

## Table of Contents

<b>ACKNOWLEDGMENTS .....</b>	<b>I</b>
<b>PREFACE .....</b>	<b>III</b>
<b>TABLE OF CONTENTS .....</b>	<b>V</b>
<b>LIST OF TABLES, FIGURES, AND BOXES .....</b>	<b>VII</b>
<b>EXECUTIVE SUMMARY .....</b>	<b>ES-1</b>
ES.1. Background Information .....	ES-2
ES.2. Recent Trends in U.S. Greenhouse Gas Emissions and Sinks .....	ES-4
ES.3. Overview of Sector Emissions and Trends .....	ES-11
ES.4. Other Information .....	ES-14
<b>1. INTRODUCTION.....</b>	<b>1-1</b>
1.1. Background Information .....	1-2
1.2. Institutional Arrangements .....	1-9
1.3. Inventory Process .....	1-10
1.4. Methodology and Data Sources.....	1-11
1.5. Key Categories .....	1-12
1.6. Quality Assurance and Quality Control (QA/QC).....	1-15
1.7. Uncertainty Analysis of Emission Estimates.....	1-17
1.8. Completeness .....	1-18
1.9. Organization of Report.....	1-18
<b>2. TRENDS IN GREENHOUSE GAS EMISSIONS .....</b>	<b>2-1</b>
2.1. Recent Trends in U.S. Greenhouse Gas Emissions and Sinks.....	2-1
2.2. Emissions by Economic Sector .....	2-15
2.3. Indirect Greenhouse Gas Emissions (CO <sub>2</sub> , NO <sub>x</sub> , NMVOCs, and SO <sub>2</sub> ) .....	2-26
<b>3. ENERGY .....</b>	<b>3-1</b>
3.1. Fossil Fuel Combustion (IPCC Source Category 1A).....	3-3
3.2. Carbon Emitted from Non-Energy Uses of Fossil Fuels (IPCC Source Category 1A) .....	3-30
3.3. Incineration of Waste (IPCC Source Category 1A1a).....	3-36
3.4. Coal Mining (IPCC Source Category 1B1a).....	3-39
3.5. Abandoned Underground Coal Mines (IPCC Source Category 1B1a) .....	3-42
3.6. Natural Gas Systems (IPCC Source Category 1B2b).....	3-46
3.7. Petroleum Systems (IPCC Source Category 1B2a).....	3-51
3.8. Energy Sources of Indirect Greenhouse Gas Emissions.....	3-57
3.9. International Bunker Fuels (IPCC Source Category 1: Memo Items).....	3-58
3.10. Wood Biomass and Ethanol Consumption (IPCC Source Category 1A) .....	3-62
<b>4. INDUSTRIAL PROCESSES .....</b>	<b>4-1</b>

4.1.	Cement Production (IPCC Source Category 2A1) .....	4-4
4.2.	Lime Production (IPCC Source Category 2A2) .....	4-7
4.3.	Limestone and Dolomite Use (IPCC Source Category 2A3) .....	4-11
4.4.	Soda Ash Production and Consumption (IPCC Source Category 2A4) .....	4-14
4.5.	Ammonia Production (IPCC Source Category 2B1).....	4-18
4.6.	Urea Consumption for Non-Agricultural Purposes .....	4-21
4.7.	Nitric Acid Production (IPCC Source Category 2B2).....	4-23
4.8.	Adipic Acid Production (IPCC Source Category 2B3).....	4-26
4.9.	Silicon Carbide Production (IPCC Source Category 2B4) and Consumption.....	4-28
4.10.	Petrochemical Production (IPCC Source Category 2B5).....	4-31
4.11.	Titanium Dioxide Production (IPCC Source Category 2B5) .....	4-34
4.12.	Carbon Dioxide Consumption (IPCC Source Category 2B5) .....	4-36
4.13.	Phosphoric Acid Production (IPCC Source Category 2B5) .....	4-39
4.14.	Iron and Steel Production (IPCC Source Category 2C1) and Metallurgical Coke Production.....	4-42
4.15.	Ferroalloy Production (IPCC Source Category 2C2) .....	4-52
4.16.	Aluminum Production (IPCC Source Category 2C3) .....	4-55
4.17.	Magnesium Production and Processing (IPCC Source Category 2C4) .....	4-59
4.18.	Zinc Production (IPCC Source Category 2C5) .....	4-62
4.19.	Lead Production (IPCC Source Category 2C5).....	4-65
4.20.	HCFC-22 Production (IPCC Source Category 2E1) .....	4-67
4.21.	Substitution of Ozone Depleting Substances (IPCC Source Category 2F) .....	4-70
4.22.	Semiconductor Manufacture (IPCC Source Category 2F6) .....	4-74
4.23.	Electrical Transmission and Distribution (IPCC Source Category 2F7) .....	4-79
4.24.	Industrial Sources of Indirect Greenhouse Gases.....	4-83
<b>5.</b>	<b>SOLVENT AND OTHER PRODUCT USE.....</b>	<b>5-1</b>
5.1.	Nitrous Oxide from Product Uses (IPCC Source Category 3D) .....	5-1
5.2.	Indirect Greenhouse Gas Emissions from Solvent Use .....	5-3
<b>6.</b>	<b>AGRICULTURE .....</b>	<b>6-1</b>
6.1.	Enteric Fermentation (IPCC Source Category 4A) .....	6-2
6.2.	Manure Management (IPCC Source Category 4B) .....	6-7
6.3.	Rice Cultivation (IPCC Source Category 4C).....	6-13
6.4.	Agricultural Soil Management (IPCC Source Category 4D) .....	6-17
6.5.	Field Burning of Agricultural Residues (IPCC Source Category 4F) .....	6-29
<b>7.</b>	<b>LAND USE, LAND-USE CHANGE, AND FORESTRY .....</b>	<b>7-1</b>
7.1.	Representation of the U.S. Land Base.....	7-4
7.2.	Forest Land Remaining Forest Land .....	7-12
7.3.	Land Converted to Forest Land (IPCC Source Category 5A2) .....	7-25

7.4.	Cropland Remaining Cropland (IPCC Source Category 5B1) .....	7-25
7.5.	Land Converted to Cropland (IPCC Source Category 5B2).....	7-36
7.6.	Grassland Remaining Grassland (IPCC Source Category 5C1).....	7-39
7.7.	Land Converted to Grassland (IPCC Source Category 5C2) .....	7-43
7.8.	Wetlands Remaining Wetlands .....	7-46
7.9.	Settlements Remaining Settlements .....	7-50
7.10.	Land Converted to Settlements (Source Category 5E2).....	7-57
7.11.	Other (IPCC Source Category 5G).....	7-57
<b>8.</b>	<b>WASTE.....</b>	<b>8-1</b>
8.1.	Landfills (IPCC Source Category 6A1).....	8-3
8.2.	Wastewater Treatment (IPCC Source Category 6B) .....	8-8
8.3.	Composting (IPCC Source Category 6D) .....	8-20
8.4.	Waste Sources of Indirect Greenhouse Gases .....	8-22
<b>9.</b>	<b>OTHER.....</b>	<b>9-1</b>
<b>10.</b>	<b>RECALCULATIONS AND IMPROVEMENTS.....</b>	<b>10-1</b>
<b>11.</b>	<b>REFERENCES.....</b>	<b>11-1</b>

## List of Tables, Figures, and Boxes

### Tables

Table ES-1: Global Warming Potentials (100-Year Time Horizon) Used in this Report.....	ES-3
Table ES-2: Recent Trends in U.S. Greenhouse Gas Emissions and Sinks (Tg or million metric tons CO <sub>2</sub> Eq.)..	ES-4
Table ES-3: CO <sub>2</sub> Emissions from Fossil Fuel Combustion by Fuel Consuming End-Use Sector (Tg or million metric tons CO <sub>2</sub> Eq.).....	ES-8
Table ES-4: Recent Trends in U.S. Greenhouse Gas Emissions and Sinks by Chapter/IPCC Sector (Tg or million metric tons CO <sub>2</sub> Eq.).....	ES-11
Table ES-5: Net CO <sub>2</sub> Flux from Land Use, Land-Use Change, and Forestry (Tg or million metric tons CO <sub>2</sub> Eq.)..	ES-13
Table ES-6: Emissions from Land Use, Land-Use Change, and Forestry (Tg or million metric tons CO <sub>2</sub> Eq.) ..	ES-13
Table ES-7: U.S. Greenhouse Gas Emissions Allocated to Economic Sectors (Tg or million metric tons CO <sub>2</sub> Eq.) .....	ES-15
Table ES-8: U.S Greenhouse Gas Emissions by Economic Sector with Electricity-Related Emissions Distributed (Tg or million metric tons CO <sub>2</sub> Eq.) .....	ES-15
Table ES-9: Recent Trends in Various U.S. Data (Index 1990 = 100).....	ES-16
Table ES-10: Emissions of NO <sub>x</sub> , CO, NMVOCs, and SO <sub>2</sub> (Gg).....	ES-17
Table 1-1: Global Atmospheric Concentration, Rate of Concentration Change, and Atmospheric Lifetime (years) of Selected Greenhouse Gases .....	1-4
Table 1-2: Global Warming Potentials and Atmospheric Lifetimes (Years) Used in this Report .....	1-8
Table 1-3: Comparison of 100-Year GWPs.....	1-9

Table 1-4: Key Categories for the United States (1990-2010) .....	1-13
Table 1-5: Estimated Overall Inventory Quantitative Uncertainty (Tg CO <sub>2</sub> Eq. and Percent) .....	1-17
Table 1-6: IPCC Sector Descriptions.....	1-18
Table 1-7: List of Annexes .....	1-20
Table 2-1: Recent Trends in U.S. Greenhouse Gas Emissions and Sinks (Tg CO <sub>2</sub> Eq.).....	2-3
Table 2-2: Recent Trends in U.S. Greenhouse Gas Emissions and Sinks (Gg).....	2-5
Table 2-3: Recent Trends in U.S. Greenhouse Gas Emissions and Sinks by Chapter/IPCC Sector (Tg CO <sub>2</sub> Eq.)...	2-7
Table 2-4: Emissions from Energy (Tg CO <sub>2</sub> Eq.).....	2-8
Table 2-5: CO <sub>2</sub> Emissions from Fossil Fuel Combustion by End-Use Sector (Tg CO <sub>2</sub> Eq.).....	2-9
Table 2-6: Emissions from Industrial Processes (Tg CO <sub>2</sub> Eq.).....	2-10
Table 2-7: N <sub>2</sub> O Emissions from Solvent and Other Product Use (Tg CO <sub>2</sub> Eq.).....	2-12
Table 2-8: Emissions from Agriculture (Tg CO <sub>2</sub> Eq.) .....	2-12
Table 2-9: Net CO <sub>2</sub> Flux from Land Use, Land-Use Change, and Forestry (Tg CO <sub>2</sub> Eq.).....	2-13
Table 2-10: Emissions from Land Use, Land-Use Change, and Forestry (Tg CO <sub>2</sub> Eq.) .....	2-14
Table 2-11: Emissions from Waste (Tg CO <sub>2</sub> Eq.) .....	2-15
Table 2-12: U.S. Greenhouse Gas Emissions Allocated to Economic Sectors (Tg CO <sub>2</sub> Eq. and Percent of Total in 2010).....	2-16
Table 2-13: Electricity Generation-Related Greenhouse Gas Emissions (Tg CO <sub>2</sub> Eq.) .....	2-18
Table 2-14: U.S. Greenhouse Gas Emissions by Economic Sector and Gas with Electricity-Related Emissions Distributed (Tg CO <sub>2</sub> Eq.) and Percent of Total in 2010.....	2-19
Table 2-15: Transportation-Related Greenhouse Gas Emissions (Tg CO <sub>2</sub> Eq.) .....	2-22
Table 2-16: Recent Trends in Various U.S. Data (Index 1990 = 100).....	2-25
Table 2-17: Emissions of NO <sub>x</sub> , CO, NMVOCs, and SO <sub>2</sub> (Gg).....	2-26
Table 3-1: CO <sub>2</sub> , CH <sub>4</sub> , and N <sub>2</sub> O Emissions from Energy (Tg CO <sub>2</sub> Eq.).....	3-1
Table 3-2: CO <sub>2</sub> , CH <sub>4</sub> , and N <sub>2</sub> O Emissions from Energy (Gg) .....	3-2
Table 3-3: CO <sub>2</sub> , CH <sub>4</sub> , and N <sub>2</sub> O Emissions from Fossil Fuel Combustion (Tg CO <sub>2</sub> Eq.) .....	3-3
Table 3-4: CO <sub>2</sub> , CH <sub>4</sub> , and N <sub>2</sub> O Emissions from Fossil Fuel Combustion (Gg).....	3-4
Table 3-5: CO <sub>2</sub> Emissions from Fossil Fuel Combustion by Fuel Type and Sector (Tg CO <sub>2</sub> Eq.).....	3-4
Table 3-6: Annual Change in CO <sub>2</sub> Emissions and Total 2010 Emissions from Fossil Fuel Combustion for Selected Fuels and Sectors (Tg CO <sub>2</sub> Eq. and Percent) .....	3-5
Table 3-7: CO <sub>2</sub> , CH <sub>4</sub> , and N <sub>2</sub> O Emissions from Fossil Fuel Combustion by Sector (Tg CO <sub>2</sub> Eq.) .....	3-7
Table 3-8: CO <sub>2</sub> , CH <sub>4</sub> , and N <sub>2</sub> O Emissions from Fossil Fuel Combustion by End-Use Sector (Tg CO <sub>2</sub> Eq.) .....	3-8
Table 3-9: CO <sub>2</sub> Emissions from Stationary Fossil Fuel Combustion (Tg CO <sub>2</sub> Eq.) .....	3-8
Table 3-10: CH <sub>4</sub> Emissions from Stationary Combustion (Tg CO <sub>2</sub> Eq.).....	3-10
Table 3-11: N <sub>2</sub> O Emissions from Stationary Combustion (Tg CO <sub>2</sub> Eq.).....	3-10
Table 3-12: CO <sub>2</sub> Emissions from Fossil Fuel Combustion in Transportation End-Use Sector (Tg CO <sub>2</sub> Eq.) <sup>a</sup> .....	3-14
Table 3-13: CH <sub>4</sub> Emissions from Mobile Combustion (Tg CO <sub>2</sub> Eq.).....	3-16
Table 3-14: N <sub>2</sub> O Emissions from Mobile Combustion (Tg CO <sub>2</sub> Eq.) .....	3-16

Table 3-15: Carbon Intensity from Direct Fossil Fuel Combustion by Sector (Tg CO <sub>2</sub> Eq./QBtu) .....	3-20
Table 3-16: Tier 2 Quantitative Uncertainty Estimates for CO <sub>2</sub> Emissions from Energy-related Fossil Fuel Combustion by Fuel Type and Sector (Tg CO <sub>2</sub> Eq. and Percent).....	3-22
Table 3-17: Tier 2 Quantitative Uncertainty Estimates for CH <sub>4</sub> and N <sub>2</sub> O Emissions from Energy-Related Stationary Combustion, Including Biomass (Tg CO <sub>2</sub> Eq. and Percent).....	3-26
Table 3-18: Tier 2 Quantitative Uncertainty Estimates for CH <sub>4</sub> and N <sub>2</sub> O Emissions from Mobile Sources (Tg CO <sub>2</sub> Eq. and Percent).....	3-28
Table 3-19: CO <sub>2</sub> Emissions from Non-Energy Use Fossil Fuel Consumption (Tg CO <sub>2</sub> Eq.).....	3-31
Table 3-20: Adjusted Consumption of Fossil Fuels for Non-Energy Uses (TBtu).....	3-31
Table 3-21: 2010 Adjusted Non-Energy Use Fossil Fuel Consumption, Storage, and Emissions.....	3-32
Table 3-22: Tier 2 Quantitative Uncertainty Estimates for CO <sub>2</sub> Emissions from Non-Energy Uses of Fossil Fuels (Tg CO <sub>2</sub> Eq. and Percent) .....	3-33
Table 3-23: Tier 2 Quantitative Uncertainty Estimates for Storage Factors of Non-Energy Uses of Fossil Fuels (Percent) .....	3-34
Table 3-24: CO <sub>2</sub> and N <sub>2</sub> O Emissions from the Incineration of Waste (Tg CO <sub>2</sub> Eq.).....	3-36
Table 3-25: CO <sub>2</sub> and N <sub>2</sub> O Emissions from the Incineration of Waste (Gg) .....	3-36
Table 3-26: Municipal Solid Waste Generation (Metric Tons) and Percent Combusted.....	3-38
Table 3-27: Tier 2 Quantitative Uncertainty Estimates for CO <sub>2</sub> and N <sub>2</sub> O from the Incineration of Waste (Tg CO <sub>2</sub> Eq. and Percent).....	3-38
Table 3-28: CH <sub>4</sub> Emissions from Coal Mining (Tg CO <sub>2</sub> Eq.) .....	3-40
Table 3-29: CH <sub>4</sub> Emissions from Coal Mining (Gg) .....	3-40
Table 3-30: Coal Production (Thousand Metric Tons).....	3-41
Table 3-31: Tier 2 Quantitative Uncertainty Estimates for CH <sub>4</sub> Emissions from Coal Mining (Tg CO <sub>2</sub> Eq. and Percent).....	3-42
Table 3-32: CH <sub>4</sub> Emissions from Abandoned Coal Mines (Tg CO <sub>2</sub> Eq.).....	3-43
Table 3-33: CH <sub>4</sub> Emissions from Abandoned Coal Mines (Gg).....	3-43
Table 3-34: Number of gassy abandoned mines occurring in U.S. basins grouped by class according to post-abandonment state .....	3-44
Table 3-35: Tier 2 Quantitative Uncertainty Estimates for CH <sub>4</sub> Emissions from Abandoned Underground Coal Mines (Tg CO <sub>2</sub> Eq. and Percent) .....	3-45
Table 3-36: CH <sub>4</sub> Emissions from Natural Gas Systems (Tg CO <sub>2</sub> Eq.)* .....	3-47
Table 3-37: CH <sub>4</sub> Emissions from Natural Gas Systems (Gg)* .....	3-47
Table 3-38: Calculated Potential CH <sub>4</sub> and Captured/Combusted CH <sub>4</sub> from Natural Gas Systems (Tg CO <sub>2</sub> Eq.) ...	3-47
Table 3-39: Non-combustion CO <sub>2</sub> Emissions from Natural Gas Systems (Tg CO <sub>2</sub> Eq.).....	3-48
Table 3-40: Non-combustion CO <sub>2</sub> Emissions from Natural Gas Systems (Gg) .....	3-48
Table 3-41: Tier 2 Quantitative Uncertainty Estimates for CH <sub>4</sub> and Non-energy CO <sub>2</sub> Emissions from Natural Gas Systems (Tg CO <sub>2</sub> Eq. and Percent).....	3-50
Table 3-42: CH <sub>4</sub> Emissions from Petroleum Systems (Tg CO <sub>2</sub> Eq.) .....	3-52
Table 3-43: CH <sub>4</sub> Emissions from Petroleum Systems (Gg).....	3-52
Table 3-44: CO <sub>2</sub> Emissions from Petroleum Systems (Tg CO <sub>2</sub> Eq.) .....	3-53

Table 3-45: CO <sub>2</sub> Emissions from Petroleum Systems (Gg).....	3-53
Table 3-46: Tier 2 Quantitative Uncertainty Estimates for CH <sub>4</sub> Emissions from Petroleum Systems (Tg CO <sub>2</sub> Eq. and Percent).....	3-55
Table 3-47: Potential Emissions from CO <sub>2</sub> Capture and Transport (Tg CO <sub>2</sub> Eq.).....	3-57
Table 3-48: Potential Emissions from CO <sub>2</sub> Capture and Transport (Gg) .....	3-57
Table 3-49: NO <sub>x</sub> , CO, and NMVOC Emissions from Energy-Related Activities (Gg).....	3-57
Table 3-50: CO <sub>2</sub> , CH <sub>4</sub> , and N <sub>2</sub> O Emissions from International Bunker Fuels (Tg CO <sub>2</sub> Eq.) .....	3-59
Table 3-51: CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O Emissions from International Bunker Fuels (Gg) .....	3-60
Table 3-52: Aviation Jet Fuel Consumption for International Transport (Million Gallons).....	3-61
Table 3-53: Marine Fuel Consumption for International Transport (Million Gallons) .....	3-61
Table 3-54: CO <sub>2</sub> Emissions from Wood Consumption by End-Use Sector (Tg CO <sub>2</sub> Eq.) .....	3-63
Table 3-55: CO <sub>2</sub> Emissions from Wood Consumption by End-Use Sector (Gg) .....	3-63
Table 3-56: CO <sub>2</sub> Emissions from Ethanol Consumption (Tg CO <sub>2</sub> Eq.).....	3-63
Table 3-57: CO <sub>2</sub> Emissions from Ethanol Consumption (Gg).....	3-63
Table 3-58: Woody Biomass Consumption by Sector (Trillion Btu) .....	3-64
Table 3-59: Ethanol Consumption by Sector (Trillion Btu) .....	3-64
Table 4-1: Emissions from Industrial Processes (Tg CO <sub>2</sub> Eq.).....	4-2
Table 4-2: Emissions from Industrial Processes (Gg) .....	4-3
Table 4-3: CO <sub>2</sub> Emissions from Cement Production (Tg CO <sub>2</sub> Eq. and Gg) .....	4-5
Table 4-4: Clinker Production (Gg).....	4-6
Table 4-5: Tier 2 Quantitative Uncertainty Estimates for CO <sub>2</sub> Emissions from Cement Production (Tg CO <sub>2</sub> Eq. and Percent).....	4-6
Table 4-6: CO <sub>2</sub> Emissions from Lime Production (Tg CO <sub>2</sub> Eq. and Gg) .....	4-7
Table 4-7: Potential, Recovered, and Net CO <sub>2</sub> Emissions from Lime Production (Gg) .....	4-8
Table 4-8: High-Calcium- and Dolomitic-Quicklime, High-Calcium- and Dolomitic-Hydrated, and Dead-Burned-Dolomite Lime Production (Gg).....	4-9
Table 4-9: Adjusted Lime Production <sup>a</sup> (Gg).....	4-9
Table 4-10: Tier 2 Quantitative Uncertainty Estimates for CO <sub>2</sub> Emissions from Lime Production (Tg CO <sub>2</sub> Eq. and Percent).....	4-11
Table 4-11: CO <sub>2</sub> Emissions from Limestone & Dolomite Use (Tg CO <sub>2</sub> Eq.).....	4-12
Table 4-12: CO <sub>2</sub> Emissions from Limestone & Dolomite Use (Gg) .....	4-12
Table 4-13: Limestone and Dolomite Consumption (Thousand Metric Tons).....	4-13
Table 4-14: Tier 2 Quantitative Uncertainty Estimates for CO <sub>2</sub> Emissions from Limestone and Dolomite Use (Tg CO <sub>2</sub> Eq. and Percent).....	4-13
Table 4-15: CO <sub>2</sub> Emissions from Soda Ash Production and Consumption (Tg CO <sub>2</sub> Eq.).....	4-15
Table 4-16: CO <sub>2</sub> Emissions from Soda Ash Production and Consumption (Gg) .....	4-15
Table 4-17: Soda Ash Production and Consumption (Gg) .....	4-17
Table 4-18: Tier 2 Quantitative Uncertainty Estimates for CO <sub>2</sub> Emissions from Soda Ash Production and Consumption (Tg CO <sub>2</sub> Eq. and Percent).....	4-17

Table 4-19: CO <sub>2</sub> Emissions from Ammonia Production (Tg CO <sub>2</sub> Eq.) .....	4-19
Table 4-20: CO <sub>2</sub> Emissions from Ammonia Production (Gg) .....	4-19
Table 4-21: Ammonia Production and Urea Production (Gg) .....	4-20
Table 4-22: Tier 2 Quantitative Uncertainty Estimates for CO <sub>2</sub> Emissions from Ammonia Production (Tg CO <sub>2</sub> Eq. and Percent).....	4-20
Table 4-23: CO <sub>2</sub> Emissions from Urea Consumption for Non-Agricultural Purposes (Tg CO <sub>2</sub> Eq.).....	4-22
Table 4-24: CO <sub>2</sub> Emissions from Urea Consumption for Non-Agricultural Purposes (Gg).....	4-22
Table 4-25: Urea Production, Urea Applied as Fertilizer, Urea Imports, and Urea Exports (Gg).....	4-23
Table 4-26: Tier 2 Quantitative Uncertainty Estimates for CO <sub>2</sub> Emissions from Urea Consumption for Non-Agricultural Purposes (Tg CO <sub>2</sub> Eq. and Percent) .....	4-23
Table 4-27: N <sub>2</sub> O Emissions from Nitric Acid Production (Tg CO <sub>2</sub> Eq. and Gg) .....	4-24
Table 4-28: Nitric Acid Production (Gg).....	4-24
Table 4-29: Tier 2 Quantitative Uncertainty Estimates for N <sub>2</sub> O Emissions from Nitric Acid Production (Tg CO <sub>2</sub> Eq. and Percent).....	4-25
Table 4-30: N <sub>2</sub> O Emissions from Adipic Acid Production (Tg CO <sub>2</sub> Eq. and Gg).....	4-26
Table 4-31: Adipic Acid Production (Gg) .....	4-27
Table 4-32: Tier 2 Quantitative Uncertainty Estimates for N <sub>2</sub> O Emissions from Adipic Acid Production (Tg CO <sub>2</sub> Eq. and Percent).....	4-28
Table 4-33: CO <sub>2</sub> and CH <sub>4</sub> Emissions from Silicon Carbide Production and Consumption (Tg CO <sub>2</sub> Eq.).....	4-29
Table 4-34: CO <sub>2</sub> and CH <sub>4</sub> Emissions from Silicon Carbide Production and Consumption (Gg) .....	4-29
Table 4-35: Production and Consumption of Silicon Carbide (Metric Tons).....	4-30
Table 4-36: Tier 2 Quantitative Uncertainty Estimates for CH <sub>4</sub> and CO <sub>2</sub> Emissions from Silicon Carbide Production and Consumption (Tg CO <sub>2</sub> Eq. and Percent).....	4-30
Table 4-37: CO <sub>2</sub> and CH <sub>4</sub> Emissions from Petrochemical Production (Tg CO <sub>2</sub> Eq.).....	4-31
Table 4-38: CO <sub>2</sub> and CH <sub>4</sub> Emissions from Petrochemical Production (Gg).....	4-31
Table 4-39: Production of Selected Petrochemicals (Thousand Metric Tons) .....	4-32
Table 4-40: Carbon Black Feedstock (Primary Feedstock) and Natural Gas Feedstock (Secondary Feedstock) Consumption (Thousand Metric Tons).....	4-33
Table 4-41: Tier 2 Quantitative Uncertainty Estimates for CH <sub>4</sub> Emissions from Petrochemical Production and CO <sub>2</sub> Emissions from Carbon Black Production (Tg CO <sub>2</sub> Eq. and Percent).....	4-33
Table 4-42: CO <sub>2</sub> Emissions from Titanium Dioxide (Tg CO <sub>2</sub> Eq. and Gg).....	4-34
Table 4-43: Titanium Dioxide Production (Gg) .....	4-35
Table 4-44: Tier 2 Quantitative Uncertainty Estimates for CO <sub>2</sub> Emissions from Titanium Dioxide Production (Tg CO <sub>2</sub> Eq. and Percent).....	4-36
Table 4-45: CO <sub>2</sub> Emissions from CO <sub>2</sub> Consumption (Tg CO <sub>2</sub> Eq. and Gg).....	4-37
Table 4-46: CO <sub>2</sub> Production (Gg CO <sub>2</sub> ) and the Percent Used for Non-EOR Applications .....	4-38
Table 4-47: Tier 2 Quantitative Uncertainty Estimates for CO <sub>2</sub> Emissions from CO <sub>2</sub> Consumption (Tg CO <sub>2</sub> Eq. and Percent).....	4-38
Table 4-48: CO <sub>2</sub> Emissions from Phosphoric Acid Production (Tg CO <sub>2</sub> Eq. and Gg) .....	4-40
Table 4-49: Phosphate Rock Domestic Production, Exports, and Imports (Gg) .....	4-41

Table 4-50: Chemical Composition of Phosphate Rock (percent by weight).....	4-41
Table 4-51: Tier 2 Quantitative Uncertainty Estimates for CO <sub>2</sub> Emissions from Phosphoric Acid Production (Tg CO <sub>2</sub> Eq. and Percent).....	4-42
Table 4-52: CO <sub>2</sub> and CH <sub>4</sub> Emissions from Metallurgical Coke Production (Tg CO <sub>2</sub> Eq.).....	4-44
Table 4-53: CO <sub>2</sub> and CH <sub>4</sub> Emissions from Metallurgical Coke Production (Gg).....	4-44
Table 4-54: CO <sub>2</sub> Emissions from Iron and Steel Production (Tg CO <sub>2</sub> Eq.).....	4-45
Table 4-55: CO <sub>2</sub> Emissions from Iron and Steel Production (Gg).....	4-45
Table 4-56: CH <sub>4</sub> Emissions from Iron and Steel Production (Tg CO <sub>2</sub> Eq.).....	4-45
Table 4-57: CH <sub>4</sub> Emissions from Iron and Steel Production (Gg).....	4-45
Table 4-58: Material Carbon Contents for Metallurgical Coke Production.....	4-46
Table 4-59: Production and Consumption Data for the Calculation of CO <sub>2</sub> and CH <sub>4</sub> Emissions from Metallurgical Coke Production (Thousand Metric Tons) .....	4-47
Table 4-60: Production and Consumption Data for the Calculation of CO <sub>2</sub> Emissions from Metallurgical Coke Production (million ft <sup>3</sup> ).....	4-47
Table 4-61: CO <sub>2</sub> Emission Factors for Sinter Production and Direct Reduced Iron Production .....	4-47
Table 4-62: Material Carbon Contents for Iron and Steel Production .....	4-48
Table 4-63: CH <sub>4</sub> Emission Factors for Sinter and Pig Iron Production .....	4-49
Table 4-64: Production and Consumption Data for the Calculation of CO <sub>2</sub> and CH <sub>4</sub> Emissions from Iron and Steel Production (Thousand Metric Tons).....	4-50
Table 4-65: Production and Consumption Data for the Calculation of CO <sub>2</sub> Emissions from Iron and Steel Production (million ft <sup>3</sup> unless otherwise specified) .....	4-50
Table 4-66: Tier 2 Quantitative Uncertainty Estimates for CO <sub>2</sub> and CH <sub>4</sub> Emissions from Iron and Steel Production and Metallurgical Coke Production (Tg. CO <sub>2</sub> Eq. and Percent) .....	4-51
Table 4-67: CO <sub>2</sub> and CH <sub>4</sub> Emissions from Ferroalloy Production (Tg CO <sub>2</sub> Eq.) .....	4-52
Table 4-68: CO <sub>2</sub> and CH <sub>4</sub> Emissions from Ferroalloy Production (Gg) .....	4-53
Table 4-69: Production of Ferroalloys (Metric Tons).....	4-53
Table 4-70: Tier 2 Quantitative Uncertainty Estimates for CO <sub>2</sub> Emissions from Ferroalloy Production (Tg CO <sub>2</sub> Eq. and Percent) .....	4-54
Table 4-71: CO <sub>2</sub> Emissions from Aluminum Production (Tg CO <sub>2</sub> Eq. and Gg) .....	4-55
Table 4-72: PFC Emissions from Aluminum Production (Tg CO <sub>2</sub> Eq.).....	4-55
Table 4-73: PFC Emissions from Aluminum Production (Gg) .....	4-56
Table 4-74: Production of Primary Aluminum (Gg) .....	4-58
Table 4-75: Tier 2 Quantitative Uncertainty Estimates for CO <sub>2</sub> and PFC Emissions from Aluminum Production (Tg CO <sub>2</sub> Eq. and Percent).....	4-58
Table 4-76: SF <sub>6</sub> Emissions from Magnesium Production and Processing (Tg CO <sub>2</sub> Eq. and Gg) .....	4-59
Table 4-77: SF <sub>6</sub> Emission Factors (kg SF <sub>6</sub> per metric ton of magnesium) .....	4-60
Table 4-78: Tier 2 Quantitative Uncertainty Estimates for SF <sub>6</sub> Emissions from Magnesium Production and Processing (Tg CO <sub>2</sub> Eq. and Percent) .....	4-62
Table 4-79: Zinc Production (Metric Tons).....	4-63
Table 4-80: Tier 2 Quantitative Uncertainty Estimates for CO <sub>2</sub> Emissions from Zinc Production (Tg CO <sub>2</sub> Eq. and	

Percent).....	4-65
Table 4-81: CO <sub>2</sub> Emissions from Lead Production (Tg CO <sub>2</sub> Eq. and Gg).....	4-66
Table 4-82: Lead Production (Metric Tons) .....	4-66
Table 4-83: Tier 2 Quantitative Uncertainty Estimates for CO <sub>2</sub> Emissions from Lead Production (Tg CO <sub>2</sub> Eq. and Percent).....	4-67
Table 4-84: HFC-23 Emissions from HCFC-22 Production (Tg CO <sub>2</sub> Eq. and Gg).....	4-68
Table 4-85: HCFC-22 Production (Gg) .....	4-69
Table 4-86: Quantitative Uncertainty Estimates for HFC-23 Emissions from HCFC-22 Production (Tg CO <sub>2</sub> Eq. and Percent).....	4-69
Table 4-87: Emissions of HFCs and PFCs from ODS Substitutes (Tg CO <sub>2</sub> Eq.) .....	4-70
Table 4-88: Emissions of HFCs and PFCs from ODS Substitution (Mg) .....	4-70
Table 4-89: Emissions of HFCs and PFCs from ODS Substitutes (Tg CO <sub>2</sub> Eq.) by Sector .....	4-71
Table 4-90: Tier 2 Quantitative Uncertainty Estimates for HFC and PFC Emissions from ODS Substitutes (Tg CO <sub>2</sub> Eq. and Percent).....	4-73
Table 4-91: PFC, HFC, and SF <sub>6</sub> Emissions from Semiconductor Manufacture (Tg CO <sub>2</sub> Eq.).....	4-74
Table 4-92: PFC, HFC, and SF <sub>6</sub> Emissions from Semiconductor Manufacture (Mg).....	4-74
Table 4-93: Tier 2 Quantitative Uncertainty Estimates for HFC, PFC, and SF <sub>6</sub> Emissions from Semiconductor Manufacture (Tg CO <sub>2</sub> Eq. and Percent).....	4-78
Table 4-94: SF <sub>6</sub> Emissions from Electric Power Systems and Electrical Equipment Manufacturers (Tg CO <sub>2</sub> Eq.) ..	4-79
Table 4-95: SF <sub>6</sub> Emissions from Electric Power Systems and Electrical Equipment Manufacturers (Gg) .....	4-79
Table 4-96: Tier 2 Quantitative Uncertainty Estimates for SF <sub>6</sub> Emissions from Electrical Transmission and Distribution (Tg CO <sub>2</sub> Eq. and percent) .....	4-82
Table 4-97: NO <sub>x</sub> , CO, and NMVOC Emissions from Industrial Processes (Gg) .....	4-83
Table 5-1: N <sub>2</sub> O Emissions from Solvent and Other Product Use (Tg CO <sub>2</sub> Eq. and Gg) .....	5-1
Table 5-2: N <sub>2</sub> O Production (Gg).....	5-1
Table 5-3: N <sub>2</sub> O Emissions from N <sub>2</sub> O Product Usage (Tg CO <sub>2</sub> Eq. and Gg) .....	5-2
Table 5-4: Tier 2 Quantitative Uncertainty Estimates for N <sub>2</sub> O Emissions from N <sub>2</sub> O Product Usage (Tg CO <sub>2</sub> Eq. and Percent).....	5-3
Table 5-5: Emissions of NO <sub>x</sub> , CO, and NMVOC from Solvent Use (Gg) .....	5-4
Table 6-1: Emissions from Agriculture (Tg CO <sub>2</sub> Eq.) .....	6-1
Table 6-2: Emissions from Agriculture (Gg).....	6-1
Table 6-3: CH <sub>4</sub> Emissions from Enteric Fermentation (Tg CO <sub>2</sub> Eq.) .....	6-2
Table 6-4: CH <sub>4</sub> Emissions from Enteric Fermentation (Gg).....	6-3
Table 6-5: Quantitative Uncertainty Estimates for CH <sub>4</sub> Emissions from Enteric Fermentation (Tg CO <sub>2</sub> Eq. and Percent).....	6-5
Table 6-6: CH <sub>4</sub> and N <sub>2</sub> O Emissions from Manure Management (Tg CO <sub>2</sub> Eq.) .....	6-8
Table 6-7: CH <sub>4</sub> and N <sub>2</sub> O Emissions from Manure Management (Gg) .....	6-9
Table 6-8: Tier 2 Quantitative Uncertainty Estimates for CH <sub>4</sub> and N <sub>2</sub> O (Direct and Indirect) Emissions from Manure Management (Tg CO <sub>2</sub> Eq. and Percent) .....	6-12

Table 6-9: CH <sub>4</sub> Emissions from Rice Cultivation (Tg CO <sub>2</sub> Eq.) .....	6-14
Table 6-10: CH <sub>4</sub> Emissions from Rice Cultivation (Gg) .....	6-14
Table 6-11: Rice Areas Harvested (Hectares) .....	6-15
Table 6-12: Ratooned Area as Percent of Primary Growth Area.....	6-16
Table 6-13: Non-USDA Data Sources for Rice Harvest Information .....	6-16
Table 6-14: Tier 2 Quantitative Uncertainty Estimates for CH <sub>4</sub> Emissions from Rice Cultivation (Tg CO <sub>2</sub> Eq. and Percent).....	6-17
Table 6-15: N <sub>2</sub> O Emissions from Agricultural Soils (Tg CO <sub>2</sub> Eq.).....	6-18
Table 6-16: N <sub>2</sub> O Emissions from Agricultural Soils (Gg).....	6-19
Table 6-17: Direct N <sub>2</sub> O Emissions from Agricultural Soils by Land Use Type and N Input Type (Tg CO <sub>2</sub> Eq.)...	6-19
Table 6-18: Indirect N <sub>2</sub> O Emissions from all Land-Use Types (Tg CO <sub>2</sub> Eq.) .....	6-20
Table 6-19: Quantitative Uncertainty Estimates of N <sub>2</sub> O Emissions from Agricultural Soil Management in 2010 (Tg CO <sub>2</sub> Eq. and Percent).....	6-27
Table 6-20: CH <sub>4</sub> and N <sub>2</sub> O Emissions from Field Burning of Agricultural Residues (Tg CO <sub>2</sub> Eq.).....	6-29
Table 6-21: CH <sub>4</sub> , N <sub>2</sub> O, CO, and NO <sub>x</sub> Emissions from Field Burning of Agricultural Residues (Gg) .....	6-29
Table 6-22: Agricultural Crop Production (Gg of Product).....	6-32
Table 6-23: U.S. Average Percent Crop Area Burned by Crop (Percent) .....	6-32
Table 6-24: Key Assumptions for Estimating Emissions from Field Burning of Agricultural Residues .....	6-32
Table 6-25: Greenhouse Gas Emission Ratios and Conversion Factors.....	6-32
Table 6-26: Tier 2 Quantitative Uncertainty Estimates for CH <sub>4</sub> and N <sub>2</sub> O Emissions from Field Burning of Agricultural Residues (Tg CO <sub>2</sub> Eq. and Percent) .....	6-33
Table 7-1: Net CO <sub>2</sub> Flux from Carbon Stock Changes in Land Use, Land-Use Change, and Forestry (Tg CO <sub>2</sub> Eq.)	7-1
Table 7-2: Net CO <sub>2</sub> Flux from Carbon Stock Changes in Land Use, Land-Use Change, and Forestry (Tg C).....	7-2
Table 7-3: Emissions from Land Use, Land-Use Change, and Forestry (Tg CO <sub>2</sub> Eq.) .....	7-2
Table 7-4: Emissions from Land Use, Land-Use Change, and Forestry (Gg) .....	7-3
Table 7-5: Size of Land Use and Land-Use Change Categories on Managed Land Area by Land Use and Land Use Change Categories (thousands of hectares) .....	7-5
Table 7-6: Net Annual Changes in C Stocks (Tg CO <sub>2</sub> /yr) in Forest and Harvested Wood Pools.....	7-14
Table 7-7: Net Annual Changes in C Stocks (Tg C/yr) in Forest and Harvested Wood Pools.....	7-15
Table 7-8: Forest area (1000 ha) and C Stocks (Tg C) in Forest and Harvested Wood Pools.....	7-15
Table 7-9: Estimates of CO <sub>2</sub> (Tg/yr) emissions for the lower 48 states and Alaska <sup>1</sup> .....	7-16
Table 7-10: Tier 2 Quantitative Uncertainty Estimates for Net CO <sub>2</sub> Flux from Forest Land Remaining Forest Land: Changes in Forest C Stocks (Tg CO <sub>2</sub> Eq. and Percent) .....	7-20
Table 7-11: Estimated Non-CO <sub>2</sub> Emissions from Forest Fires (Tg CO <sub>2</sub> Eq.) for U.S. Forests <sup>1</sup> .....	7-22
Table 7-12: Estimated Non-CO <sub>2</sub> Emissions from Forest Fires (Gg Gas) for U.S. Forests <sup>1</sup> .....	7-22
Table 7-13: Estimated Carbon Released from Forest Fires for U.S. Forests .....	7-22
Table 7-14: Tier 2 Quantitative Uncertainty Estimates of Non-CO <sub>2</sub> Emissions from Forest Fires in Forest Land Remaining Forest Land (Tg CO <sub>2</sub> Eq. and Percent).....	7-23

Table 7-15: Direct N <sub>2</sub> O Fluxes from Soils in <i>Forest Land Remaining Forest Land</i> (Tg CO <sub>2</sub> Eq. and Gg N <sub>2</sub> O) ....	7-24
Table 7-16: Quantitative Uncertainty Estimates of N <sub>2</sub> O Fluxes from Soils in <i>Forest Land Remaining Forest Land</i> (Tg CO <sub>2</sub> Eq. and Percent) .....	7-25
Table 7-17: Net CO <sub>2</sub> Flux from Soil C Stock Changes in <i>Cropland Remaining Cropland</i> (Tg CO <sub>2</sub> Eq.) .....	7-27
Table 7-18: Net CO <sub>2</sub> Flux from Soil C Stock Changes in <i>Cropland Remaining Cropland</i> (Tg C) .....	7-27
Table 7-19: Tier 2 Quantitative Uncertainty Estimates for Soil C Stock Changes occurring within <i>Cropland Remaining Cropland</i> (Tg CO <sub>2</sub> Eq. and Percent).....	7-31
Table 7-20: Emissions from Liming of Agricultural Soils (Tg CO <sub>2</sub> Eq.) .....	7-32
Table 7-21: Emissions from Liming of Agricultural Soils (Tg C).....	7-32
Table 7-22: Applied Minerals (Million Metric Tons).....	7-33
Table 7-23: Tier 2 Quantitative Uncertainty Estimates for CO <sub>2</sub> Emissions from Liming of Agricultural Soils (Tg CO <sub>2</sub> Eq. and Percent).....	7-34
Table 7-24: CO <sub>2</sub> Emissions from Urea Fertilization in <i>Cropland Remaining Cropland</i> (Tg CO <sub>2</sub> Eq.).....	7-35
Table 7-25: CO <sub>2</sub> Emissions from Urea Fertilization in <i>Cropland Remaining Cropland</i> (Tg C) .....	7-35
Table 7-26: Applied Urea (Million Metric Tons) .....	7-35
Table 7-27: Quantitative Uncertainty Estimates for CO <sub>2</sub> Emissions from Urea Fertilization (Tg CO <sub>2</sub> Eq. and Percent) .....	7-36
Table 7-28: Net CO <sub>2</sub> Flux from Soil C Stock Changes in Land <i>Converted to Cropland</i> (Tg CO <sub>2</sub> Eq.) .....	7-37
Table 7-29: Net CO <sub>2</sub> Flux from Soil C Stock Changes in <i>Land Converted to Cropland</i> (Tg C).....	7-37
Table 7-30: Tier 2 Quantitative Uncertainty Estimates for Soil C Stock Changes occurring within <i>Land Converted to Cropland</i> (Tg CO <sub>2</sub> Eq. and Percent).....	7-39
Table 7-31: Net CO <sub>2</sub> Flux from Soil C Stock Changes in <i>Grassland Remaining Grassland</i> (Tg CO <sub>2</sub> Eq.).....	7-40
Table 7-32: Net CO <sub>2</sub> Flux from Soil C Stock Changes in Grassland Remaining Grassland (Tg C) .....	7-40
Table 7-33: Tier 2 Quantitative Uncertainty Estimates for C Stock Changes occurring within <i>Grassland Remaining Grassland</i> (Tg CO <sub>2</sub> Eq. and Percent).....	7-42
Table 7-34: Net CO <sub>2</sub> Flux from Soil C Stock Changes for <i>Land Converted to Grassland</i> (Tg CO <sub>2</sub> Eq.) .....	7-44
Table 7-35: Net CO <sub>2</sub> Flux from Soil C Stock Changes for <i>Land Converted to Grassland</i> (Tg C).....	7-44
Table 7-36: Tier 2 Quantitative Uncertainty Estimates for Soil C Stock Changes occurring within <i>Land Converted to Grassland</i> (Tg CO <sub>2</sub> Eq. and Percent).....	7-46
Table 7-37: Emissions from <i>Peatlands Remaining Peatlands</i> (Tg CO <sub>2</sub> Eq.) .....	7-47
Table 7-38: Emissions from <i>Peatlands Remaining Peatlands</i> (Gg) .....	7-48
Table 7-39: Peat Production of Lower 48 States (in thousands of Metric Tons).....	7-49
Table 7-40: Peat Production of Alaska (in thousands of Cubic Meters).....	7-49
Table 7-41: Tier-2 Quantitative Uncertainty Estimates for CO <sub>2</sub> Emissions from <i>Peatlands Remaining Peatlands</i> .....	7-50
Table 7-42: Net C Flux from Urban Trees (Tg CO <sub>2</sub> Eq. and Tg C).....	7-51
Table 7-43: C Stocks (Metric Tons C), Annual C Sequestration (Metric Tons C/yr), Tree Cover (Percent), and Annual C Sequestration per Area of Tree Cover (kg C/m <sup>2</sup> -yr) for 14 U.S. Cities.....	7-53
Table 7-44: Tier 2 Quantitative Uncertainty Estimates for Net C Flux from Changes in C Stocks in Urban Trees (Tg CO <sub>2</sub> Eq. and Percent) .....	7-54
Table 7-45: Direct N <sub>2</sub> O Fluxes from Soils in <i>Settlements Remaining Settlements</i> (Tg CO <sub>2</sub> Eq. and Gg N <sub>2</sub> O) .....	7-55

Table 7-46: Quantitative Uncertainty Estimates of N <sub>2</sub> O Emissions from Soils in <i>Settlements Remaining Settlements</i> (Tg CO <sub>2</sub> Eq. and Percent) .....	7-57
Table 7-47: Net Changes in Yard Trimming and Food Scrap Stocks in Landfills (Tg CO <sub>2</sub> Eq.).....	7-58
Table 7-48: Net Changes in Yard Trimming and Food Scrap Stocks in Landfills (Tg C).....	7-58
Table 7-49: Moisture Content (%), C Storage Factor, Proportion of Initial C Sequestered (%), Initial C Content (%), and Decay Rate (year <sup>-1</sup> ) for Landfilled Yard Trimmings and Food Scraps in Landfills .....	7-60
Table 7-50: C Stocks in Yard Trimmings and Food Scraps in Landfills (Tg C) .....	7-60
Table 7-51: Tier 2 Quantitative Uncertainty Estimates for CO <sub>2</sub> Flux from Yard Trimmings and Food Scraps in Landfills (Tg CO <sub>2</sub> Eq. and Percent).....	7-61
Table 8-1: Emissions from Waste (Tg CO <sub>2</sub> Eq.) .....	8-2
Table 8-2: Emissions from Waste (Gg) .....	8-2
Table 8-3: CH <sub>4</sub> Emissions from Landfills (Tg CO <sub>2</sub> Eq.) .....	8-4
Table 8-4: CH <sub>4</sub> Emissions from Landfills (Gg) .....	8-4
Table 8-5: Tier 2 Quantitative Uncertainty Estimates for CH <sub>4</sub> Emissions from Landfills (Tg CO <sub>2</sub> Eq. and Percent).....	8-6
Table 8-6: CH <sub>4</sub> and N <sub>2</sub> O Emissions from Domestic and Industrial Wastewater Treatment (Tg CO <sub>2</sub> Eq.).....	8-9
Table 8-7: CH <sub>4</sub> and N <sub>2</sub> O Emissions from Domestic and Industrial Wastewater Treatment (Gg) .....	8-9
Table 8-8: U.S. Population (Millions) and Domestic Wastewater BOD <sub>5</sub> Produced (Gg) .....	8-11
Table 8-9: Domestic Wastewater CH <sub>4</sub> Emissions from Septic and Centralized Systems (2010) .....	8-11
Table 8-10: Industrial Wastewater CH <sub>4</sub> Emissions by Sector (2010).....	8-12
Table 8-11: U.S. Pulp and Paper, Meat, Poultry, Vegetables, Fruits and Juices, Ethanol, and Petroleum Refining Production (Tg) .....	8-12
Table 8-12: Variables Used to Calculate Percent Wastewater Treated Anaerobically by Industry (%).....	8-13
Table 8-13: Wastewater Flow (m <sup>3</sup> /ton) and BOD Production (g/L) for U.S. Vegetables, Fruits, and Juices Production .....	8-14
Table 8-14: U.S. Population (Millions), Available Protein (kg/person-year), and Protein Consumed (kg/person-year) .....	8-17
Table 8-15: Tier 2 Quantitative Uncertainty Estimates for CH <sub>4</sub> Emissions from Wastewater Treatment (Tg CO <sub>2</sub> Eq. and Percent).....	8-18
Table 8-16: CH <sub>4</sub> and N <sub>2</sub> O Emissions from Composting (Tg CO <sub>2</sub> Eq.) .....	8-21
Table 8-17: CH <sub>4</sub> and N <sub>2</sub> O Emissions from Composting (Gg) .....	8-21
Table 8-18: U.S. Waste Composted (Gg) .....	8-21
Table 8-19 : Tier 1 Quantitative Uncertainty Estimates for Emissions from Composting (Tg CO <sub>2</sub> Eq. and Percent).....	8-22
Table 8-20: Emissions of NO <sub>x</sub> , CO, and NMVOC from Waste (Gg).....	8-22
Table 10-1: Revisions to U.S. Greenhouse Gas Emissions (Tg CO <sub>2</sub> Eq.) .....	10-5
Table 10-2: Revisions to Annual Net CO <sub>2</sub> Fluxes from Land Use, Land-Use Change, and Forestry (Tg CO <sub>2</sub> Eq.)	10-7

## **Figures**

Figure ES-1: U.S. Greenhouse Gas Emissions by Gas .....	ES-4
Figure ES-2: Annual Percent Change in U.S. Greenhouse Gas Emissions .....	ES-4
Figure ES-3: Cumulative Change in Annual U.S. Greenhouse Gas Emissions Relative to 1990 .....	ES-4

Figure ES-4: 2010 Greenhouse Gas Emissions by Gas (percentages based on Tg CO <sub>2</sub> Eq.) .....	ES-6
Figure ES-5: 2010 Sources of CO <sub>2</sub> Emissions.....	ES-7
Figure ES-6: 2010 CO <sub>2</sub> Emissions from Fossil Fuel Combustion by Sector and Fuel Type.....	ES-7
Figure ES-7: 2010 End-Use Sector Emissions of CO <sub>2</sub> , CH <sub>4</sub> , and N <sub>2</sub> O from Fossil Fuel Combustion .....	ES-7
Figure ES-8: 2010 Sources of CH <sub>4</sub> Emissions.....	ES-9
Figure ES-9: 2010 Sources of N <sub>2</sub> O Emissions .....	ES-10
Figure ES-10: 2010 Sources of HFCs, PFCs, and SF <sub>6</sub> Emissions .....	ES-11
Figure ES-11: U.S. Greenhouse Gas Emissions and Sinks by Chapter/IPCC Sector .....	ES-11
Figure ES-12: 2010 U.S. Energy Consumption by Energy Source .....	ES-12
Figure ES-13: Emissions Allocated to Economic Sectors .....	ES-14
Figure ES-14: Emissions with Electricity Distributed to Economic Sectors .....	ES-16
Figure ES-15: U.S. Greenhouse Gas Emissions Per Capita and Per Dollar of Gross Domestic Product .....	ES-16
Figure ES-16: 2010 Key Categories .....	ES-18
Figure 1-1: U.S. QA/QC Plan Summary .....	1-16
Figure 2-1: U.S. Greenhouse Gas Emissions by Gas.....	2-1
Figure 2-2: Annual Percent Change in U.S. Greenhouse Gas Emissions .....	2-1
Figure 2-3: Cumulative Change in Annual U.S. Greenhouse Gas Emissions Relative to 1990 .....	2-1
Figure 2-4: U.S. Greenhouse Gas Emissions and Sinks by Chapter/IPCC Sector.....	2-7
Figure 2-5: 2010 Energy Chapter Greenhouse Gas Sources.....	2-8
Figure 2-6: 2010 U.S. Fossil Carbon Flows (Tg CO <sub>2</sub> Eq.) .....	2-8
Figure 2-7: 2010 CO <sub>2</sub> Emissions from Fossil Fuel Combustion by Sector and Fuel Type.....	2-9
Figure 2-8: 2010 End-Use Sector Emissions from Fossil Fuel Combustion .....	2-9
Figure 2-9: 2010 Industrial Processes Chapter Greenhouse Gas Sources .....	2-10
Figure 2-10: 2010 Agriculture Chapter Greenhouse Gas Sources.....	2-12
Figure 2-11: 2010 Waste Chapter Greenhouse Gas Sources .....	2-15
Figure 2-12: Emissions Allocated to Economic Sectors.....	2-16
Figure 2-13: Emissions with Electricity Distributed to Economic Sectors.....	2-19
Figure 2-14: U.S. Greenhouse Gas Emissions Per Capita and Per Dollar of Gross Domestic Product .....	2-25
Figure 3-1: 2010 Energy Chapter Greenhouse Gas Sources.....	3-1
Figure 3-2: 2010 U.S. Fossil Carbon Flows (Tg CO <sub>2</sub> Eq.) .....	3-1
Figure 3-3: 2010 U.S. Energy Consumption by Energy Source .....	3-5
Figure 3-4: U.S. Energy Consumption (Quadrillion Btu).....	3-5
Figure 3-5: 2010 CO <sub>2</sub> Emissions from Fossil Fuel Combustion by Sector and Fuel Type.....	3-5
Figure 3-6: Annual Deviations from Normal Heating Degree Days for the United States (1950–2010) .....	3-6
Figure 3-7: Annual Deviations from Normal Cooling Degree Days for the United States (1950–2010).....	3-6
Figure 3-8: Nuclear, Hydroelectric, and Wind Power Plant Capacity Factors in the United States (1990–2010)....	3-6
Figure 3-9: Electricity Generation Retail Sales by End-Use Sector .....	3-11

Figure 3-10: Industrial Production Indices (Index 2007=100) .....	3-12
Figure 3-11: Sales-Weighted Fuel Economy of New Passenger Cars and Light-Duty Trucks, 1990–2010.....	3-14
Figure 3-12: Sales of New Passenger Cars and Light-Duty Trucks, 1990–2010.....	3-14
Figure 3-13: Mobile Source CH <sub>4</sub> and N <sub>2</sub> O Emissions.....	3-16
Figure 3-14: U.S. Energy Consumption and Energy-Related CO <sub>2</sub> Emissions Per Capita and Per Dollar GDP ....	3-21
Figure 4-1: 2010 Industrial Processes Chapter Greenhouse Gas Sources .....	4-1
Figure 6-1: 2010 Agriculture Chapter Greenhouse Gas Emission Sources .....	6-1
Figure 6-2: Sources and Pathways of N that Result in N <sub>2</sub> O Emissions from Agricultural Soil Management.....	6-18
Figure 6-3: Major Crops, Average Annual Direct N <sub>2</sub> O Emissions Estimated Using the DAYCENT Model, 1990-2010 (Tg CO <sub>2</sub> Eq./year).....	6-20
Figure 6-4: Grasslands, Average Annual Direct N <sub>2</sub> O Emissions Estimated Using the DAYCENT Model, 1990-2010 (Tg CO <sub>2</sub> Eq./year).....	6-20
Figure 6-5: Major Crops, Average Annual N Losses Leading to Indirect N <sub>2</sub> O Emissions Estimated Using the DAYCENT Model, 1990-2010 (Gg N/year).....	6-20
Figure 6-6: Grasslands, Average Annual N Losses Leading to Indirect N <sub>2</sub> O Emissions Estimated Using the DAYCENT Model, 1990-2010 (Gg N/year).....	6-21
Figure 6-7: Comparison of Measured Emissions at Field Sites and Modeled Emissions Using the DAYCENT Simulation Model .....	6-28
Figure 7-1. Percent of Total Land Area in the General Land-Use Categories for 2010 .....	7-6
Figure 7-2: Forest Sector Carbon Pools and Flows .....	7-13
Figure 7-3: Estimates of Net Annual Changes in C Stocks for Major C Pools .....	7-15
Figure 7-4: Average C Density in the Forest Tree Pool in the Conterminous United States, 2010.....	7-15
Figure 7-5: Total Net Annual CO <sub>2</sub> Flux for Mineral Soils under Agricultural Management within States, 2010, <i>Cropland Remaining Cropland</i> .....	7-27
Figure 7-6: Total Net Annual CO <sub>2</sub> Flux for Organic Soils under Agricultural Management within States, 2010, <i>Cropland Remaining Cropland</i> .....	7-27
Figure 7-7: Total Net Annual CO <sub>2</sub> Flux for Mineral Soils under Agricultural Management within States, 2010, <i>Land Converted to Cropland</i> .....	7-37
Figure 7-8: Total Net Annual CO <sub>2</sub> Flux for Organic Soils under Agricultural Management within States, 2010, <i>Land Converted to Cropland</i> .....	7-37
Figure 7-9: Total Net Annual CO <sub>2</sub> Flux for Mineral Soils under Agricultural Management within States, 2010, <i>Grassland Remaining Grassland</i> .....	7-40
Figure 7-10: Total Net Annual CO <sub>2</sub> Flux for Organic Soils under Agricultural Management within States, 2010, <i>Grassland Remaining Grassland</i> .....	7-40
Figure 7-11: Total Net Annual CO <sub>2</sub> Flux for Mineral Soils under Agricultural Management within States, 2010, <i>Land Converted to Grassland</i> .....	7-44
Figure 7-12: Total Net Annual CO <sub>2</sub> Flux for Organic Soils under Agricultural Management within States, 2010, <i>Land Converted to Grassland</i> .....	7-44
Figure 8-1: 2010 Waste Chapter Greenhouse Gas Sources .....	8-1

## **Boxes**

Box ES- 1: Methodological approach for estimating and reporting U.S. emissions and sinks.....	ES-1
Box ES- 2: Recent Trends in Various U.S. Greenhouse Gas Emissions-Related Data .....	ES-16
Box ES- 3: Recalculations of Inventory Estimates.....	ES-19
Box 1-1: Methodological approach for estimating and reporting U.S. emissions and sinks .....	1-2
Box 1-2: The IPCC Fourth Assessment Report and Global Warming Potentials.....	1-8
Box 1-3: IPCC Reference Approach .....	1-12
Box 2-1: Methodology for Aggregating Emissions by Economic Sector.....	2-23
Box 2-2: Recent Trends in Various U.S. Greenhouse Gas Emissions-Related Data .....	2-25
Box 2-3: Sources and Effects of Sulfur Dioxide .....	2-27
Box 3-1: Weather and Non-Fossil Energy Effects on CO <sub>2</sub> from Fossil Fuel Combustion Trends .....	3-6
Box 3-2: Carbon Intensity of U.S. Energy Consumption .....	3-20
Box 3-3: Carbon Dioxide Transport, Injection, and Geological Storage.....	3-56
Box 4-1: Industrial Processes Data from EPA's Greenhouse Gas Reporting Program .....	4-4
Box 6-1. Tier 1 vs. Tier 3 Approach for Estimating N <sub>2</sub> O Emissions.....	6-22
Box 6-2: Comparison of Tier 2 U.S. Inventory Approach and IPCC (2006) Default Approach.....	6-30
Box 7-1: Methodological approach for estimating and reporting U.S. emissions and sinks .....	7-3
Box 7-2: CO <sub>2</sub> Emissions from Forest Fires .....	7-16
Box 7-3: Tier 3 Approach for Soil C Stocks Compared to Tier 1 or 2 Approaches .....	7-28
Box 8-1: Methodological approach for estimating and reporting U.S. emissions and sinks .....	8-1
Box 8-2: Waste Data from the Greenhouse Gas Reporting Program .....	8-2
Box 8-3: Biogenic Wastes in Landfills.....	8-7

