

Table of Contents

Acknowledgments	i
Preface	ii
Table of Contents	iii
List of Tables, Figures, and Boxes	vi
Tables	vi
Figures	x
Boxes	xi
Executive Summary	ES-1
Recent Trends in U.S. Greenhouse Gas Emissions	ES-2
Emissions by Economic Sector	ES-7
Global Warming Potentials	ES-10
Carbon Dioxide Emissions	ES-10
Methane Emissions	ES-18
Nitrous Oxide Emissions	ES-20
HFC, PFC, and SF ₆ Emissions	ES-22
Ambient Air Pollutant Emissions	ES-25
Changes in This Year's Inventory Report	Changes-1
Methodological Changes	Changes-1
Changes in Historical Data	Changes-9
1. Introduction	1-1
Greenhouse Gases	1-2
Global Warming Potentials	1-6
Recent Trends in U.S. Greenhouse Gas Emissions	1-8
Emissions by Economic Sectors	1-15
Methodology and Data Sources	1-21
Uncertainty in and Limitations of Emission Estimates	1-22
Organization of Report	1-23
2. Energy	2-1
Carbon Dioxide Emissions from Fossil Fuel Combustion	2-3
Carbon Stored in Products from Non-Energy Uses of Fossil Fuels	2-19
Stationary Combustion (excluding CO ₂)	2-21
Mobile Combustion (excluding CO ₂)	2-24
Coal Mining	2-30
Natural Gas Systems	2-32
Petroleum Systems	2-34
Municipal Solid Waste Combustion	2-36
Natural Gas Flaring and Ambient Air Pollutant Emissions from Oil and Gas Activities	2-39
International Bunker Fuels	2-41
Wood Biomass and Ethanol Consumption	2-45

3. Industrial Processes	3-1
Iron and Steel Production	3-3
Cement Manufacture	3-5
Ammonia Manufacture and Urea Application	3-7
Lime Manufacture	3-9
Limestone and Dolomite Use	3-12
Soda Ash Manufacture and Consumption	3-14
Titanium Dioxide Production	3-16
Ferroalloy Production	3-17
Carbon Dioxide Consumption	3-19
Petrochemical Production	3-20
Silicon Carbide Production	3-21
Nitric Acid Production	3-22
Adipic Acid Production	3-23
Nitrous Oxide Product Usage	3-24
Substitution of Ozone Depleting Substances	3-26
Aluminum Production	3-28
HCFC-22 Production	3-31
Semiconductor Manufacture	3-32
Electrical Transmission and Distribution	3-34
Magnesium Production and Processing	3-35
Industrial Sources of Ambient Air Pollutants	3-38
4. Solvent Use	4-1
5. Agriculture	5-1
Enteric Fermentation	5-2
Manure Management	5-5
Rice Cultivation	5-10
Agricultural Soil Management	5-14
Field Burning of Agricultural Residues	5-20
6. Land-Use Change and Forestry	6-1
Changes in Forest Carbon Stocks	6-2
Changes in Carbon Stocks in Urban Trees	6-10
Changes in Agricultural Soil Carbon Stocks	6-12
Changes in Yard Trimming Carbon Stocks in Landfills	6-19
7. Waste	7-1
Landfills	7-1
Wastewater Treatment	7-5
Human Sewage (Domestic Wastewater)	7-8
Waste Sources of Ambient Air Pollutants	7-10
8. References	8-1
Executive Summary	8-1
Changes in this Year's Inventory	8-1
1. Introduction	8-4
2. Energy	8-5
3. Industrial Processes	8-13
4. Solvent Use	8-19
5. Agriculture	8-19
6. Land-Use Change and Forestry	8-31
7. Waste	8-35

Annexes

The annexes are contained on the accompanying CD or can be found at <<http://www.epa.gov/globalwarming/inventory>>.

ANNEX A: Methodology for Estimating Emissions of CO ₂ from Fossil Fuel Combustion	A-1
ANNEX B: Methodology for Estimating the Carbon Content of Fossil Fuels	B-1
ANNEX C: Methodology for Estimating Carbon Stored in Products from Non-Energy Uses of Fossil Fuels	C-1
ANNEX D: Methodology for Estimating Emissions of CH ₄ , N ₂ O, and Ambient Air Pollutants from Stationary Combustion	D-1
ANNEX E: Methodology for Estimating Emissions of CH ₄ , N ₂ O, and Ambient Air Pollutants from Mobile Combustion and Methodology for and Supplemental Information on Transportation- Related GHG Emissions	E-1
ANNEX F: Methodology for Estimating CH ₄ Emissions from Coal Mining	F-1
ANNEX G: Methodology for Estimating CH ₄ Emissions from Natural Gas Systems	G-1
ANNEX H: Methodology for Estimating CH ₄ Emissions from Petroleum Systems	H-1
ANNEX I: Methodology for Estimating CO ₂ Emissions from Municipal Solid Waste Combustion	I-1
ANNEX J: Methodology for Estimating Emissions from International Bunker Fuels used by the U.S. Military	J-1
ANNEX K: Methodology for Estimating HFC and PFC Emissions from Substitution of Ozone Depleting Substances	K-1
ANNEX L: Methodology for Estimating CH ₄ Emissions from Enteric Fermentation	L-1
ANNEX M: Methodology for Estimating CH ₄ and N ₂ O Emissions from Manure Management	M-1
ANNEX N: Methodology for Estimating N ₂ O Emissions from Agricultural Soil Management	N-1
ANNEX O: Methodology for Estimating Net Changes in Forest Carbon Stocks	O-1
ANNEX P: Methodology for Estimating Net Changes in Carbon Stocks in Mineral and Organic Soils	P-1
ANNEX Q: Methodology for Estimating CH ₄ Emissions from Landfills	Q-1
ANNEX R: Key Source Analysis	R-1
ANNEX S: Global Warming Potential Values	S-1
ANNEX T: Ozone Depleting Substance Emissions	T-1
ANNEX U: Sulfur Dioxide Emissions	U-1
ANNEX V: Complete List of Source Categories	V-1
ANNEX W: IPCC Reference Approach for Estimating CO ₂ Emissions from Fossil Fuel Combustion	W-1
ANNEX X: Sources of Greenhouse Gas Emissions Excluded	W-1
ANNEX Y: Constants, Units, and Conversions	Y-1
ANNEX Z: Abbreviations	Z-1
ANNEX AA: Chemical Formulas	AA-1
ANNEX AB: Glossary	AB-1

List of Tables, Figures, and Boxes

Tables

Table ES-1: Recent Trends in U.S. Greenhouse Gas Emissions and Sinks (Tg CO ₂ Eq.)	ES-3
Table ES-2: Annual Change in CO ₂ Emissions from Fossil Fuel Combustion for Selected Fuels and Sectors (Tg CO ₂ Eq. and Percent)	ES-5
Table ES-3: U.S. Greenhouse Gas Emissions Allocated to Economic Sectors (Tg CO ₂ Eq.)	ES-7
Table ES-4: U.S. Greenhouse Gas Emissions by Economic Sector and Gas with Electricity-Related Emissions Distributed (Tg CO ₂ Eq.)	ES-8
Table ES-5: Recent Trends in Various U.S. Data (Index 1990 = 100) and Global Atmospheric CO ₂ Concentration	ES-9
Table ES-6: Global Warming Potentials (100 Year Time Horizon) Used in this Report	ES-10
Table ES-7: Comparison of 100 Year GWPs	ES-11
Table ES-8: U.S. Sources of CO ₂ Emissions and Sinks (Tg CO ₂ Eq.)	ES-13
Table ES-9: CO ₂ Emissions from Fossil Fuel Combustion by End-Use Sector (Tg CO ₂ Eq.)	ES-14
Table ES-10: U.S. Sources of CH ₄ Emissions (Tg CO ₂ Eq.)	ES-18
Table ES-11: U.S. Sources of Nitrous Oxide Emissions (Tg CO ₂ Eq.)	ES-21
Table ES-12: Emissions of HFCs, PFCs, and SF ₆ (Tg CO ₂ Eq.)	ES-23
Table ES-13: Emissions of Ozone Depleting Substances (Gg)	ES-24
Table ES-14: Emissions of NO _x , CO, NMVOCs, and SO ₂ (Gg)	ES-25
Table Changes-1: Revisions to U.S. Greenhouse Gas Emissions (Tg CO ₂ Eq.)	Changes-2
Table Changes-2: Revisions to Net CO ₂ Sequestration from Land-Use Change and Forestry (Tg CO ₂ Eq.)	Changes-3
Table 1-1: Global atmospheric concentration (ppm unless otherwise specified), rate of concentration change (ppb/year) and atmospheric lifetime (years) of selected greenhouse gases	1-3
Table 1-2: Global Warming Potentials and Atmospheric Lifetimes (Years) Used in this Report	1-6
Table 1-3: Comparison of 100 Year GWPs	1-7
Table 1-4: Effects on U.S. Greenhouse Gas Emission Trends Using IPCC SAR and TAR GWP Values (Tg CO ₂ Eq.)	1-7
Table 1-5: Comparison of Emissions by Sector using IPCC SAR and TAR GWP Values (Tg CO ₂ Eq.)	1-8
Table 1-6: Annual Change in CO ₂ Emissions from Fossil Fuel Combustion for Selected Fuels and Sectors (Tg CO ₂ Eq. and Percent)	1-10
Table 1-7: Recent Trends in Various U.S. Data (Index 1990 = 100)	1-14
Table 1-8: Recent Trends in U.S. Greenhouse Gas Emissions and Sinks (Tg CO ₂ Eq.)	1-12
Table 1-9: Recent Trends in U.S. Greenhouse Gas Emissions and Sinks (Gg)	1-13
Table 1-10: Recent Trends in U.S. Greenhouse Gas Emissions and Sinks by Chapter/IPCC Sector (Tg CO ₂ Eq.)	1-15
Table 1-11: U.S. Greenhouse Gas Emissions Allocated to Economic Sectors (Tg CO ₂ Eq. and Percent of Total in 2001)	1-16
Table 1-12: Electricity Generation-Related Greenhouse Gas Emissions (Tg CO ₂ Eq.)	1-18
Table 1-13: U.S. Greenhouse Gas Emissions by “Economic Sector” and Gas with Electricity-Related Emissions Distributed (Tg CO ₂ Eq.) and percent of total in 2001	1-19
Table 1-14: Transportation-Related Greenhouse Gas Emissions (Tg CO ₂ Eq.)	1-20
Table 1-15: IPCC Sector Descriptions	1-23

Table 1-16: List of Annexes	1-24
Table 2-1: Emissions from Energy (Tg CO ₂ Eq.)	2-2
Table 2-2: Emissions from Energy (Gg)	2-2
Table 2-3: CO ₂ Emissions from Fossil Fuel Combustion by Fuel Type and Sector (Tg CO ₂ Eq.)	2-4
Table 2-4: Fossil Fuel Carbon in Products (Tg CO ₂ Eq.)	2-7
Table 2-5: CO ₂ Emissions from International Bunker Fuels (Tg CO ₂ Eq.)	2-7
Table 2-6: CO ₂ Emissions from Fossil Fuel Combustion by End-Use Sector (Tg CO ₂ Eq.)	2-8
Table 2-7: CO ₂ Emissions from Fossil Fuel Combustion in Transportation End-Use Sector (Tg CO ₂ Eq.)	2-10
Table 2-8: Carbon Intensity from Direct Fossil Fuel Combustion by Sector (Tg CO ₂ Eq./QBtu)	2-14
Table 2-9: Carbon Intensity from all Energy Consumption by Sector (Tg CO ₂ Eq./QBtu)	2-15
Table 2-10: Change in CO ₂ Emissions from Direct Fossil Fuel Combustion Since 1990 (Tg CO ₂ Eq.)	2-16
Table 2-11: 2001 Non-Energy Fossil Fuel Consumption, Storage, and Emissions (Tg CO ₂ Eq. unless otherwise noted)	2-19
Table 2-12: Storage and Emissions from Non-Energy Fossil Fuel Consumption (Tg CO ₂ Eq.)	2-20
Table 2-13: CH ₄ Emissions from Stationary Combustion (Tg CO ₂ Eq.)	2-22
Table 2-14: N ₂ O Emissions from Stationary Combustion (Tg CO ₂ Eq.)	2-22
Table 2-15: CH ₄ Emissions from Stationary Combustion (Gg)	2-23
Table 2-16: N ₂ O Emissions from Stationary Combustion (Gg)	2-23
Table 2-17: NO _x , CO, and NMVOC Emissions from Stationary Combustion in 2001 (Gg)	2-24
Table 2-18: CH ₄ Emissions from Mobile Combustion (Tg CO ₂ Eq.)	2-26
Table 2-19: N ₂ O Emissions from Mobile Combustion (Tg CO ₂ Eq.)	2-26
Table 2-20: CH ₄ Emissions from Mobile Combustion (Gg)	2-27
Table 2-21: N ₂ O Emissions from Mobile Combustion (Gg)	2-27
Table 2-22: NO _x , CO, and NMVOC Emissions from Mobile Combustion in 2001 (Gg)	2-28
Table 2-23: CH ₄ Emissions from Coal Mining (Tg CO ₂ Eq.)	2-31
Table 2-24: CH ₄ Emissions from Coal Mining (Gg)	2-31
Table 2-25: Coal Production (Thousand Metric Tons)	2-32
Table 2-26: CH ₄ Emissions from Natural Gas Systems (Tg CO ₂ Eq.)	2-33
Table 2-27: CH ₄ Emissions from Natural Gas Systems (Gg)	2-33
Table 2-28: CH ₄ Emissions from Petroleum Systems (Tg CO ₂ Eq.)	2-35
Table 2-29: CH ₄ Emissions from Petroleum Systems (Gg)	2-35
Table 2-30: CO ₂ and N ₂ O Emissions from Municipal Solid Waste Combustion (Tg CO ₂ Eq.)	2-37
Table 2-31: CO ₂ and N ₂ O Emissions from Municipal Solid Waste Combustion (Gg)	2-37
Table 2-32: NO _x , CO, and NMVOC Emissions from Municipal Solid Waste Combustion (Gg)	2-37
Table 2-33: Municipal Solid Waste Generation (Metric Tons) and Percent Combusted	2-38
Table 2-34: U.S. Municipal Solid Waste Combusted, by Data Source (Metric Tons)	2-39
Table 2-35: CO ₂ Emissions from Natural Gas Flaring	2-40
Table 2-36: NO _x , NMVOCs, and CO Emissions from Oil and Gas Activities (Gg)	2-40
Table 2-37: Total Natural Gas Reported Vented and Flared (Million Ft ³) and Thermal Conversion Factor (Btu/Ft ³)	2-40
Table 2-38: Emissions from International Bunker Fuels (Tg CO ₂ Eq.)	2-43
Table 2-39: Emissions from International Bunker Fuels (Gg)	2-43
Table 2-40: Aviation Jet Fuel Consumption for International Transport (Million Gallons)	2-44
Table 2-41: Marine Fuel Consumption for International Transport (Million Gallons)	2-45
Table 2-42: CO ₂ Emissions from Wood Consumption by End-Use Sector (Tg CO ₂ Eq.)	2-46
Table 2-43: CO ₂ Emissions from Wood Consumption by End-Use Sector (Gg)	2-46

Table 2-44: CO ₂ Emissions from Ethanol Consumption	2-46
Table 2-45: Woody Biomass Consumption by Sector (Trillion Btu)	2-47
Table 2-46: Ethanol Consumption	2-47
Table 2-47: CH ₄ Emissions from Non-Combustion Fossil Sources (Gg)	2-48
Table 2-48: Formation of CO ₂ Through Atmospheric CH ₄ Oxidation (Tg CO ₂ Eq.)	2-48
Table 3-1: Emissions from Industrial Processes (Tg CO ₂ Eq.)	3-2
Table 3-2: Emissions from Industrial Processes (Gg)	3-3
Table 3-3: CO ₂ Emissions from Iron and Steel Production	3-4
Table 3-4: CO ₂ Emissions from Cement Production	3-5
Table 3-5: Cement Production (Gg)	3-6
Table 3-6: CO ₂ Emissions from Ammonia Manufacture	3-7
Table 3-7: CO ₂ Emissions from Urea Application	3-7
Table 3-8: Ammonia Production	3-8
Table 3-9: Urea Production	3-8
Table 3-10: Urea Net Imports	3-9
Table 3-11: Net CO ₂ Emissions from Lime Manufacture	3-10
Table 3-12: CO ₂ Emissions from Lime Manufacture (Gg)	3-10
Table 3-13: Lime Production and Lime Use for Sugar Refining and PCC (Thousand Metric Tons)	3-11
Table 3-14: Hydrated Lime Production (Thousand Metric Tons)	3-11
Table 3-15: CO ₂ Emissions from Limestone & Dolomite Use (Tg CO ₂ Eq.)	3-12
Table 3-16: CO ₂ Emissions from Limestone & Dolomite Use (Gg)	3-12
Table 3-17: Limestone and Dolomite Consumption (Thousand Metric Tons)	3-13
Table 3-18: Dolomitic Magnesium Metal Production Capacity (Metric Tons)	3-14
Table 3-19: CO ₂ Emissions from Soda Ash Manufacture and Consumption	3-15
Table 3-20: CO ₂ Emissions from Soda Ash Manufacture and Consumption (Gg)	3-15
Table 3-21: Soda Ash Manufacture and Consumption (Thousand Metric Tons)	3-16
Table 3-22: CO ₂ Emissions from Titanium Dioxide	3-16
Table 3-23: Titanium Dioxide Production	3-17
Table 3-24: CO ₂ Emissions from Ferroalloy Production	3-18
Table 3-25: Production of Ferroalloys (Metric Tons)	3-18
Table 3-26: CO ₂ Emissions from Carbon Dioxide Consumption	3-19
Table 3-27: Carbon Dioxide Consumption	3-20
Table 3-28: CH ₄ Emissions from Petrochemical Production	3-20
Table 3-29: Production of Selected Petrochemicals (Thousand Metric Tons)	3-21
Table 3-30: CH ₄ Emissions from Silicon Carbide Production	3-21
Table 3-31: Production of Silicon Carbide	3-21
Table 3-32: N ₂ O Emissions from Nitric Acid Production	3-22
Table 3-33: Nitric Acid Production	3-22
Table 3-34: N ₂ O Emissions from Adipic Acid Production	3-23
Table 3-35: Adipic Acid Production	3-24
Table 3-36: N ₂ O Emissions from Nitrous Oxide Product Usage	3-25
Table 3-37: N ₂ O Production (Thousand Metric Tons)	3-26
Table 3-38: Emissions of HFCs and PFCs from ODS Substitution (Tg CO ₂ Eq.)	3-27
Table 3-39: Emissions of HFCs and PFCs from ODS Substitution (Mg)	3-27
Table 3-40: CO ₂ Emissions from Aluminum Production	3-28
Table 3-41: PFC Emissions from Aluminum Production (Tg CO ₂ Eq.)	3-29

Table 3-42: PFC Emissions from Aluminum Production (Gg)	3-29
Table 3-43: Production of Primary Aluminum	3-30
Table 3-44: HFC-23 Emissions from HCFC-22 Production	3-31
Table 3-45: HCFC-22 Production	3-32
Table 3-46: PFC, HFC, and SF ₆ Emissions from Semiconductor Manufacture (Tg CO ₂ Eq.)	3-32
Table 3-47: PFC, HFC, and SF ₆ Emissions from Semiconductor Manufacture (Mg)	3-33
Table 3-48: SF ₆ Emissions from Electrical Transmission and Distribution	3-34
Table 3-49: SF ₆ Emissions from Magnesium Production and Processing	3-36
Table 3-50: SF ₆ Emission Factors (kg SF ₆ per metric ton of magnesium)	3-36
Table 3-51: 2001 Potential and Actual Emissions of HFCs, PFCs, and SF ₆ from Selected Sources (Tg CO ₂ Eq.)	3-37
Table 3-52: NO _x , CO, and NMVOC Emissions from Industrial Processes (Gg)	3-38
Table 4-1: Emissions of NO _x , CO, and NMVOC from Solvent Use (Gg)	4-2
Table 5-1: Emissions from Agriculture (Tg CO ₂ Eq.)	5-2
Table 5-2: Emissions from Agriculture (Gg)	5-2
Table 5-3: CH ₄ Emissions from Enteric Fermentation (Tg CO ₂ Eq.)	5-3
Table 5-4: CH ₄ Emissions from Enteric Fermentation (Gg)	5-3
Table 5-5: CH ₄ and N ₂ O Emissions from Manure Management (Tg CO ₂ Eq.)	5-7
Table 5-6: CH ₄ and N ₂ O Emissions from Manure Management (Gg)	5-7
Table 5-7: CH ₄ Emissions from Rice Cultivation (Tg CO ₂ Eq.)	5-11
Table 5-8: CH ₄ Emissions from Rice Cultivation (Gg)	5-12
Table 5-9: Rice Areas Harvested (Hectares)	5-13
Table 5-10: N ₂ O Emissions from Agricultural Soil Management (Tg CO ₂ Eq.)	5-16
Table 5-11: N ₂ O Emissions from Agricultural Soil Management (Gg)	5-16
Table 5-12: Direct N ₂ O Emissions from Managed Soils (Tg CO ₂ Eq.)	5-16
Table 5-13: Direct N ₂ O Emissions from Pasture, Range, and Paddock Livestock Manure (Tg CO ₂ Eq.)	5-16
Table 5-14: Indirect N ₂ O Emissions (Tg CO ₂ Eq.)	5-17
Table 5-15: Emissions from Field Burning of Agricultural Residues (Tg CO ₂ Eq.)	5-20
Table 5-16: Emissions from Field Burning of Agricultural Residues (Gg)	5-21
Table 5-17: Agricultural Crop Production (Thousand Metric Tons of Product)	5-22
Table 5-18: Percentage of Rice Area Burned by State	5-22
Table 5-19: Percentage of Rice Area Burned in California	5-23
Table 5-20: Key Assumptions for Estimating Emissions from Agricultural Residue Burning	5-23
Table 5-21: Greenhouse Gas Emission Ratios	5-24
Table 6-1: Net CO ₂ Flux from Land-Use Change and Forestry (Tg CO ₂ Eq.)	6-2
Table 6-2: Net CO ₂ Flux from Land-Use Change and Forestry (Tg C)	6-2
Table 6-3: Net Changes in Carbon Stocks in Forest and Harvested Wood Pools, and Total Net Forest Carbon Flux (Tg CO ₂ Eq.)	6-5
Table 6-4: Net Changes in Carbon Stocks in Forest and Harvested Wood Pools, and Total Net Forest Carbon Flux (Tg C)	6-5
Table 6-5: U.S. Forest Carbon Stock Estimates (Tg C)	6-5
Table 6-6: Net CO ₂ Flux From Urban Trees (Tg CO ₂ Eq.)	6-10
Table 6-7: Carbon Stocks (Metric Tons C), Annual Carbon Sequestration (Metric Tons C/yr), Tree Cover (Percent), and Annual Carbon Sequestration per Area of Tree Cover (kg C/m ² cover-yr) for Ten U.S. Cities	6-11
Table 6-8: Net CO ₂ Flux From Agricultural Soils (Tg CO ₂ Eq.)	6-13
Table 6-9: Net Annual CO ₂ Flux from U.S. Agricultural Soils Based on Monte Carlo Simulation (Tg CO ₂ Eq.) ..	6-16

Table 6-10: Quantities of Applied Minerals (Thousand Metric Tons)	6-17
Table 6-11: Net CO ₂ Flux from Landfilled Yard Trimmings (Tg CO ₂ Eq.)	6-19
Table 6-12: Storage Factor (kg C/kg dry yard trimmings), Moisture Content (kg water/kg wet yard trimmings), Yard Trimmings Composition (percent), and Carbon Storage Factor (kg C/kg wet yard trimmings) of Landfilled Yard Trimmings	6-20
Table 6-13: Collection and Destination of Yard Trimmings (Million Metric Tons, or Tg, wet weight)	6-20
Table 7-1: Emissions from Waste (Tg CO ₂ Eq.)	7-2
Table 7-2: Emissions from Waste (Gg)	7-2
Table 7-3: CH ₄ Emissions from Landfills (Tg CO ₂ Eq.)	7-3
Table 7-4: CH ₄ Emissions from Landfills (Gg)	7-3
Table 7-5: CH ₄ Emissions from Domestic and Industrial Wastewater Treatment (Tg CO ₂ Eq.)	7-5
Table 7-6: CH ₄ Emissions from Domestic and Industrial Wastewater Treatment (Gg)	7-5
Table 7-7: U.S. Population (Millions) and Wastewater BOD Produced (Gg)	7-7
Table 7-8: U.S. Pulp and Paper, Meat and Poultry, and Vegetables, Fruits and Juices Production (Million Metric Tons)	7-7
Table 7-9: N ₂ O Emissions from Human Sewage	7-8
Table 7-10: U.S. Population (Millions) and Average Protein Intake (kg/Person/Year)	7-9
Table 7-11: Emissions of NO _x , CO, and NMVOC from Waste (Gg)	7-10

Figures

Figure ES-1: U.S. GHG Emissions by Gas	ES-2
Figure ES-2: Annual Percent Change in U.S. GHG Emissions	ES-4
Figure ES-3: Absolute Change in U.S. Greenhouse Gas Emissions Since 1990	ES-4
Figure ES-4: 2001 Greenhouse Gas Emissions by Gas	ES-4
Figure ES-5: Emissions Allocated to Economic Sectors	ES-7
Figure ES-6: Emissions with Electricity Distributed to Economic Sectors	ES-8
Figure ES-7: U.S. Greenhouse Gas Emissions Per Capita and Per Dollar of Gross Domestic Product	ES-9
Figure ES-8: 2001 U.S. Fossil Carbon Flows (Tg CO ₂ Eq.)	ES-12
Figure ES-9: 2001 Sources of CO ₂	ES-12
Figure ES-10: 2001 U.S. Energy Consumption by Energy Source	ES-13
Figure ES-11: U.S. Energy Consumption (Quadrillion Btu)	ES-13
Figure ES-12: 2001 CO ₂ Emissions from Fossil Fuel Combustion by Sector and Fuel Type	ES-15
Figure ES-13: 2001 End-Use Sector Emissions of CO ₂ from Fossil Fuel Combustion	ES-15
Figure ES-14: 2001 Sources of CH ₄	ES-18
Figure ES-15: 2001 Sources of N ₂ O	ES-20
Figure ES-16: 2001 Sources of HFCs, PFCs, and SF ₆	ES-23
Figure 1-1: U.S. GHG Emissions by Gas	1-9
Figure 1-2: Annual Percent Change in U.S. GHG Emissions	1-9
Figure 1-3: Absolute Change in U.S. GHG Emissions Since 1990	1-9
Figure 1-4: U.S. Greenhouse Gas Emissions Per Capita and Per Dollar of Gross Domestic Product	1-10
Figure 1-5: U.S. GHG Emissions by Chapter/IPCC Sector	1-14
Figure 1-6: Emissions Allocated to Economic Sectors	1-15
Figure 1-7: Emissions with Electricity Distributed to Economic Sectors	1-18
Figure 2-1: 2001 Energy Chapter GHG Sources	2-1
Figure 2-2: 2000 U.S. Fossil Carbon Flows (Tg CO ₂ Eq.)	2-3
Figure 2-3: 2001 U.S. Energy Consumption by Energy Source	2-4
Figure 2-4: Annual Deviations from Normal Heating Degree Days for the United States (1949-2001)	2-5

Figure 2-5: Annual Deviations from Normal Cooling Degree Days for the United States (1949-2001)	2-5
Figure 2-6: Aggregate Nuclear and Hydroelectric Power Plant Capacity Factors in the United States (1973-2001)	2-6
Figure 2-7: U.S. Energy Consumption (Quadrillion Btu)	2-6
Figure 2-8: 2001 CO ₂ Emissions from Fossil Fuel Combustion by Sector and Fuel Type	2-7
Figure 2-9: 2001 End-Use Sector Emissions of CO ₂ from Fossil Fuel Combustion	2-8
Figure 2-10: Motor Gasoline Retail Prices (Real)	2-9
Figure 2-11: Motor Vehicle Fuel Efficiency	2-9
Figure 2-12: Industrial Production Indexes (Index 1992=100)	2-11
Figure 2-13: Heating Degree Days	2-12
Figure 2-14: Cooling Degree Days	2-12
Figure 2-15: Electricity Generation Retail Sales by End-Use Sector	2-13
Figure 2-16: U.S. Energy Consumption and Energy-Related CO ₂ Emissions Per Capita and Per Dollar GDP	2-15
Figure 2-17: Change in CO ₂ Emissions from Fossil Fuel Combustion Since 1990 by End-Use Sector	2-15
Figure 2-18: Mobile Source CH ₄ and N ₂ O Emissions	2-25
Figure 3-1: 2001 Industrial Processes Chapter GHG Sources	3-1
Figure 5-1: 2001 Agriculture Chapter GHG Sources	5-1
Figure 5-2: Direct and Indirect N ₂ O Emissions from Agricultural Soils	5-15
Figure 6-1. Forest Sector Carbon Pools and Flows	6-3
Figure 6-2. Forest Carbon Stocks by Region, 1997	6-6
Figure 6-3. Forest Carbon Stocks, Per Hectare, by County, 1997	6-7
Figure 6-4. Net Annual CO ₂ Flux, per Hectare, From Mineral Soils Under Agricultural Management, 1990-1992	6-14
Figure 6-5. Net Annual CO ₂ Flux, per Hectare, From Mineral Soils Under Agricultural Management, 1993-2001	6-14
Figure 6-6. Net Annual CO ₂ Flux, per Hectare, From Organic Soils Under Agricultural Management, 1990-1992	6-15
Figure 6-7. Net Annual CO ₂ Flux, per Hectare, From Organic Soils Under Agricultural Management, 1993-2001	6-15
Figure 7-1: 2001 Waste Chapter GHG Sources	7-1

Boxes

Box ES-1: Recent Trends in Various U.S. Greenhouse Gas Emissions-Related Data	ES-9
Box ES-2: The IPCC Third Assessment Report and Global Warming Potentials	ES-11
Box ES-3: Emissions of Ozone Depleting Substances	ES-24
Box ES-4: Sources and Effects of Sulfur Dioxide	ES-26
Box 1-1: The IPCC Third Assessment Report and Global Warming Potentials	1-8
Box 1-2: Recent Trends in Various U.S. Greenhouse Gas Emissions-Related Data	1-14
Box 1-3: IPCC Good Practice Guidance	1-21
Box 2-1: Weather and Non-Fossil Energy Effects on CO ₂ from Fossil Fuel Combustion Trends	2-5
Box 2-2: Carbon Intensity of U.S. Energy Consumption	2-14
Box 2-3: Biogenic Emissions and Sinks of Carbon	2-37
Box 2-4: Formation of CO ₂ Through Atmospheric CH ₄ Oxidation	2-48
Box 3-1: Potential Emission Estimates of HFCs, PFCs, and SF ₆	3-37
Box 5-1: DAYCENT Model Estimates of N ₂ O Emissions from Agricultural Soils	5-19
Box 6-1: Century model estimates of soil carbon stock changes on cropland	6-18
Box 7-1: Biogenic Emissions and Sinks of Carbon	7-3