



**MINNESOTA**  
Climate Change  
Advisory Group



# Minnesota Climate Change Advisory Group

AFW Technical Work Group Meeting #1

May 24, 2007

Minnesota Department of Commerce  
Minnesota Pollution Control Agency  
The Center for Climate Strategies

# Welcome and Introductions

- State of Minnesota
- Minnesota Technical Work Group (TWG) Members
- Members of the Public
- Center for Climate Strategies

# Agenda

- Introductions
- Purpose and Goals
- Review of TWG Process
- Review of Minnesota Emissions Inventory & Forecast
- Agenda, Time and Date for Next Meeting
- Public Input and Announcements

# MCCAG Purpose & Goals

- Purpose
  - Achieve Governor’s “Next Generation Energy Initiative” goal of developing “a comprehensive plan to reduce Minnesota’s emissions of greenhouse gas emissions.”
- Goals (may be changed or added to by pending legislation)
  - Review and approval of a current and comprehensive inventory and forecast of greenhouse gas (GHG) emissions in Minnesota from 1990 to 2020;
  - Development of a comprehensive set of specific policy recommendations and associated analyses to reduce GHG emissions and enhance energy and economic policy in Minnesota by 2020 and beyond;
  - Development and recommendation of a set of recommended statewide GHG reduction goals and targets for implementation of these actions; and
  - Issuance of recommendations in the form of a final report to the Governor by February 1, 2008.

# MCCAG Roles & Responsibilities

- MCCAG Process convened by Governor Pawlenty
- DOC and PCA oversee and coordinate process
- MCCAG makes recommendations to Governor
- **TWGs provide informal guidance to MCCAG**
- Public input and review for stakeholders
- CCS provides facilitation, technical support, final report

# TWVG Roles

- Assist MCCAG
  - Identify potential state actions
  - Identify potential priorities for analysis
  - Suggest straw policy designs
  - Assist with analysis and review of options
  - Assist with development of policy alternatives
  - Assist with input to and review of MCCAG reports
  - Review and assist with the state GHG inventory and forecast

# TWG Composition

- Energy Supply
  - Heat and power generation; typical locus for cap and trade or carbon tax policy
- Commercial, Industrial, and Residential
  - Energy efficiency & conservation, industrial process, waste management
- Transportation and Land-Use
  - Including vehicle efficiency, alternative fuels & demand reduction programs, development patterns
- Agriculture, Forestry and Waste
  - Land protection, forest restoration, sustainable forest management, bioenergy, sustainable wood products, waste reduction, recycling
- Cross-Cutting Issues
  - Reporting, registries, public education

# Ground Rules

- Supportive of the process
- Attendance at meetings
- Equal footing
- Stay current with information
- No backsliding
- Do not represent the MCCAG or TWGs
- Make objective contributions

# Timing

<b>Date</b>	<b>Action</b>
April 20, 2007	1 <sup>st</sup> MCCAG meeting
June 14, 2007	2 <sup>nd</sup> MCCAG meeting
August 2, 2007	3 <sup>rd</sup> MCCAG meeting
September 27, 2007	4 <sup>th</sup> MCCAG meeting
November 8, 2007	5 <sup>th</sup> MCCAG meeting
January 10, 2008	6 <sup>th</sup> MCCAG meeting
February 1, 2008	MCCAG Report Due
Between CCAG Meetings	2 TWG conference calls and or meetings for each TWG between MCCAG meetings

# Stepwise Planning Process

1. Develop inventory and forecast of emissions
2. Identify a full range of possible actions
3. Identify initial priorities for analysis
4. Develop straw proposals
5. Quantify GHG reductions and costs/savings
6. Evaluate externalities, feasibility issues
7. Develop alternatives to address barriers
8. Aggregate results
9. Iterate to final agreements
10. Finalize and report recommendations

# Building Consensus

- Comprehensive
- Stepwise
- Fact based
- Transparent
- Inclusive
- Collaborative
- Consensus driven



# Coverage Of Issues



- All GHG's
- All sectors
- All potential implementation mechanisms
- State and multi-state actions
- Short and long term actions

# Decision Criteria

- GHG Reduction Potential (MMtCO<sub>2</sub>e)
- Cost or Cost Saved Per Ton GHG Removed
- Co-benefits
- Feasibility Issues

# Catalog of States Actions

- Over 300 actions taken by US states
- Existing, planned and proposed state level actions
- Wide variety of US states
- All sectors
- Wide variety of implementation mechanisms
- Includes key MN actions
- MCCAG will add new potential actions
- Starting place for identification of MCCAG priorities

# Screening of Potential Actions

## - Agriculture Sample

Option No.	Climate Mitigation Option	Priority for Analysis	Potential GHG Emissions Reduction	Potential Cost or Savings	Additional Impacts, Feasibility Considerations	Notes
<b>AFW-1</b>	<b>AGRICULTURE'S PRODUCTION OF FUELS AND ELECTRICITY</b>					
1.1	Manure Digesters/Other Waste Energy Utilization**					
1.2	Biodiesel Production (incentives for feedstocks and production plants)					
1.3	Biomass Feedstocks for Electricity or Steam Production**					
1.4	Ethanol Production					

# Policy Design Proposals

- TWGs start with Catalog of states' actions, screen options, and recommend priorities for MN
- MCCAG identifies about 50 draft potential priority options for further development
- TWGs develop initial policy option designs (“straw proposals”)
  - Timing
  - Goals
  - Coverage
- CCS quantifies and presents for review
- MCCAG revisits list of potential priorities, as needed

# Policy Option Template

- Policy Description (Concept)
- Policy Design (Goals, Timing, Coverage)
- Implementation Methods
- Related Programs and Policies (BAU)
- Estimated GHG Savings and Costs Per MMTCO<sub>2e</sub>
  - Data Sources, Methods and Assumptions
  - Key Uncertainties
- Additional (non-GHG) Benefits and Costs, as Needed
- Feasibility Issues, if Needed
- Status Of Group Approval
- Level of Group Support
- Barriers to Consensus, if any

# Final Report

- Executive Summary
- Background, Purpose And Goals
- MN Emissions Inventory & Forecast
- MCCAG Recommendations & Results
  - Agriculture
  - Forestry
  - Energy Supply
  - Residential, Commercial, Industrial
  - Transportation & Land Use
  - Waste Management
  - Cross Cutting Issues
- Appendices



# Inventory Approach

- Standard US EPA and UN methodologies, guidelines, and tools
- Emphasis on transparency, consistency, and significance
- Used MN inventory for 1990-2004/2005
  - Prepared by Peter Ciborowski, MN PCA
- Consumption and production-based emissions from electricity generation
  - Very simplified approach used for initial analysis

# Projection Approach

- Reference case assumes no major changes from business-as-usual (BAU)
  - Includes assessment of approved policies and actions to the extent possible (e.g., Renewable Energy Standards)
- Growth assumptions from existing sources
  - State population and employment forecasts
  - US Census and Bureau of Labor & Statistics
  - US Energy Information Administration

# Coverage

- Six gases per USEPA and UNFCCC guidelines
  - Carbon Dioxide (CO<sub>2</sub>), Methane (CH<sub>4</sub>), Nitrous Oxide (N<sub>2</sub>O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulfur Hexafluoride (SF<sub>6</sub>)
- All major emitting sectors
  - Electricity Supply & Demand (Consumption Based)
  - Residential, Commercial, Industrial (RCI) Fuel Use and Non-fuel Use Processes
  - Transportation (onroad and nonroad)
  - Natural gas pipeline transmission & distribution
  - Agriculture, Forestry, and Waste
- Emissions expressed as CO<sub>2</sub> equivalent
  - 100-year global warming potentials
    - CO<sub>2</sub> = 1; CH<sub>4</sub> = 22; N<sub>2</sub>O = 310; halogenated gases, up to 25,000

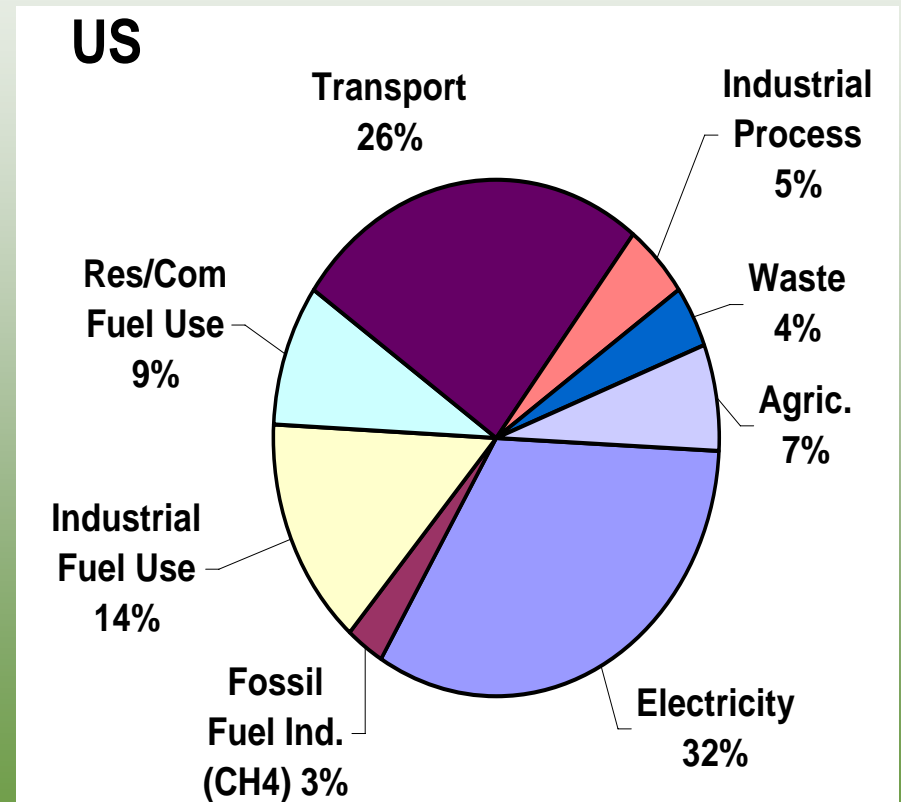
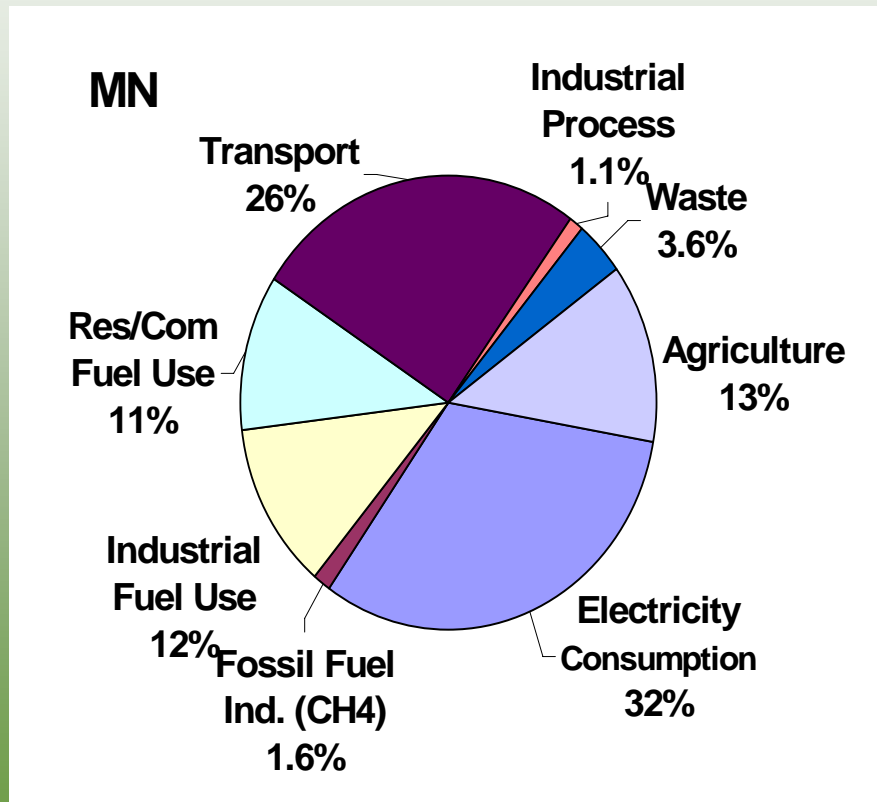
# Key Points

- Preliminary draft for MCCAG and TWG review and revision, as needed
- Helpful for diagnosis of GHG emissions, but not a baseline for modeling or compliance for individual options
- Consumption and Production methods
- Net and Gross methods

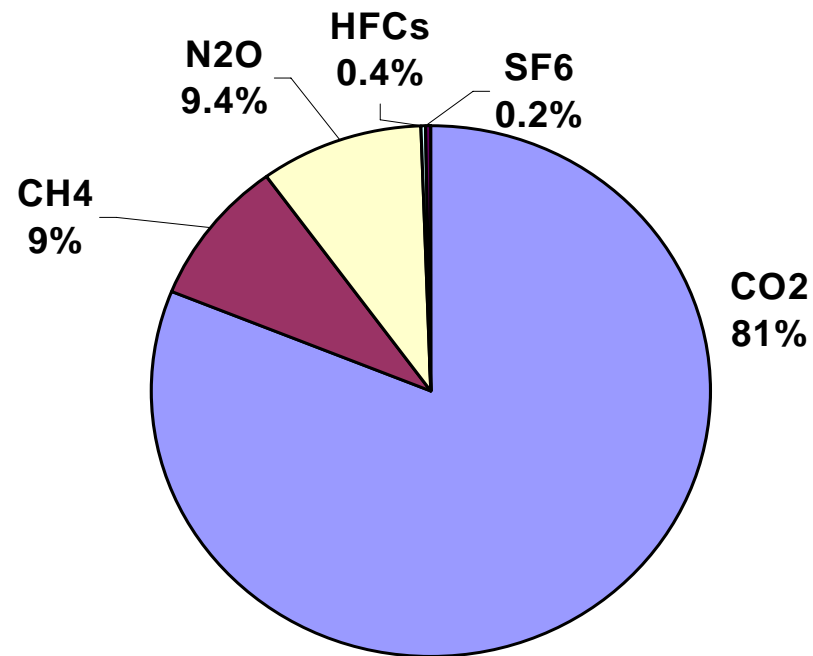
# Key Points

- Other Pollutants
  - MN PCA Inventory includes:
    - Carbon monoxide (CO) from combustion processes
    - CO<sub>2</sub> from biomass combustion
  - IPCC Guidelines –
    - Report CO and biomass CO<sub>2</sub> separately from six GHG pollutants
    - Good to track for multi-pollutant assessment of GHG options
  - CO and biomass CO<sub>2</sub> not included in I&F totals presented today

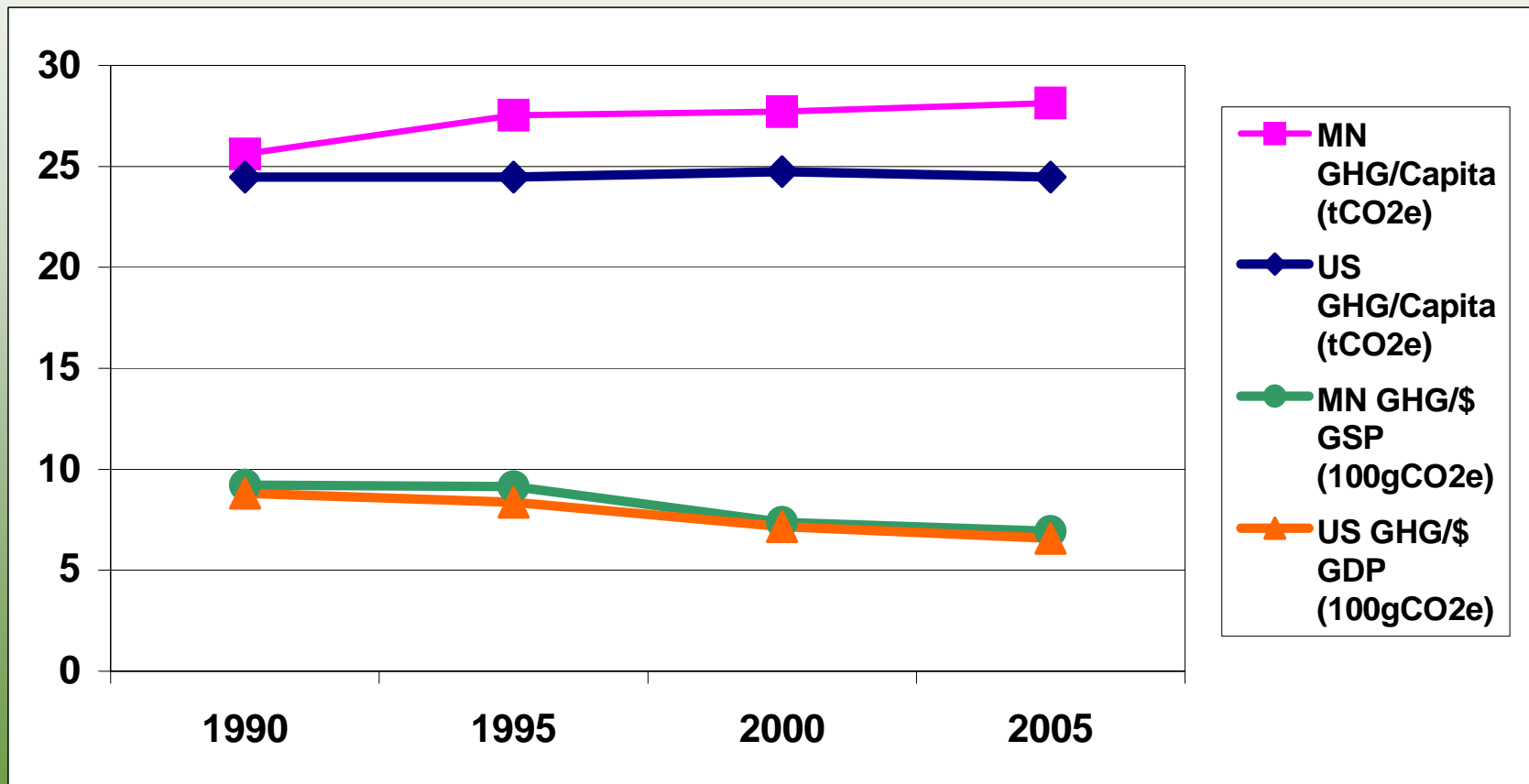
# MN & US Emissions By Sector, Year 2000



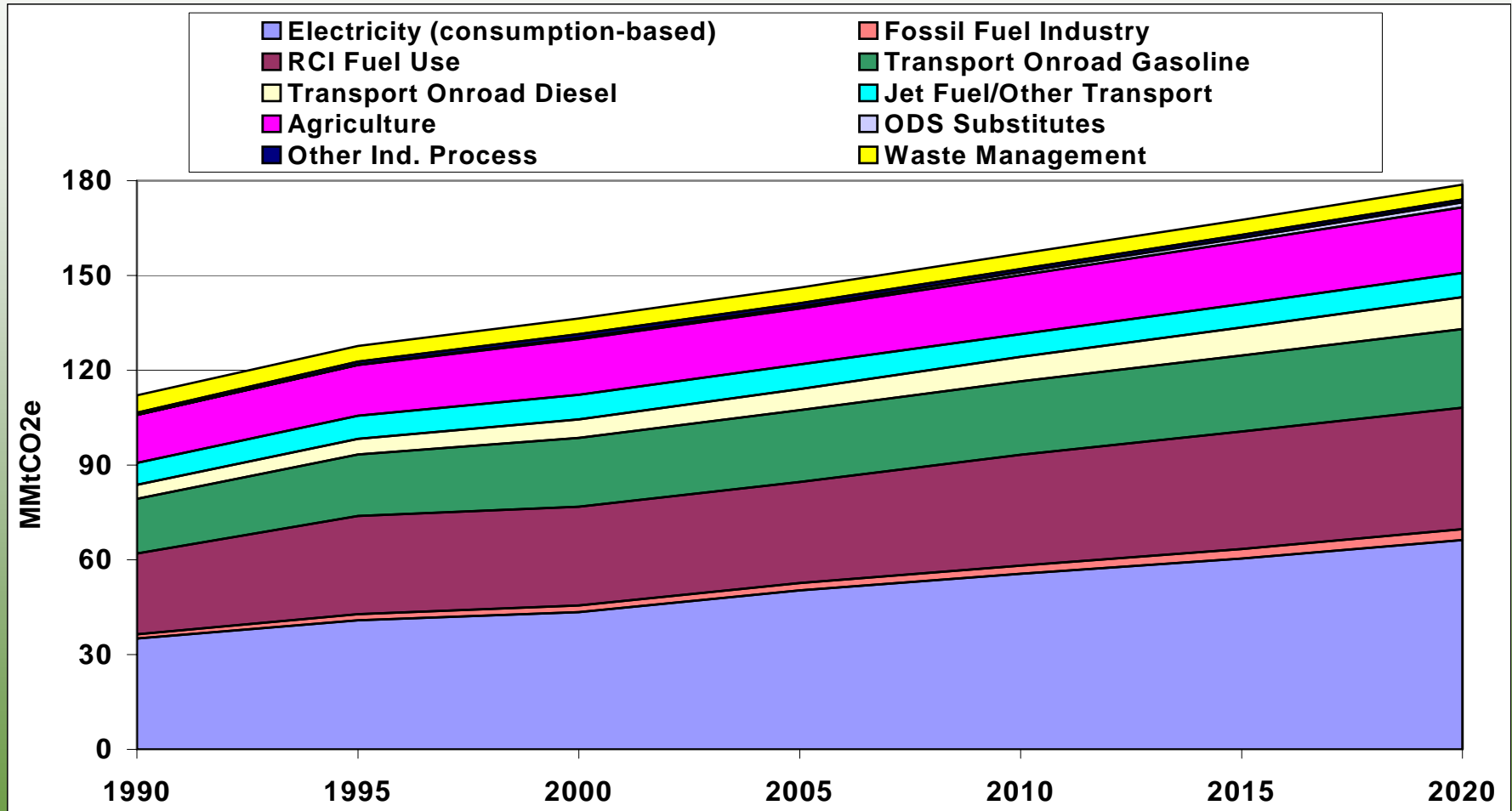
# MN Emissions By GHG, Year 2000 (MMtCO<sub>2</sub>e Based)



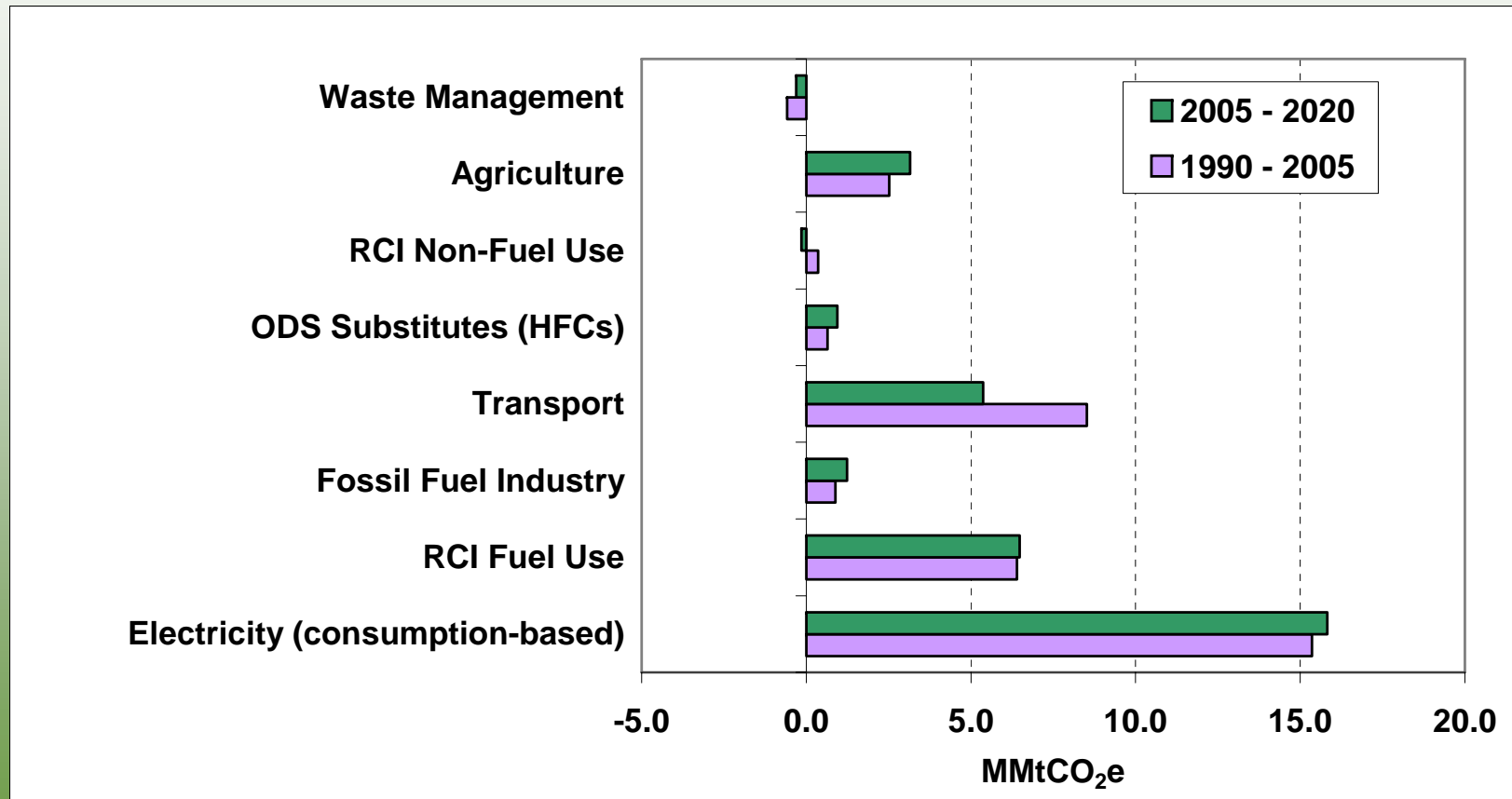
# Per Capita and GSP/GDP GHG Emissions, 1990-2005



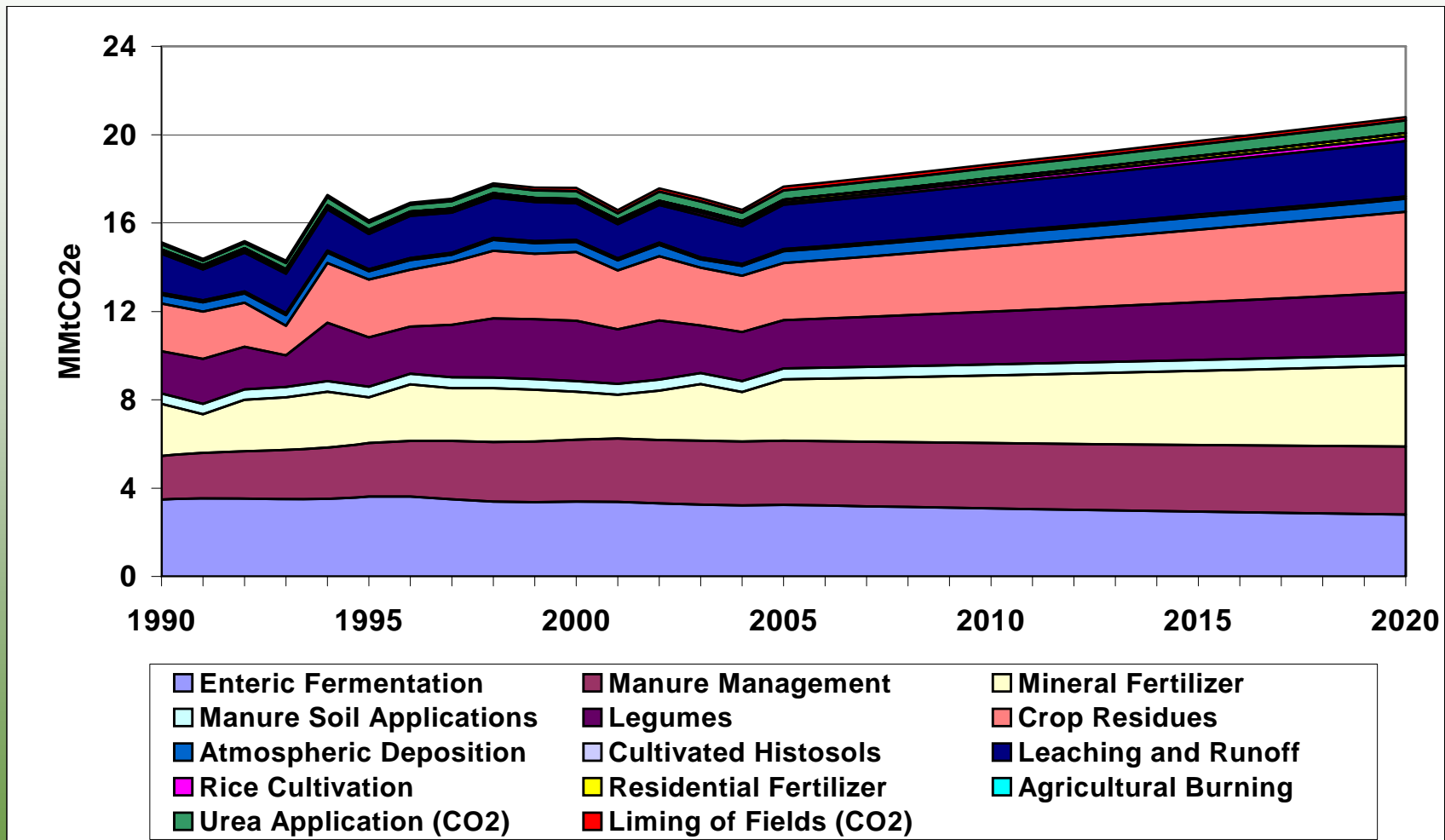
# Gross MN GHG Emissions By Sector, 1990-2020



# MN Emissions Growth (MMtCO<sub>2</sub>e Basis)



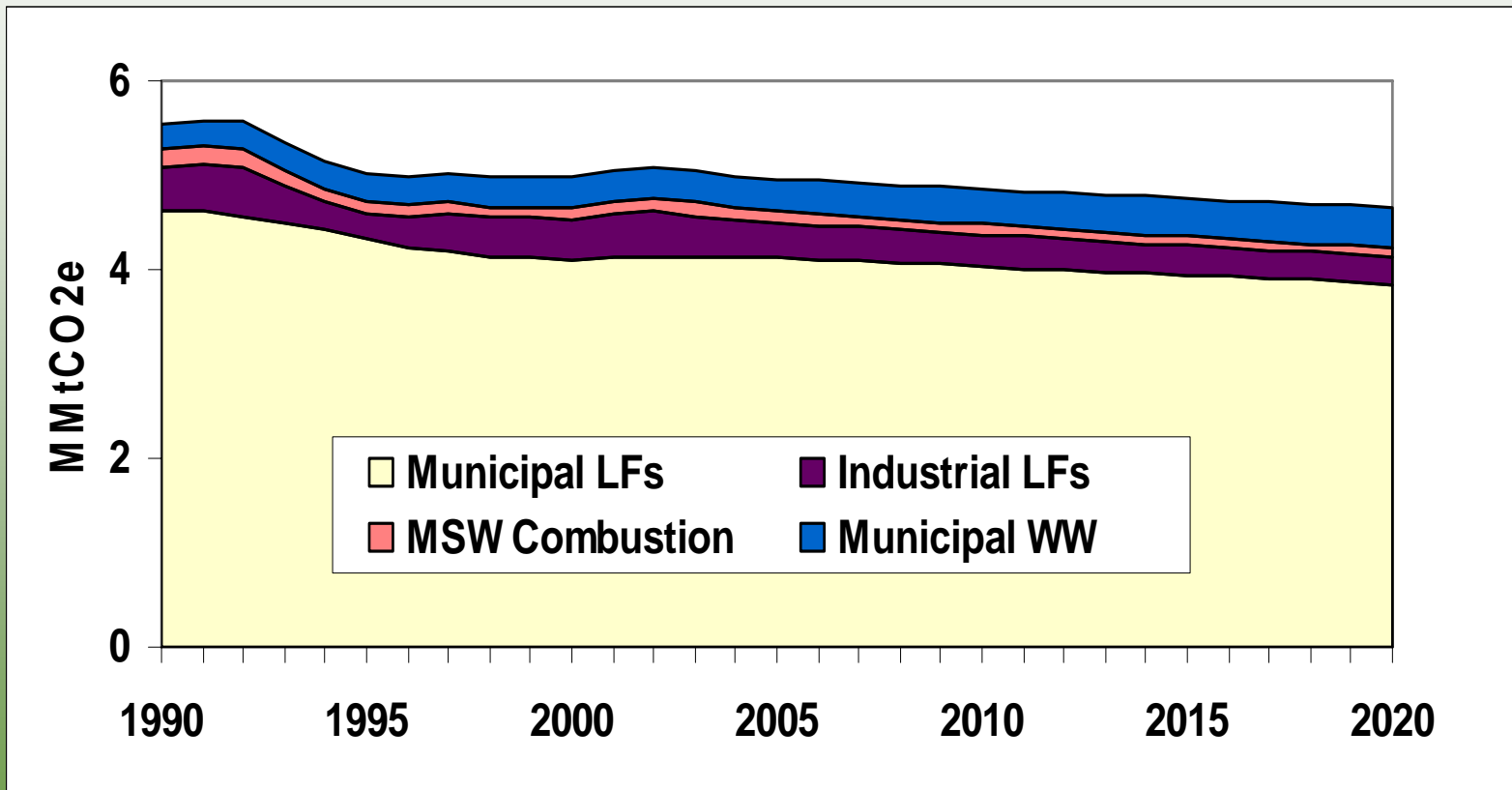
# Agriculture



# Agriculture

- Data Sources: MN PCA Inventory
- Methods
  - Agricultural Soils: Crop production data and EPA emission factors
  - Enteric Fermentation and Manure Management: livestock populations and EPA emission factors
  - Fertilizer: Fertilizer consumption and EPA emission factors
  - Agricultural Burning: SGIT and crop production data
  - Growth based on historical trends
- Key Assumptions
  - Future growth assumed to follow historical trends
- Key Uncertainties
  - Projection data

# Waste Management



# Waste Management

- Data sources
  - Landfills: EPA LandGEM Model with MN PCA inputs
  - Waste combustion: MN PCA
  - Wastewater: State population
- Methods
  - LandGEM Model estimates emissions
  - Waste combustion and Wastewater: EPA emission factors with data sources above

# Waste Management

- Key Assumptions
  - Growth Rates: based on historical emissions trends
- Key Uncertainties
  - Future controls applied to uncontrolled landfills
  - Assumption that future growth will follow historical trends
  - Industrial WW –lack of data for meat/poultry, pulp/paper, and food/vegetable processing

# Forestry

## USFS - Stock Change 1990-2003

Carbon Pool	MMtCO <sub>2</sub> e/yr (positive # net emission)
Live Trees	3.5
Standing Dead Trees	0.56
Live Understory	0.08
Down and Dead Trees	0.33
Forest Floor	1.09
Soil Organic Carbon	22
Harvested Wood Products and Landfills	-4.6
<b>Total (with/without SOC)</b>	<b>23/0.92</b>

# Forestry

## USFS - Stock Change 1990-2003

	1990	2003	Difference (2003-1990)
Forests (1,000 hectares)	6,751	6,568	-182
Timberland (1,000 hectares)	5,958	5,973	15
Total (1,000 hectares)	12,709	12,541	-168

# Forestry

- Data Sources

- USFS carbon stock for 2 inventories (1990-2003) based on FORCARB2 model
- USFS also provides modeled estimates for harvested wood products

- Methods

- Forestry: USFS FORCARB2 carbon stock change model provides carbon pools for each inventory cycle
- Flux calculated for each pool based on difference in time between inventory cycles
- Carbon pool data for the 1990-2003 time-period used to quantify flux.

# Forestry

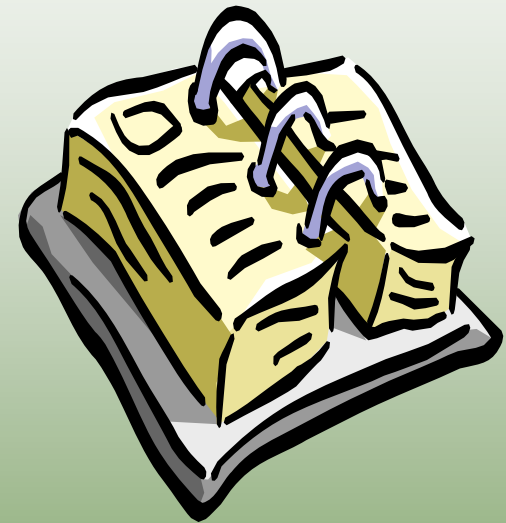
- Key Assumptions
  - 1990-2003 carbon stock trends representative of current conditions
  - No significant change in sequestration trends from 2006-2020
- Key Uncertainties
  - Effects of future development on forested acreage
  - Effects of near-term climate change on forest sequestration levels

# Next Steps

- Review the MN Catalog of Policy Options
- Further review of GHG Inventory & Forecast

# Next TWG Meeting

- Agenda:
  - Review/revise policy options catalog
  - Review Minnesota emissions inventory and projections
- Time and Date: June 7, 3:00-4:30 pm



# Public Input, Announcements