, the estimates of the carbon sequestered are based in part on projections of stock in the year 2000. This is why the estimates of carbon stored changed from 311.5 MMTCE in the period 1990-1992 to 208.6 MMTCE in the period 1993-1996. This method was consistent with the methods outlined in the 1996 Revised IPCC Guidelines. The inventory also tracked carbon stored in wood products over time, an approach which was consistent with the new IPCC

Guidelines although the default methods provided there were not strictly followed. A new comprehensive statistical survey was under development in 1997 (for the first time since 1992), and it may lead to further changes in the land-use change and forestry inventory.

21. The updated GHG inventory had implications for the analysis of trends in GHG emissions in the United States. While the IPCC Guidelines did not clearly require an analysis of GHG emission trends over time, the review team noted that it was important to have such information, in both on an aggregated basis and by gas and by sector. Although much of this analysis was absent from the CAR2, the United States provided this information to the review team on request for both the inventory contained in the CAR2 and the updated 1996 inventory.

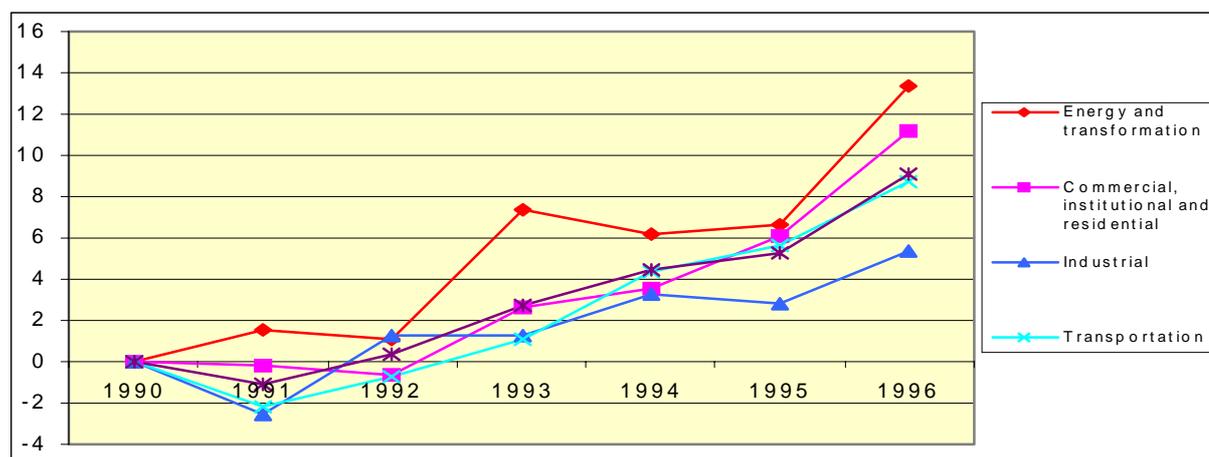
22. The updated 1990-1996 inventory indicated that the United States recognized that GHG emissions had been growing more rapidly than previously thought, and that the gap in emission levels between the base year and subsequent years was larger than that presented in the CAR2. Indeed, the total GHG emissions were estimated to be 9.5 per cent above 1990 levels in 1996. In the same time carbon sequestration from land-use change and forestry declined by approximately 30 per cent, which resulted in an increase of the net emissions by 19.5 per cent.

23. Between 1990 and 1996, CO₂ emissions increased by 9 per cent (table 1 and figure 1). On a sectoral basis, CO₂ emissions increased by 13 per cent in the residential sector (largely the result of increased “plug-load”), 11 per cent in the commercial sector, 5 per cent in the industrial sector and 9 per cent in the transportation sector, including emissions from electricity generation.

24. The review team noted that the new 1990-1996 inventory did not present GHG emissions from electricity transformation/production separately, but rather distributed these emissions to the end-use sectors. This was an interesting way to present the data and was especially useful for policy analysis. The review team noted that the GHG inventory should continue to present the data both ways, as was done in the CAR2, to ensure conformity with the IPCC Guidelines.

Table 1. CO₂ emissions by sector, 1990-1996, (MMTCE)

	1990	1991	1992	1993	1994	1995	1996
Energy and transformation	253.0	257.0	255.7	271.6	268.6	269.7	286.7
Commercial, institutional and residential	206.7	206.4	205.3	212.2	214.1	219.2	229.9
Industrial	453.1	441.6	459.0	459.0	468.1	465.7	477.5
Transportation	409.6	400.8	406.7	414.1	427.4	432.8	445.5
US territories	9.1	10.7	9.8	10.6	11.4	11.2	10.8
Natural gas flaring	2.0	2.2	2.2	3.0	3.0	3.7	3.5
Industrial processes	15.0	14.7	14.8	15.2	16.1	16.9	17.4
Total, CO₂	1349	1333	1354	1386	1409	1419	1471
Land-use change and forestry	-311.5	-311.5	-311.5	-208.6	-208.6	-208.6	-208.6

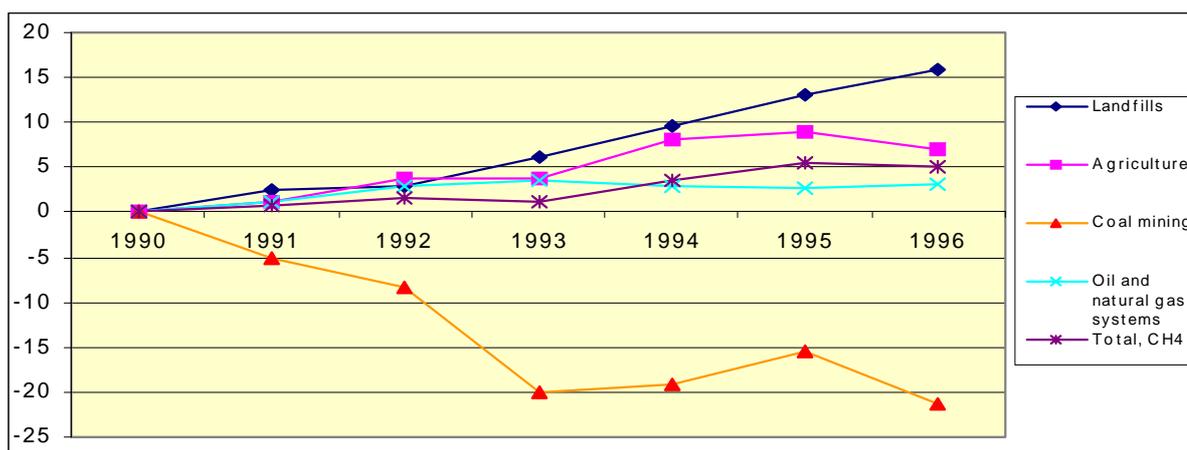
Figure 1. Percentage change in CO₂ emissions, by sector relative to 1990

25. Over the same 1990-1996 period, CH₄ emissions increased by 5 per cent, reflecting increases in emissions from landfills and manure management, and decreased emissions from coal mines as a result of increased methane capture (table 2 and figure 2). At the same time, N₂O emissions increased by 23 per cent, primarily as a result of increased emissions from motor vehicles and adipic acid and nitric acid production (table 3 and figure 3). Finally, GWP-weighted emissions of “new gases” increased by 64 per cent in 1990-1996. This reflected increased emissions from the semiconductor industry and electricity transmission/distribution, as well as increased emissions from all relevant substitutes for ozone-depleting chemicals except HFC-23.

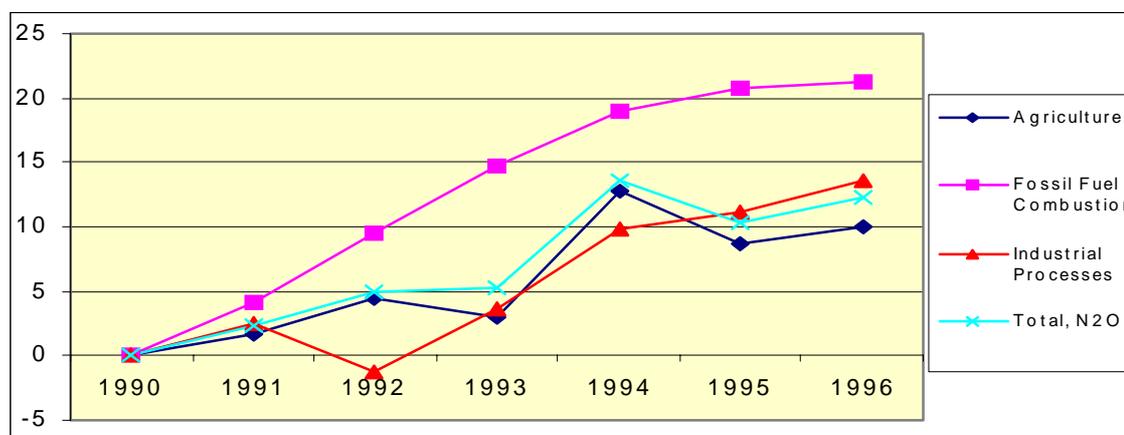
Table 2. CH₄ emissions by sector, 1990-1996, (MMTCE)

	1990	1991	1992	1993	1994	1995	1996
Landfills	56.2	57.6	57.8	59.7	61.6	63.6	65.1
Agriculture	50.3	50.9	52.2	52.2	54.4	54.8	53.8
Coal mining	24.0	22.8	22.0	19.2	19.4	20.3	18.9
Oil and natural gas systems	34.5	34.9	35.5	35.7	35.5	35.4	35.6
Other	4.9	4.9	5.0	5.1	5.0	5.1	5.2
Total, CH₄	169.9	171.1	172.5	171.9	175.9	179.2	178.6

26. In 1996 CO₂ emissions from fossil fuel combustion accounted for 81 per cent of total GHG emissions in the United States. The shares of other gases were as follows: CH₄ 10 per cent, N₂O 7 per cent and the “new gases” 2 per cent. There were practically no changes in the emission share by gas in 1996 compared to the base year 1990.

Figure 2. Percentage change in CH₄ emissions, by sector relative to 1990Table 3. N₂O emissions by sector, 1990-1996, (MMTCE)

	1990	1991	1992	1993	1994	1995	1996
Agriculture	65.1	66.3	68.1	67.1	73.4	70.2	71.7
Fossil fuel combustion	16.9	17.6	18.5	19.4	20.1	20.4	20.5
Industrial processes	8.1	8.3	8	8.4	8.9	9.0	9.2
Others	2.1	2.2	2.2	2.3	2.4	1.6	2.3
Total, N₂O	92.3	94.4	96.8	97.1	104.9	101.9	103.7

Figure 3. Percentage change in N₂O emissions, by sector relative to 1990

III. POLICIES AND MEASURES

27. The updated CCAP of the United States contained about 50 measures relating to climate change, which were listed in the CAR2 together with the details of implementation of these measures and their effect. While the United States failed to use the reporting table required under the UNFCCC Guidelines, thereafter referred to as the guidelines, the CAR2 included most of the information requested in it. Accordingly, the review team concluded that the United States has respected the guidelines in this area.

28. In particular, the review team noted that the United States has a system in place to monitor and report on the progress of initiatives included in the CCAP. First, the United States conducted periodic inter-agency reviews of the programmes (coordinated by the White House) that included a review of programme accomplishments and adjustment of programme goals based on the success or failure of each programme. Second, there was clear assignment among agencies of responsibilities for monitoring the effectiveness of their programmes and reporting on them to the Congress and the public. Specific progress indicators were documented by each agency, as required under the Government Performance and Results Act for all federal programmes. The review team concluded that the existing system should allow the United States to make a balanced assessment of the effectiveness of its policies and measures, but noted that the team was not provided with current estimates of the effectiveness of many of the policies and measures.

29. The original CCAP relied largely on voluntary initiatives to reduce GHG emissions. A small number of regulatory initiatives were also included, but fiscal instruments were not used. This approach did not change significantly in the period leading up to the publication of the CAR2, which contained only six new policies and measures compared to CAR1. The team was informed that these six initiatives were largely voluntary ones and would have only a minimal impact on GHG emissions by the year 2000. At the same time, the review team noted that funding restrictions had resulted in the termination of 11 of the original policies and measures identified in the CAR1.

30. The review team learned that a small number of new initiatives had been launched by the Administration since the CAR2 was published to demonstrate federal leadership in GHG emissions reduction. These initiatives were directed at improving energy efficiency in federal government buildings and facilities, and incorporating energy efficiency considerations into federal government procurement. The review team noted that neither of these initiatives was expected to reduce emissions significantly by the year 2000.

31. In addition, the team learned that the United States' experience with the CCAP demonstrated that voluntary actions alone would not be enough to meet the climate change commitments. As a result, the Administration announced a number of new initiatives to reduce GHG emissions and the review team was provided with information on these new initiatives. However, the vast majority of the initiatives were only proposals at the time of the in-depth review and had not yet been fully considered by the Congress. Chief among these new initiatives was the Climate Change Technology Initiative (CCTI), which proposed that \$3.6 billion be spent over the next five years on tax incentives to promote energy-efficient technologies and enhanced use of low-carbon energy sources. An additional \$2.7 billion would be directed to research and development support for climate-friendly technologies. Finally, it was made clear to the review team that the Administration was considering options for a "credit for early action" scheme that would be linked to a future domestic GHG emissions cap and allowance trading system.

32. The EPA also has a State and Local Outreach Programme that provides governments at these levels with technical and financial assistance to compile GHG inventories and to develop climate change mitigation programmes. In the course of the in-depth review, the review team had an opportunity to talk to State officials and gained important insights into a broad range of activities underway at that level to reduce GHG emissions. The review team noted that 30 states had developed GHG inventories and 10 had completed the design of action plans. Moreover, 13 cities, all participants in the Cities for Climate Protection Campaign of the International Council for Local Environmental Initiatives had also developed action plans.

A. Carbon dioxide

1. Residential and commercial sector

33. From a GHG emissions reduction perspective, the single most important initiative in this sector was the Energy Star labelling programme which, at the time of the visit involved more than 500 manufacturers and more than 200 home builders in the United States. More than 13,000 product models were reported to qualify for the Energy Star label. Also important were three initiatives based on voluntary partnerships: Green Lights and Energy Star Buildings, and Rebuild America. The Green Lights programme alone had partnerships with more than 2,300 organizations. Participants in the programme have found, on average, that investments in lighting retrofits reduce energy use by 50 per cent and have a rate of return of 35 per cent. Taken together, Energy Star labelling and these initiatives were expected to account for about 90 per cent of all the emission reductions generated by the CCAP in this sector in the year 2000.

34. The review team noted that most of the voluntary programmes in the United States' CCAP were designed to encourage emitters to install energy-efficient equipment when capital stock was turning over. This approach had been pursued because the Administration believed it increased the cost-effectiveness of the programme and provided industry with an opportunity to be engaged in the development of actions to reduce energy use and emissions. The Green Lights programme was unique with respect to the other energy efficiency programmes as the energy efficiency retrofits were encouraged at any time during the life cycle of equipment.

35. The four new voluntary programmes included in the CAR2 aimed at enhancing research and development into, and market penetration of, key technologies such as fuel cells and energy-efficient buildings, windows and lighting products. The review team noted, however, that these initiatives were expected to have only a minimal impact on GHG emissions by the years 2000 and 2005. One programme in the buildings sector relating to the State Revolving Fund for Public Buildings had been terminated and the effectiveness of the others had been dramatically affected by funding cutbacks.

36. While voluntary initiatives will contribute virtually all of the emission reductions in this sector through the year 2000, and will continue to be the most important contributor thereafter, stricter residential appliance standards and state building codes were expected to make an increasingly important contribution over time. This represented a significant change from the thinking in the CAR1, when residential appliance standards were considered to be the single most important measure in the short-term. The review team noted that these changed expectations were in part a reflection of the fact that the implementation of these standards had been delayed by a temporary Congressional moratorium on the development of such standards.

37. In the course of its visit, the review team learned that the President had launched a programme to put solar photovoltaic devices on a million roofs by 2010, which is expected to have a small direct effect on emissions. This effort would be assisted by some of the elements in the proposed CCTI. Initiatives proposed for the residential and commercial sector included: tax credits for the purchase of energy-efficient building equipment and homes and the purchase of rooftop solar power systems, as well as new research and development support for energy efficient housing and residential solar energy technologies.

2. Industry

38. Three key initiatives were expected to account for more than 85 per cent of the emission reductions generated in the industrial sector by the CCAP in the year 2000 and beyond. The most important initiative was Waste Minimization, which would only have an indirect effect on industrial GHG emissions. One of the programmes of this initiative, called Waste Wise, formed voluntary partnerships with more than 800 organizations and partners in 1997 that have led to the establishment of voluntary waste prevention and recycling goals. The Climate Wise initiative and the Motor Challenge were two voluntary initiatives that were also expected to contribute significantly to GHG emissions reduction in this sector. As of 1997, more than 250 companies were participating in Climate Wise, voluntarily developing GHG emission reduction action plans. At the same time, 1600 organizations have joined the Motor Challenge, which encourages

the adoption of a more energy-efficient system approach to developing and purchasing motors and motor-driven equipment. Funding cutbacks resulted in three of the measures in the industrial sector being terminated by the time the CAR2 was published and two more being merged.

39. The review team was informed that the proposed CCTI included both tax incentives and research and development support for combined heat and power systems. Moreover, increased research and development spending for carbon capture and storage had been proposed. Finally, it appeared that the United States would soon develop agreements with key industry sectors to obtain additional voluntary commitments to reduce GHG emissions.

3. Transport

40. Only four measures targeted emissions from the transportation sector. Funding cutbacks, coupled with delays in getting legislation through Congress to change the tax treatment of employer-provided parking and to allow fuel economy labels for tires, have resulted in the projected effectiveness of these two measures being revised downward. Indeed, the inability to surmount legislative hurdles meant that the key transportation-related initiatives in the CCAP were voluntary programmes to encourage telecommuting and the adoption of innovative transportation strategies. The review team noted that the relative scarcity of measures in this sector contrasts starkly with the contribution made by this sector to total GHG emissions.

41. In the course of its visit, the review team learned that the Congress was considering a series of bills that would re-authorize spending for the Intermodal Surface Transportation Efficiency Act (ISTEA) over a six-year period. In June 1998 President Clinton signed the Transportation Equity Act for the 21st Century, in which along with the reauthorization of the transit and highway programs several changes were made to the tax treatment of employer-provided parking. The review team was informed, that while these bills were not expected to fundamentally alter transport patterns, some of them may have GHG emission reduction benefits. For example, the bill provided a 35 per cent increased funding for the existing \$8.1 billion Congestion Mitigation and Air Quality Improvement Program, a new \$120 million grant program to States for sustain ability pilot initiatives under the Transportation and Community and System Preservation Pilot program and \$3 billion in transportation enhancement funding to provide for alternative means to driving single occupancy vehicles. Moreover, the bill included \$500 million for the Clean Fuels Formula Grant program, which will also help to address emissions from transportation. The proposed CCTI did include tax credits for the purchase of fuel efficient vehicles and enhanced funding support for the Partnership for a New Generation of Vehicles research and development programme.

4. Energy supply

42. One out of 11 measures designed to reduce GHG emissions from the energy supply sector, only one, namely the Climate Challenge programme, was expected to account for 85 per cent of all the year 2000 emission reductions expected from this sector. Indeed, the review team noted that this initiative made the largest contribution of any single initiative to the emission

reductions generated by the CCAP. Over 630 electric utilities, accounting for more than 70 per cent of utility carbon emissions, were participating in the Climate Challenge. Under this programme, participating companies voluntarily develop action plans to reduce GHG emissions and the review team noted that a broad range of approaches to emission reductions were being taken, including: improving the efficiency of electric power generation, demand-side management, methane recovery, carbon sequestration, renewable energy projects and technology transfer.

43. The establishment of a Green Power Network was the one new initiative described in the CAR2 for this sector. This Internet-based information source provides for an exchange of information on successful green power programmes to encourage the creation of more green power buyers and sellers. The review team noted, however, that no emission reductions were estimated for this action.

44. In the course of its visit, the review team also learned that the Administration had presented a proposal to Congress for a comprehensive electricity competition plan. This proposal could contribute to GHG emissions reduction by: removing barriers to combined heat and power generation, establishing a renewable portfolio standard for electricity generators, and creating a Public Benefit Fund to support efforts at the state level to reduce GHG emissions. On the other hand, it could increase GHG emissions by providing incentives for existing coal-fired power stations to continue operating longer than they otherwise would and by lowering energy prices. The review team heard a range of views on the potential impact of this proposal on future levels of GHG emissions.

45. Finally, the review team noted that the proposed CCTI would provide research and development support for: renewable energy technologies, extending the life of existing nuclear power plants, and cleaner combustion of coal. Current tax credits for electricity produced from wind and biomass would be extended into the future under this proposal.

5. Forestry and land-use change

46. During the in-depth review, the review team was informed that there were many cost-effective opportunities to enhance carbon sequestration in forests in the United States. It noted however, that there were practically only two measures with a quantified impact on the forest sink. One of these measures aimed at decreasing the demand for wood products and was responsible for 80 per cent of the projected increase in carbon sequestration in the year 2000. The review team noted that this measure encompassed the same waste minimization and pollution prevention programmes as were projected to make the single biggest contribution to emission reductions in the industrial sector. An afforestation programme that sought to accelerate tree planting in non-industrial private forests was the only other measure described in the CAR2 that contributed to enhanced carbon sequestration.

47. The review team noted that since the CAR2 was published, no new initiatives have been taken to increase carbon sequestration in the United States' forests. In the course of its visit, the review team did learn that the proposed CCTI included some proposals for increased research

and development spending related to the natural carbon cycle. Finally, the review team was informed that the Farm Bill that was to go before the Congress would assist the federal Government with carbon sequestration in agricultural soils by getting marginal farm land out of production and encouraging the increased use of conservation tillage practices. It was noted by the review team that the United States would be unable to take credit for such initiatives until carbon releases/sequestration from agricultural soils were included in the GHG inventory.

B. Methane

48. The CCAP of the United States was unique among Annex I Parties with regard to the level of attention paid to policies and measures targeted at methane, nitrous oxide, and high-GWP gases. Most of these initiatives were voluntary programmes, consistent with the approach taken by the United States with respect to energy-related CO₂ emissions. The review team was informed that the partnerships developed through such voluntary programmes have facilitated improved data collection that has resulted in a better understanding of the source and quantity of these emissions, as well as assisted in the identification and implementation of cost-effective emission reduction actions.

49. Measures to reduce methane emissions targeted emissions from the natural gas industry, landfills, coal mines and the agricultural sector. The review team noted, that unlike measures to reduce carbon dioxide emissions, most of the measures targeted at methane emissions were expected in the CAR2 to accomplish more in the year 2000 than had been originally projected in the CAR1. Programmes targeted at methane emissions from the agricultural sector were the exception in this regard, with significantly less effect expected from them in the CAR2 than had originally been projected.

50. The Natural Gas Star programme was a voluntary initiative within which natural gas producers, transmitters and distributors developed action plans to reduce fugitive methane emissions from their operations. While much of the natural gas industry remained outside the programme, as it covered only 30 per cent of this industry, the initiative was expected to expand and increase its effectiveness in future years.

51. The review team noted that the United States was using a mix of regulation and voluntary initiatives to decrease methane emissions from landfills. A new Landfill Rule, promulgated under the Clean Air Act in 1996, required the large landfills to capture and combust their methane emissions. At the same time, the voluntary Landfill Methane Outreach Programme facilitated compliance with the Rule by providing technical and economic information and by facilitating the formation of partnerships that can develop projects to combust the methane and thus produce energy, reducing GHG emissions even further.

52. Another voluntary initiative, targeted at the capture and use of coal-bed methane, was also included in the CAR2. The Coal-bed Methane Outreach Programme has facilitated the voluntary adoption of initiatives to introduce coal-bed methane into the natural gas system or to use it directly as a power source on-site. That this initiative had demonstrated new technologies that were ultimately applied in a joint implementation project in China.

53. Two voluntary initiatives relating to methane emissions were launched in the agricultural sector. The review team noted that efforts to improve the efficiency of animal production were expected to make a larger contribution to emissions reduction than efforts directed at manure management through the year 2010. The Ruminant Livestock Efficiency Programme encourages livestock producers to increase the efficiency of their animals through improved grazing management, improved genetic characteristics, strategic feed supplementation and diseases control.

C. Nitrous oxide

54. The United States reported only one measure to reduce nitrous oxide emissions which targeted the agricultural sector. It was noted by the review team, however, that many of the actions seeking to reduce carbon dioxide emissions from energy use would also reduce nitrous oxide emissions from the sector. Moreover, massive reductions in nitrous oxide emissions from adipic acid production were already included in the United States' baseline projection.

55. The one measure described in the CAR2 was a voluntary programme coordinated by the Department of Agriculture. It sought to improve the efficiency of fertilizer management by providing farmers with better information on fertilizer management options and soil conditions. The review team noted in particular that efforts had been made to link fertilization rates to information provided by Geography Information Systems. The expected contribution of this initiative to GHG emissions reduction was higher in the CAR2 than in the CAR1, but this simply reflected a change in GWP values. No new initiatives to address nitrous oxide emissions were described to the review team in the course of the in-depth review.

D. Other greenhouse gases

56. The review team noted that the United States was the first Party to design a national strategy to control emissions of HFCs and perfluorocarbons (PFCs). Indeed, policies and measures targeted at these high GWP gases were expected to produce more than 25 per cent of the emission reductions generated by the CCAP as described in the CAR2. To the review team, this seemed disproportionately large given the small contribution made by these gases to overall GHG emissions in the United States.

57. The United States has in place four programmes to reduce emissions of high-GWP gases. The largest single contributor to GHG emissions reduction in the year 2000 was expected to be a new programme entitled the Environmental Stewardship Initiative. Through this programme, the EPA planned to establish voluntary partnerships with the semiconductor, electrical and magnesium industries to reduce emissions through the pursuit of pollution prevention and improved environmental efficiency.

58. All three of the remaining programmes described in the CAR2 were also discussed in the CAR1, although two of the three programmes were expected to have a larger impact on future emission levels in the CAR2 than had previously been envisioned. The most significant of the three was the Significant New Alternatives Programme that restricted the use of substitutes for

ozone-depleting chemicals in some applications through regulation. Each of the remaining two initiatives focused on voluntary partnerships, one with HCFC-22 producers and one with the aluminium industry, involving essentially all of the producers in these sectors. The proposed CCTI did propose the establishment of new tax incentives to accelerate the reduction of high-GWP gas emission.

IV. PROJECTIONS AND ESTIMATES OF THE EFFECTS OF MEASURES

59. The CAR2 presented two sets of projections of GHG emissions: a baseline scenario and a “with measures” scenario with data for the years 2000, 2005, 2010 and 2020. Projections covered the GHG gases, including CO₂, CH₄, N₂O, HFCs, PFCs and sulphur hexafluoride (SF₆), and the forest sinks. While the projections have been developed in the same manner as the projections contained in the CAR1, changes to key assumptions have produced significantly different results with the projections revised upwards. The review team believed these changes to key assumptions were reasonable and the revised projections were methodologically sound. In general, the review team believed that the United States has respected the guidelines in this area by presenting information on projections of all GHGs and sinks. An important omission was a failure to provide projections of GHG emissions by sector and by gas, which made it very difficult to follow the sectoral trends. In addition, no projection of emissions associated with bunker fuels was provided.

60. The methodological approach to projecting the future emissions trend did not change between the CAR1 and CAR2. The same IDEAS model was used for the energy-related emissions in both cases. IDEAS was a general equilibrium model, which combined features of macroeconomic top-down with technology-specific bottom-up modelling, with a link between the energy demand and supply through equilibrium market prices. The model was less data-intensive, compared to the model used by the EIA to produce the *Annual Energy Outlook* (AEO), but was flexible enough to represent the impact of the climate-related policy options on the future emission trend. In fact, IDEAS model started from an AEO scenario that did not include any CCAP programs, providing an important difference from what was published in either the AEO97 or 98. The energy end-use technologies and associated impact of the energy efficiency programmes were presented in the IDEAS model by the relevant cost curves, which in turn were updated on a regular basis using expert estimates. Only those energy technologies were presented in the model that were available at the time of analysis. A limitation of the model was its inability to simulate the impact of electricity market liberalization.

61. The baseline projection of energy-related CO₂ emissions was developed through an inter-agency process that refines the most recent EIA projection from the AEO. Thus, energy supply technologies in IDEAS were calibrated against the EIA model and the energy prices were updated. It was noted by the review team that this process could be made more transparent. The “with measures” projection included in the CAR2 was created through the same methodological approach as that used in the CCAP. Energy-related CO₂ emission reductions were determined against the common baseline projection and were then integrated through the IDEAS model.

62. Baseline and “with measures” projections for other GHGs were calculated largely

bottom-up through a mix of spreadsheet models, expert engineering judgement, and industry consultations. In most of the cases, the models used for these gases were compatible with those used for the GHG inventory. For example, a vintage model used for the HFCs inventory was also used to estimate their future trend.

63. As in the case of CAR1, the CAR2 provided a detailed description of the key assumptions influencing the future emission trend, including economic growth, industrial production index, energy intensity, miles travelled, energy prices, population, residential housing stock and commercial floor space. There were two groups of changes in the key assumptions between the CAR1 and CAR2. The first group of changes, which were minor ones, referred to the update of the 1990 values for commercial floor space in the CAR2, because in the CAR1 the preliminary data for this variable were used, and changes in the vehicle miles travelled, due to the new definitions of heavy-duty trucks as opposed to light trucks. The second group of changes, which included the major ones, reflected the observed development trend in the last three years before publishing of the CAR2 and its impact on the values of the key variables in 2000. These included higher population growth, higher economic growth, lower energy prices, and especially lower electricity prices as a result of the liberalization of the electricity market and lower coal prices as a result of increased productivity. The growth in gross domestic product (GDP) was an exogenous variable to the model and its values derived from macroeconomic models were within the range of 1.7-1.9 per cent annually for the period 2000-2020. The team noted that these values were lower than the observed GDP growth rates for 1992-1997 period.

64. The team found that the approach to scenario definition was very clear and in line with the guidelines. The baseline scenario included all policy decisions which were implemented before the CCAP. For instance, any policies to promote energy efficiency implemented before 1993 were included. The “with measures” scenario incorporated the effect of the entire portfolio of measures envisaged in the CCAP and further updated in the CAR2. There were however, some marginal cases for which the effect of measures was distributed among both scenarios. For instance, the effect of the Landfill Ordinance was included in the baseline scenario, but the incremental value of methane saved through implementation of stricter standards than initially planned was included in the “with measures” scenario. It was thus possible to avoid double counting to a large extent and to outline clearly the effect of the CCAP.

65. In its CAR1, the United States projected that baseline GHG emissions in the year 2000 would be 106 MMTCE (7.3 per cent) above 1990 levels. The revised baseline contained in the CAR2 projected that emissions would be 264 MMTCE (18.1 per cent) above 1990 levels at that time. Some of the key assumptions that were responsible for this increase include: changes in economic assumptions (e.g., reduced fossil fuel prices, increased economic activity), changes in technical assumptions (e.g., increased electrification), reduced funding for baseline energy efficiency programmes, increased population growth, and a number of factors related to non-CO₂ greenhouse gases. The review team believes that the changes in key assumptions were explained in the CAR2 in a clear and transparent manner..

66. The United States estimated also in its CAR1 that the measures contained in it would essentially return GHG emissions to 1990 levels in the year 2000. The CAR2, however,

projected GHG emissions in the year 2000 for the “with measures” scenario to be 12.9 per cent above 1990 levels, once actions in the CCAP have been taken into account. On a gas-by-gas basis, “with measures” emission trends for the period 1990-2000 were projected to be: +15.9 per cent for CO₂, -11.8 per cent for CH₄, -13.9 per cent for N₂O, and +75 per cent for high GWP-gases. Indeed, the CAR2 indicated that the implemented measures were expected to fill only 29 per cent of the gap between 1990 emissions and projected baseline emissions in the year 2000.

67. The key explanatory factors related to the increased gap between 1990 emissions and projected “with measures” emission levels in the year 2000 were the same factors that led to a much higher estimate of projected baseline emissions. Indeed, the CAR2 indicated that changes to the baseline projection accounted for approximately 83 per cent of the increase in the gap. The remainder of the difference was explained by changes in assumptions about the effectiveness of the individual actions that make up the CCAP.

68. The review team found that the CAR2 did a good job of describing how sensitive the “with measures” projection was to changes in key assumptions, but noted that more could be done to quantify these sensitivities in a comprehensive and coordinated manner. It also noted, that relatively small changes in the assumptions related to the energy prices and economic growth had a huge impact on the emissions. In fact, a decrease of only 2.6 per cent in energy prices, for example, would offset almost half of the expected effect of the CCAP in 2000.

69. While the CAR2 did not provide an assessment of the impact of electricity market liberalization on the future emission trend, the team was extensively briefed on this issue during the visit in the light of the Administration proposal for electricity market liberalization placed before the Congress. It has been estimated that the impact of this proposal would be to reduce GHG emissions by about 25-40 MMTCE by 2010. The review team heard divergent views from different stakeholders on the effect of electricity market liberalization on the future emissions, which made this impact very uncertain.

70. In the course of its visit, the review team received copies of the 1998 AEO and noted that its projection of energy-related CO₂ emissions in the year 2000 was 2.2 per cent above the estimate in the 1997 AEO (with the discrepancy growing larger as one moves further into the future). It projected the CO₂ emissions to grow by 11.8 per cent for the 1995-2000 period, while according to the CAR2 “with measures” scenario the projected growth was 8 per cent. Concern was expressed by the business non-governmental organisations (NGO) on the reliability of the GHG projection results as a basis for taking further action on climate change. Even so, after examining the additional materials provided, the conclusion drawn by the team was that the IDEAS model was methodologically sound and a useful tool for climate policy analysis.

71. The results of the GHG emission projection clearly indicated that the current portfolio of policies and measures contained in the CAR2 would not allow the United States to achieve the domestic target to return GHG emissions to 1990 levels by the year 2000. It was stressed to the team that the fact that the United States would not meet the stabilization target had been well understood in the process of preparing the CAR2. Therefore, the CAR2 was not designed to

indicate how the United States would meet its target, but rather to initiate the process of developing an infrastructure to allow for a GHG reduction in the long term. None the less, while the effectiveness of the policies and measures was projected to increase over time, the gap between the 1990 emissions and the projected “with measures” emissions was expected to be significantly larger in the year 2010. Indeed, the CAR2 indicated that projected “with measures” GHG emissions in the year 2010 would be 26 per cent above 1990 levels.

72. Estimating the effects of individual policies and measures and their impact on the emission trend was difficult for all Parties, but the review team believed that the United States had made a good effort that respects the guidelines in this area. The review team noted, however, that the United States CCAP was composed largely of voluntary initiatives and that these posed a challenge when estimating the effects of measures. A range of views on the accuracy of these estimates was presented to the review team by different stakeholders and the team noted that the EIA was more sceptical about the potential emission reductions associated with these measures than the CAR2. Non the less, the review team believed the United States has made a serious effort to estimate the effects of these measures and update these estimates in response to changing circumstances.

73. The team learned that while the results of AEO were used in preparing the GHG scenarios using IDEAS model, the impact of the voluntary agreements estimated by IDEAS model has been considered in the AEO. In some cases, however, such as Motor Challenge the effect of the programme was adjusted downward to avoid overlap with the market-based forecast produced using the technology possibility curves. Moreover, the impact of the voluntary programmes was proportionally reduced to account for reduced funding. This explains why the CO₂ emission trend of AEO was somewhat higher than the trend of the “with measures” scenario.

74. As noted earlier, changes in the baseline projection accounted for most of the change in the gap between 1990 emissions and projected emissions in the year 2000 under a “with measures” scenario. Non the less, the review team noted that there were significant changes in the estimates of the effects of individual measures between the CCAP and CAR2. This was particularly true with respect to estimates of the effects of measures targeted at energy-related CO₂ emissions. Indeed, the CAR2 indicated that these measures were only expected to reduce emissions in the year 2000 by 50 per cent of the amount projected in the CCAP.

75. The significance of this change was evident when examining the projected estimates of the effects of measures on a sectoral basis. In the CAR2, for example: residential and commercial sector actions were expected to reduce GHG emissions by only 10.3 MMTCE in the year 2000 instead of 26.9 MMTCE, industrial sector actions were expected to reduce GHG emissions by only 4.8 MMTCE in the year 2000 instead of 19.0 MMTCE, transportation sector actions were expected to reduce GHG emissions by only 5.3 MMTCE in the year 2000 instead of 8.1 MMTCE, and energy supply sector actions were expected to reduce GHG emissions by only 1.3 MMTCE in the year 2000 instead of 10.8 MMTCE.

76. It must be noted, however, that some of these reductions were offset by the fact that the United States provided estimates of the effects of foundation actions (i.e., Climate Challenge,

Climate Wise, State and Local Outreach) for the first time in the CAR2. Indeed, these actions were projected to reduce GHG emissions altogether by 11.3 MMTCE in the year 2000. There was a large risk of double counting emission reductions generated by these foundation actions (either because actions were already included in the baseline or have been captured through other initiatives). The review team believed, however, that the United States had made a serious effort to minimize the possibility of double counting and had taken credit for significantly fewer emission reductions than have been claimed under these initiatives.

77. The main explanatory factor for the reduced effectiveness of policies and measures targeted at energy-related CO₂ emissions was that funding for these programmes had turned out to be significantly less than forecast in the CAR1. In some cases (e.g., Motor Challenge), the review team was informed that subsequent analysis indicated that the CAR1 had overestimated the effectiveness of measures. Finally, difficulties in obtaining Congressional approval for some actions, including a two-year moratorium on new energy efficiency standards, reduced the expected effectiveness of a number of measures in the year 2000.

78. The review team noted that policies and measures targeted at land-use change and forestry were expected to make a smaller contribution to climate protection in the United States compared to the estimates in the CAR1. While these measures were expected to account for 9.2 per cent of total emission reductions in the CAR1, the CAR2 indicated that they were only expected to contribute 3.2 per cent of the total. This change was a reflection of the fact that some initiatives in this area have been terminated and the estimated effect of all of the remaining measures has been revised downward.

79. It was clear that the United States had significantly revised downward its estimates of the effects of policies and measures directed at energy-related CO₂ emissions and the enhancement of carbon sequestration. At the same time, however, the CAR2 indicated that the United States has significantly increased its estimate of the effects of policies and measures targeted at methane, nitrous oxide, and high-GWP gases. While such actions accounted for only 30 per cent of total emission reductions in the CAR1, in the CAR2 they were expected to account for 54 per cent of the total. In absolute terms, the CAR2 indicates that these policies and measures were expected to reduce GHG emissions by 40.9 MMTCE in the year 2000, as opposed to an estimate of 32.6 MMTCE in the CAR1. The review team noted that all non-CO₂ gases accounted for only 22 per cent of the United States' GHG emissions inventory. Concern was also expressed during the meeting with the NGOs, that there was no clear link between the amount of the budget allocated among the different programmes and the expected results estimated in terms of GHG emission saved.

80. With the exception of programmes targeted at decreasing methane emissions from livestock, all policies and measures directed at methane, nitrous oxide or high GWP gases were projected to be more effective in the CAR2 than they were in the CAR1. In addition, the creation of the Environmental Stewardship Initiative for high-GWP gases was expected to significantly increase the effectiveness of action in this sector.

81. During the course of the review, the United States indicated that policies and measures

focusing on non-CO₂ greenhouse gas emissions were on track to achieve the reductions envisioned in the CAR2. The review team felt, however, that these policies and measures might have difficulties in delivering the expected emission reductions. The EPA has estimated that policies and measures had reduced methane emissions by 3.5 MMTCE in 1997, whereas the reduction expected by the year 2000 is 15.5 MMTCE. This represented only small part of the projected emissions reduction more than half way through the time period. Similarly, policies and measures targeting high-GWP gases were estimated to have reduced emissions by 4.5 MMTCE in 1997, roughly a third of the 13.5 MMTCE reduction expected in the year 2000.

82. The review team noted that further analysis was required to determine why estimates of the effects of policies and measures directed at non-CO₂ greenhouse gases have remained constant or increased over time, while estimates of the effects of other policies and measures have been cut back dramatically. Part of the answer appeared to lie in the fact that funding for policies and measures directed at non-CO₂ greenhouse gases was cut back much less dramatically than funding targeted at reducing energy-related GHG emissions.

V. VULNERABILITY AND ADAPTATION

83. The United States was clearly among the countries leading in assessing vulnerabilities to climate change and the CAR2 presented complete coverage of all key sectors vulnerable to climate change, including agricultural land, water supplies, lightly managed ecosystems, coastal areas, forests and human health. Additionally, the CAR2 provided information on the projected impacts of climate change and identified a number of adaptation strategies that can be pursued or were being pursued. It was the view of the review team that the United States has respected the reporting guidelines in this area. The team was briefed on the two core components of vulnerability and adaptation assessment: scientific assessment and public outreach. It was stressed that, in contrast to climate change mitigation, the assessment of vulnerability and adaptation was not policy driven.

84. While few initiatives had been undertaken primarily to facilitate adaptation to the potential impacts of climate change, it was clear that the United States was taking action to reduce vulnerabilities to climate change through contingency planning and ecosystem management. Uncertainty about the potential impacts of climate change had made it difficult to determine the economic costs associated with such impacts as well as to identify and cost the actions that were most appropriate for adaptation.

85. Unlike the CAR1, no effort was made in the CAR2 to assess the relative sensitivity and adaptability of sectors and ecosystems to the projected impacts of climate change. This reflects the fact that little work has yet been done to assess climate change vulnerability in an integrated manner and the current assessment, although detailed enough, was done bottom-up. As a result, no assessment has been made with regard to which vulnerabilities, if any, should receive priority attention in the United States.

86. Much of the work on vulnerability and adaptation assessment was coordinated through the Global Change Research Programme. Limited mention was made in the CAR2, however, of

the methodologies used for this assessment. While recognizing that the current models and approaches needed to improve their resolution to produce better assessments of vulnerabilities at the regional level, the review team noted that more detailed information on methodologies would be extremely useful to others working in this area.

87. Since the CAR2 was completed, the first integrated national assessment of the impacts of climate change on the public, environment and resources of the United States has been launched. This initiative, which examines the potential impacts of climate change over the next 30 years and the next 100 years, focuses on 20 different regions and a number of different sectors and will also serve as a valuable source of information for climate change education and outreach in these regions and sectors. A synthesis report is to be published in January 2000.

VI. FINANCIAL ASSISTANCE AND TECHNOLOGY TRANSFER

88. The CAR2 provided a comprehensive picture of the action taken by the United States to provide financial assistance and facilitate technology transfer in connection with climate change on a bilateral and a multilateral basis, as well as on the non-governmental efforts. In terms of bilateral activities, the Agency for International Development (USAID) was coordinator of these activities and the financial assistance was channelled through it. The team noted that the USAID funding for climate-related projects (energy efficiency, renewables and forestry) fell from a peak of \$212 million in 1993 to \$145 million in 1997.

89. Information on more than 70 bilateral climate change mitigation and adaptation projects supported by USAID was presented in the CAR2, including projects which addressed climate change directly through: improved energy efficiency, increased use of renewables, energy market reform, adoption of clean-coal technologies, the enhancement of forest sinks, and the development of frameworks to support policy tools like joint implementation and emissions trading. Some of the projects presented, however, were much broader in scope, supporting such activities as integrated environmental management in Brazil, natural resource management in the Philippines, and environmental policy and technology in the Russian Federation. While detailed information has been provided for each of these projects, the review team noted that this information was not presented in a format consistent with that required by the guidelines.

90. Several projects were recognized by both the review team and the host country as very successful, including the \$7 million Joint Implementation (JI)/Activities Implemented Jointly (AIJ) project with Bolivia for buying concessional land and forest planting for the very low cost of carbon saved, and the \$4 million USAID/DOE project with Mexico for energy efficiency and industrial pollution prevention. The collaborative US AID/India and Global Environmental Facility (GEF) project to reduce energy-related GHG emissions by lowering the major barriers to state-of-the-art energy technologies has been acknowledged for its innovative approach.

91. Since the CAR2 was released, the United States has launched a Climate Change Initiative (CCI) within USAID, which would provide \$1 billion over the next five years to support climate change projects. These funds would be used: (a) as credit instruments to leverage additional funds for "climate-friendly" investment (\$250 million), and (b) as grant assistance

(\$750 million). The choice of countries and regions that would participate in the programme would reflect current and expected future contributions to net global GHG emissions and/or the responsiveness of governments in taking actions on climate change.

92. USAID has begun work to assess the impact of its projects on GHG emissions, and the review team was informed that improved monitoring and measurement were among the high priorities for USAID. It was expected that the first results of a comprehensive monitoring and reporting programme will be made available at the end of the 1998 fiscal year.

93. Virtually all of the USAID projects described in the CAR2 were related to the transfer of technologies and advanced management practices in addition to the provision of financial assistance. This transfer of “hard” and “soft” technologies included support for the training and developing of local expertise that can maintain and improve these technologies and practices. It was clear, however, that the main contribution of many USAID projects to technology transfer was to create conditions that facilitate private sector investment in the development and transfer of technologies. Indeed, the review team noted that a new pilot programme on technology cooperation with developing countries had recently been initiated by USAID and the EPA.

94. The team felt particularly that the work done in the framework of the United States Country Studies Programme was laudable in terms of its significant contribution to capacity building in developing countries and countries with economies in transition with regard to the science of climate change and the development of policy responses. It was noted that the key to the success of the programme lay in the good coordination of the federal agencies, the emphasis on the necessity for work to be done entirely in the country concerned, and the immense opportunities for exchange of information and expertise among all the countries participating in the programme. Whatever steps were taken in the United States to follow up on its experience with the Country Studies Programme, the review team urged continued and improved cooperation with other national and multilateral donors to increase efficiency and avoid duplication of effort.

95. As to the role of the United States in multilateral organizations, such as the IPCC, GEF, the Organisation for Economic Co-operation and Development and the International Energy Agency, the team shared the view of the host country that this role was essential in supporting climate change related activities and projects, and that multilateral efforts were essential to achieve success. It was noted by the review team that, while the United States was the main donor in most of these multilateral organizations, its legislative process had resulted in payment delays to the multilateral organizations. Full payment of overdue obligations in its initial commitment of \$430 million to the GEF is expected shortly. However, funding for the first United States payment toward the new GEF replenishment has been delayed.

96. The private sector clearly was playing an increasingly important role in the transfer of financial resources and climate-friendly technologies to developing countries and countries with economies in transition. Even in cases, where the GEF supported climate technology transfer, this support was meant to help overcome market barriers, while the rest of the project financing was assumed by the private sector. The team noted that the United States had not yet been able

to quantify the private sector contribution.

97. Finally, the review team conveyed the message that the CAR2 did not include the summary tables required by the guidelines. Moreover, it did not clearly quantify financial assistance on an annual basis and did not indicate what part of financial assistance was new and additional. The United States indicated that current practices for collecting and reporting information under USAID made it difficult to report information in the format required by the guidelines. In particular, the lack of clear methodologies for defining “climate-related” projects and “new and additional” resources was found to be problematic. Accordingly, the United States chose to report in a detailed and transparent manner on a project-by-project basis.

98. The CAR2 included a report on the activities of the United States “Initiative on Joint Implementation” (USIJI). This information, while not required under the guidelines, was quite useful and had been presented in a manner consistent with decisions taken by the Conference of the Parties at its first session and the Subsidiary Body for Scientific and Technological Advice at its second session on reporting of activities implemented jointly. As of the time of the visit, 32 projects had been approved under the USIJI. The focus was mainly on energy efficiency or forestry, and most were based in Central and South America.

99. The review team noted that USIJI had contributed significantly to the analysis of key methodological issues related to joint implementation projects, such as: defining project baselines, assessing additionality, and ensuring adequate monitoring and verification. At the same time the USIJI experience has highlighted some key barriers to implementation, including difficulties in securing financing and difficulties in obtaining host country approval.

VII. RESEARCH AND SYSTEMATIC OBSERVATION

100. The United States has pursued a number of initiatives in the areas of research and systematic observation, including research related to the prediction of climate change, impacts and adaptation, mitigation technologies, socio-economic causes and effects, and international activities and capacity building. The review team believed that the United States has respected the reporting guidelines in this area.

101. Federal government research related to the prediction of climate change as well as climate change impacts and adaptation was coordinated through the United States’ Global Change Research Programme. Funding for this programme has remained relatively constant at \$1.8 billion per year, with spending in fiscal year 1998 projected to be \$1.867 billion. As of 1998, about 60 per cent of these funds were devoted to space-based observation, and the remainder was distributed among 11 different agencies. Funds supported domestic activity as well as multilateral and bilateral programmes of scientific research and systematic observation.

102. Federal government spending in research on mitigation and new technologies was largely carried out through the Department of Energy and the EPA. While the CAR2 described a

number of initiatives in this area, there was no information on the funding of these initiatives. The review team was informed, however, that government spending represented a declining proportion of total national research and development spending in these areas. In fiscal year 1998, this funding was projected to be \$819 million. If approved by Congress, the Administration's proposed CCI would increase research, development and demonstration spending for key climate change mitigation technologies by \$2.7 billion over a five-year period after launching the CCI.

103. Extensive analytical work with respect to the socio-economic impacts of action to reduce GHG emissions has been undertaken in the United States. The review team was provided with one recent example of this work prepared by five national laboratories and entitled "Scenarios of US Carbon Reductions: Potential Impacts of Energy Technologies by 2010 and Beyond". Some stakeholders expressed concern that key data and assumptions underlying some of the rest of the federal Government's socio-economic analysis had not been presented in a transparent manner.

VIII. EDUCATION, TRAINING, AND PUBLIC AWARENESS

104. While responsibility for most formal education programmes rests with state and local governments in the United States, the federal Government has undertaken a number of initiatives related to climate change education, training, and public awareness. Many of these programmes were reported in the CAR2 and the review team felt that CAR2 did respect the reporting guidelines in this area. The review team noted that the United States law does not permit the research side of the federal Government to be a public advocate on the climate change issue.

105. The United States has initiated a number of specific projects to make information about climate change available to teachers and students at all levels in the education system. Most of these projects are linked to scientific research programmes on climate change in the United States. Some of the policies and measures that made up the CCAP also included significant components directed toward training (e.g., EPA State and Local Climate Change Programme) or education (e.g., Energy Star Programmes). While several different federal government departments and agencies are directly involved in initiatives related to climate change education and training, the review team noted that it was not clear to what extent these initiatives were being coordinated across the federal government.

106. Since the CAR2 was produced, the US EPA has launched a new constituency-based public outreach programme. This initiative focuses on the potential risks of climate change and possible mitigation options. It is targeted at constituencies likely to be affected by the impacts of climate change, including the medical community, inhabitants of coastal regions, users of recreational areas, and specific industry sectors. A similar initiative was part of the national assessment discussed in Section V of this report. The EPA has also recently produced a document, *Cool Facts about Global Warming*, that has proved to be a popular and valuable public education tool.

107. While not its primary purpose, the CAR2 has also contributed to increased public awareness about climate change in the United States. The review team believed that the federal

Government had made a serious effort to provide stakeholders with an opportunity to review and comment on a draft of the national communication before it was published. It should be noted, however, that there was a diversity of views among stakeholders on this issue.

IX. CONCLUSIONS

108. After reviewing the data, assumptions and methodology used to produce the GHG emission inventory in the CAR2, the review team concluded that the inventory had been revised and updated in accordance with the most recent guidance from the IPCC. Base year emissions have been revised upward in both the CAR2 and subsequent submissions to the UNFCCC secretariat as a result of methodological improvements, as well as the inclusion of new emission sources and improved emission factors. According to the most recent data, total GHG emissions increased by 10 per cent between 1990 and 1996. The review team believed that the revisions made to the historical GHG emissions were justified and provided an improved basis for policy decisions and a better understanding of the GHG emission trends. The review team concluded that the United States continued to be among the countries leading the process of further improving the IPCC methodology for GHG inventory.

109. With regard to the United States overall strategy to reduce GHG emissions, the review team concluded that the CAR2 provided little evidence that significant action had been taken to build on the foundation laid in the 1993 CCAP. Only a few new measures were reported in the CAR2, and these were expected to have a small impact on GHG emissions. At the same time, many measures reported in the CAR1 were phased out and funding for the remaining measures was substantially below expectations. As a result, projected emission reductions from the CCAP had been revised in the CAR2 and were significantly below the original projections. While the United States has implemented a number of measures concerning methane, nitrous oxide and high-GWP gases, the review team noted that less attention has been paid to carbon dioxide emissions, particularly in the sectors with a large share of these emissions, or with fastest growing emissions, such as transport sector. In the course of the visit, the review team was informed of a number of new initiatives under consideration since the CAR2 was published, but most of these initiatives have not yet been examined by the Congress and little information was provided on their potential contribution to the GHG emission reduction. The review team noted that these proposed measures would begin to move the United States policy beyond the voluntary approach adopted in the CCAP and the CAR2.

110. The review team shared the views expressed by the United States Administration that the package of measures contained in the CAR2 would not allow the United States to achieve its domestic target of returning GHG emissions to 1990 levels by the year 2000. In fact, the projections contained in the CAR2 indicated that GHG emissions were expected to be 13 per cent above 1990 levels in the year 2000 and that the new measures proposed in the CAR2 would have little impact on emissions in the same period. This emissions gap was significantly higher than projected in the CAR1 and reflected changes to the baseline forecast that projected more aggressive growth in emissions as well as lower expectations with respect to the effect of policies and measures on emission trends. In the course of its visit, the team was shown more recent

projections prepared by the EIA that indicated even higher possible growth in the future.

111. The review team noted that a number of initiatives had been implemented at federal, state and local level to increase public awareness on climate change. It also recognized the efforts made by the United States to involve all stakeholders in the policy debate on climate change. It especially noted that many stakeholders have widely divergent views, which in turn makes it more difficult to develop a climate change response strategy in the United States.
