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## **Report of the technical review of the sixth national communication of the United States of America**

Parties included in Annex I to the Convention are requested, in accordance with decision 9/CP.16, to submit a sixth national communication to the secretariat by 1 January 2014. This report presents the results of the technical review of the sixth national communication of the United States of America conducted by an expert review team in accordance with the “Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention”.

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## I. Introduction and summary

### A. Introduction

1. For the United States of America the Convention entered into force on 21 March 1994. Under the Convention, the United States made a commitment to reducing its greenhouse gas (GHG) emissions by in the range of 17 per cent by 2020 below the 2005 level.
2. This report covers the in-country technical review of the sixth national communication (NC6) of the United States, coordinated by the secretariat, in accordance with the “Guidelines for the technical review of information reported under the Convention related to GHG inventories, biennial reports (BRs) and national communications by Parties included in Annex I to the Convention” (decision 23/CP.19).
3. The review took place from 24 February to 1 March 2014 in Washington, D.C., United States, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: Mr. Marko Aunedi (Croatia), Ms. Ana Maria Danila (European Union), Mr. Qingxian Gao (China), Ms. Thelma Krug (Brazil) and Mr. Peer Stiansen (Norway). Ms. Krug and Mr. Stiansen were the lead reviewers. The review was coordinated by Ms. Inkar Kadyrzhanova and Ms. Katia Simeonova (secretariat).
4. During the review, the expert review team (ERT) reviewed each section of the NC6.
5. In accordance with decision 23/CP.19, a draft version of this report was communicated to the Government of the United States, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

### B. Summary

6. The ERT conducted a technical review of the information reported in the NC6 of the United States in accordance with the “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications” (hereinafter referred to as the UNFCCC reporting guidelines on NCs).
7. The United States considered all of the recommendations provided in the report of the in-depth review of its fifth national communication (NC5).<sup>1</sup> The ERT welcomed the improved reporting by the United States in comparison with that in the NC5. During the review, the United States provided further relevant information, in particular the methodologies used for assessing the effects of the policies and measures (PaMs) reported in chapter 4 of the NC6 and the methodologies used for preparing the projections for non-carbon dioxide (CO<sub>2</sub>) and non-energy CO<sub>2</sub> emissions.<sup>2</sup>

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<sup>1</sup> FCCC/IDR.5/USA.

<sup>2</sup> The methodologies are available at <[http://unfccc.int/files/national\\_reports/annex\\_i\\_natcom/submitted\\_natcom/application/pdf/climate\\_action\\_report\\_chapter\\_4\\_methodologies.pdf](http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/climate_action_report_chapter_4_methodologies.pdf)> and <[http://unfccc.int/files/national\\_reports/biennial\\_reports\\_and\\_iar/submitted\\_biennial\\_reports/application/pdf/methodologies\\_for\\_u\\_s\\_greenhouse\\_gas\\_emissions\\_projections.pdf](http://unfccc.int/files/national_reports/biennial_reports_and_iar/submitted_biennial_reports/application/pdf/methodologies_for_u_s_greenhouse_gas_emissions_projections.pdf)>.

**1. Completeness and transparency of reporting**

8. Gaps and issues related to the reported information identified by the ERT are presented in table 1 below.

**2. Timeliness**

9. The NC6 was submitted on 1 January 2014, in line with the deadline of 1 January 2014 mandated by decision 9/CP.16. The United States resubmitted its NC6 on 9 January 2014.

**3. Adherence to the reporting guidelines**

10. The information reported by the United States in its NC6 is completely in adherence with the UNFCCC reporting guidelines on NCs as per decision 4/CP.5 (see table 1). However, the ERT noted that the NC6 does not always follow the outline of the national communication included in the annex to those guidelines (see para. 97 below).

Table 1

**Summary of completeness and transparency issues of reported information in the sixth national communication of the United States of America<sup>a</sup>**

<i>Sections of national communication</i>	<i>Completeness</i>	<i>Transparency</i>	<i>Reference to paragraphs</i>
Executive summary	Complete	Transparent	
National circumstances	Complete	Transparent	
Greenhouse gas inventory	Complete	Transparent	
Policies and measures (PaMs)	Mostly complete	Transparent	20
Projections and total effect of PaMs	Mostly complete	Transparent	72
Vulnerability assessment, climate change impacts and adaptation measures	Complete	Transparent	
Financial resources and transfer of technology	Mostly complete	Transparent	110 and 111
Research and systematic observation	Complete	Transparent	
Education, training and public awareness	Complete	Transparent	

<sup>a</sup> A list of recommendations pertaining to the completeness and transparency issues identified in this table included in the chapter on conclusions and recommendations.

**II. Technical review of the reported information in the national communication**

**A. Information on greenhouse gas emissions and national circumstances relevant to greenhouse gas emissions and removals**

**1. Information on relevant national circumstances**

11. In its NC6, the United States provided a detailed description of the national circumstances and elaborated on the framework legislation and key policy documents on climate change. The United States reported on how national circumstances and changes thereto affect GHG emissions and removals in the country. Overall, an increased population and substantial economic growth, in the period 1990–2005, contributed to the increase in emissions in that period. After 2005, emissions started to decline as a result of both slower

economic growth and the 2008–2009 recession, but also due to reduced GHG intensity of economic output. During the review, the United States provided additional information, including on population density and distribution, temperature and precipitation distribution, and extreme events, as well as a description of gross domestic product (GDP) per capita, GDP by sector and international trade patterns, and information on energy market structure, price, taxes and trade. The ERT noted that it would be very useful for the United States to provide this information in its next national communication as well as in order to enhance the explanation of the relationship between its national circumstances and emissions and removals.

12. The United States also provided detailed information on its institutional arrangements related to climate change policymaking (see paras. 21 and 22 below). The ERT noted that the information on the roles and responsibilities of the states and local governments in relation to climate change policy and action presented in the chapter of the NC6 on national circumstances is somewhat limited. During the review, the United States provided extensive information on and clarifications of its institutional arrangements, including during the meeting of the ERT with representatives of the states and local governments. The ERT noted that the United States could improve the transparency of its reporting by providing a more detailed description of the roles and responsibilities of the states and local governments related to climate change in its next national communication. Further information on the review of the institutional and legislative arrangements for the coordination and implementation of PaMs is provided in chapter II.B below. Table 2 illustrates the national circumstances of the United States by providing some indicators relevant to GHG emissions and removals.

Table 2  
**Indicators relevant to greenhouse gas emissions and removals for the United States of America**

	1990	2000	2005	2010	2011	Change 1990–2011 (%)	Change 2010–2011 (%)
Population (million)	250.18	282.40	295.99	309.77	312.04	24.7	0.7
GDP (2005 USD billion using PPP)	7 962.60	11 158.10	12 564.30	12 992.00	13 225.90	66.1	1.8
TPES (Mtoe)	1 915.00	2 273.33	2 318.86	2 215.50	2 191.19	14.4	–1.1
GHG emissions without LULUCF (kt CO <sub>2</sub> eq)	6 169 592.14	7 045 346.25	7 169 899.34	6 790 642.12	6 665 700.87	8.0	–1.8
GHG emissions with LULUCF (kt CO <sub>2</sub> eq)	5 388 745.64	6 394 662.32	6 197 431.56	5 921 547.77	5 797 284.50	7.6	–2.1
GDP per capita (2005 USD thousand using PPP)	31.83	39.51	42.45	41.94	42.39	33.2	1.1
TPES per capita (toe)	7.65	8.05	7.83	7.15	7.02	–8.2	–1.8
GHG emissions per capita (t CO <sub>2</sub> eq)	24.66	24.95	24.22	21.92	21.36	–13.4	–2.6
GHG emissions per GDP unit (kg CO <sub>2</sub> eq per 2005 USD using PPP)	0.77	0.63	0.57	0.52	0.50	–35.1	–3.8

*Sources:* (1) GHG emission data: the United States' 2013 GHG inventory submission; (2) Population, GDP and TPES data: International Energy Agency.

*Note:* The ratios per capita and per GDP unit are calculated relative to GHG emissions without LULUCF; the ratios are calculated using the exact (not rounded) values and may therefore differ from a ratio calculated with the rounded numbers provided in the table.

*Abbreviations:* GDP = gross domestic product, GHG = greenhouse gas, LULUCF = land use, land-use change and forestry, PPP = purchasing power parity, TPES = total primary energy supply.

## 2. Information on the greenhouse gas inventory, emissions and trends

13. The United States provided in its NC6 a summary of information on GHG emission trends for the period 1990–2011. This information is consistent with the 2013 national GHG inventory submission. Summary tables, including trend tables for emissions in CO<sub>2</sub> eq (given in the common reporting format tables), are provided in an annex to the NC6. During the review, the ERT took note of an advanced draft of the Party’s 2014 national GHG inventory submission, which the United States planned to submit to the secretariat on 15 April 2014.

Table 3  
Greenhouse gas emissions by sector in the United States of America, 1990–2011

Sector	GHG emissions (kt CO <sub>2</sub> eq)				Change (%)		Share <sup>a</sup> by sector (%)	
	1990	2000	2010	2011	1990–2011	2010–2011	1990	2011
	1. Energy	5 267 347.08	6 119 611.96	5 889 117.78	5 745 698.03	9.1	–2.4	85.4
A1. Energy industries	1 828 513.67	2 306 942.75	2 278 105.81	2 176 897.73	19.1	–4.4	29.6	32.7
A2. Manufacturing industries and construction	854 659.78	850 694.05	786 230.46	779 137.19	–8.8	–0.9	13.9	11.7
A3. Transport	1 492 361.27	1 829 656.41	1 762 497.35	1 743 683.56	16.8	–1.1	24.2	26.2
A4.–A5. Other	767 191.43	837 603.84	777 861.26	768 980.15	0.2	–1.1	12.4	11.5
B. Fugitive emissions	324 620.94	294 714.91	284 422.91	276 999.40	–14.7	–2.6	5.3	4.2
2. Industrial processes	316 147.45	352 433.19	303 439.65	326 461.30	3.3	7.6	5.1	4.9
3. Solvent and other product use	4 404.02	4 879.50	4 387.15	4 387.15	–0.4	0.0	0.1	0.1
4. Agriculture	413 861.23	432 176.83	462 269.97	461 496.95	11.5	–0.2	6.7	6.9
5. LULUCF	–780 846.50	–650 683.94	–869 094.35	–868 416.37	11.2	–0.1	NA	NA
6. Waste	167 832.35	136 244.78	131 427.57	127 657.44	–23.9	–2.9	2.7	1.9
7. Other	NA	NA	NA	NA				
<b>GHG total with LULUCF</b>	<b>5 388 745.64</b>	<b>6 394 662.32</b>	<b>5 921 547.77</b>	<b>5 797 284.50</b>	<b>7.6</b>	<b>–2.1</b>	<b>NA</b>	<b>NA</b>
<b>GHG total without LULUCF</b>	<b>6 169 592.14</b>	<b>7 045 346.25</b>	<b>6 790 642.12</b>	<b>6 665 700.87</b>	<b>8.0</b>	<b>–1.8</b>	<b>100.0</b>	<b>100.0</b>

*Note:* The changes in emissions and the share by sector are calculated using the exact (not rounded) values and may therefore differ from values calculated with the rounded numbers provided in the table.

*Abbreviations:* GHG = greenhouse gas, LULUCF = land use, land-use change and forestry, NA= not applicable

<sup>a</sup> The shares of sectors are calculated relative to GHG emissions without LULUCF; for the LULUCF sector, the negative values indicate the share of GHG emissions that was offset by GHG removals through LULUCF.

14. Total GHG emissions<sup>3</sup> excluding emissions and removals from land use, land-use change and forestry (LULUCF) increased by 8.0 per cent between the base year (1990) and 2011 in the United States, whereas total GHG emissions including net emissions or removals from LULUCF increased by 7.6 per cent over the same period. CO<sub>2</sub> continues to be by far the most important GHG for the United States, as in 2011 it accounted for

<sup>3</sup> In this report, the term “total GHG emissions” refers to the aggregated national GHG emissions expressed in terms of CO<sub>2</sub> eq excluding LULUCF, unless otherwise specified.

84.1 per cent of the Party's total GHG emissions and CO<sub>2</sub> emissions increased by 9.9 per cent between 1990 and 2011. Methane (CH<sub>4</sub>) emissions, which decreased by 10.1 per cent between 1990 and 2011, contributed 8.6 per cent of the Party's total GHG emissions in 2011 (expressed on a CO<sub>2</sub> eq basis), while the contribution of nitrous oxide (N<sub>2</sub>O) to the Party's total GHG emissions in the same year was 5.2 per cent, with the emission level remaining about the same as in 1990. Hydrofluorocarbon (HFC) emissions show an increasing trend, with the emission level being about 2.5 times higher in 2011 than in 1990, while their share of the Party's total GHG emissions in 2011 was 1.9 per cent. Perfluorocarbon (PFC) and sulphur hexafluoride (SF<sub>6</sub>) emissions plummeted between 1990 and 2011 by 66.0 per cent and 71.3 per cent, respectively, with their combined share of the Party's total GHG emissions in 2011 being only 0.2 per cent. An analysis of the drivers of GHG emission trends in each sector is provided in chapter II.B below. Table 3 provides an overview of GHG emissions by sector from the base year to 2011.

15. The ERT noted that after a peak in 2007, the upward trend in emissions changed to a downward trend, with the total GHG emissions including LULUCF having reduced by 6.5 per cent by 2011 compared with the 2005 level. In its NC6, the United States reported that the economic downturn which started in 2008, fuel switching from coal to natural gas, increased use of renewable energy for electricity generation, energy prices, improvements in energy efficiency as well as introduction of federal and state policies were the main factors driving the decline in emissions. The preliminary inventory information for 2012 made available to the ERT during the review suggested the continuation of that trend, with emissions in 2012 being already 9.8 per cent below the 2005 level. A further increase in electricity production from natural gas at the expense of an increase in electricity production from renewables, some decrease in the electricity demand due to mild winters, drops in fuel used for transportation due to some decrease in vehicle-miles travelled (VMT) and an increase in energy efficiency more than offset the effect on emissions of the rebound of the economy in 2012.

## **B. Policies and measures**

16. In its NC6, the United States provided comprehensive and well-organized information on its package of PaMs implemented, adopted and planned in order to fulfil its commitments under the Convention. While the NC6 focuses on the PaMs implemented and adopted, the first biennial report (BR1) has its main focus on PaMs planned, as part of the 2013 President's Climate Action Plan (CAP). Both the PaMs reported in the NC6 and those from the CAP reported in the BR1 have the potential to deliver the significant emission reductions necessary to put the United States on course to attaining its 17 per cent emission reduction target.

### **1. Policies and measures related to implementation of commitments under the Convention**

17. In the NC6, in reporting on its PaMs adopted, implemented and planned in achieving its commitments under the Convention, the United States provided information on PaMs by sector and by gas, as well as on cross-cutting PaMs. The textual description of the principal PaMs is supplemented by a summary table. The presentation of the PaMs in the NC6 is mostly complete (see para. 20 below), transparent and concise, and the information is supported by relevant references to where the PaMs are more thoroughly described.

18. The NC6 shows, with a few exceptions, a continuation of the implementation of a set of PaMs similar to those presented in the NC5. Importantly, the trend of increasing the scope of the PaMs and shifting from voluntary approaches towards more regulatory and

economic approaches that was outlined in the previous review report has become more prominent in the NC6. Accordingly, regulatory policies implemented, adopted and planned since the NC5 in the energy, transport and industry sectors are estimated to have a significant impact on emissions. These policies include emission standards for future power plants, light- and heavy-duty vehicles and the oil and natural gas industry, as well as energy efficiency standards for equipment and lighting, and best available control technology for GHG emissions (see chapters II.B.2 and II.B.3 below).

19. The governmental structure and the overall policy and legal context of the United States are well elaborated on in its NC6, with an emphasis on the governance of the energy and climate change policy and the overarching legal framework for acting on climate change (see para. 23 below). Information on the way progress made in relation to PaMs is monitored and evaluated over time and on relevant institutional arrangements is also provided. During the review, the United States provided additional information on such issues, elaborating on the assumptions and methodologies used for monitoring and evaluating specific PaMs, including the assessment of possible interactions between different PaMs and the roles of different federal departments and agencies. Limited information was also provided on the cost of, and cost savings from PaMs, and on non-GHG mitigation benefits, such as job creation, economic transformation, reduced oil dependence and the protection of national heritage. While the ERT acknowledges that the recommendations and encouragements made in the previous review reports have been taken into account by the Party, it encourages the United States to provide information on the way the progress made in relation to PaMs is monitored and evaluated over time and on relevant institutional arrangements in a more systematic manner in its next national communication.

20. The ERT noted that some policies reported in the NC5 are no longer in place, such as the proposed comprehensive economy-wide energy and climate legislation, the American Clean Energy and Security Act (ACES) and the Solar Energy Technology Programme. If enacted, ACES would have contained the Party's 2020 and 2050 emission targets and would have introduced a cap-and-trade system for the United States. ACES was defeated in the Senate (see para. 22 below). There was no reported information in the NC6 on policies that are no longer in place, but a list of such policies and the explanation as to why they are not currently in place was provided during the review. The ERT encourages the United States to provide in its next national communication an explanation for the absence of such PaMs. The ERT noted that while the United States did not explicitly state in the NC6 how they believe their PaMs are modifying longer-term trends in GHG emissions, many of the PaMs reported are expected to have lasting effects on such trends as shown in the projections by 2030. The ERT recommends that the United States report such information in its next national communication.

## **2. Policy framework and cross-sectoral measures**

21. The NC6 includes a comprehensive description of the governmental structure as well as the political, legal and institutional framework relevant to climate policy. It outlines the three pillars of the contemporary climate and energy policy of the United States at the federal level, namely the Clean Air Act (CAA), the American Recovery and Reinvestment Act (ARRA) and the most recent CAP, launched by the President in June 2013. There are also PaMs and targets at the state and subnational levels that make a significant contribution and reinforce the efforts at the federal level. Further information was provided during the review with regard to the roles of federal departments and agencies as well as the roles of states and cities (see chapter II.B.5 below).

22. As noted in the previous review report, the political and institutional system in the United States renders the climate change policymaking process complex and difficult. The



Executive Branch of the Government, represented by the President, his Cabinet and the Executive Office, is central in the development and implementation of climate policy. The Legislative Branch, which consists of the House of Representatives and the Senate, is the primary law-making body. The passing of new legislation, including new climate and energy legislation, requires the support of both chambers of the Congress and the President, who signs the relevant bills into law. For example, although the legislation for a GHG emission cap-and-trade system received support from the House of Representatives in 2009, it did not pass the Senate and was not implemented. Finally, the Judicial Branch plays a significant role in defining the jurisdiction of the Executive Departments and interpreting the application of climate and energy policies under existing laws.

23. ***Regulating within existing legislation, the Clean Air Act.*** The difficulty of passing new legislation through the Congress, in particular on emissions trading, marked a turning point in the approach used by the United States Administration towards regulating GHG emissions, which elected to regulate within existing legislation. This was enabled by the 2007 ruling of the Supreme Court establishing that GHGs are pollutants that the United States Environmental Protection Agency (EPA) has the authority to regulate under CAA, enacted in 1963 and revised several times thereafter. Therefore, CAA became the foundation for introducing a significant body of GHG emission regulations that shifted the climate policy from relying mostly on voluntary approaches towards regulations with a higher degree of predictability of emission reduction outcomes. The effects of such regulations were complemented by a number of economic incentives, such as grants and tax credits, for example a production tax credit for non-hydro renewable energy.

24. ***American Recovery and Reinvestment Act.*** ARRA, launched in 2009 to address the effects of the economic crisis in 2008, has played an important role in addressing climate change through the funding of new clean-energy technologies over the past few years. This included federal subsidies for renewables and energy efficiency that more than doubled between 2007 and 2010 (from USD 17.9 to 37.2 billion), resulting in a doubling of the share of renewable energy in energy supply between 2005 and 2012. It also included financing for the development of carbon capture and storage (CCS) and some measures for efficiency improvements. The ERT noted that the use of the act, which was put in place in response to the general economic downturn, is an innovative way of using federal spending to bring about a less emission-intensive future and co-benefits, such as new jobs. However, funding through the act has time limits in accordance with its general purpose; thus, the continuation and further development of initiatives currently funded by the act is seen as a challenge. This was well described in the NC6 and the information made available to the ERT during the review and reflected in the emission projections.

25. ***Climate Action Plan.*** The 2013 CAP sets the framework and direction for the development of the Party's present and future climate policy, which aims to put the United States on the path towards reaching its 17 per cent emission reduction target below the 2005 level by 2020. The CAP comprises executive actions<sup>4</sup> across three key pillars: reducing emissions; preparing for the impacts of climate change; and leading international efforts to combat climate change and prepare for its impacts (see para. 119 below). It is estimated that the CAP could result in annual emission reductions in the range of 610,000–1,025,000 kt CO<sub>2</sub> eq by 2020.

26. The CAP builds on policies implemented to date and signals a number of new initiatives for executive actions that the United States Administration expects to provide significant emission reductions. The policies already implemented and new initiatives are

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<sup>4</sup> In the absence of congressional action to date, the President has laid out a comprehensive Climate Action Plan of executive actions, grounded in existing legal authorities that will be implemented across United States government agencies.

targeting: (i) CO<sub>2</sub> emissions from the power sector, notably through emission standards for new and existing power plants, advancing the fuel efficiency of vehicles, doubling electricity generation from solar and wind power by 2020, unlocking the potential for energy innovation, and enhancing the energy efficiency of buildings and appliances; (ii) HFC emissions through international and domestic action and investments in low-emission technologies; (iii) CH<sub>4</sub> emissions through a comprehensive strategy; (iv) the preservation of the role of forests; (v) the phasing out of fossil fuel subsidies; (vi) the establishment of a federal quadrennial energy review to propose action and investment to ensure that the United States meets the goals of its energy policy; and (vii) leadership at the federal level. During the review, the United States released a new Strategy to Reduce Methane Emissions that is part of the CAP and is aimed at reducing both domestic and international emissions through incentive-based programmes addressing such sources as landfills, coal mines, agriculture, and oil and gas sectors. This strategy also highlights examples of technologies and industry-led best practices that are already helping to cut CH<sub>4</sub> emissions. Further information on the policies and initiatives of the CAP is presented in the report of the technical review of the first biennial report (TRR/BR1) (see para. 28 of the TRR/BR1).

27. ***Cross-sectoral measures addressing shale gas and renewables.*** The development of PaMs, as well as recent years' changes in emission trends, must be seen in the light of two significant developments: new drilling technology has made it possible to explore the vast resources of shale gas spread over the United States territory; and the cost of non-hydro renewables, such as wind and solar, has come down significantly. This together with the federal production tax incentives (2 cents per kWh), the federal investment tax credit, the demand created through the Renewable Portfolio Standards (RPS) implemented at the state level and reduced costs have made it possible to double the contribution of such sources to about 6.5 per cent in 2012, compared with 3.5 per cent in 2005, of the primary energy supply, mostly from wind, in just a few years (see para. 36 below). The President's CAP set another doubling of the generation of power from renewables as a goal for 2020 (see para. 35 below).

28. ***Addressing the reduction of emissions from public operations.*** The ERT noted the efforts reported to reduce emissions from public operations at the federal and other levels of government. This was seen as important because of the significant potential for emission reductions, since the public sector not only controls sources of substantial emissions but can also set a powerful example for other sectors of the economy. At the federal level, Executive Order 13514 on Goals and Emission Targets, issued in 2009, sets a framework for the action of federal agencies and relevant institutions and aims to initiate such action, for example those aimed at reducing emissions from vehicles and buildings while improving environmental, energy and economic performance. Since 2010, the federal Government has had a target for its own operations of a 28 per cent reduction in emissions by 2020 compared with the 2008 level and annual sustainability plans were introduced by the federal agencies. The implementation of the aforementioned order is coordinated by the Office of the Federal Environmental Executive. The ERT was informed that government GHG emissions had been reduced by 15 per cent relative to the 2008 baseline level by 2012. Table 4 provides a summary of the reported information on the key PaMs of the United States at the federal level.

29. ***The significant role of the subnational level.*** The ERT noted more comprehensive reporting on non-federal-level PaMs in the NC6 compared with the NC5 and the wealth of information provided to the ERT by representatives of the states and cities during the review on the increasing prominence of subnational PaMs (see chapter II.B.4 below). The ERT also noted the significant and growing role of the states and local governments in climate change policymaking and implementation. This refers not only to the effective implementation by the states of PaMs adopted at the federal level, but also to the further

enhancement and strengthening of PaMs at the state and city levels, which in turn helps to shape the overall climate change policy responses of the United States. The ERT encourages the United States to continue to report on PaMs undertaken at the subnational level in its next national communication.

Table 4  
**Summary of information on policies and measures reported by the United States of America**

<i>Sectors affected</i>	<i>List of key policies and measures</i>	<i>Estimate of mitigation impact (kt CO<sub>2</sub> eq)</i>
<b>Policy framework and cross-sectoral measures</b>	Climate Action Plan (2013)	610 000–1 025 000 by 2020
	Clean Air Act (1963, 1970, 1977 and 1990)	NA
	Energy Independence and Security Act (2007)	NA
	American Recovery and Reinvestment Act (2009)	NA
<b>Energy</b>	Executive Order 13514 on Goals and Emission Targets	NA
	Carbon pollution standards for new and existing power plants	NA
	Carbon capture and storage demonstration and large-scale geological storage	1 000 by 2011; 7 000 by 2015; 16 200 by 2020
	Nuclear Power Waste Policy Act	NA
Energy supply /renewable energy	Renewable Portfolio Standards	NA
	Biomass initiatives	NA
	Onshore and offshore renewable energy development programmes	6 700 by 2011; 25 600 by 2015; 41 500 by 2020
	Clean Energy Programmes	29 600 2011; 44 000 2015; 73 300 2020
Residential and commercial sectors (energy efficiency)	ENERGY STAR Programmes	221 400 by 2011; 218 200 by 2015; 277 900 by 2020
	Appliance and Equipment Energy Efficiency Standards Programme (including lighting)	165 000 by 2011; 233 000 by 2015; 257 000 by 2020
	Building Energy Codes	NA
<b>Transport</b>	National Programme for Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards Rule	35 000 by 2011; 92 000 by 2015; 236 000 by 2020
	National Programme for Heavy-Duty Vehicle Greenhouse Gas Emissions and Fuel Efficiency Standards	NA by 2011 and 2015; 37 700 by 2020

	Renewable Fuel Standard	NA by 2011 and 2015; 138 400 by 2020
	Light-duty vehicle fuel economy and environment label	NA
	SmartWay Transport Partnership	NA by 2011 37 000 by 2015; 43 000 by 2020
	Federal transit, highway and railway programmes	NA
	Next Generation Air Transportation System	NA by 2011; 1 000 by 2015; 3 800 by 2020
<b>Industrial processes</b>	Significant New Alternatives Policy Programme	206 900 by 2011; 252 000 by 2015; 311 100 by 2020
	Natural Gas STAR Programme	35 300 by 2011; 20 600 by 2015; 22 100 by 2020
	Federal air standards for the oil and natural gas industry	NA by 2011; 32 600 by 2015; 39 900 by 2020
<b>Agriculture and forestry</b>	Conservation Reserve Programme	51 600 by 2011; 61 200 by 2015 and 2020
	Natural Resources Conservation Service	11 900 by 2011; 20 100 by 2015; 27 600 by 2020
<b>Waste management</b>	Landfill Air Regulation	NA by 2011; 162 700 by 2015; 183 100 by 2020
	Landfill Methane Outreach Programme	15 800 by 2011; 14 300 by 2015; 15 700 by 2020
	Sustainable Materials Management Programme	NA by 2011; 30 by 2015 and 2020

*Abbreviation:* NA = not available.

### 3. Policies and measures in the energy sector

30. Between 1990 and 2007, GHG emissions from the energy sector increased by 19.0 per cent (999,556.01 kt CO<sub>2</sub> eq). They then declined thereafter following the economic downturn starting in 2008, resulting in a difference between 1990 and 2011 of 9.1 per cent (478,350.95 kt CO<sub>2</sub> eq). In addition, the change in the emissions trajectory for the energy sector since 2007 can be explained by the remarkable expansion in natural gas exploration and use, significant developments in relation to renewable energy sources and possibly also behavioural changes. The shift in the emission trend also reflects the impact of PaMs, in particular fuel economy standards and appliance efficiency standards.

31. **Energy supply.** Energy supply accounts for a relatively stable share of around 30 per cent of the total emissions of the United States. From 2005, which is the base year for the 2020 target under the Convention, to 2012 energy supply and consumption were reduced by about 5 per cent. The share of natural gas in the primary energy consumption grew from 22.5 per cent in 2005 to 27.4 per cent in 2012, owing to the availability and relatively low price of shale gas. In the same period, the share of non-hydro renewables almost doubled to 6.5 per cent. The share of nuclear energy in the primary energy consumption remained stable at about 8 per cent and is expected to remain stable at least in the medium term, while the shares of coal, and oil and oil products declined by almost 4 per cent each. The ERT noted that future developments in energy supply are likely to be significantly influenced by PaMs reported in the NC6, at both the federal and subnational levels.

32. The ERT also noted that new carbon pollution standards for power plants appear to be the single most significant policy by its mitigation potential in the near and medium terms. For new plants, EPA issued a new proposal in September 2013 that already sets the standard. The proposal is now in a process of rule-making, including providing comments and public hearings. The draft rule for existing plants is expected to be presented by EPA in June 2014 and a final rule in June 2015. Thus, there is some uncertainty regarding the final scope and stringency of the standards, how they will be implemented and consequently the magnitude of the expected emission reductions. In part owing to such uncertainties, no estimates of effects were presented in the NC6. The new standards will work in conjunction with the state-level emissions trading schemes. The ERT acknowledged that the importance of the compatibility of regulations at the federal and state levels was recognized by both levels. To that end, the standards prepared by EPA are seen as a floor, allowing regulators at other levels to go beyond them.

33. The new standards for power plants, corresponding actions at the state level and other environmental regulations, such as those related to mercury, are expected to affect further the level of power generation by existing coal plants. The ERT noted that no new development in coal power is envisaged. This reflects the economics in the energy sector, where costs make natural gas and renewables more competitive, and the assessment that new coal power plants would not comply with the new proposed standards to reduce carbon pollution from existing power plants, except for those with CCS.

34. The United States has put significant resources into the development of CCS technology for years; as such technology could play a major role in preventing emissions from point sources using fossil fuels from reaching the atmosphere. The NC6 presented a CCS demonstration and large-scale geological storage cooperative agreements programme of the United States Department of Energy (DOE), which currently comprises eight installations of different kinds using CCS scheduled to be established by 2020. The first of those large-scale facilities is expected to be in operation in 2014 and, overall, the programme is expected to yield 16,200 kt CO<sub>2</sub> eq emission reductions by 2020. The ERT noted the importance of the effort to gain experience in CCS by stimulating investment in low-emission coal-based power generation technology. It also noted that, as no new coal power plants are envisaged, it is unlikely that plants with CCS facilities will be economically viable in the United States before there is a significant change in the carbon price and the economics of the power sector changes, owing to the competitiveness of natural gas and renewables. The ERT was informed that current incentives may also make it difficult to implement projects at all eight facilities reported in the NC6.

35. **Renewable energy sources.** Building on the success of doubling the share of non-hydro renewable energy sources in the total energy supply between 2005 and 2012, the CAP sets a target for another doubling by 2020. Most of the growth is expected to come from wind power, but power from solar photovoltaics has seen a drastic growth in recent years, with the possibility of extending that growth in the future. The ERT noted that there

is major potential in wind energy and ambition for the further rapid expansion of renewable energy. To that end, it also noted the vital importance of providing sites for such expansion, in order to avoid delays when developers of wind, solar and geothermal facilities are willing to invest in new capacity, notwithstanding the considerable federal land that was already made available through the efforts of the United States Department of the Interior and its Bureau of Land Management.

36. The ERT further noted that tax incentives, such as the federal production tax credit (2 cents per kWh), appear to have been a significant driver for the development of renewable sources, in particular wind, but also solar. To some extent, the new developments reflect the status of decisions on such tax incentives. RPS at the state level also play a major role in driving the expansion of renewable energy using a market-based approach; as the standards establish requirements for electricity utilities and other retail electricity providers to serve a minimum percentage (or absolute amount) of customer energy load from eligible sources of renewable electricity. RPS are in place in 29 states, with targets going up to 40 per cent in Hawaii by 2030 and 33 per cent in California by 2020. Similarly, many individuals, companies and public institutions have a preference for the purchase of electricity from renewables, altogether providing additional demand and driving supply. The ERT noted the importance of having a power system that allows such demand to be met, thus driving the transition to cleaner fuels also from the demand side. This includes arrangements such as independent power producers, third-party access and technology solutions, such as smart grids.

37. Biomass utilization remains relatively stable and no major changes are envisaged in the short run. The portfolio of policy instruments and programmes to promote biomass use includes schemes for loans, grants and guarantees as well as analytical support targeting the rural production of biomass for energy and fuel use. Such instruments and programmes also promote sustainable rural development. Examples of PaMs in the energy supply sector are Clean Energy Programmes, which encourage the use of power from highly efficient combined heat and power plants as well as the purchase of 'green' power managed by EPA.

38. **Energy efficiency.** The ERT noted that a number of programmes and initiatives on energy efficiency reported in the NC6, including the Energy Independence and Security Act (2007), that have provisions designed to increase energy efficiency, and introduced energy efficiency standards as a moving target as technological change continuously leads to increased efficiency. The ERT noted that the United States' system of energy efficiency standards for equipment and appliances is longstanding and substantive. Programmes include grants, partnerships, information and labelling, education and other elements, and target efficiency in different sectors. Many of the federal programmes reported are implemented at the subnational level, including the Clean Energy Programmes (see para. 37 above). Other examples of programmes targeting energy end-use sectors are provided in paragraphs 39–42 below.

39. **Residential and commercial sectors.** After an initial increase in emissions following the 1990s, emissions from the residential and commercial sectors have fluctuated within a narrow margin over the years, resulting in emissions in 2011 being approximately at the same level as in 1990. This stable emissions level reflects two compensating trends. On the one hand, there was the challenge posed by a rapidly growing population as well as changing settlement patterns, which together led to an increasing demand for new residential and commercial buildings and appliances. On the other hand, this resulted in a growing emphasis on spatial planning and effective building codes, as well as appliance standards, which contributed to limiting emissions in the longer term.

40. Improving energy efficiency has been the single most important policy that contributed to reducing emissions from the residential and commercial sectors. The policy was implemented chiefly by the regulations and standards put in place by DOE and the

ENERGY STAR Programmes of EPA, which are complementary and mutually reinforcing programmes implemented to boost the adoption of energy-efficient products, practices and services through effective partnerships, objective measurement tools and consumer education. During the review, the ERT was provided with additional information on the development and implementation of appliance standards and building codes, as well as information on how some subnational authorities are working on such issues. To that end, the ERT noted that state and local governments can play at least an equally important role as the federal Government in the implementation of measures targeting this sector (see chapter II.B.4 below). The implementation of building codes is not evenly spread across the country; while many states have implemented codes recently, some lag behind.

41. The DOE Appliance and Equipment Energy Efficiency Standards and Lighting Energy Efficiency Standards develop test procedures and set minimum energy conservation standards across 50 categories of appliances and equipment, including lighting. Since 2010, when the Party's NC5 was published, 17 new and updated standards have been issued and energy users have saved more than USD 40 billion on their utility bills. Lighting standards were also tightened, requiring light bulbs to use about 25 per cent less energy compared with traditional light bulbs as of 2012. In the NC6, the United States revised estimated effects of such standards, without lighting, for 2020, from 6,100 kt CO<sub>2</sub> eq reported in the NC5 to 216,000 kt CO<sub>2</sub> eq reported in the NC6. For lighting standards, the corresponding figures for 2020 were 1,500 kt CO<sub>2</sub> eq reported in the NC5 and 41,000 kt CO<sub>2</sub> eq reported in the NC6. Though there was no change in the methodology used to calculate the effects from DOE Appliance and Equipment Energy Efficiency Standards, the NC6 uses the programme implementation start year of 1987 as the 'zero' point for reductions.

42. Labels, information and various voluntary approaches mostly implemented by EPA, together with a number of voluntary programmes managed by DOE, such as Better Building Challenge and Better Building Alliance, have complemented the effects of the minimum efficiency standards. Among them, the ENERGY STAR Programmes stand out as they have brought about significant emission reductions. For example, it is expected that ENERGY STAR Programmes will deliver emission reductions of 141,200 kt CO<sub>2</sub> eq from labelled products and 93,500 kt CO<sub>2</sub> eq from commercial buildings by 2020. Also, the Government at all levels, targeting its own operations, can yield significant emission reductions in the buildings sector and set a good example (see para. 40 above). The ERT noted that, while ARRA has channelled funding for efficiency improvements in the last four years, it is a time-limited act, and thus the continuation of its efforts may pose a challenge regarding funding (see para. 38 above).

43. **Industrial sector.** Industry represented almost a third of the energy demand in the United States in 2012. Over the last four decades that share has declined and over the recent five-year period there has been a decline also in absolute numbers. Almost half of the related emissions come from electricity production. In the NC6, many of the PaMs reported cover multiple sectors, including industry. Such PaMs encompass programmes for combined heat and power (CHP), the purchase of 'green' power, biofuels, CCS, information and labelling, etc. Many of the PaMs are typically targeting more energy-efficiency improvements and, hence, lead to emission reductions (see para. 38 above). Thus, the quantifications of emission reductions do not specify emission reductions in industry, with the exception of ENERGY STAR for industry, which enables industrial companies to reduce energy use in a cost-effective way and is expected to yield 36,600 kt CO<sub>2</sub> eq emission reductions by 2020 (see para. 40 above). CHP Technical Assistance Partnerships and Industrial Assessment Centres managed by DOE help with energy audits and reduce the cost of CHP.

44. **Transport sector.** In 2011, the transport sector ranked second, after energy industries, in terms of the level of emissions, accounting for 26.2 per cent of the Party's

total GHG emissions. Emissions from this sector increased by about 16.8 per cent between 1990 and 2011 (251,322.29 kt CO<sub>2</sub> eq). However, that overall growth masks a net decrease in emissions of approximately 8 per cent between 2005 and 2011, which was due to a combination of regulatory, market and behavioural factors as well as the economic downturn.

45. The policy mix in the transport sector reported in the NC6 shows a continuous shift from voluntary, research and information-based programmes towards regulations and standards, which was already evident from the PaMs reported in the NC5. Also, the shift in the policy mix in the transport sector is marked by an increased stringency of the policies implemented or planned. The regulations and standards are expected to deliver by far the most sizeable emission reductions in the sector.

46. The regulation finalized by the United States Department of Transport (DOT) and EPA in April 2010, the National Programme for Light-Duty Vehicle (LDV) Greenhouse Gas Emission Standards and Corporate Average Fuel Economy (CAFE) Standards Rule, put forward fuel economy standards for passenger cars, light-duty trucks and medium-duty passenger vehicles and was a milestone achievement in the United States, specifically intended to reduce fuel consumption and GHG emissions from fuel combustion. The first phase of the CAFE Standards, which target light-duty trucks and passenger cars for model years 2012–2016, is projected to result in an average industry fleet-wide tailpipe CO<sub>2</sub> level of 250 g/mile (156 g/km) by 2016, including expected reductions in HFC emissions from air conditioners. The second phase of the programme, announced in 2011 for the model years 2017–2025, is expected to deliver much lower average industry emissions at 163 g/mile (101 g/km) CO<sub>2</sub>. The total annual impact of the programme by 2020 from vehicles manufactured to meet the standards for model years 2012–2016 and 2017–2025 was estimated at 236,000 kt CO<sub>2</sub> eq emission reductions. The programme is expected to cut 6 Gt CO<sub>2</sub> emissions during the lifetime of the cars and light trucks sold between 2012 and 2025. Additional potential savings could result from a mid-term review of the standard for model years 2017–2025.

47. The joint rule of EPA and the National Highway Traffic Safety Administration on the Heavy-Duty Vehicle Emissions and CAFE Standards is expected to achieve up to a 23 per cent reduction in GHG emissions and fuel consumption for semi-trailer trucks and up to a 9 per cent emission reduction for buses, special purpose trucks and other vocational vehicles. The programme is expected to cut 270 Mt CO<sub>2</sub> eq emissions over the lifetime of the vehicles sold in model years 2014–2018.

48. The Renewable Fuel Standard (RFS), established under the Energy Independence and Security Act of 2007, requires an annual use of 136 million m<sup>3</sup> renewable fuel for transport by 2022. The EPA rules include new definitions and criteria for both renewable fuels and the biofuel feedstocks used to produce them, including statutory life cycle emission thresholds designed to ensure significant reductions in fuel use and GHG emissions as well for production technologies. Changes to RFS recognize the expansion of opportunities for biofuel production and are expected to lead to a cut of 138,400 kt CO<sub>2</sub> eq in emissions by 2020.

49. In addition to regulatory policies, there are voluntary and economic schemes, such as the SmartWay Transport Partnership, the LDV fuel economy and environment label, the federal transit, highway and railway programmes, and the national clean diesel campaign that are expected to provide additional GHG emission reductions. More specifically, the SmartWay Transport Partnership promotes collaboration with businesses and other stakeholders to decrease climate-related and other emissions from the movement of goods. The LDV labelling programme for new-generation vehicles provides information on vehicles' fuel economy, energy use, fuel costs and environmental impacts. The transit programmes provide grants to support the construction and operation of transit services and



the deployment of a range of advanced technologies for vehicles and stations, including hybrid and clean-fuel transit buses.

50. **International aviation and maritime transportation.** Emissions from international bunker fuels in the United States increased by about 7.5 per cent in the period 1990–2011 and accounted for about 1.7 per cent of the Party's total GHG emissions in 2011. The United States is working with the International Civil Aviation Organization and the International Maritime Organization to address those emissions. According to the information provided during the review, the United States is supporting international approaches in this area, and its legislation already has provisions in place so that it can implement any regulations coming out of those bodies without delay or further involving the Legislative Branch of the Government.

51. With regards to on-going efforts, the Federal Aviation Administration (FAA) of DOT has already introduced GHG reduction goals as part of its Next Generation Air Transportation System, focusing efforts on increasing the efficient of aircraft operations and reducing GHG emissions through airspace, operational and infrastructure improvements. FAA is also advancing in the development of alternative jet fuels through the Commercial Aviation Alternative Fuels Initiative, a coalition of airlines, aircraft and engine manufacturers. Additional strategies to reduce emissions from the aviation sector are being advanced through four Aviation Low-Emission, Fuel Efficiency and Renewable Fuels measures.

#### 4. Policies and measures in other sectors

52. In 1990 and 2011, GHG emissions from the non-energy sectors accounted for the same share of about 14 per cent of the total GHG emissions of the United States without LULUCF. Total emissions from the non-energy sectors in 2011 were some 0.2 per cent higher (16,036.85 kt CO<sub>2</sub> eq) than in 2005 and 2.0 per cent higher than in 1990 (17,757.79 kt CO<sub>2</sub> eq). In 2011, emissions from industrial processes, solvent and other product use, agriculture and waste accounted for 4.9, 0.1, 6.9 and 1.9 per cent of the total emissions (excluding LULUCF) from the non-energy sectors, respectively.

53. **Industrial processes.** In 2011, GHG emissions from industrial processes were 3.3 per cent (10,313.85 kt CO<sub>2</sub> eq) above the 1990 level and 1.3 per cent (4,304.11 kt CO<sub>2</sub> eq) below the 2005 level. The emission decrease after 2005 was mainly owing to the increased control and regulation of emissions. Widespread installation of pollution control has curbed emissions of N<sub>2</sub>O from industry. In contrast, emissions from HFCs, used to substitute ozone-depleting substances (ODS), have been constantly increasing and are the largest and fastest-growing source of fluorinated gases (HFCs, PFCs and SF<sub>6</sub>).

54. The PaMs addressing emissions from industrial processes are implemented by EPA through a mix of regulatory, voluntary and information-based instruments. The Significant New Alternatives Policy (SNAP) Programme is the measure that delivers by far the most sizeable mitigation impact from the use of non-ODS in the industrial and consumer sectors, namely 311,100 kt CO<sub>2</sub> eq emission reductions by 2020. It is constantly being revised, considering the comparative impact of available and potentially available alternatives for both ODS and fluorinated gases. In addition, the federal air standards for the oil and natural gas industry, put in place in April 2012 by EPA, regulate volatile organic compounds (VOCs) and air toxins (expected to yield an almost 95 per cent reduction in VOC emissions) and will have a significant co-benefit in the form of the reduction of CH<sub>4</sub> emissions by 39,900 kt CO<sub>2</sub> eq by 2020. The Natural Gas STAR programme focuses on cooperation between oil and natural gas companies to promote proven cost-effective technologies to reduce methane emissions from natural gas systems.

55. **Agriculture.** In 2011, agriculture contributed 6.9 per cent of the total GHG emissions of the United States and emissions from the sector were 11.5 and 3.4 per cent (47,635.72 and 15,308.95 kt CO<sub>2</sub> eq) higher than in 1990 and 2005, respectively. The relatively stable level of emissions since 2005 can be attributed to resource conservation programmes and the shift to on-site manure management, and to some extent to the economic downturn.

56. In the agriculture sector, voluntary, economic and information-based instruments dominate the policy mix used to reduce GHG emissions and they are consistent with the broader incentive-based approach to land management. The United States Farm Bill is the primary agricultural and food policy tool of the federal Government. The bill sets a framework for the future climate policies in agriculture and provides certainty of the funding provided to farmers. During the review, the ERT received additional information on the new Farm Bill, adopted early in 2014. The new bill reduces federal expenditure in the sector, and funding for voluntary initiatives, such as the Conservation Reserve Programme (CRP) (see para. 57 below), will be reduced. As a result, the emission reduction impact of the policies in the agriculture sector could be at the lower end of the range of projected values reported in the NC6.

57. CRP and the Natural Resources Conservation Service (NRCS) are the largest agriculture and land-use programmes in the country. CRP is an incentive for farmers to place highly erodible cropland or other environmentally sensitive acreage into vegetative cover (native grasses, wildlife plantings, trees, etc.) for 10 to 15 years. A total of 10.35 million ha were enrolled in the programme at the end of 2013, mainly concentrated in the centre and north-west of the country. Incentives can take the form of technical assistance, annual rental payments or cost-share assistance. The United States Department of Agriculture (USDA) has estimated that CRP resulted in 51,600 and 49,000 kt CO<sub>2</sub> eq emission reductions in 2011 and 2012, respectively. Owing to the decreased funding in the new Farm Bill, CRP is likely to yield more than 41,500 kt CO<sub>2</sub> eq emission reductions by 2015 and by 2020.

58. NRCS provides financial and/or technical assistance to farmers enrolled in the programmes, addressing specific conservation practices. NRCS administers several conservation programmes, the main ones being the Environmental Quality Incentives programme and the Conservation Technical Assistance programme, and has an aggregate mitigation potential of 20,100 and 27,600 kt CO<sub>2</sub> eq by 2015 and 2020, respectively.

59. **LULUCF.** The LULUCF sector was a net sink of around 868,416 kt CO<sub>2</sub> eq in the United States in 2011 and net GHG removals have increased by 11.2 per cent (87,569.87 kt CO<sub>2</sub> eq) since 1990. The increasing trend in removals was mainly owing to an increased rate of net carbon accumulation in forest carbon stocks. However, in the longer term the rate of carbon sequestration is likely to decline (see paras. 74 and 88 below).

60. The main PaMs affecting the LULUCF sector are the components of CRP, NRCS and similar agricultural programmes that take land out of production for periods of typically 10 to 15 years, increasing biomass and soil carbon stocks. The NC6 only reported two programmes directed solely at the LULUCF sector and did not quantify their effects. The programmes are implemented by the USDA Forest Service (USFS) and include the Woody Biomass Utilization Grant Programme and the Forest Ecosystem Restoration and Hazardous Fuels Reduction programmes. During the review, USDA provided additional information on the carbon pool potential of the sector and its estimations of the mitigation potential of the LULUCF sector.

61. **Waste management.** Between 1990 and 2011, GHG emissions from the waste sector decreased by 23.9 per cent (40,174.91 kt CO<sub>2</sub> eq). In 2011, emissions from the sector were

6.8 per cent (9,283.90 kt CO<sub>2</sub> eq) below the 2005 level, despite growing waste quantities. Significant reductions in CH<sub>4</sub> emissions from landfills are the driver for the emission reductions in the sector. In the near future, material management and life cycle approaches will lead to further decrease in emissions due to their increasing impact on emission levels.

62. The United States promotes mitigation in the waste sector predominantly through regulatory policies, complemented by voluntary activities in the field. The single most important instrument in the sector is the Landfill Air Regulation under EPA. It has been implemented by the states since 1996, requiring large landfills to capture and combust their landfill gas emissions. EPA also has two voluntary programmes: the Landfill Methane Outreach Programme, aiming to reduce CH<sub>4</sub> emissions through cost-effective means supporting the recovery and use of landfill gas for energy, and the Sustainable Material Management Programme, providing systemic approaches to reducing the use of materials and their associated environmental life cycle impacts. The latter is to incorporate the current WasteWise programme, which encourages recycling and reducing waste generation.

## **5. Policies and measures implemented at the regional, state and local levels**

63. The role of the non-federal governments in the climate policymaking of the United States is significant and steadily growing. A plethora of PaMs has been put in place, aimed at achieving emission reductions, including GHG emission and renewable energy targets, emissions trading schemes (ETS) and GHG performance standard for power plants implemented at the regional, state and city levels.

64. Regional, state and local governments play a key role in implementing the policies adopted at the federal level, further enhancing the climate action policies and shaping the climate policy of the United States. States will have a key responsibility in the implementation of provisions of the CAP, such as the implementation of the policies on existing and new power plants. States can also lead towards federal action and could pave the way for policy development at the federal level, as demonstrated by the role played by the vehicle efficiency standards in California in reducing the carbon intensity of motor fuel. This was also demonstrated by the role of the Regional Greenhouse Gas Initiative (RGGI) and California in piloting ETS, including experience with auctioning allowances, maintaining consistency across participating states and provinces, tracking allowances and compliance arrangements, and the use of revenue, including for promoting energy efficiency.

65. The interaction between the federal and state policies could be rather complex. For example, the existing ETS may be affected by the new regulation on power plants at the federal level. The ERT was informed that the federal Government works closely with the state governments to ensure that actions at the federal and state levels are mutually supportive. For example, in setting standards for vehicles, it has been possible for states like California to go beyond the minimum levels set by the federal Government.

66. Table 5 summarizes the main state-level PaMs currently being implemented at the time of the visit of the ERT. As at January 2014, 29 states had state-wide emission targets or limits, 29 states had RPS and 18 states had mandatory energy efficiency resource standards. The number of states with GHG emission targets has doubled since the NC5. Besides those policies, other key policies at the state and local levels encompass ETS, building energy codes, transport and infrastructure planning, and alternative means of transport.

67. Among the ETS introduced at the state level, the California cap-and-trade programme and RGGI stand out. The California cap-and-trade programme was introduced through California's Global Warming Solutions Act (2006), a comprehensive programme

aimed at reducing GHG emissions by 2 per cent each year by 2015 and by 3 per cent from 2015 to 2020 through regulations and market mechanisms, including cap-and-trade rules that came into effect on 1 January 2013 and apply to large electrical power and industrial plants. The rules will extend from 2015 to fuel distributors, encompassing nearly 85 per cent of the state's total emissions of about 450 Mt CO<sub>2</sub> eq per year.

68. Established in 2005, RGGI, the first mandatory cap-and-trade programme in the United States to limit CO<sub>2</sub> emissions from the power sector, is projected to contribute to a 45 per cent reduction in the annual power-sector CO<sub>2</sub> emissions by 2020 from the 2005 level. RGGI currently involves the States of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island and Vermont. From 1 January 2014, an updated Model Rule was enforced, with an emissions cap for 2014 of 91 Mt CO<sub>2</sub> (a 45 per cent reduction on the cap for 2013). The cap will further decline by 2.5 per cent annually until 2020, resulting in a cumulative 15 per cent reduction in annual emissions from the cap for 2014.

69. During the in-country visit of the ERT, representatives of states, counties and cities emphasized the increasing activity at the non-federal level in climate policymaking. Representatives of the Conference of United States Mayors, the National League of Counties and the National Governors Association mentioned that, although building codes, transport infrastructure and alternative fuels were areas for action at the city level, widespread progress is strongly linked to action at the state and federal levels. Specific examples of action at the city level provided to the ERT during the review involved Philadelphia, Pennsylvania, which has an action plan of 15 measurable targets in five goal areas (which include reducing GHG emissions to 20 per cent below the 1990 level by 2015), implemented through constantly updated initiatives, regarding municipal and private energy use, renewable energy, air quality, waste, GHG emission reduction, equity, VMT and resilient infrastructure.

Table 5

**Summary of major policies, policy instruments and targets implemented at the state level in the United States of America**

<i>Policy/measure/programme</i>	<i>Participating states</i>
Emission targets (29 states)	AR, AZ, CA, CO, CT, DC, FL, HI, IL, IO, KY, MA, MD, ME, MN, MI, MT, NH, NJ, NM, NY, OR, RI, SC, UT, VA, VT, WA, WI
Renewable energy portfolio standards (29 states)	AK, AZ, CA, CO, CT, DC, DE, HI, IA, IL, IN, KS, MA, MD, ME, MN, MO, MT, NC, ND, NH, NJ, NM, NV, NY, OK, OR, RI, SD, TX, UT, VA, VT, WA, WI
Energy-efficiency resource standards and targets (34 states)	AR, AZ, CA, CO, CT, DE, FL, HI, IA, IL, IN, MA, MD, ME, MI, MN, NC, ND, NM, NV, NY, OH, OK, OR, PA, RI, SD, TX, UT, VA, VT, WA, WI, WV
Emission performance standards for electrical power (4 states)	CA, MT, OR, WA
Climate Action Plan (29 states)	AK, AL, AR, AZ, CA, CO, CT, DE, FL, HI, IA, ID, IL, KS, KY, MA, MD, ME, MN, MI, MO, MT, NC, NH, NJ, NM, NV, NY, OR, PA, RI, SC, TN, UT, VA, VT, WA, WI
Participation in regional initiatives (13 states)	CA, CT, DC, DE, MA, MD, ME, NH, NJ, NY, PA, RI, VT
Greenhouse gas reporting and registries (43 states)	AL, AZ, CA, CO, CT, DE, FL, GA, HI, IA, ID, IL, KS, KY, MA, MD, ME, MN, MI, MO, MT, NC, NH, NJ, NM, NV, NY, OH, OK, OR, PA, RI, SC, TN, TX, UT, VA, VT, WA, WI, WV, WY
Standards and caps for emissions from electricity (14 states)	CA, CT, DE, IL, MA, MD, ME, MT, NH, NY, OR, RI, VT, WA
Alternative energy portfolio standards	MI, OH, PA, WV

<i>Policy/measure/programme</i>	<i>Participating states</i>
(4 states)	
Renewable or alternative sources goal (7 states)	AK, IN, ND, OK, SD, UT, VA
Carbon capture and storage incentives (19 states)	CO, FL, IL, IN, KS, KY, LA, MA, MI, MS, MT, ND, NM, OH, TX, UT, VA, WV, WY
Net metering: monitoring of net electricity generation outflow	All, except AK, AL, MS, SD, TN
Transportation mandates and incentives for biofuels (45 states)	All, except DE, NJ, NV, UT, WV, WY
Zero-emission vehicle programme (10 states)	CA, CT, MA, MD, ME, NJ, NY, OR, RI, VT
Policies and measures related to vehicle-miles travelled (19 states)	AZ, CA, CT, DE, FL, GA, HI, MA, ME, NJ, NY, OR, PA, RI, TN, VA, VT, WA, WI
Low-carbon fuel standard (15 states)	CA, CT, DC, DE, MA, MD, ME, NH, NJ, NY, OR, PA, RI, VT, WA
Polices and measures related to medium- and heavy-duty vehicles (38 states)	AL, AR, AZ, CA, CT, DC, DE, FL, HI, IL, IN, KS, MA, MD, ME, MI, MO, NC
Buildings	NE, NH, NJ, NM, NV, NY, OH, OK, OR, PA, RI, SC, TX, UT, VA, VT, WA, WI, WV
Energy codes – residential (42 states)	All, except AK, AZ, KS, ME, MO, MS, ND, SD, WY
Energy codes – commercial (42 states)	All, except AK, AZ, KS, ME, MO, MS, ND, SD, WY
Appliance efficiency standards (16 states)	AZ, CA, CT, DC, FL, MA, MD, MN, NH, NJ, NV, NY, OR, RI, VT, WA
Property assessed clean energy (31 states)	AR, CA, CO, CT, DC, FL, GA, HI, IL, LA, MA, MD, ME, MI, MN, MO, NC, NH, NJ, NM, NV, NY, OH, OK, OR, TX, UT, VA, VT, WI, WY
Green building standards for state buildings (44 states)	All, except AK, KS, ME, MS, ND, NE, WV, WY

*Source:* Adapted from the Center for Climate and Energy Solutions, 22 October 2013; see <<http://www.c2es.org/docUploads/All%20State%20Initiatives%20October%202013.pdf>>.

*Abbreviations:* AK = Alaska, AL = Alabama, AR = Arkansas, AZ = Arizona, CA = California, CO = Colorado, CT = Connecticut, DE = Delaware, FL = Florida, GA = Georgia, HI = Hawaii, IA = Iowa, ID = Idaho, IL = Illinois, IN = Indiana, KS = Kansas, KY = Kentucky, LA = Louisiana, MA = Massachusetts, MD = Maryland, ME = Maine, MI = Michigan, MN = Minnesota, MO = Missouri, MS = Mississippi, MT = Montana, NC = North Carolina, ND = North Dakota, NE = Nebraska, NH = New Hampshire, NJ = New Jersey, NM = New Mexico, NV = Nevada, NY = New York, OH = Ohio, OK = Oklahoma, OR = Oregon, PA = Pennsylvania, RI = Rhode Island, SC = South Carolina, SD = South Dakota, TN = Tennessee, TX = Texas, UT = Utah, VA = Virginia, VT = Vermont, WA = Washington, WI = Wisconsin, WV = West Virginia, WY = Wyoming.

## C. Projections and the total effect of policies and measures

70. The NC6 provides information on projections of GHG emissions and removals for a ‘with measures’ scenario and an estimate of the total effect of PaMs. The energy-sector emission projections are consistent with the 2013 Energy Information Administration Annual Energy Outlook (AEO2013), while the projections for LULUCF and non-CO<sub>2</sub> gases were developed using an updated methodology compared with that used for the NC5.

### 1. Projections overview, methodology and key assumptions

71. The GHG emission projections provided by the United States in its NC6 include a ‘with measures’ scenario (also referred to as the ‘2012 Policy Baseline’ scenario) until 2030, presented relative to actual inventory data for 2000, 2005, 2010 and 2011.

Projections are presented on a sectoral basis, using the same sectoral categories used in the PaMs section and on a gas-by-gas basis for all GHGs. Projections are also provided in an aggregated format for each sector as well as for a national total, using global warming potential values. Estimates of the total effect of PaMs were provided for 2015 and 2020. Emission projections related to fuel sold to ships and aircraft engaged in international transport were reported separately and not included in the totals. The projections data are presented in a tabular format and they are also illustrated using charts.

72. The NC6 does not include some information required by the UNFCCC reporting guidelines on NCs on the total effect of PaMs disaggregated by gas. In response to a question raised by the ERT during the review, the United States provided additional information, elaborating on the total effect of PaMs by gas. The ERT recommends that such information be included in the Party's next national communication.

73. The 'with measures' scenario presented in the NC6 includes the PaMs implemented as of September 2012, and the energy-sector emission projections are consistent with AEO2013. In particular, the energy-sector emission projections include the impact of the sunset provisions as specified by law, such as the expiration of the renewable production tax credits in 2012, and do not include the impact of potential future laws and regulations. A 'with additional measures' scenario was not included in the NC6. Such a scenario was presented in the BR1 and it incorporated the additional measures formulated in the President's CAP of June 2013.

74. Important for the scenario definition is the indication from the recent trends in the LULUCF sector that in the long term, the rate of carbon sequestration for United States' forests is likely to reduce due to forest land conversion and the impact of climate change on forest growth. However, the exact timing of those changes is uncertain. To take into account such uncertainty, two different estimates were made for the LULUCF sector removal projections until 2030 under the same 'with measures' scenario: (i) a high-sequestration scenario, based on recent trends (accumulation of 556,560 ha land on average annually and 0.26 per cent carbon density in the period 2000–2010); and (ii) a low-sequestration scenario, where the increase in forest area levels off and the carbon density reverts to the historical average level of 0.23 per cent by 2030.

75. EPA has the overall responsibility of preparing the projections, with input from other agencies. The AEO2013 reference case prepared by the DOE Energy Information Administration (EIA) provided the basis for the projection of energy-related CO<sub>2</sub> emissions under the 'with measures' scenario, after subtracting the emissions from international bunker fuels and adding the emissions from the United States territories. EPA prepared the projections of non-energy CO<sub>2</sub> emissions and non-CO<sub>2</sub> emissions using its updated methodology. USDA, USFS and EPA jointly prepared the estimates of projected carbon sequestration in the LULUCF sector. In response to a question raised by the ERT during the review, the United States provided additional detailed information on the interaction between the agencies involved in preparing the national GHG emission projections.

76. The United States reported on the methodology used to develop the emission projections in its NC6, as well as on changes in methodology since the NC5. Given the complexity of the methodologies, the United States chose to provide references to separate documents in the NC6 instead of describing the methodology in detail. Additional detailed documentation on methodologies for: (i) the energy sector; (ii) the non-energy CO<sub>2</sub> and non-CO<sub>2</sub> projections; and (iii) the LULUCF projections were provided to the ERT during the review and are also now provided on the UNFCCC website to complement the information reported in the NC6. The ERT noted the good practice of providing additional documentation on detailed projection methodologies that cannot be included in the NC6 due to its volume. Nevertheless, the ERT encourages the United States to include short summaries of the key methodologies used, for instance in an appendix to the national

communication. Changes in methodology between the NC5 and the NC6 resulted in more refined non-energy CO<sub>2</sub> and non-CO<sub>2</sub> projections as well as the quantification of uncertainty with respect to the projections of LULUCF removals.

77. Several models were used to develop the emission projections for the different sectors. Energy-related CO<sub>2</sub> emissions were projected using the National Energy Modelling System (NEMS) developed by the DOE EIA Office of Energy Analysis. The NEMS model relies on a market-based approach to energy system analysis. Its modules represent different fuel supply markets, conversion sectors and end-use consumption sectors. It balances energy supply and demand whilst accounting for economic competition among the various energy fuels and sources. It accounts for macroeconomic feedback and international interactions. The model projects energy flows and emissions, for the period up to 2040, which are driven by GDP, population and energy price scenarios. The coverage of the PaMs is limited to those that have enacted legislation and available funding.

78. The methodology behind the non-energy CO<sub>2</sub> and non-CO<sub>2</sub> projections is described in a document prepared by EPA. Because of the large number of emission sources, EPA developed source-specific projection methodologies for a limited set of source categories. For the remaining source categories, the projections are calculated using an extrapolation of emission data based on the historical trend over the past 10 years. EPA projected changes in activity data (AD) and emission factors (EFs) from the base year, on the basis of macroeconomic drivers, such as population, GDP and energy use, and source-specific AD, such as fossil fuel production, industrial production or livestock population and crop production.

79. The NC6 lists transparently the key variables and assumptions relevant to developing the projections: population, GDP, primary energy consumption and energy intensity, energy consumption and prices, and VMT. Both the observed (for 2000, 2005, 2010 and 2011) and the projected (for 2015, 2020, 2025 and 2030) values of those variables are presented. For instance, the population is assumed to increase at a rate of around 0.9 per cent annually between 2015 and 2030, whereas the assumed annual GDP growth rate in the same period is assumed to be 2.5 per cent. As requested by the UNFCCC reporting guidelines on NCs, the United States has reported the main differences in the assumptions, methods, and results between projections in NC6 and those in earlier national communications. For instance, assumptions for 2020 were compared with assumptions for the same year reported in the previous two national communications (2006 Climate Action Report (CAR) and 2010 CAR). This comparison highlighted that the total real GDP for 2020 (expressed in 2005 USD) reported in the NC6 is 2.8 per cent and 14.7 per cent lower, respectively, than that reported in the NC5 and the fourth national communication.

80. The NC6 discusses qualitatively the uncertainties and related sensitivities of the emission projections to the key underlying drivers, such as technological development, regulatory and statutory changes, energy prices, economic growth and weather and climate. AEO2013 explores this in more depth by quantifying the sensitivity of the energy-related emission projections to changes in economic growth and energy prices and availability, as well as to policy-driven developments in terms of support for renewable sources (so-called 'side cases'). The impact of the GDP growth rate seems to be the largest, as the projected emissions for 2020 in the high- and low-growth cases are 4 per cent above and 5 per cent below the reference case emissions, respectively.

81. The NC6 did not include quantitative information on uncertainties related to the non-CO<sub>2</sub> projections. Additional information on the uncertainties associated with the emission projections was provided after the review, with a focus on the non-CO<sub>2</sub> projections. It suggested that the uncertainty of the non-CO<sub>2</sub> projections stems from both the uncertain estimation of EFs and the uncertain evolution of AD over the projection period. The level of EF uncertainty seems to be higher for non-CO<sub>2</sub> gases (in particular CH<sub>4</sub>

and N<sub>2</sub>O). The ERT encourages the United States to provide a summary of the quantitative assessment of the sensitivity of the projections of all gases to different assumptions in its next national communication.

## 2. Results of projections

82. The key results of the emission projections presented in the NC6 are provided in table 6 and the emission trends are illustrated in the figure below. According to the ‘with measures’ scenario reported in the NC6, total GHG emissions (excluding LULUCF) are projected to be 5.3 per cent lower than the 2005 level in 2020 and 2.3 per cent lower in 2030. Compared with the 1990 level, they are projected to be 10.0 per cent and 13.5 per cent higher in 2020 and 2030, respectively. If, on the other hand, emissions and removals from LULUCF are considered, the projected emissions for 2020 are between 4.5 and 0 per cent lower than in 2005, while the emissions projected for 2030 are between 1.5 per cent lower and 4.5 per cent higher than in 2005. Emission ranges are attributable to the uncertainty of the projected carbon sequestration in the LULUCF sector (see paras. 74 above and 88 below), adding an additional uncertainty of 4.5 and 6.0 percentage points to the emissions projected for 2020 and 2030, respectively.

83. With regard to projections by gas under the ‘with measures’ scenario, CO<sub>2</sub> emissions are projected to decline by 7.6 per cent between 2005 and 2020, the bulk of reductions occurring between 2005 and 2011 followed by a slight increase thereafter up to 2020. Energy-related CO<sub>2</sub> emissions resulting from current policies are projected to decline slightly between 2011 and 2020, to the level of 5,243 Mt CO<sub>2</sub> eq. The average annual change in energy-related CO<sub>2</sub> emissions is projected to shift from a 1.2 per cent increase observed between 1990 and 2005 to a decrease of 0.6 per cent from 2005 to 2020, as a result of the continuous shift from coal to natural gas in electricity generation, the growing use of renewable energy, improved vehicle efficiency, slower growth in energy demand and the impact of the recession in the period 2008–2009 (2007 is expected to remain the year with the highest level of energy-related emissions up to 2020). Non-energy-related CO<sub>2</sub> emissions are projected to increase by 12.3 per cent between 2005 and 2020, while their share in total GHG emissions will continue to remain insignificant (less than 5 per cent) in 2020, as a consequence of the increased use of fossil fuels for non-energy uses, iron and steel production, natural gas systems and cement production.

84. Total CH<sub>4</sub> emissions are projected to remain relatively stable and increase by 1.0 per cent only between 2005 and 2020, resulting on the one hand from the growing emissions from coal mining, enteric fermentation and manure management and on the other hand from the declining emissions from natural gas production and landfills, as well as from the co-benefits of the mandatory limits on VOC emissions. N<sub>2</sub>O emissions are estimated to decrease by 2.5 per cent between 2005 and 2020, resulting from a combination of increasing crop production and the related use of fertilizers, which is expected to be largely, but not entirely, offset by the decline in emissions from stationary and mobile combustion. HFC emissions are projected to increase by 80 per cent between 2005 and 2020 and to continue increasing beyond 2020, driven by an increased demand for refrigeration and air conditioning. PFC and SF<sub>6</sub> emissions are estimated to decline over the same period, thanks to the increased scope of voluntary measures and incentives. Industrial emissions of HFCs, PFCs and SF<sub>6</sub> from aluminium, magnesium and semiconductor manufacturing and electricity transmission and distribution are expected to decrease as a result of voluntary emission reductions through partnerships.

85. With regard to projections by sector, the total emissions from the energy sector (excluding transportation) under the ‘with measures’ scenario are projected to decline by 6.5 per cent from 2005 to 2020. Energy-related CO<sub>2</sub> emissions over the same period are expected to decline in the electricity production and residential sectors, but increase in the



industrial and commercial sectors. CO<sub>2</sub> emissions from electricity production are expected to decline by 13.4 per cent from 2005 to 2020, despite an increase in electricity generation of 20.9 per cent over the same period, owing primarily to the continuous shift from the use of coal to natural gas for electricity generation and the increasing share of renewable energy consumed. Total electricity generation according to the ‘with measures’ projection will increase from 4,093 TWh in 2011 to 4,389 TWh in 2020, with almost equal shares of around 44 per cent of the new capacity for that period coming from natural gas and renewables, and coal and nuclear power accounting for the rest in similar proportions.

86. Emissions from the transport sector are projected to decline by 11.9 per cent between 2005 and 2020. The major part of that decline already occurred between 2005 and 2012, reflecting the impact of the economic downturn, while the projected emissions beyond 2012 remain fairly constant. In contrast to the historical trend of continuously increasing energy demand for transportation, the relatively steady level of demand projected up to 2020 is, on the one hand, a result of the declining energy use of LDVs, reflecting fuel economy improvements and a decrease in VMT, and, on the other hand, a result of the increased energy use of heavy-duty vehicles, aircraft, marine and rail transportation, and pipelines. N<sub>2</sub>O emissions from mobile combustion are expected to decrease rapidly between 2005 and 2020, owing to improvements in emission control technologies and the turnover of the existing vehicle fleet.

87. Emissions from industrial processes are projected to grow by 31 per cent from 2005 to 2020, with rapid growth expected after 2011 associated with the increased output from energy-intensive industries (e.g. iron and steel, cement and glass production), driven largely by lower natural gas prices and the continued economic recovery. Emissions from agriculture are projected to increase by 8.7 per cent from 2005 to 2020, as a result of increased crop and livestock production, driven by steady economic growth. The projections assume stable global agricultural markets, normal weather and the continuation of existing policies, such as the 2008 Farm Bill. Emissions from the waste sector, which are dominated by CH<sub>4</sub> emitted from landfills, are estimated to decline by 8.1 per cent between 2005 and 2020, despite the increasing volume of disposed waste. This is a result of the increased recovery and combustion of landfill gas, driven by more stringent regulations and voluntary schemes.

88. The LULUCF sector was a net sink in 2011, resulting in net GHG emission offsets of 868,416 kt CO<sub>2</sub> eq (about 13.1 per cent of the Party’s total GHG emissions excluding LULUCF). Because of a positive growth-to-harvest ratio, some expansion of the forested area (due mostly to the conversion of cropland to forests) and the increase in the average carbon density of forests by about 9 per cent since 1991, net GHG sequestration has been growing, peaking in 2004 at 983,794 kt CO<sub>2</sub> eq. In the longer term, there will be a limit on how much carbon the forest can store and, consequently, a tendency is expected towards a decline in the net GHG sequestration (see para. 74 above). For that reason, the projected net GHG sink for the LULUCF sector is estimated for two different sequestration pathways. The projected CO<sub>2</sub> sink in the high-sequestration scenario changes from 905 Mt CO<sub>2</sub> eq in 2011 to 898 Mt CO<sub>2</sub> eq in 2020 and 937 Mt CO<sub>2</sub> eq in 2030, while for the low-sequestration scenario the projected values are 614 Mt CO<sub>2</sub> eq and 565 Mt CO<sub>2</sub> eq for 2020 and 2030, respectively.

89. Although the NC6 does not describe a ‘with additional measures’ scenario, such a scenario was presented in the BR1 to reflect the estimate of the effect of additional measures not included in the ‘with measures’ scenario reported in the NC6. Such additional measures are at the planning stage and correspond to the President’s CAP released in June 2013 (see para. 25 above). The projected emission levels under different scenarios and information on the United States’ quantified economy-wide emission reduction target are presented in table 6 and the figure below.

90. According to the projections presented in the NC6, the United States meeting its economy-wide target of reducing its total GHG emissions (including LULUCF) in the range of 17 per cent below the 2005 level by 2020 with the measures implemented as at September 2012 is likely to be very difficult, given the reduction achieved so far of 6.5 per cent and also because, after 2012, emissions are projected to start an upward trend in the absence of additional measures. Therefore, such additional measures were deemed necessary. They are planned to be implemented to achieve the 2020 target as outlined in the 2013 CAP. They are described in the BR1 and their assessment is presented in the TRR/BR1 (see para. 25 of the TRR/BR1).

91. One of the challenges in attaining the target by 2020 is the significant uncertainty associated with both the effect of the additional measures and the future carbon sequestration trends in the LULUCF sector. The ERT noted the transparent approach taken by the United States in assessing and presenting those uncertainties. The projections presented in the BR1 suggest that, despite the uncertainties, the implemented PaMs presented in the NC6 and the additional measures presented in the BR1 have the potential to deliver the significant emission reductions necessary to put the United States on course to attaining its target for 2020. However, it is possible that further measures will be needed to that end (see para. 26 of the TRR/BR1).

Table 6  
**Summary of greenhouse gas emission projections for the United States of America**

	<i>Greenhouse gas emissions (kt CO<sub>2</sub> eq per year)</i>	<i>Changes in relation to the 1990 level (%)</i>	<i>Changes in relation to the 2005 level (%)</i>
Quantified economy-wide emission reduction target under the Convention	Not available yet	–	–
Inventory data 1990 (excluding LULUCF) <sup>a</sup>	6 169 592	–	–
Inventory data 2005 (excluding LULUCF) <sup>a</sup>	7 169 899	15.7	–
Inventory data 2011 (excluding LULUCF) <sup>a</sup>	6 665 701	8.0	–7.0
‘With measures’ projections for 2020 (excluding LULUCF) <sup>b</sup>	6 787 000	10.0	–5.3
‘With additional measures’ projections for 2020 (excluding LULUCF) <sup>c</sup>	–	–	–
‘With measures’ projections for 2030 (excluding LULUCF) <sup>b</sup>	7 005 000	13.5	–2.3
Inventory data 1990 (including LULUCF) <sup>a</sup>	5 388 745	–	–
Inventory data 2005 (including LULUCF) <sup>a</sup>	6 197 432	15.0	–
Inventory data 2011 (including LULUCF) <sup>a</sup>	5 797 285	7.6	–6.5
‘With measures’ projections for 2020 (including LULUCF) <sup>b</sup>	5 917 000 to 6 201 000	9.8 to 15.1	–4.5 to 0.0

	Greenhouse gas emissions (kt CO <sub>2</sub> eq per year)	Changes in relation to the 1990 level (%)	Changes in relation to the 2005 level (%)
'With additional measures' projections for 2020 (including LULUCF) <sup>c</sup>	–	–	–
'With measures' projections for 2030 (including LULUCF) <sup>b</sup>	6 104 000 to 6 476 000	13.3 to 20.2	–1.5 to 4.5

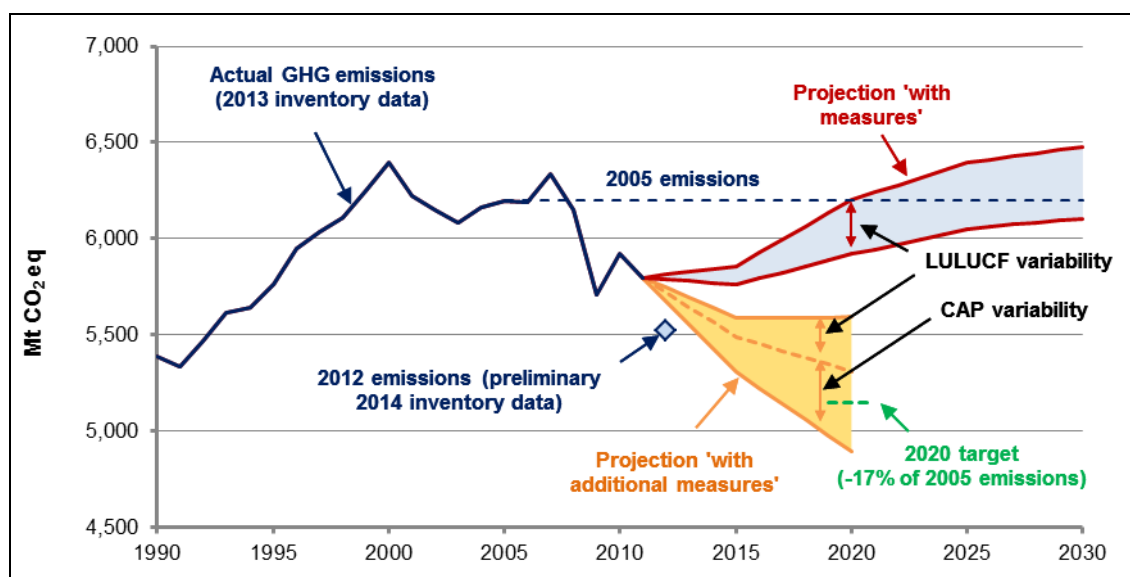
Abbreviation: LULUCF = land use, land-use change and forestry.

<sup>a</sup> The United States' 2013 greenhouse gas inventory submission.

<sup>b</sup> The United States' sixth national communication.

<sup>c</sup> Not fully quantifiable due to uncertainty regarding the estimations of land use, land-use change and forestry net emissions and impact of additional measures reported in the first biennial report. Further information is provided in the report of the technical review of the first biennial report of the United States.

### Greenhouse gas emission projections



Sources: (1) Data for the years 1990–2011: the United States' 2013 greenhouse gas inventory submission; (2) Data for 2012: the United States' preliminary 2014 greenhouse gas inventory data; (3) Data for the 'with measures' scenario for the years 2015–2030: the United States' sixth national communication; (4) Data for the 'with additional measures' scenario for 2020: the United States' first biennial report (intermediate years have been interpolated). All emissions are inclusive of net removals from land use, land-use change and forestry.

Abbreviations: CAP = Climate Action Plan; GHG = greenhouse gas; LULUCF = land use, land-use change and forestry.

### 3. Total effect of policies and measures

92. In its NC6, the United States presented the aggregated effect of PaMs implemented between the NC5 (2010 CAR) and the NC6 on the basis of the difference between the GHG emission projections under the 'with measures' scenarios reported in the NC5 (measures implemented by March 2009) and in the NC6 (measures implemented by September 2012), given that no 'without measures' scenario was included in the projections. The difference between the total emissions reported in the NC5 and in the NC6 was then adjusted in order to remove the impact of GDP and population growth using the Kaya method, which decomposes emissions into factors representing population, per capita GDP, energy intensity, and carbon intensity of energy. The ERT noted that this represents a new

approach, which significantly enhances the transparency of estimating the total effect of PaMs. Some reporting issues in relation to the total effect of PaMs are noted in paragraph 86 above.

93. The ERT also noted that the information provided by the United States on the total effect of PaMs for 2020, 2025 and 2030 and relevant information on factors and activities for each sector is not sufficiently complete. The ERT further noted that the United States could include in its next national communication an estimate of the total effect of PaMs for the years beyond 2020 in accordance with the years for which projections are provided.

94. The United States reported that the total estimated effect of adopted and implemented PaMs is around 350 Mt CO<sub>2</sub> eq in terms of total GHG emissions avoided in 2015 and 2020. The additional information on the total effect of PaMs disaggregated by gas allowed for the consideration of the historical recalculations of the inventory data (in particular for CH<sub>4</sub> and N<sub>2</sub>O) that were made to reflect methodological changes. That additional information shows a slightly higher estimate of the total effect of PaMs of around 400 Mt CO<sub>2</sub> eq for 2015 and 450 Mt CO<sub>2</sub> eq for 2020, most of which is attributed to CO<sub>2</sub> (around 350 Mt CO<sub>2</sub> eq). A significant level of uncertainty is acknowledged with respect to the estimates. The ERT took note of the constructive effort made by the United States towards improving the approach used to quantify the total effect of its PaMs.

Table 7  
**Projected effects of planned, implemented and adopted policies and measures in 2020**

<i>Gas</i>	<i>Effect of implemented and adopted measures (Mt CO<sub>2</sub> eq)</i>	<i>Relative value (% of 1990 emissions)</i>	<i>Effect of planned measures (Mt CO<sub>2</sub> eq)</i>	<i>Relative value (% of 1990 emissions)</i>
CO <sub>2</sub>	350	5.7	485–800	7.9–13.0
CH <sub>4</sub>	20	0.3	25–90	0.4–1.5
N <sub>2</sub> O	10	0.2	NA	NA
HFCs	60	1.0	100–135	1.6–2.2
PFCs	1	0.0	NA	NA
SF <sub>6</sub>	1	0.0	NA	NA
<b>Total</b>	<b>450</b>	<b>7.3</b>	<b>610–1 025</b>	<b>9.9–16.6</b>

*Sources:* Effect of implemented and adopted measures: additional information provided to the expert review team after the review; effect of planned measures: the United States’ first biennial report.

*Note:* The total effect of implemented and adopted policies and measures is defined on the basis of the difference between the ‘with measures’ scenarios reported in the fifth and sixth national communications, with adjustments made to remove the effects of gross domestic product and population growth; the total effect of planned policies and measures is estimated in the first biennial report over and above the ‘with measures’ scenario. The relative value to 1990 emissions is excluding land use, land-use change and forestry. The figures for CO<sub>2</sub> and total have been rounded to the nearest 50 Mt CO<sub>2</sub> eq, while the estimates for the individual gases have been rounded to a single significant digit. The figures are individually rounded and do not necessarily sum to the total.

*Abbreviation:* NA = not available.

95. The information reported in the NC6 refers to the aggregate effect of implemented PaMs; therefore, by looking at projections alone it is difficult to assess which sectors are expected to deliver the largest emission reductions, although the overview of PaMs suggests that most reductions will occur in the energy and transport sectors. The most effective PaMs and drivers behind GHG emission reductions are described in chapter II.B above. Table 7 provides an overview of the total effect of PaMs as reported in the NC6 and additional information provided to the ERT during the review. It also provides information on the effect of planned measures as reported in the BR1.

## **D. Provision of financial resources and technology transfer to developing country Parties**

### **1. Finance, including “new and additional” resources**

96. In its NC6, the United States provided detailed information on measures taken to give effect to its commitments under Article 4, paragraphs 3, 4 and 5, of the Convention as required by the UNFCCC reporting guidelines on NCs. The ERT noted that complete information on all of the mandatory elements was provided. Further consideration of the information on finance reported by the United States in accordance with the “UNFCCC biennial reporting guidelines for developed country Parties” (hereinafter referred to as the UNFCCC reporting guidelines on BRs) is provided in chapters II.D.1 and II.D.2 of the TRR/BR1.

97. However, the ERT also noted a few instances where the transparency of the reporting could be improved. More specifically, the ERT noted that the United States does not follow strictly the outline contained in the annex to the UNFCCC reporting guidelines, as it did not use the titles of the sections provided in the outline. During the review, the United States agreed to follow the outline closely in its next national communication. The ERT recommends that the United States adhere to the UNFCCC reporting guidelines on NCs for its next national communication and follow the outline provided to improve the transparency of its reporting.

98. Furthermore, the ERT noted that, in reporting on its bilateral and regional contributions related to the implementation of the Convention, the United States did not fully adhere to the UNFCCC reporting guidelines on NCs, as the tables used did not strictly follow the guidelines to report information on mitigation and adaptation and further split the information into relevant categories in a tabular format. Instead, the United States reported information split into the categories of energy, forestry and agriculture, and adaptation. The ERT encourages the United States to provide in its next national communication information on its bilateral and regional contributions in a tabular format, using the categories required by the aforementioned guidelines, in order to enhance the transparency of its reporting.

99. The United States included a section in its NC6 to indicate what “new and additional” financial resources it has provided pursuant to Article 4, paragraph 3, of the Convention and clarified how it has determined such resources as being “new and additional”. In response to the recommendation made in the previous review report, the United States provided a detailed explanation that the United States Administration has to seek new climate funding from the Congress every year, and that this type of funding was virtually zero in 1992 and increased to a total of USD 7.5 billion in the period 2010–2012.

100. With regard to the fast-track financing period, the United States reported that it allocated an average USD 2.5 billion per year during 2010–2012. Within that amount, the average annual congressionally appropriated assistance (approximately USD 1.6 billion per year during 2010–2012) increased fourfold compared with the allocations from the same source made previously (approximately USD 370 million per year during 2003–2009). During the review, the United States provided additional information on the trends in climate finance from 2003 to 2013. The ERT noted a significant increase in funding since 2010 relative to the nearly stable amount in the period 2003–2009. A figure of USD 2.7 billion reported for 2013 shows a further increase in relation to the climate-related funding provided for 2012 (USD 2.3 billion).

101. The United States reported that its total amount of climate-related financial assistance for 2010–2012 includes funding, mostly in grant format, from three sources: congressionally appropriated assistance (its share decreased from 79.5 to 55.2 per cent

during 2010–2012), development finance through the Overseas Private Investment Corporation (OPIC) (its share increased from 7.8 to 31.6 per cent over the same period) and finance from the Export-Import Bank of the United States (Ex-Im) (its share increased from 12.7 to 13.2 per cent).

102. In its NC6, the United States reported an increase in its commitments to assist developing countries to mitigate and adapt to climate change since the NC5. It was highlighted during the review that climate change has become a key priority of diplomatic and development assistance and has been integrated into all core operations of major foreign assistance agencies. For example, the 2010 Presidential Policy Directive on Global Development identified the Global Climate Change Initiative as the top priority development initiative, which provides a platform to integrate climate considerations into all foreign assistance work of the United States. Besides that, the 2010 United States First Quadrennial Diplomacy and Development Review also identified climate change as one of the main pillars of United States diplomacy and international development. Furthermore, the 2012 United States Agency for International Development (USAID) Climate Change and Development Strategy prioritized climate considerations, such as the promotion of clean energy, sustainable landscapes and adaptation, in all USAID operations between 2012 and 2016. During the review, the United States informed the ERT that the Department of State and USAID Strategic Plan for Fiscal Years 2014 to 2017, released in April 2014, establish the promotion of the transition to a low-emission, climate-resilient world while expanding global access to sustainable energy as one of its five strategic goals.

103. The United States reported that its climate finance allocations are made in line with the three pillars of the Global Climate Change Initiative, namely adaptation, clean energy and sustainable landscapes (focusing on deforestation and REDD-plus<sup>5</sup>). The NC6 provides detailed information on the funds allocated under each pillar and describes sample initiatives, demonstrating a diversity of focus areas, objectives, scope and geographical coverage of the work implemented in 2010–2012 under each pillar.

104. The United States provided detailed information on financial resources related to the implementation of the Convention provided through multilateral and bilateral and regional channels for 2010–2012. However, regarding the contributions through multilateral channels, such as multilateral institutions and programmes, the United States clearly stated that the total reported amounts include not only funds directly attributable to climate change activities, as it is currently not always possible to identify and separate such funds.

105. In terms of financial flows to the Global Environment Facility (GEF), the United States reported that, for the fifth replenishment of the GEF for 2011–2014, it pledged USD 575 million, which represents a 50 per cent increase on its pledge for the fourth replenishment. Specifically, for the programmes related to climate change between 2010 and 2012, the United States allocated USD 149 million. The ERT noted an increasing trend over that period, from USD 44 million allocated in 2010 to USD 60 million allocated in 2012, as indicated in table 8 below, which summarizes information on financial resources.

106. Regarding the allocation of financial resources through bilateral and regional channels, as indicated in table 8 below, the total provision of public financing amounted to about USD 2.0 billion in 2010, USD 3.2 billion in 2011 and USD 2.3 billion in 2012. The United States provided information on the allocation of those resources by region, for example in 2012 the largest share was allocated to Asia (39 per cent), followed by Africa (36 per cent), Latin America and the Caribbean (22 per cent), Europe and Eurasia (2 per cent) and the Middle East (1 per cent).

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<sup>5</sup> Policy approaches and positive incentives on issues relating to reducing emissions from deforestation and forest degradation in developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries.

107. In terms of the thematic focus of the bilateral and regional financial assistance reported in the NC6, the ERT assessed that in 2010–2012 the largest share was directed towards mitigation, particularly energy (69.3 per cent) and agriculture and forestry (11.9 per cent), while the allocation to adaptation was considerably lower (18.8 per cent).

Table 8  
**Summary of information on financial resources for 2010–2012**  
(Millions of United States dollars)

<i>Allocation channel of public financial support</i>	<i>Years of disbursement</i>		
	<i>2010</i>	<i>2011</i>	<i>2012</i>
Official development assistance <sup>a</sup>	30 353.3	30 919.6	30 687.0
Contribution to the Global Environment Facility	44.0	44.9	59.9
Contributions to the IPCC and UNFCCC	13.0	10.0	10.0
International development association <sup>b</sup>	1 262.5	1 352.5	1 325.0
Contributions through multilateral, bilateral and regional channels <sup>c</sup>	1 996.2	3 193.6	2 284.5
Fast-start finance	1 996.2	3 193.6	2 284.5

*Abbreviations:* IPCC = Intergovernmental Panel on Climate Change.

<sup>a</sup> Query Wizard for International Development Statistics, available at <<http://stats.oecd.org/qwids/>>.

<sup>b</sup> Funding allocated to the multilateral institution, such as International Development Association supports not only climate change activities. It is not possible to identify which amount is directed to such activities. Therefore, these numbers represent total contributions to this institution.

<sup>c</sup> These contributions cover only grant-based assistance related to the implementation of the Convention.

108. The United States also provided detailed information on the assistance that it has made available to developing country Parties that are particularly vulnerable to the adverse effects of climate change to help them to meet the costs of adaptation to those adverse effects. The support provided to the least developed countries, small island developing States and Africa, considered to be the most vulnerable, amounts to nearly 80 per cent of the specific adaptation funding. The funds were allocated to programmes to increase the resilience of the most vulnerable sectors, such as food and water security, coastal management and public health, which seek to prepare the most vulnerable countries for increasing climate-related risks and impacts. An example of such programmes is the Pilot Programme for Climate Resilience, to which the United States contributed USD 84 million during 2010–2012, which benefited vulnerable populations in 18 countries.

## 2. Technology transfer

109. The United States provided in its NC6 comprehensive and well-organized information on activities related to the transfer of technology and notable activities undertaken by the public and private sectors. Further consideration of the information on technology transfer reported by the United States in accordance with the UNFCCC guidelines on BRs is provided in chapters II.D.1 and II.D.2 of the TRR/BR1.

110. The ERT noted that, in its NC6, the United States reported several examples of technology development and transfer projects addressing the needs of developing countries. However, the Party did not report on concrete steps taken by the Government to support the development and enhancement of the endogenous capacities and technologies of developing countries, although the ERT recognizes that the United States participates in and supports a number of global and regional programmes addressing those needs. The ERT recommends that the United States provide such information in its next national communication. Furthermore, the ERT noted that the United States did not provide

information on the years in operation of relevant projects and programmes aimed at technology transfer, as required by table 6 of the UNFCCC reporting guidelines on NCs. The ERT recommends that the United States include such information, where feasible, in its next national communication.

111. The United States reported on success stories in relation to technology transfer, but it did not mention any cases or experience of failure stories in relation to technology transfer, with a view to sharing relevant experience internationally and increasing learning opportunities for the success of future activities. Although it only indicated success stories in its NC6, the United States clarified during the review that there are failure stories as well, in particular when there was insufficient political support for concrete activities and projects. Also, change in government has sometimes had an impact on technology transfer initiatives, which have no longer been regarded as a priority. During the review, the United States reinforced the country-driven nature of its assistance to developing countries. The ERT discussed the indicators used by the United States to assess the level of success of technology transfer and noted that information on such indicators could be an important element to be shared in its next national communication. The ERT recommends that the United States include, where feasible, information on failure stories in relation to technology transfer in its next national communication.

112. The United States reported, in a textual format, on the steps taken, particularly since 2009, by the Government to promote, facilitate and finance the transfer of technology. Among them are: creating partnerships, such as the United States Partnership to Advance Clean Energy and the United States–China Clean Energy Research Center; engaging the private sector in technology cooperation through the creation of an enabling environment for private-sector investment; helping to support the development of the policies and regulations and overall institutional scaffolding required to facilitate technology transfer; and working with other countries on regional initiatives to transform market structures that will expedite technology flows. The ERT noted an important initiative called Climate Technology Initiative, which contributed to fostering international cooperation for the accelerated development and diffusion of climate-friendly technologies and practices.

113. The United States reported several examples of activities related to technology transfer and the promotion of private-sector activities by facilitating the access of companies based in the United States to international markets that provided clean-energy and climate-friendly technologies around the world. Initiatives such as trade shows and organized trade missions to several key markets, as well as the launch of initiatives such as the Civil Nuclear Trade Initiative and the Renewable Energy and Energy Efficiency Export Initiative, have led United States climate-friendly technology exporters to several countries, including China, India, Mexico, Chile and Brazil, and the Middle East.

114. The Party provided some examples of both public and private sector initiatives, such as the Global Methane Initiative, the Super-Efficient Equipment and Appliance Development, and the Global Lighting and Energy Access Partnership. The ERT noted that the United States could provide information in its next national communication on the share of joint public–private initiatives and those carried out by the public sector only, recognizing the difficulty of collecting information on private-sector initiatives.

115. The ERT noted that the United States included in its NC6 optional information on the impact on emissions and removals of the sample projects and programmes aimed at technology transfer in the table of examples of United States technology development and transfer activities. The ERT noted that, in order to increase transparency, the Party could include in its next national communication summary information on how it estimates the impact on emissions and removals.



116. The United States reported activities related to financing access by developing countries to ‘hard’ or ‘soft’ environmentally-sound technologies. The Party clarified in its NC6 that most of its funding for technology transfer is provided to finance ‘soft’ technology transfer (including capacity-building, which is considered to be an integral part of technology transfer) with a view to fostering an enabling environment for ‘hard’ technology transfer. The United States reported in its NC6 the transfer of ‘hard’ environmentally-sound technologies through OPIC and Ex-Im, such as the provision of wind turbines and solar panels.

## **E. Vulnerability assessment, climate change impacts and adaptation measures**

117. In its NC6, the United States provided the required information on its expected vulnerability and current climate impacts, covering regional, sectoral and cross-sectoral considerations, and an outline of the action taken to implement Article 4, paragraph 1(b) and (e), of the Convention with regard to adaptation. The ERT noted that, although the United States provided a description of regional climate change vulnerabilities and impacts and information on adaptation activities at the state, regional and local levels, the description of expected vulnerability and impacts of climate change is complete but somewhat limited. The ERT also noted that the United States considered all of the recommendations made in the previous review report.

118. During the review, the United States provided information on the results of the recent Third National Climate Assessment (see para. 120 below), including information on climate trends and sectoral and regional impacts, in particular infrastructure, water supplies, and agriculture, and highlighted the adaptation response actions taken and planned at different levels of government. A better understanding of climate change impacts and vulnerability by the public could help to garner support for federal and state actions, including ongoing and planned PaMs. The ERT noted that the United States could improve the transparency of its reporting by providing in its next national communication a description of expected vulnerabilities and impacts of climate change by region and relevant adaptation actions taken to address those impacts.

119. The United States reported that since its NC5 new impetus has been given to addressing adaptation matters by the President’s 2013 CAP as it provided further direction to government agencies on enhancing preparedness for climate change. One of the three pillars of the President’s CAP focuses on the preparedness of the United States for the impacts of climate change, national cross-cutting adaptation strategies and agency adaptation plans.

120. Building on CAP, in November 2013 the President issued Executive Order 13653, “Preparing the United States for the Impacts of Climate Change”, aimed at building national preparedness and resilience and ensuring the safety, health and well-being of communities. In addition, the United States explained during the review that it is expecting the final results of the Third National Climate Assessment, which will be presented in an action-oriented format, to be geared towards addressing the needs of decision makers who are faced with the management of increasing climate risks. During the review, the United States provided extensive information on the outcomes of the recent global change research. The ERT took note of that information.

121. The United States provided information in its NC6 on vulnerabilities by sector, focusing on such sectors as water resources, energy, transport, agriculture, forestry, ecosystems and biodiversity, and health. The United States also provided information on cross-sectoral considerations, namely: urban infrastructure; land use; tribal culture, lands

and resources; water, energy and land; as well as coastal zones. The ERT took note of that information.

122. The ERT noted that information on sectoral vulnerabilities and on corresponding adaptation activities related to each vulnerable sector is not easily traceable in the NC6, as the United States presented only selected samples of the adaptation actions taken by the federal Government and regional and state initiatives. During the review, the United States provided a summary of its adaptation efforts and information on actions taken to address vulnerabilities at the federal and local levels. The ERT also noted that, in order to facilitate a better understanding of the reported information, the United States could organize the information in its next national communication in such a way that information on the sample of actions taken to address climate impacts and vulnerabilities is presented by sector. In addition, the ERT noted that the United States could improve the transparency of its reporting by providing in its next national communication a description of the adaptation actions addressing regional vulnerabilities and impacts. Table 9 summarizes the information on vulnerability and adaptation to climate change presented in the NC6.

Table 9  
**Summary of information on vulnerability and adaptation to climate change**

<i>Vulnerable area</i>	<i>Examples/comments/adaptation measures reported</i>
Agriculture and food security	<i>Vulnerability:</i> the adverse impacts of weather extreme events on patterns and productivity of crops, livestock and fishery systems are expected to increase over the next century <i>Adaptation:</i> regional climate hubs will be developed to provide climate-related scientific and technical support, assessments, outreach and education for the agriculture sector. In addition, the United States Department of Agriculture is working with farmers to improve water-use efficiency and provides science-based knowledge to manage the risks, challenges and opportunities
Biodiversity and natural ecosystems	<i>Vulnerability:</i> increased risk of extinction of species at local, regional, and national scales and the location of species (shifting area of wildlife, fish and native plants) will lead to ecosystem disruptions and direct negative impacts on communities as well as the loss of species and landscapes, for example in Alaska, alterations in marine ecosystems have implications for fisheries and communities <i>Adaptation:</i> the development of strategic documents on climate resilience of the coastal, ocean and Great Lakes communities and ecosystems, and on addressing impacts of climate change on the fish, wildlife, and plant resources and their habitats was recommended in 2010
Coastal zones	<i>Vulnerability:</i> populations in coastal areas outside the Great Lakes region are already affected by violent storms and sea level rises. Erosion and sediment migration will be exacerbated by increased lakeside storm events, tributary flooding and wave action due to loss of ice cover <i>Adaptation:</i> the same measures as for biodiversity and natural ecosystems. in addition, the adaptation includes development of guidance for incorporating climate change considerations into the planning and design of projects in coastal areas
Impacts of extreme weather events	<i>Vulnerability:</i> observed impacts of climate change include intensified floods in some regions, summer droughts in much of the United States and changes in the seasonality of run-off. Water supplies are being reduced and are affecting ecosystems and livelihoods in many regions <i>Adaptation:</i> innovative strategies were developed, including those aimed at strengthening communities against future extreme weather and other climate impacts in the north-eastern United States affected by Hurricane Sandy
Forests	<i>Vulnerability:</i> a decline in forest health and an increase in forest disturbances are already being observed and are projected to continue due to the increase in the acreage burned by wildfire, the spread of insects and disease, drought and extreme events <i>Adaptation:</i> actions aimed at expanding and prioritizing forest and rangeland restoration efforts to make areas less vulnerable to catastrophic fire

<i>Vulnerable area</i>	<i>Examples/comments/adaptation measures reported</i>
Human health	<p><i>Vulnerability:</i> direct threats from heatwaves or storms, and indirect threats, such as heat-exacerbated air quality impacts on infectious diseases, have become more critical. Heat is already the leading cause of weather-related deaths. Poor air quality standards affect those in the population with existing lung conditions. Red Ozone Alert days (when the air is unhealthy) in the 50 largest cities in the eastern United States are projected to increase by 68 per cent due to warming</p> <p><i>Adaptation:</i> climate impacts and health considerations are incorporated into adaptation planning, public-health surveillance and early-warning systems to improve the detection of health risks. The development of the Climate-Ready States and Cities Initiative helps state and city health departments to plan and prepare for the potential health effects of climate change</p>
Infrastructure and economy	<p><i>Vulnerability:</i> rising sea levels, storm surges, heatwaves and extreme weather events have already compounded structural effects stressing essential services. The loss of electrical power leads to impacts on communication systems, the transportation and public-health sectors</p> <p><i>Adaptation:</i> the United States conducted a research project aimed at assessing the vulnerability to sea level rise and increased erosion along the North Atlantic Seaboard, and identifying adaptation actions to ensure that the resources of the seashore remain resilient</p>
Water resources	<p><i>Vulnerability:</i> impacts on water resources vary across the country, with more frequent droughts and increased water loss from plants in the west and more likely floods, water quality problems and impacts on aquatic ecosystems and species in most regions. Declines in mountain snowpack are vitally important in the West and Alaska. These changes have impacts on transportation, agriculture, energy production, industrial uses and other needs, including human consumption of water resources</p> <p><i>Adaptation:</i> improved water resource management, including by strengthening data and information systems on impacts on water and developing a national action plan to strengthen climate adaptation for freshwater resources, will improve adaptive capacities and management of natural resources, and support state and local preparedness. For example, the Water SMART Programme helps states to deal with rapid population growth, climate change, ageing infrastructure and land-use changes</p>
Energy	<p><i>Vulnerability:</i> extreme weather events and water shortages are already interrupting energy supply and impacts are expected to increase in the future. Most vulnerabilities and risks are created by local events, but the impacts are often national or international in scope</p> <p><i>Adaptation:</i> climate preparedness and resilience are enhanced by facilitating basic scientific discovery and deployment of more climate-resilient energy technologies; convening and partnering with industry and federal, state and local leaders; and providing technical information and assistance. Information and tools are developed to help local and regional planners to anticipate effects on the energy system and adaptation needs</p>

123. The ERT noted that the United States federal Government recognizes that state and local actions are essential for ensuring the nation’s preparedness for the impacts of climate change, and also noted the selected examples of state, regional, local and tribal adaptation efforts, which are in many cases accomplished with federal support or in coordination with federal agencies.

124. The ERT further noted that the United States provided a detailed description of international adaptation activities, including the Presidential Policy Directive on Global Development and the Global Climate Change Initiative, the USAID programmes, the High Mountain Adaptation Partnership and the Climate Services Partnership, etc. During the review, the United States provided additional information on cooperation with developing countries on mitigation and adaptation, such as bilateral cooperation with China and India. The ERT noted that the information reported on international cooperation in the NC6 is rather limited and that a description of the Party’s international cooperative actions with developing countries for enhancing preparedness for climate risks and climate adaptation would improve its next national communication.

## **F. Research and systematic observation**

125. The United States provided information on its actions relating to research and systematic observation and addressed both domestic and international activities, including the World Climate Programme (WCP), the International Geosphere-Biosphere Programme (IGBP), the Global Climate Observing System (GCOS) and the Intergovernmental Panel on Climate Change (IPCC).

126. The United States continues to be an international leader in climate change research and systematic observation and in clean-energy technology development, as reflected in the information reported in the NC6. The United States provided detailed descriptions of its flagship research programme called the United States Global Change Research Programme (GCRP) and its new 10-year strategic plan that aim at advancing global change science, as well as of its international research programmes and partnerships. During the review, the United States provided further extensive information on the National GCRP Plan 2012–2021 and the National Climate Assessment. The ERT noted that the new GCRP plan emphasizes the integrated observation and modelling approach, which aims to advance capabilities to observe the physical, chemical, biological and human components of the Earth's system over multiple space and timescales, and to improve and develop advanced models that integrate across all components of the Earth's system. The priority attached to technology research and innovation activities as well as to strategies for addressing national challenges is high, as reflected in the information reported by the United States in its NC6. This priority comes with associated substantial and ongoing funding to develop new technologies and bring them to market.

127. The NC6 reflects actions taken to support related capacity-building in developing countries, including the provision of funding for scientists from developing countries to visit the United States and work directly with United States researchers on global change research. The ERT noted that the information reported on the identification of opportunities for and barriers to free and open international exchange of data and information, on action taken to overcome barriers, and on support provided to developing countries to establish and maintain observing and related data and monitoring systems is limited. The ERT encourages the United States to provide such information in its next national communication.

128. The ERT also noted that the United States places a high priority on the research and development (R&D) needed to understand, observe and respond to global change. The GCRP advances the legislative mandate to deepen basic scientific understanding while providing information and tools to support the nation's and the world's preparation. The United States has enhanced coordination with other nations and international organizations on global change research activities, promoted increased international access to scientific data and information, and fostered increased participation in international global change research by developing countries. The ERT welcomes the support provided by the United States Government to the IPCC Task Force on National Greenhouse Gas Inventories as well as to the IPCC Working Group II Technical Support Unit.

129. The ERT acknowledges the United States' role of global leadership in developing the fundamental scientific and technological foundation for understanding the causes and consequences of climate and global change, reducing scientific uncertainties and supporting adaptation and mitigation actions to manage risk and produce benefits on the local, regional and global scales. Understanding the importance of international cooperation and collaboration, the United States GCRP international research programmes and partnerships engage with and provide significant financial support for a variety of international programmes. For example, the USDA Foreign Agricultural Service sponsors the Global Research Alliance Fellowships to support scientists from developing countries.

130. Realizing that well-designed multilateral collaboration projects focused on achieving practical results can accelerate the development and commercialization of new technologies, the United States has initiated or joined a number of technology collaboration projects on the use of hydrogen and fuel cells, carbon sequestration, and nuclear energy and fusion, which address many energy-related concerns, including climate change. The ERT acknowledges the United States' important role in such international research and innovation activities.

131. In the national context, the United States is committed to promoting the accelerated development and deployment of clean-energy technologies to reduce GHG emissions. The 2011 DOE Quadrennial Technology Review articulated six strategies for energy technology innovation for the nation, including increasing vehicle efficiency, electrifying the fleet, deploying alternative hydrocarbon fuels, increasing building and industrial efficiency, modernizing the grid and deploying clean electricity. Substantial ongoing initiatives aimed at energy research and development, which are funded as part of regular budget process, are complemented by additional activities. More than USD 25 billion was allocated in additional funding for R&D activities across a broad portfolio of GHG mitigation options through ARRA. The ERT acknowledges the efforts made by the United States aimed at promoting energy research and technology.

132. In terms of activities related to systematic observation, the United States reported on satellite and non-satellite climate observations of the global environment and challenges related to the maintenance of a long-term consistent and comprehensive observation system. It was reported in the NC6 that the United States has increased its domestic and international investments in observation systems, which include the National Aeronautics and Space Administration, the National Oceanic and Atmospheric Administration, the United States Geological Survey and the Defence Meteorological Satellites Programme. The United States supports international efforts in building the Global Earth Observation System of Systems, which is a partnership of 80 countries, the European Commission and nearly 60 international organizations.

133. The United States' GCOS programme has two priorities: the development of reference-level climate observing efforts; and a data management programme in the Pacific Islands region. In its NC6, the United States reported detailed information on atmospheric, ocean, terrestrial and cryospheric climate observing systems and associated programmes and networks.

134. In addition, the NC6 provides some information on the support provided by the Party to developing countries to establish and maintain observing systems, but that information appears to be limited. However, the ERT noted that the United States provides information and data for many global observing networks and serves as the backbone of the global Earth observation systems for the global benefit.

## **G. Education, training and public awareness**

135. In its NC6, the United States provided information on its actions relating to education, training and public awareness at the domestic level. Although formal education is not a federal jurisdiction, the Government recognizes the importance of such actions, as shown in the more detailed information on the support provided for formal educational initiatives on climate change that was provided in the NC6 compared with the NC5.

136. The ERT noted that the United States' educational efforts focus on three areas, namely the science of climate change, the human-climate interaction and using climate education to promote behavioural change. A conceptual framework for science education developed at the National Research Council in 2011 and an innovative way to address

climate change education within the decentralized United States education system was informed by the Next Generation Science Standards for Today's Students and Tomorrow's Workforce. The ERT acknowledges the United States' efforts in the development of education and training programmes and materials.

137. It was reported that the federal educational programmes have begun to develop a coordinated national network of partnerships related to educational programmes on climate science and have matured significantly since the NC5. In 2012, the United States GCRP mission and strategic plan were expanded to include education as a critical component of the national response to global change and the need for better integration of social, ecological and physical sciences to understand the changing environment. The United States reported on a broad number of federal agencies and their programmes aimed at increasing awareness and education on climate change, impacts, challenges and solutions. During the review, the United States provided extensive information on primary education and training as well as on the numerous federal, non-governmental organization and individual efforts to support sustained and robust educational and communication initiatives to develop a climate-literate citizenry and skilled workforce.

138. In the previous review report, the ERT encouraged the United States to include a section in its national communication reporting additional information on international activities related to education, training and outreach, where appropriate, or providing more information on the specific actions taken abroad. The ERT noted that in its NC6 the United States reported that USAID plays a leadership role in providing climate change related international assistance, including on education, training and public awareness. However, the information reported on participation in international activities is limited.

139. There has been an enhanced national effort made to engage the public at large in climate change, geared towards increasing awareness and building support for action. The ERT encourages the United States to provide additional information on public participation in the preparation or domestic review of the national communication.

### **III. Conclusions and recommendations**

140. The ERT conducted a technical review of the information included in the NC6 of the United States and concluded that the information is reported in accordance with the UNFCCC reporting guidelines on NCs. The ERT also concluded that the NC6 provides a good overview of the contemporary national climate policy of the United States. During the review, the United States provided additional information that augmented the information reported in the NC6 and facilitated the understanding of it, including the methodologies used for assessing the effects of the PaMs reported in chapter 4 of the NC6 and the methodologies used for the preparation of the projections of non-CO<sub>2</sub> and non-energy CO<sub>2</sub> emissions.

141. The United States' emissions for 2011 were estimated to be 8.0 per cent above the 1990 level excluding LULUCF and 7.6 per cent above including LULUCF. However, after a peak in 2007, the upward trend in emissions changed to a downward trend, with the total GHG emissions including LULUCF having reduced by 6.5 per cent by 2011 compared with the 2005 level, and, according to the preliminary data in the Party's draft 2014 GHG inventory, they have reduced by an additional 3.5 per cent between 2011 and 2012. Since 2005, in addition to the macroeconomic changes resulting from the economic downturn starting in 2008, emission trends have been influenced by the extensive exploration of the vast resources of shale gas in the United States, significant fuel switching from coal to natural gas for power generation; and the doubling of the share of electricity generation from renewable energy. Since 2010, those developments, together with PaMs influencing

emissions from other sectors and sources, such as transportation and energy-efficiency improvement, have more than offset the impact on emissions of the rebound of the economy.

142. The GHG emission projections reported by the United States in its NC6 include a 'with measures' scenario until 2030, which includes the impact of PaMs implemented as at September 2012. The United States reported a 'with additional measures' scenario in its BR1, which includes the impact of the additional measures reflected in the 2013 President's CAP.

143. According to the 'with measures' scenario, the Party's total GHG emissions (excluding LULUCF) are projected to be 10.0 per cent and 13.5 per cent higher than the 1990 level in 2020 and 2030, respectively. Compared with the 2005 level, the emissions are projected to be 5.3 per cent and 2.3 per cent lower in 2020 and 2030, respectively. When emissions and removals from LULUCF are considered, the Party's total GHG emissions are projected to be lower than the 2005 level by between 4.5 and 0 per cent in 2020, while the emissions in 2030 are projected to be between 1.5 per cent lower and 4.5 per cent higher than in 2005. Emission ranges are attributable to the uncertainty of the projected carbon sequestration in the LULUCF sector, adding an additional uncertainty of 4.5 and 6 percentage points to the emissions projected for 2020 and 2030, respectively.

144. According to the projections presented in its NC6, the United States meeting its quantified economy-wide target of reducing its total GHG emissions (including LULUCF) in the range of 17 per cent below the 2005 level by 2020 is likely to be very difficult with the measures implemented as at September 2012, given the reduction achieved so far of 6.5 per cent by 2011 and also because after 2012 emissions are projected to start growing again. Therefore, additional measures were deemed necessary with a view to achieving the 2020 target, as outlined in the 2013 CAP launched by the President and reflected in the 'with additional measures' scenario reported in the Party's BR1.

145. The 2013 CAP comprises, together with CAA and the ARRA, the framework for the contemporary climate and energy policy of the United States. Adding to the strengthened action taken within existing legislation, such as CAA, the CAP is setting the direction for the development of the Party's present and future climate policy and is aimed at putting the United States on the path towards reaching its economy-wide emission reduction target. The CAP provides a holistic approach to climate policy, considering in a single policy framework domestic and international responses, and, within domestic responses, considering both mitigation and adaptation.

146. The framework of contemporary climate and energy policy of the United States encompasses more than 60 policies reported at the federal level, a vast number of federal programmes that aim at supporting PaMs at the state and local levels of governance, and a large and growing number of policies at the state and local levels. The plethora of PaMs shows their increasing scope and a continuous shift since 2008 from voluntary approaches that dominated the policy mix in the past towards more regulatory and economic approaches. Such approaches are manifested in policies implemented in the energy, transport and industry sectors.

147. In terms of mitigation impacts, the PaMs addressing improvements in energy efficiency, such as ENERGY STAR labelling, buildings and industry, the appliance and equipment energy-efficiency standards, the National Programme for Light Duty Vehicle Greenhouse Gas Emissions and CAFE Standards, and policies to promote renewable energy are expected to deliver significant emission reductions in the near and long terms. In addition, the new proposed standards to reduce carbon pollution from existing power plants for power plants introduced in 2013 appear to be the single most effective policy for reducing emissions from energy supply, despite some uncertainty of the size of the impact

as it will be defined by the final form of the standards. Another significant PaM is the SNAP Programme, which delivers the most sizeable mitigation impact in the industrial processes sector through a mix of regulatory, voluntary and information-based instruments.

148. The significant and growing role of the state and local level in climate policymaking and implementation is reflected not only in the effective implementation of PaMs adopted at the federal level, but also in the further enhancement and strengthening of PaMs implemented at the state and city levels and the growing number of states adopting climate PaMs. As at January 2014, 29 states had state-wide emission targets or limits, 29 states had RPS and 18 states had mandatory energy-efficiency standards. Other key policies at the state and local levels encompass ETS, building energy codes, transport and infrastructure planning, and alternative means of transport. Among the ETS introduced at the state level, the California cap-and-trade programme and RGGI stand out as the most effective in terms of potential emission reductions.

149. In its NC6, the United States reported on the increase in its commitments to assist developing countries to mitigate and adapt to climate change since the NC5. Climate change has become a key priority of diplomatic and development assistance and has been integrated into all core operations of major foreign assistance agencies. This is manifested in the 2010 Presidential Policy Directive on Global Development, which identified the Global Climate Change Initiative as the top-priority United States development policy and its three pillars: adaptation, clean energy and sustainable landscapes (deforestation and REDD-plus). Climate change priorities have been integrated into all major foreign assistance agencies, including USAID, the Millennium Challenge Corporation and the Overseas Private Investment Corporation.

150. The United States indicated what “new and additional” financial resources it has provided pursuant to Article 4, paragraph 3, of the Convention and acknowledged that climate financing increased from virtually zero in 1992 to a total of USD 7.5 billion in the period 2010–2012. With regard to the fast-track financing period, the United States reported that it allocated an average USD 2.5 billion per year during 2010–2012. Within that amount, the average annual congressionally appropriated assistance (approximately USD 1.6 billion per year during 2010–2012) increased fourfold compared with the allocations from the same source made previously (approximately USD 370 million per year during 2003–2009).

151. The United States reported detailed information on financial resources related to the implementation of the Convention provided through multilateral and bilateral and regional channels for 2010–2012. Financial resources provided through multilateral channels encompassed contributions directly targeting climate change and broader policy objectives, such as poverty alleviation and stimulating economic growth. The amount of such resources remained relatively stable between 2010 and 2012 or increased, for example the contribution to the GEF. Public financial resources provided through bilateral and regional assistance in the same period fluctuated and amounted to about USD 2.0 billion in 2010, USD 3.2 billion in 2011 and USD 2.3 billion in 2012.

152. The promotion, facilitation and finance of technology transfer continue to be among the priorities for the development assistance of the United States. This is reflected in the information reported by the United States in its NC6 on the steps taken to that end. The effort is geared mostly at mitigation and includes the United States’ engagement in cooperation and partnerships with developing countries in activities targeting, among others, the market transformation of energy-efficient equipment and appliances and efficient lighting, reducing CH<sub>4</sub> emissions, and terrestrial carbon management. There are also examples in the area of adaptation, such as support for a famine early-warning framework.



153. With regard to its expected vulnerability to climate change and current impacts, the United States provided in its NC6 comprehensive information. The Party reported vulnerabilities by sector, focusing on such sectors as water resources, energy, transport, agriculture, forestry, ecosystems and biodiversity, and health, and on cross-sectoral considerations, namely in such areas as: urban infrastructure; land use; tribal culture, lands and resources; water, energy and land; as well as coastal zones. The United States also reported on the regional consideration of vulnerabilities and impacts. It provided information on adaptation activities and adaptation plans for various agencies at the local, state and regional levels, including on the actions taken to implement Article 4, paragraph 1(b) and (e), of the Convention with regard to adaptation. This was augmented by the information from the most recent National Climate Assessment that was provided to the ERT during the review.

154. The President's CAP provided further direction to government agencies on enhancing preparedness for climate change. Building on that plan, the President issued Executive Order 13653, "Preparing the United States for the Impacts of Climate Change", aimed at building national preparedness and resilience and ensuring the safety, health and well-being of communities. The on-going effort in assessing climate change impacts and in preparing for, and implementing, adaptation actions reflects the large size of the United States and its geographical and socioeconomic diversity.

155. In its NC6, the United States provided a great deal of information on its actions relating to education, training and public awareness at the domestic level. Although formal education is not a federal jurisdiction, the Government recognizes the importance of such actions, as shown in the more detailed information on the support provided for formal educational initiatives on climate change that was provided in the NC6 compared with in the NC5. This reflects the action taken to coordinate climate change educational efforts at the federal level, namely through the United States GCRP and other cross-cutting initiatives, and in support of a number of programmes and partnerships through federal agencies. Also, there has been an enhanced national effort to engage the public at large in climate change, geared towards increasing awareness and building support for action.

156. The United States continues to be an international leader in climate change research and systematic observation and in clean-energy technology development, as reflected in the information reported in the NC6, which covers both domestic and international activities, including WCP, IGBP, GCOS and the IPCC. It provided a detailed description of its flagship Global Change Research Programme and its achievements, as well as information on action taken to support related capacity-building in developing countries, including providing funding for scientists from developing countries to conduct global climate change research jointly with scientists from the United States. Also, the summary of information provided in the NC6 on global observation systems and activities suggests that the United States continues to be a major contributor to GCOS, sponsored by the World Meteorological Organization.

157. In the course of the review, the ERT provided a recommendation to the United States to improve the transparency of its reporting in its next national communication by using the titles of the sections of the NC provided in the outline contained in the annex to the UNFCCC reporting guidelines on NCs. In addition, the ERT formulated several recommendations relating to the completeness of the United States' reporting under the Convention. The key recommendations<sup>6</sup> are that the United States improve its reporting by including in its next national communication information on the following:

- (a) How it believes its PaMs are modifying longer-term trends in GHG emissions;

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<sup>6</sup> The recommendations are given in full in the relevant sections of this report.

- (b) The total effect of PaMs disaggregated by gas;
- (c) Activities related to technology transfer, including failure stories;
- (d) The years in operation of projects and programmes aimed at technology transfer, as required by table 6 of the UNFCCC reporting guidelines on NCs;
- (e) Steps taken by the Government to support the development and enhancement of the endogenous capacities and technologies of developing countries.

## Annex

### Documents and information used during the review

#### A. Reference documents

“Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications”. FCCC/CP/1999/7. Available at <<http://unfccc.int/resource/docs/cop5/07.pdf>>.

“Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories”. FCCC/CP/1999/7. Available at <<http://unfccc.int/resource/docs/cop5/07.pdf>>.

“Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention”. Annex to decision 23/CP.19. Available at <<http://unfccc.int/resource/docs/2013/cop19/eng/10a02.pdf#page=20>>.

FCCC/SBI/2011/INF.1. Compilation and synthesis of fifth national communications. Executive summary. Note by the secretariat. Available at <<http://unfccc.int/resource/docs/2011/sbi/eng/inf01.pdf>>.

FCCC/SBI/2011/INF.1/Add.1. Compilation and synthesis of fifth national communications. Note by the secretariat. Addendum. Policies, measures, and past and projected future greenhouse gas emission trends of Parties included in Annex I to the Convention. Available at <<http://unfccc.int/resource/docs/2011/sbi/eng/inf01a01.pdf>>.

FCCC/SBI/2011/INF.1/Add.2. Compilation and synthesis of fifth national communications. Note by the secretariat. Addendum. Financial resources, technology transfer, vulnerability, adaptation and other issues relating to the implementation of the Convention by Parties included in Annex I to the Convention. Available at <<http://unfccc.int/resource/docs/2011/sbi/eng/inf01a02.pdf>>.

FCCC/SBI/2011/INF.2. Compilation and synthesis of supplementary information incorporated in fifth national communications submitted in accordance with Article 7, paragraph 2, of the Kyoto Protocol. Note by the secretariat. Available at <<http://unfccc.int/resource/docs/2011/sbi/eng/inf02.pdf>>.

FCCC/IDR.5/USA. Report of the in-depth review of the fifth national communication of the United States of America. Available at <<http://unfccc.int/resource/docs/2011/idr/usa05.pdf>>.

Sixth national communication of the United States of America. Available at <[http://unfccc.int/files/national\\_reports/annex\\_i\\_natcom/submitted\\_natcom/application/pdf/2014\\_u.s.\\_climate\\_action\\_report\[1\]rev.pdf](http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/2014_u.s._climate_action_report[1]rev.pdf)>.

2013 GHG inventory submission of the United States of America. Available at <[http://unfccc.int/national\\_reports/annex\\_i\\_ghg\\_inventories/national\\_inventories\\_submissions/items/7383.php](http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/7383.php)>.

#### B. Additional information provided by the Party

Responses to questions during the review were received from Mr. Andrew Rakestraw (United States Department of State), including additional material on updated

policies and measures, greenhouse gas projections and recent climate policy developments in the United States of America. The following documents<sup>1</sup> were also provided by the United States:

The methodologies for assessing the effects from the policies and measures reported in the NC6 chapter 4. Available at

<[http://unfccc.int/files/national\\_reports/annex\\_i\\_natcom/submitted\\_natcom/application/pdf/climate\\_action\\_report\\_chapter\\_4\\_methodologies.pdf](http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/climate_action_report_chapter_4_methodologies.pdf)>.

The methodologies used for preparation of projections for non-CO<sub>2</sub> and non-energy CO<sub>2</sub> emissions. Available at

<[http://unfccc.int/files/national\\_reports/biennial\\_reports\\_and\\_jar/submitted\\_biennial\\_reports/application/pdf/methodologies\\_for\\_u\\_s\\_greenhouse\\_gas\\_emissions\\_projections.pdf](http://unfccc.int/files/national_reports/biennial_reports_and_jar/submitted_biennial_reports/application/pdf/methodologies_for_u_s_greenhouse_gas_emissions_projections.pdf)>.

Meeting the Fast Start Commitment. The U.S. Climate Finance in Fiscal Year 2012. Available at <<http://www.state.gov/documents/organization/201130.pdf>>.

Draft Third US National Climate Assessment. Available at

<<http://ncadac.globalchange.gov/download/NCAJan11-2013-publicreviewdraft-fulldraft.pdf>>.

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<sup>1</sup> Reproduced as received from the Party.