

Climate Change Update from the Air Pollution Control Division

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**GIVEN TO THE AQCC
BY
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Overview

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- **GHG Overview**
- **GHG Regulations**
- **Climate Change Activities and Initiatives**
- **2013 Updated GHG Inventory**

GHG – What that includes...

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- **Carbon dioxide (CO₂):**
 - *Source:* living organisms, burning of fossil fuels
 - 84% of US emissions

- **Methane (CH₄):**
 - *Source:* coal formations, natural gas development, landfills, livestock digestive processes, decomposing waste
 - 9% of US emissions (CO₂e)

GHG – What that includes...

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- **Nitrous Oxide (N₂O):**
 - *Source:* fuel burning, fertilizer manufacturing
 - 5% of US emissions (CO₂e)
- **Hydrofluorocarbon gases (HFC):**
 - *Source:* refrigeration, semi-conductor manufacturing
- **Perfluorocarbons (PFC):**
 - *Source:* aluminum smelting, uranium enriching, semi-conductors
- **Sulfur Hexafluoride (SF₆):**
 - *Source:* high-voltage equipment, insulation for manufacturing cable cooling systems

GHG – GWP

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- Global Warming Potential (GWP)

GHG	GWP
Carbon Dioxide	1
Methane	21
Nitrous Oxide	310
HFCs	12 - 17,200
PFCs	350 - 17,340
Sulfur Hexafluoride	23,900

40 C.F.R. Part 98, Subpart A, Table A-1: Global Warming Potentials (74 FR 56395-56396)

GHG – CO₂e

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- Carbon Dioxide Equivalent (CO₂e)

CO ₂	X	1	=	1 CO ₂ e
CH ₄	X	21	=	21 CO ₂ e
N ₂ O	X	310	=	310 CO ₂ e
HFC	X	17,200	=	17,200 CO ₂ e
PFC	X	17,340	=	17,340 CO ₂ e
SF ₆	X	23,900	=	23,900 CO ₂ e
GHG				Total GHG CO ₂ e

GHG Regulations

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In Place

- **GHG Regulations**
 - Mandatory Reporting Rule
 - Tailoring Rule
 - Federal fuel economy/GHG standards

Recent Changes

- **Biogenic Deferral**
- **EGU NSPS**
 - Proposed rule for new and modified sources
 - States may be required to come up with a plan under CAA 111(d) for existing sources

Colorado Climate Change Activities and Initiatives

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- **Greening Government**
 - State Agencies GHG Reduction Goal
- **Climate Adaptation Analyses**
- **Renewable Energy Standard**
- **Co-Benefits**
 - **Regional Haze/Clean Air Clean Jobs**
 - ✦ Replacement of coal electric generating capacity with natural gas
 - **Ozone precursor emission reductions**
 - ✦ CH₄ reductions from oil and gas strategies
 - **Mobile sources fuel savings strategies**

Colorado Climate Change Activities and Initiatives

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- **GHG permitting for major stationary sources**
- **Partner in Fostering Electric Vehicle Expansion in the Rockies (FEVER)**
- **Natural gas vehicle initiative**
- **Assessment of Colorado Clean Cars standards**
- **Assessment of Colorado GHG reporting rule**

2013 Updated GHG Inventory

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Goals of the Updated Inventory

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- **Produce an updated inventory for CO**
 - 2020 & 2030 projections
 - Chapters for each sector
- **Create a template that can be updated in the future**
- **Release as a draft and accept comments**
 - Run model in full 'default' mode and establish baseline
- **Consider comments received**
 - Rerun modules with improvements, if necessary

The Update

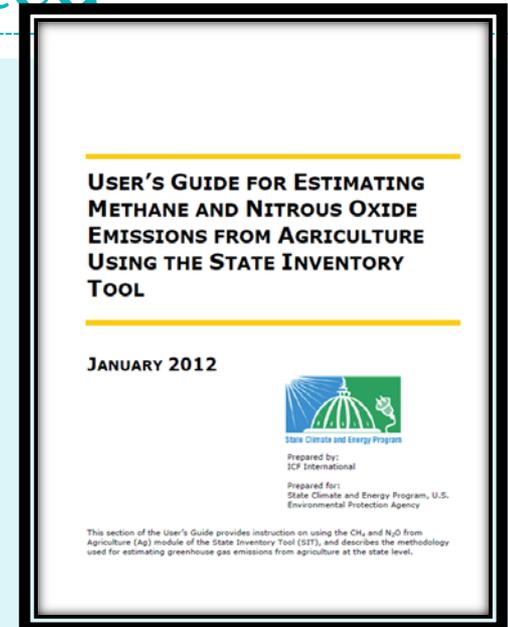
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- Considered ‘top down’ versus ‘bottom up’ inventory
 - Past GHG inventories for the **State** are primarily top down
 - Over 20 local municipalities in Colorado have inventories, all bottom up
- Chapters for each sector
 - Transportation
 - Oil and Gas
 - Agriculture
- Detailed description of the methodology used

Top Down Approach Adopted

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- EPA released an update to the State Inventory Tool (SIT) (formerly State Greenhouse Inventory Tool) – Feb 2013
- Model has ten modules & projection tool
- Consideration given to using Argonne Labs GREET model for transportation
- Consideration given to use CSU Agricultural and Forest model
- EPA continues to update each module with new data base links and improvement to calculations



The EPA State Inventory Tool (SIT)-Benefits

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- Has 10 emissions modules
- Has a projection module
- Links major national data bases to calculation schemes
- Has consistency with other states
- Follows the international GHG protocol the U.S. agreed to follow for the national inventory
- Allows for customization of emission factors and activity assumptions
- Was updated by EPA in 2013 to improve the process using latest assumptions

SIT Model - Drawbacks

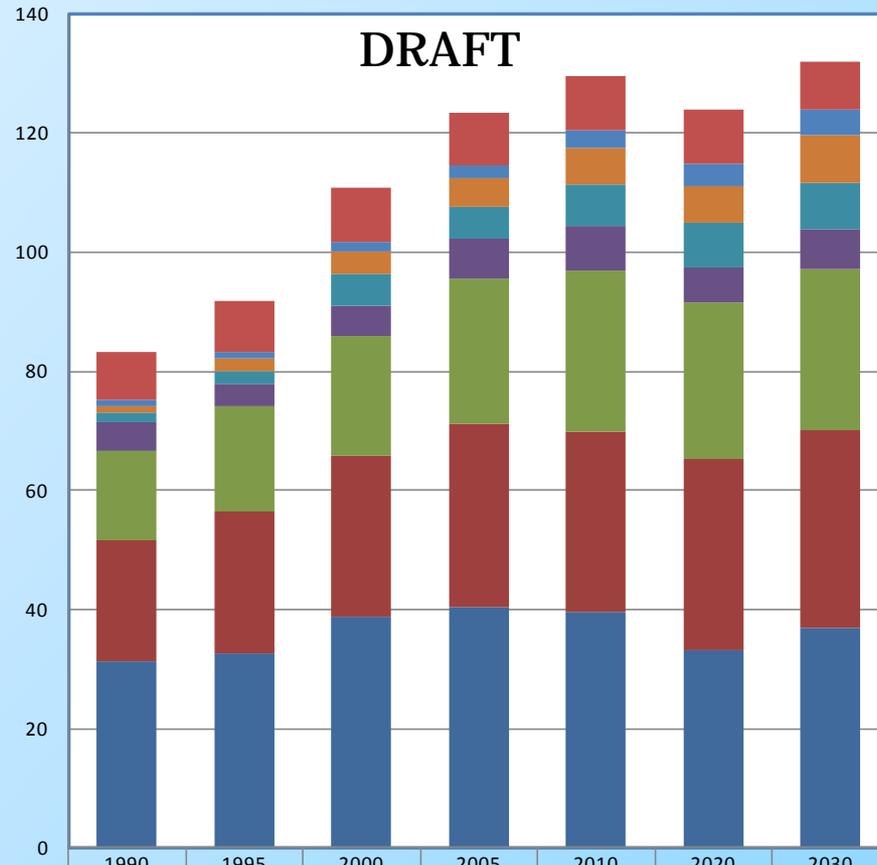
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- One size fits all
- Difficult to track down national data bases and source of original information
- Spreadsheets complex and appear to have some data gaps
- Updates in 2010 data cause 'shifting' sand
- National data bases often difficult to dissect to determine validity of assumptions

Colorado CO₂e Emissions by Sector

DRAFT

CO₂e
Million
Metric
Tons



Agriculture	8.14	8.43	9.13	8.77	9.02	9.24	8.25
Waste	1.07	1.1	1.59	2.27	2.93	3.73	4.21
Industrial Processes	1.08	2.19	3.67	4.65	6.26	5.99	7.91
Oil and Gas	1.71	1.99	5.38	5.46	6.98	7.47	7.89
Coal	4.81	3.73	5.32	6.61	7.54	5.96	6.61
RCI	15.01	17.87	19.96	24.5	26.81	26.28	27.01
Transportation	20.11	23.73	27.02	30.88	30.47	32.1	33.18
Electric Power	31.43	32.66	38.83	40.29	39.53	33.2	37.03

Total	83.36	91.7	110	123	129.54	123.9	132.09
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DRAFT Results

Table 1 Summary of Colorado GHG Emissions by emission sector SIT Model Runs 1990-2030 (July 2, 2013 Analysis)

MMTCO2E	1990	1995	2000	2005	2010	2020	2030
Electric Power	31.43	32.66	38.83	40.29	39.53	33.2	37.02
Transportation	20.11	23.73	27.02	30.88	30.47	32.1	33.18
Residential, Commercial, Industrial	15.01	17.87	19.96	24.5	26.81	26.28	27.01
Coal	4.81	3.73	5.32	6.61	7.54	5.96	6.6
Oil and Gas	1.72	2	5.39	5.47	6.98	7.47	7.89
Industrial Processes	1.08	2.19	3.67	4.65	6.26	5.99	7.91
Agriculture	8.14	8.43	9.13	8.77	9.02	9.24	8.25
Waste	1.07	1.1	1.59	2.27	2.93	3.73	4.21
Total	83.36	91.72	110.9	123.44	129.54	123.97	132.06
Electricity Consumption Emissions (CO2 Eq.)	N/A	N/A	38.75	43.55	48.32	62.12	70.04
LULUCF Summary of Emissions and Sequestration in Colorado	-11.64	-10.53	-10.96	-10.97	-8.99	N/A	N/A

Questions?

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