



Agriculture, Forestry, and Waste Technical Work Group Teleconference Meeting #3

June 2, 2006



Today's Agenda

- Call to order
- Roll Call of Technical Work Group (TWG) members
- Review and approval of last call summary
- Prioritization of list of potential state actions
- GHG Global Warming Potentials
- Review and discussion of the draft North Carolina greenhouse gas (GHG) emissions inventory and forecast for Agriculture, Forestry, and Waste
- Call to the public
- Proposed agenda items for next meeting
- Announcements

Catalog of State Actions

- Catalog Updated Based on Input from Last CAPAG Meeting
- Approach for Priority Voting
 - Email ballot sent out by CCS
 - One vote per option
 - Add comments (e.g. policy packaging)
 - Return to Holly Lindquist
 - Top 10 options (high), next 10 (medium), remaining options (low)

GHG Global Warming Potentials

Gas	Atmospheric Lifetime	100-year GWP ^a	20-year GWP	500-year GWP
Carbon dioxide (CO ₂)	50-200	1	1	1
Methane (CH ₄) ^b	12±3	21	56	6.5
Nitrous oxide (N ₂ O)	120	310	280	170
HFC-23	264	11,700	9,100	9,800
HFC-125	32.6	2,800	4,600	920
HFC-134a	14.6	1,300	3,400	420
HFC-143a	48.3	3,800	5,000	1,400
HFC-152a	1.5	140	460	42
HFC-227ea	36.5	2,900	4,300	950
HFC-236fa	209	6,300	5,100	4,700
HFC-4310mee	17.1	1,300	3,000	400
CF ₄	50,000	6,500	4,400	10,000
C ₂ F ₆	10,000	9,200	6,200	14,000
C ₄ F ₁₀	2,600	7,000	4,800	10,100
C ₆ F ₁₄	3,200	7,400	5,000	10,700
SF ₆	3,200	23,900	16,300	34,900

See Appendix I in the Inventory & Forecast Report

NC GHG Emissions

- Inventory and Reference Case Projections 1990-2020 to support mitigation planning
 - Initial estimates by CCS for further discussion and revision
 - Not a baseline for reporting or compliance
 - Provided in transparent, review draft format
 - Uses best available references and assumptions
 - Results may change with modification of data sources, methods, assumptions

Coverage

- Six gases per U.S. EPA and UNFCCC guidelines
 - Carbon Dioxide (CO₂), Methane (CH₄), Nitrous Oxide (N₂O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulfur Hexafluoride (SF₆)
 - Black Carbon not included at this time
- All major emitting sectors
 - Electricity Consumption (production + imports)
 - Residential, Commercial, Industrial (RCI) –
 - Fuel Use & Natural Gas Transmission / Distribution Systems
 - Industrial Processes
 - Transportation
 - Agriculture and Forestry
 - Waste Management

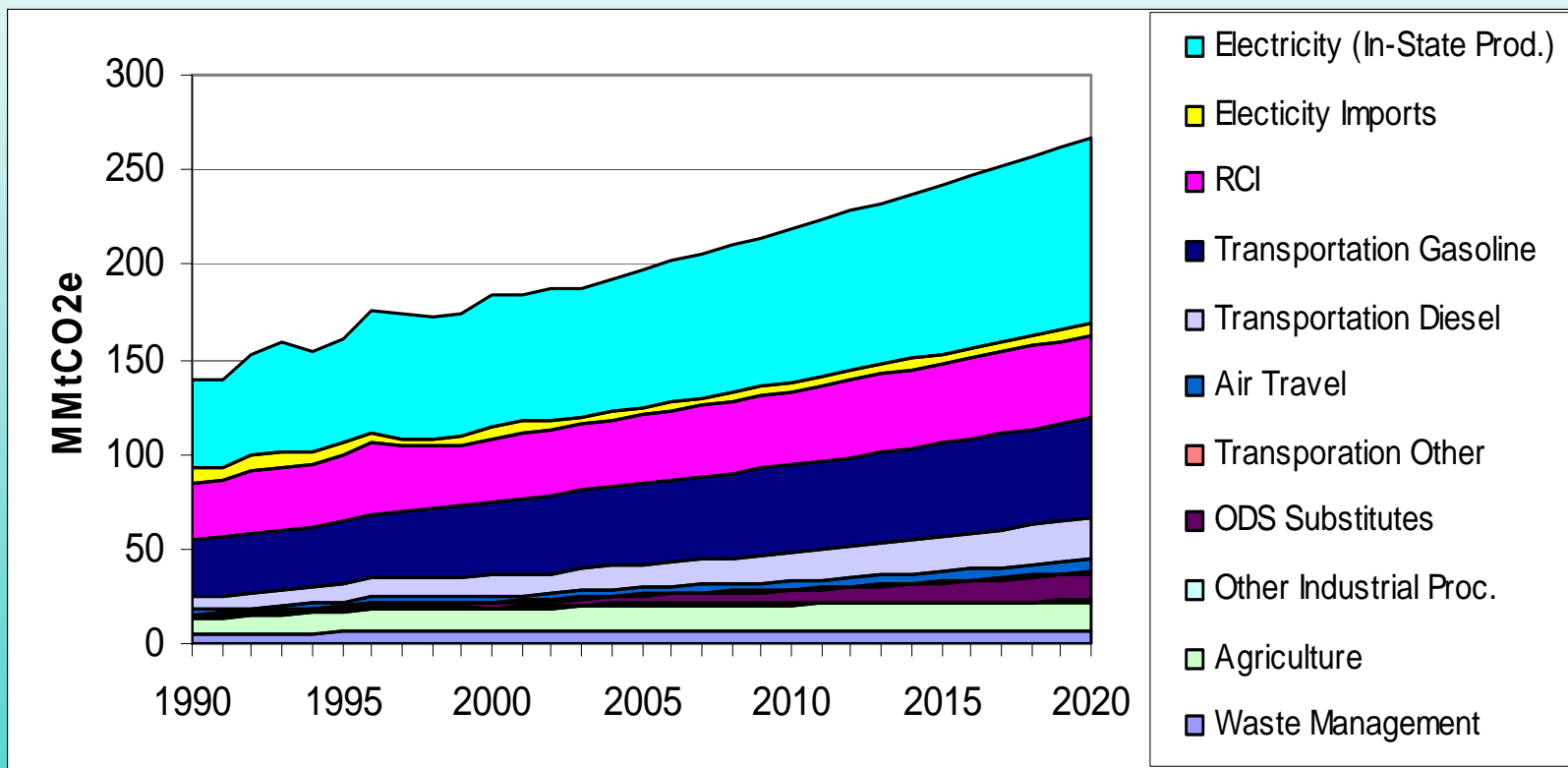
Inventory Approach

- Historical estimates from 1990-2000 or the most recent year possible
- Standard U.S. EPA and UN methodologies, guidelines, and tools, augmented as needed for North Carolina
- Emphasis on transparency, consistency, and significance
- Preference for North Carolina or regional data, where available
- Consumption and production-basis emissions from electricity and heat generation
- Simplified approach used for initial analysis to support general planning needs
- All units expressed as million metric tons carbon dioxide equivalent (MMTCO_{2e})

Projection Approach

- Forecast of emissions from most recent year to years 2010 and 2020
- Reference case assumes no major changes from business-as-usual
 - Includes approved policies and actions
 - Typically assumes constant technology and market choices
 - Uses extrapolation where modeling is not available
- Emissions growth driven by many factors

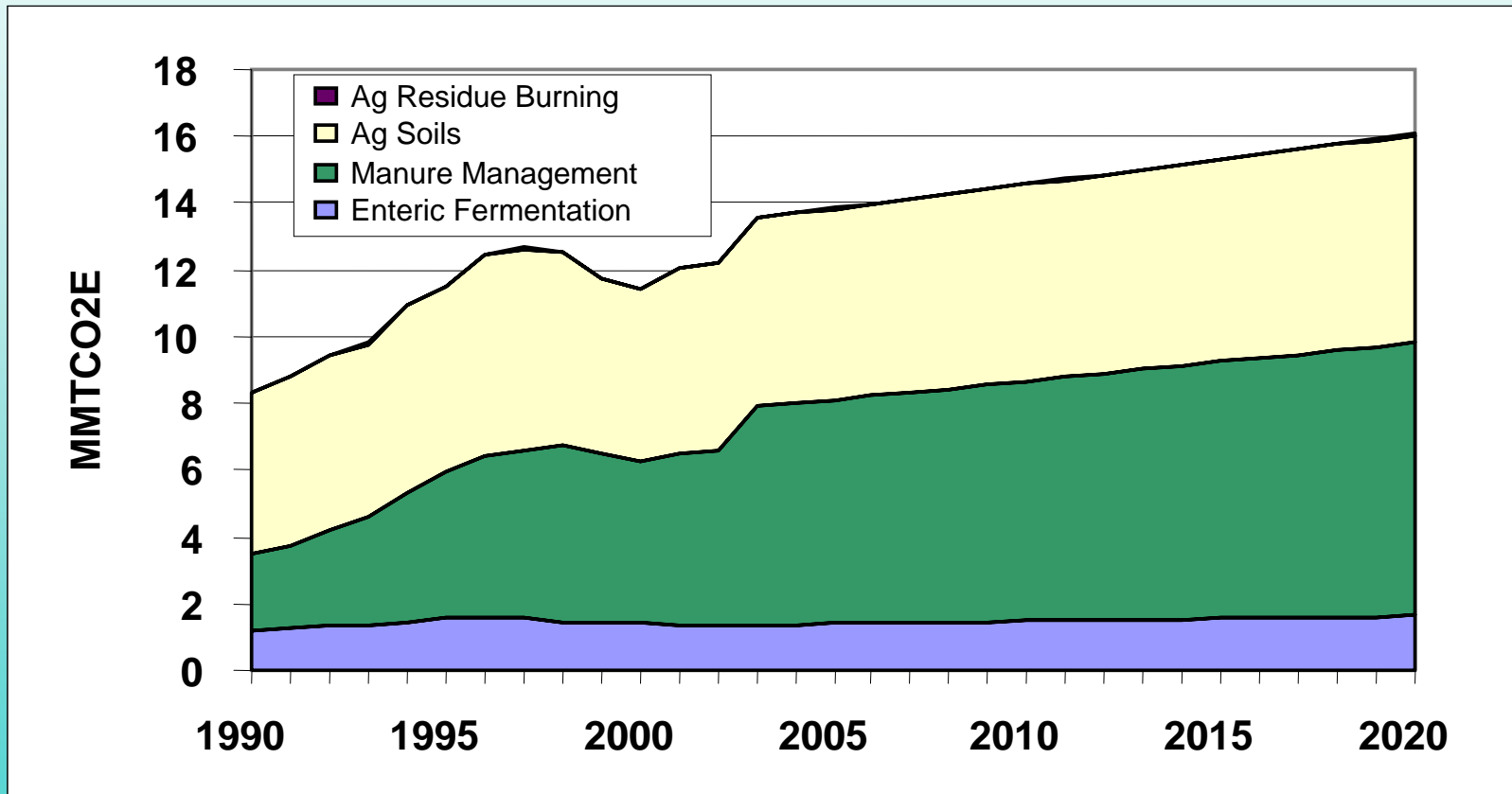
NC GHG Emissions 1990-2020



Agriculture

- Emission Sources:
 - Enteric fermentation from animals (CH₄)
 - Primarily cattle
 - Manure management (CH₄, N₂O)
 - Cattle, swine, poultry, sheep, goats, horses
 - Agricultural soils (N₂O)
 - Plant residues & legumes
 - Fertilizer application (synthetic & organic)
 - Agricultural residue burning (CH₄, N₂O)

Agriculture



Agriculture

- Inventory (1990–2002):
 - Data Sources
 - NC data for crop acreage and animal populations
 - USDA National Agriculture Statistical Service
 - Emission factors and other data (e.g., animal mass) from EPA's SGIT
 - Methods
 - SGIT
 - Emissions = Activity x EF x GWP

Agriculture

- Ref. Case Projections (2003–2020):
 - Data Sources and Methods
 - Growth factors calculated from 1990 to 2000 NC population data from USDA National Agriculture Statistical Service
 - Swine populations held constant at 2000 level
 - August 1997 moratorium on new and expanded swine farms with 250 or more hogs

Agriculture

- Key Assumptions and Uncertainties
 - Reference Case Projections
 - Growth factors based on USDA National Agriculture Statistical Service data – are these realistic for North Carolina through 2020?
 - Will moratorium on new and expanded swine farms be lifted sometime before 2020?

Forestry

- Emission Sources and Sinks:
 - Forested land = 56% of NC land area
 - Emissions based on carbon stock changes
 - Four carbon accounts:
 - Live and dead standing trees
 - Forest floor and coarse woody debris
 - Soils
 - Wood products and landfills

Forestry

NC Emissions and Sinks	1990-2000
Live and Dead Standing Trees	-6.9
Forest floor and coarse woody debris	-0.8
Soils	-3.1
Wood products and landfills	-13.0
Total	-23.7

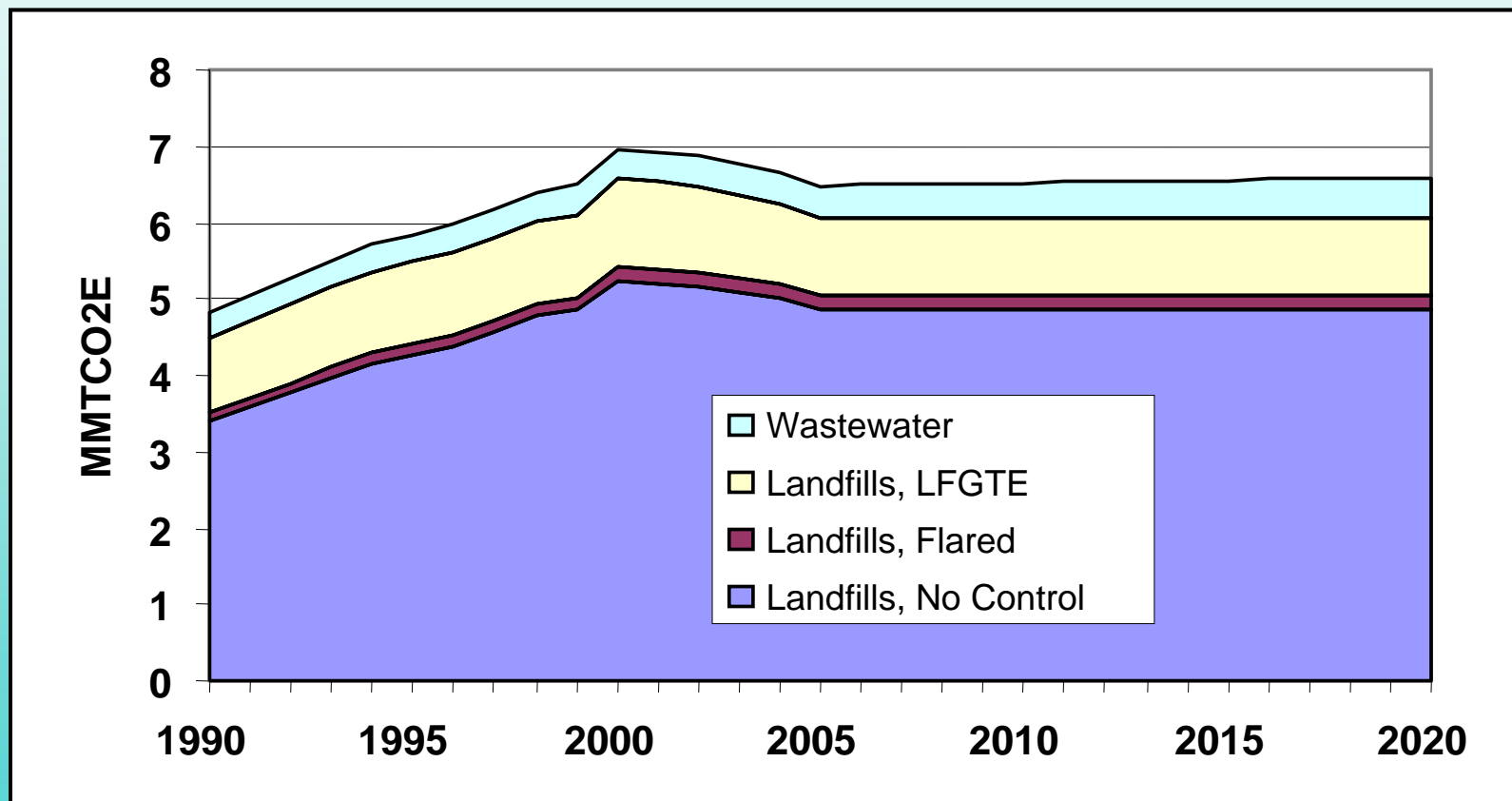
Forestry

- Inventory (1990 and 2000):
 - Data Sources
 - U.S. Forest Service data from Forest Carbon Model (FORCARB) based on FIA data from years 1987-1997
 - Methods
 - Carbon stock changes, plus estimated flows from soil carbon and harvested wood products
- Ref. Case Projections (2001–2020):
 - Held constant at 1987-1997 rates

Waste Management

- Emission Sources:
 - Wastewater
 - Uncontrolled Landfills
 - Landfills with Landfill Gas Collection System and Flare
 - Landfills with Landfill Gas Collection System and Landfill-Gas-to-Energy Plant (LFGTE)

Waste Management



Waste Management

- Inventory (1990–2005):
 - Data Sources
 - NC OSBM Population Estimates
 - EPA Landfill Methane Outreach Program (LMOP) Database

Waste Management

- Inventory (1990–2005):
 - Methods
 - Wastewater
 - Emissions = Pop. x Per Capita BOD (kg/day) x Fraction of BOD anaerobically digested x 365 Days/Year x Emission Factor

Waste Management

- Inventory (1990–2005):
 - Methods
 - Landfills
 - Classify landfills as small or large (large defined as greater than 1.1 million tons waste-in-place)
 - Emissions calculated using regression equation specific to large or small landfills
 - » $\text{Emissions} = (\text{No. of Landfills} \times \text{Y-intercept}) + (\text{Slope} \times \text{Waste-in-Place})$
 - Controlled Landfills
 - Collection efficiency assumed to be 75%

Waste Management

- Ref. Case Projections (2006–2020):
 - Data Sources
 - NC OSBM Population Projections
 - Methods
 - Wastewater
 - Assumed to grow at same rate as population
 - Landfills
 - No Growth
 - » Historical emissions do not follow population
 - » Per capita CH₄ emissions expected to decline due to Federal requirements (NSPS and Emission Guidelines)

Waste Management

- Key Uncertainties
 - Landfill Activity
 - Landfill Gas Recovery Data
 - Landfill and Wastewater Emission Factors
 - Affects of Federal Landfill Requirements

Black Carbon

- One of two carbonaceous aerosol species
 - BC and Organic Carbon (OC)
- Also known as light absorbing carbon (LAC), and elemental carbon (EC)
- Absorbs solar energy and warms the troposphere (like GHG's)

Sources of Black Carbon

- Fossil Fuel Combustion
- Biomass Combustion
- Other (Minor) Sources

Public Input, Announcements

Next TWG Call

- Agenda
 - Further review of mitigation options list
 - Further review of inventory and forecast
- Time and date