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# City of Roanoke 2009 Carbon Emissions And Energy Summary

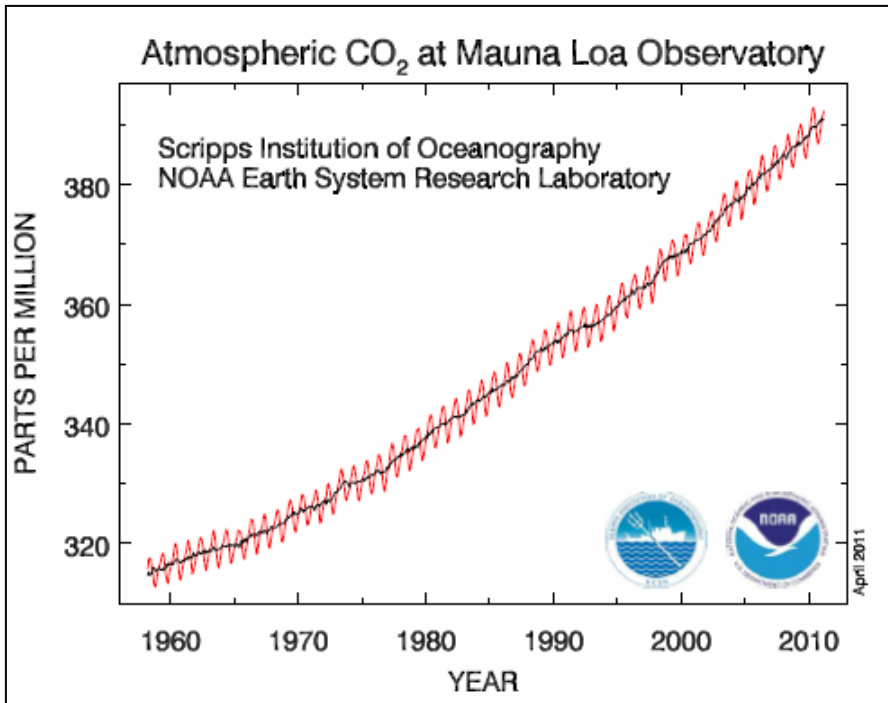
**Roanoke City Council Meeting**

April 18, 2011

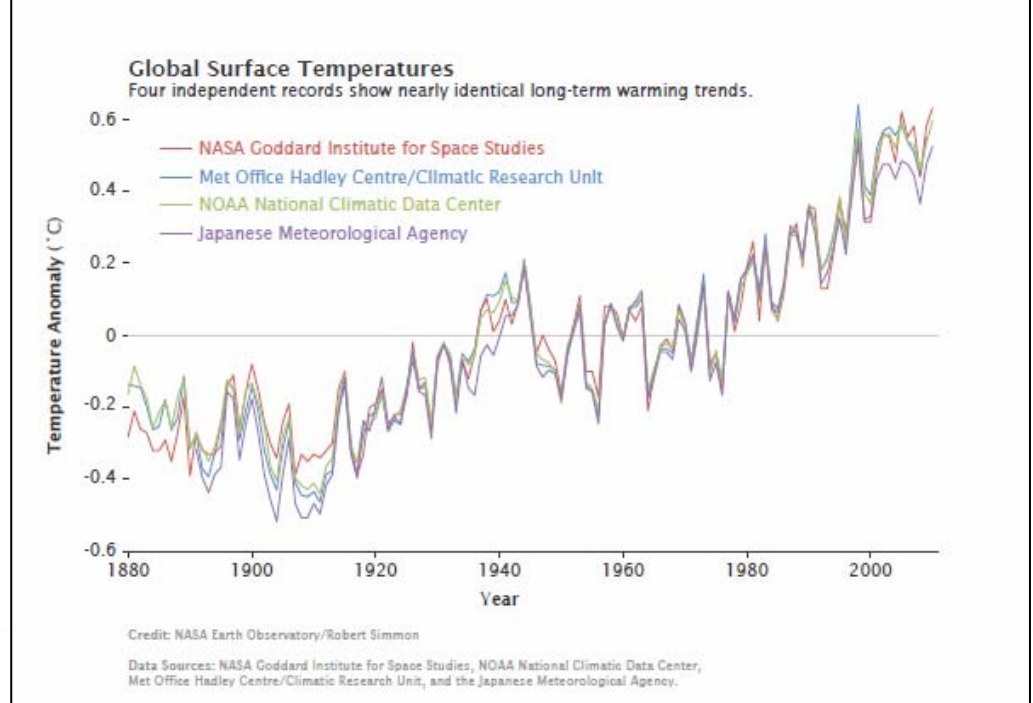
**Sean McGinnis, PhD, LEED AP**

Director - VT Green Engineering Program  
Roanoke Citizens for Clean & Green Committee

# Carbon Dioxide Emissions



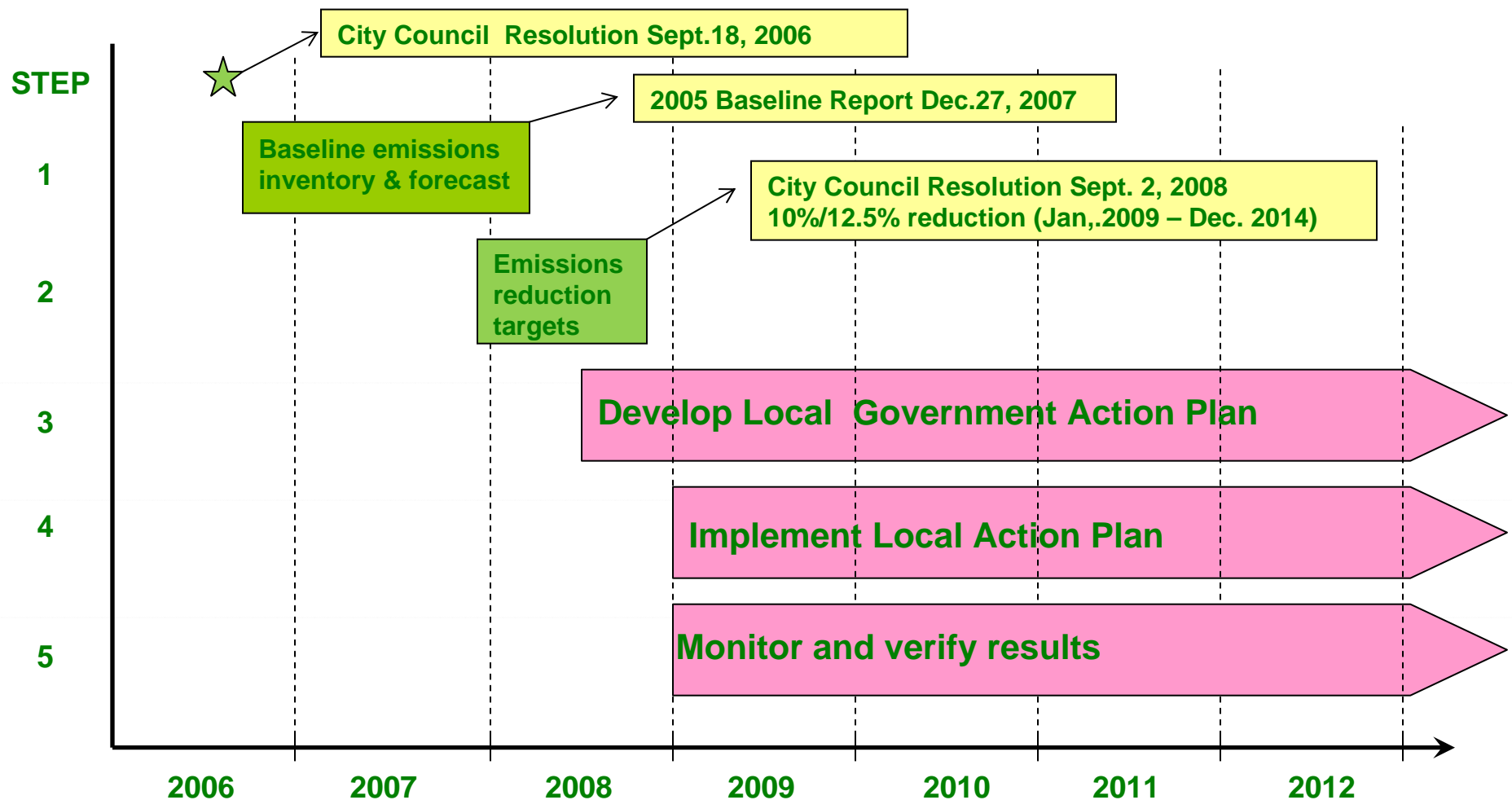
<http://www.esrl.noaa.gov/gmd/ccgg/trends/>



<http://www.nasa.gov/topics/earth/features/2010-climate-records.html>

Fuel	Amount	CO <sub>2</sub> Emissions (lbs)	CO <sub>2</sub> Emissions (lbs) Per 100,000 BTU
Natural Gas	1 therm	12	12
Gasoline	1 gallon	20	16
Coal	1 kWh	2.1	21

# 5 Step Process For Carbon Reduction

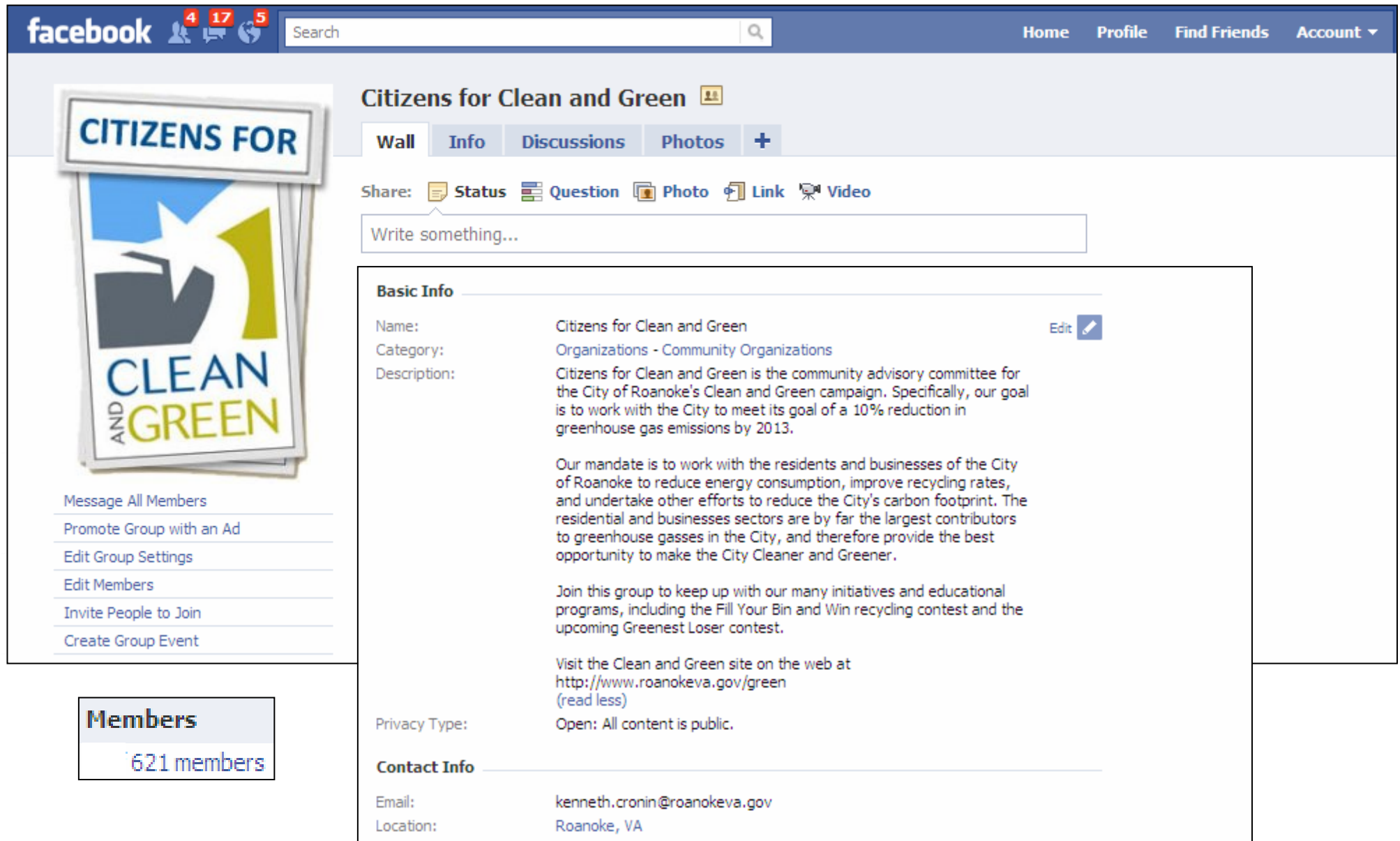


# Clean & Green Committee

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- **Citizens for Clean & Green Committee formed in December 2008 to consider options for carbon and energy reduction in the community**
  
- **2011 Committee Members**
  1. Stan Breakell – Breakell Inc.
  2. Adam Cohen – Structures Design/Build
  3. Ken Cronin – City of Roanoke Staff
  4. Tom Fitzpatrick –Roanoke City Public Schools
  5. Braden Gandee – Clean Vibes
  6. Jeremy Holmes – Roanoke Valley-Alleghany Regional Commission (Ride Solutions)
  7. Sean McGinnis –Virginia Tech Green Engineering Program
  8. Mark Powell – Roanoke Community Garden Association
  9. John Renick – Meridium, Inc.
  10. Cristina Siegel –Clean Valley Council
  11. Katie Wallace – The Wallace Agency
  12. Clarice Walker - Loudon Melrose Neighborhood Organization, Inc.
  13. Laura Wasko - Retellus, LLC
  14. Billy Weitzenfeld – Association of Energy Conservation Professionals

# Clean & Green Programs - Ongoing



The screenshot shows the Facebook interface for the 'Citizens for Clean and Green' group. The top navigation bar includes the Facebook logo, notification counts (4, 17, 5), a search bar, and links for Home, Profile, Find Friends, and Account. The group name 'Citizens for Clean and Green' is displayed with a profile picture icon. Below the name are tabs for Wall, Info, Discussions, Photos, and a plus sign for more options. A share menu is visible with options for Status, Question, Photo, Link, and Video. A text input field for writing a post is present. The 'Basic Info' section is highlighted with a black border and contains the following details:

- Name:** Citizens for Clean and Green (with an Edit icon)
- Category:** Organizations - Community Organizations
- Description:** Citizens for Clean and Green is the community advisory committee for the City of Roanoke's Clean and Green campaign. Specifically, our goal is to work with the City to meet its goal of a 10% reduction in greenhouse gas emissions by 2013.  
  
Our mandate is to work with the residents and businesses of the City of Roanoke to reduce energy consumption, improve recycling rates, and undertake other efforts to reduce the City's carbon footprint. The residential and businesses sectors are by far the largest contributors to greenhouse gasses in the City, and therefore provide the best opportunity to make the City Cleaner and Greener.  
  
Join this group to keep up with our many initiatives and educational programs, including the Fill Your Bin and Win recycling contest and the upcoming Greenest Loser contest.  
  
Visit the Clean and Green site on the web at <http://www.roanokeva.gov/green> (read less)
- Privacy Type:** Open: All content is public.
- Contact Info:**
  - Email:** [kenneth.cronin@roanokeva.gov](mailto:kenneth.cronin@roanokeva.gov)
  - Location:** Roanoke, VA

On the left side of the page, there is a stack of 'CITIZENS FOR CLEAN AND GREEN' signs. Below the signs is a menu with the following options: Message All Members, Promote Group with an Ad, Edit Group Settings, Edit Members, Invite People to Join, and Create Group Event. At the bottom left, a 'Members' box shows '621 members'.

# Clean & Green Programs - 2011



CITIZENS FOR CLEAN & GREEN PRESENT:

## CITY OF ROANOKE GREEN ACADEMY

*If you are a resident of the City of Roanoke, and interested in reducing your energy costs and learning about green building,*

*this series of evening classes is for you.*

*Our regional experts share their knowledge on everything from*

*Energy Conservation & Weatherization,  
to Renewable Energy & Water Conservation.*

**Sessions begin Thursday, January 20th**

*and continue the following Thursday evenings for 4 weeks*

Jan 20, Jan 27, Feb 3

**Fishburn Park Elementary School**

Feb 11 Graduation, Location TBD

**5:30pm light dinner; Program from 6pm to 8pm**

visit [www.roanokeva.gov/green](http://www.roanokeva.gov/green) for an application and more information

- 25 citizens attended

# Clean & Green Programs - 2010



## ROANOKE IS GOING CLEAN AND GREEN.

ABOUT THE CAMPAIGN. CITY EFFORTS. PARTNERS. WHAT YOU CAN DO. CONTACT US.

**featured GREENIE**

**LANFORD BROTHERS CO.**

MORE GREENIES

### Clean and Green Pledge

Take the "Citizens for Clean & Green" Campaign Pledge. Attached below is a PDF document outlining commitments you can make to become more Clean & Green.

[Click here to read the Clean & Green Pledge](#)

Fill out the form below to take the Clean and Green Pledge:

Name:

Address:

Phone:

E-mail:

Check the box if you would like more info about this initiative:

Check the box if you have already completed a carbon footprint:

**SUBMIT GREEN SUGGESTIONS**

**CLEAN AND GREEN PLEDGE**

**PROGRESS TOWARD C&G GOALS**

**CLEAN AND GREEN VIDEOS**

**LOCAL CARBON FOOTPRINT CALCULATOR**

**GREEN OFFICE CHECKLIST**

**CLEAN & GREEN BUSINESS COALITION**

**PERSONAL EMISSIONS CALCULATOR**

**RESIDENTIAL ENVIRONMENTAL CHECKLIST**

**FILL YOUR BIN AND WIN CONTEST**

## "CITIZENS FOR CLEAN & GREEN" – CAMPAIGN PLEDGE

I pledge to begin taking the following actions to reduce my carbon footprint, to lower the impacts of my lifestyle on the environment, and to help make Roanoke a greener place to live, work and play. Commit to this pledge online in the *Clean & Green* link at [www.roanokeva.gov](http://www.roanokeva.gov) or mail your contact info with the card on the back to: Ken Cronin, Department of General Services, 215 Church Avenue SW, Roanoke, VA 24011.



### TIER 1 COMMITMENTS – Easy

- Participate in the city's recycling program for aluminum cans, steel, clear glass, paper & plastics (#1, #2).**
  - o *Recycled aluminum uses 95% less energy than virgin aluminum from bauxite ore.<sup>1</sup>*
- Adjust your thermostat to 78 °F or higher in summer and 68 °F or lower in winter.**
  - o *Energy savings can be as much as 1% for each degree set higher in summer and lower in winter.<sup>2</sup>*
- Replace the most frequently used incandescent light bulbs with compact fluorescent light (CFL) bulbs immediately; replace all other incandescent bulbs with CFLs as they burn out.**
  - o *Save \$30 over the life of each CFL bulb; if every US home installed 1 CFL bulb, the energy saved would light >3 million homes/yr, save >\$600 million/yr in energy costs, and prevent greenhouse gases equivalent to the emissions of more than 800,000 cars.<sup>3</sup>*
- Turn off lights and unplug electronics /chargers when not in use; set computers to "power saving mode".**
  - o *Enabling computer power management options can save as much as 60-80% of the energy that would have been wasted.<sup>4</sup>*
- Maintain proper air pressure in vehicle tires.**
  - o *Improve fuel economy up to 3%.<sup>5</sup> Save 50 – 100 gallons of gas per year per vehicle (over 100,000 registered vehicles in Roanoke).*

### TIER 2 COMMITMENTS – Moderate

- Reduce energy use for hot water by installing water saving fixtures and showerheads, insulating your water heater and pipes, and turning down your water heater temperature setting.**
  - o *Water heating accounts for approximately 20% of total home energy use and costs an average household over \$300 a year.<sup>6</sup>*
- Seal air leaks around windows, doors and other wall penetrations with weather stripping, caulk or insulation.**
  - o *Air leakage can add 10% to your annual energy bill which equates to about \$70 per year for the average home.<sup>7</sup>*
- Discontinue the use of second refrigerators.**
  - o *20% of all households use a second refrigerator that is typically 10 years old, uses over 1000 kWh, and costs \$100 annually.<sup>8</sup>*
- Wash clothes in cold water; dry laundry using a clothesline instead of using the dryer whenever possible.**
  - o *Heating water accounts for 85-90% of the energy to wash clothes. Dryers are high energy users with no Energy Star models.<sup>9</sup>*
- Bike, walk, carpool or use public transportation at least once per week for errands or your work commute.**
  - o *For each individual, a 5 mile roundtrip by car avoided weekly would reduce carbon dioxide emissions by about 200 lbs.<sup>10</sup>*

### TIER 3 COMMITMENTS – More Difficult

- Reduce "vampire" energy use with a "smart power strip" that senses when appliances are off.**
  - o *Vampire energy can be 5% of residential energy use; taken across all U.S. households, this wastes an estimated 65 billion kWh of electricity, costs consumers more than \$5.8 billion and emits more than 87 billion pounds of carbon dioxide each year.<sup>11</sup>*
- Buy a programmable thermostat and adjust the temperature overnight and when the house is unoccupied.**
  - o *Save 5 – 10% of the energy and cost to cool/heat your house by setting the thermostat 5 – 10 degrees warmer/cooler.<sup>12</sup>*
- Seal and insulate ducts for air conditioning and forced air heating systems; check for adequate attic insulation levels.**
  - o *In a typical house, 20% of the air that moves through the duct system is lost due to leaks, holes, and poorly connected ducts.<sup>13</sup>*
- Choose Energy Star appliances and electronic devices when purchasing these items.**
  - o *Over 30% of all electricity use in a house is for kitchen and laundry appliances.<sup>14</sup>*
- When purchasing a new/used vehicle, select models that get at least 20% better fuel economy than your current vehicle.**
  - o *30% of all greenhouse gas emissions in the US are a result of transportation.<sup>15</sup>*
- MEASURE YOUR CARBON FOOTPRINT AND TAKE ACTION TO REDUCE IT BY 2% PER YEAR TO HELP ROANOKE MEET ITS COMMUNITY-WIDE CARBON DIOXIDE EMISSIONS REDUCTION GOAL OF 10% OVER THE NEXT 5 YEARS.**

- ~240 Carbon Pledges to Date

# Roanoke Energy and Carbon Inventory Analysis

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- **Scope**

1. City limits and physical boundaries
2. Residential, commercial, industrial, and municipal activities
3. Electricity, natural gas, transportation fuels, and waste

- **Data Sources**

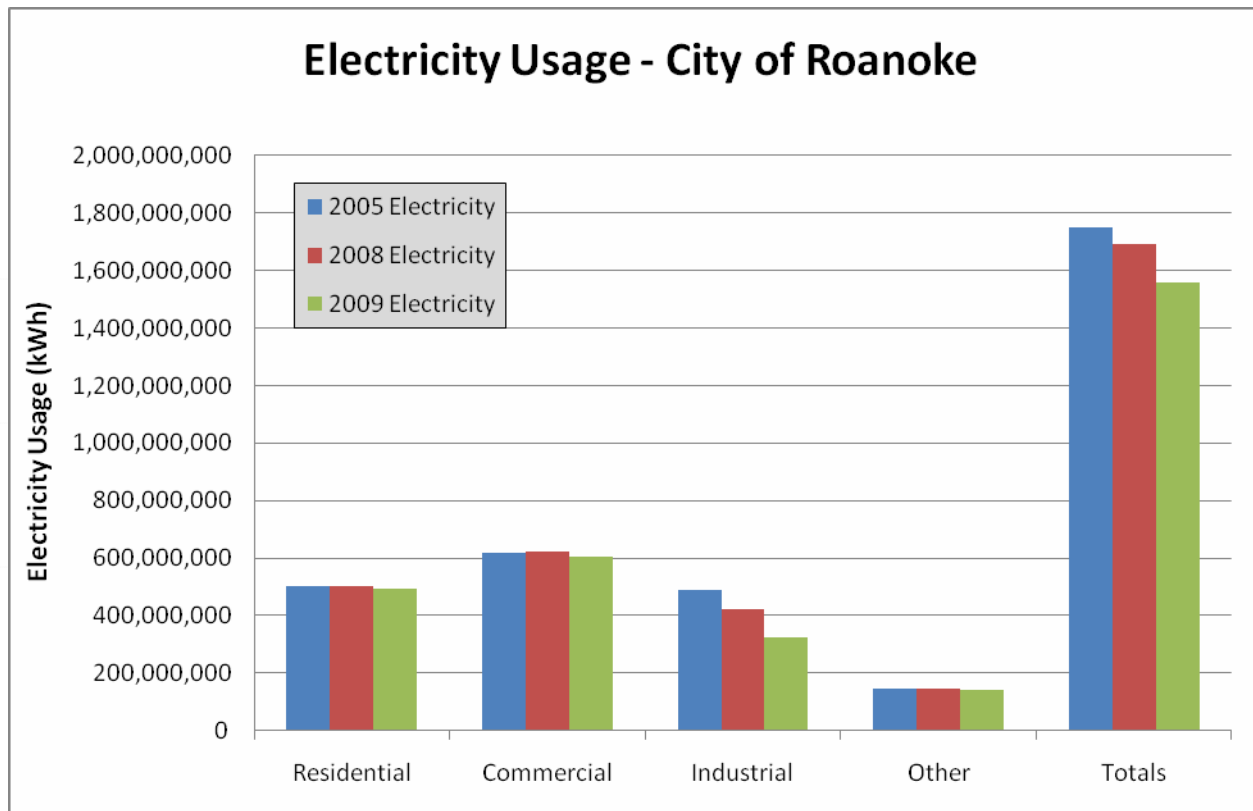
1. Utility billing records for electricity and natural gas use by sector
2. VDOT Vehicle miles travelled (VMT) data

- **Emission Analysis**

1. Clean Air and Climate Protection (CACP) software estimates emissions of Greenhouse Gases (GHGs) including carbon dioxide and methane and EPA Criteria Air Pollutants (CAPs) including nitrogen oxides, sulfur oxides, carbon monoxide, volatile organic compounds (VOCs) and 10 micron particulate matter based on the fuel amount/type and point-source chemical emissions.

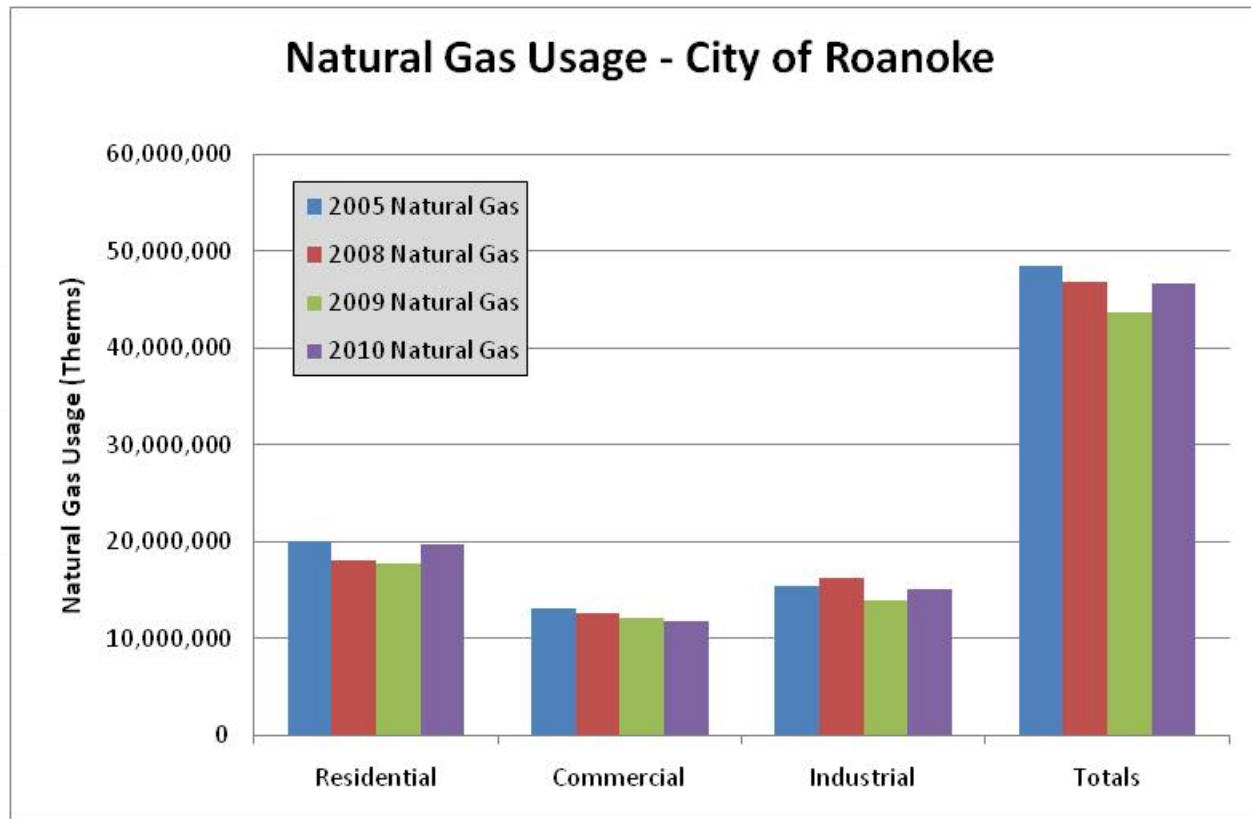
# Roanoke Electricity Usage

Sector	2005 (kWh)	2008 (kWh)	2009 (kWh)
Residential	502,467,666	502,356,265	491,080,493
Commercial	616,360,103	620,738,676	602,960,432
Industrial	487,843,077	423,724,837	323,468,495
Other	145,349,802	144,533,915	140,517,611
Totals	1,752,020,648	1,691,353,693	1,558,027,031
		-3.5%	-11.1%



# Roanoke Natural Gas Usage

Sector	2005 (therms)	2006 (therms)	2007 (therms)	2008 (therms)	2009 (therms)	2010 (therms)
Residential	19,967,493	17,530,390	17,555,052	18,066,905	17,696,938	19,747,112
Commercial	13,087,409	12,223,436	12,071,818	12,532,208	12,038,571	11,741,128
Industrial	15,435,141	15,418,465	14,909,238	16,262,069	13,989,730	15,108,375
Totals	48,490,043	45,172,291	44,536,108	46,861,182	43,725,239	46,596,615
				-3.4%	-9.8%	-3.9%

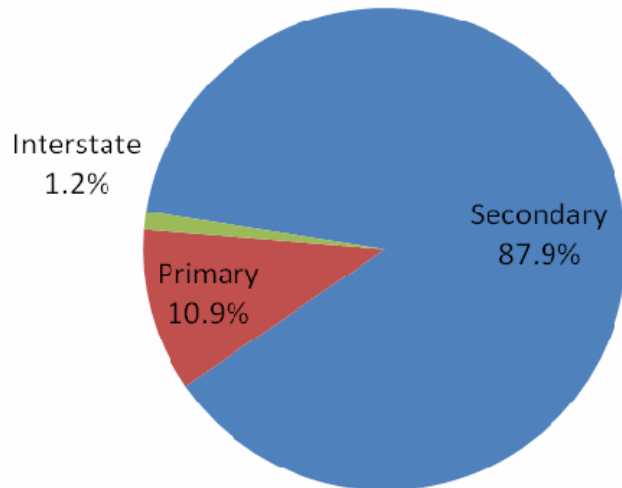


# Roanoke Transportation Analysis – VDOT Data

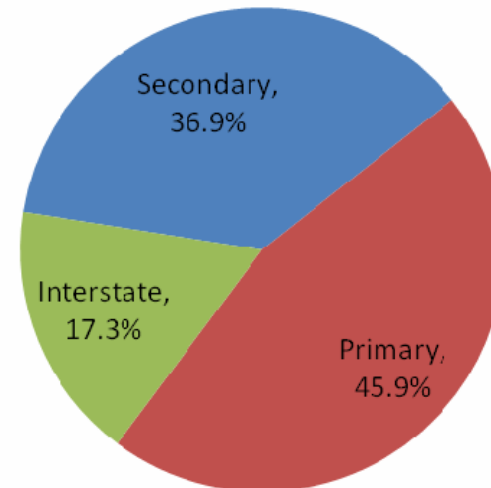
Year	Vehicles Miles Traveled (VMT)
2005	736,548,004
2008	744,814,259
2009	792,675,391
Change vs. 2005	7.6%

- While most of the road miles are secondary, the percentage of miles travelled on the primary and interstate roads are much higher

Roanoke Road Type Miles By Percentage

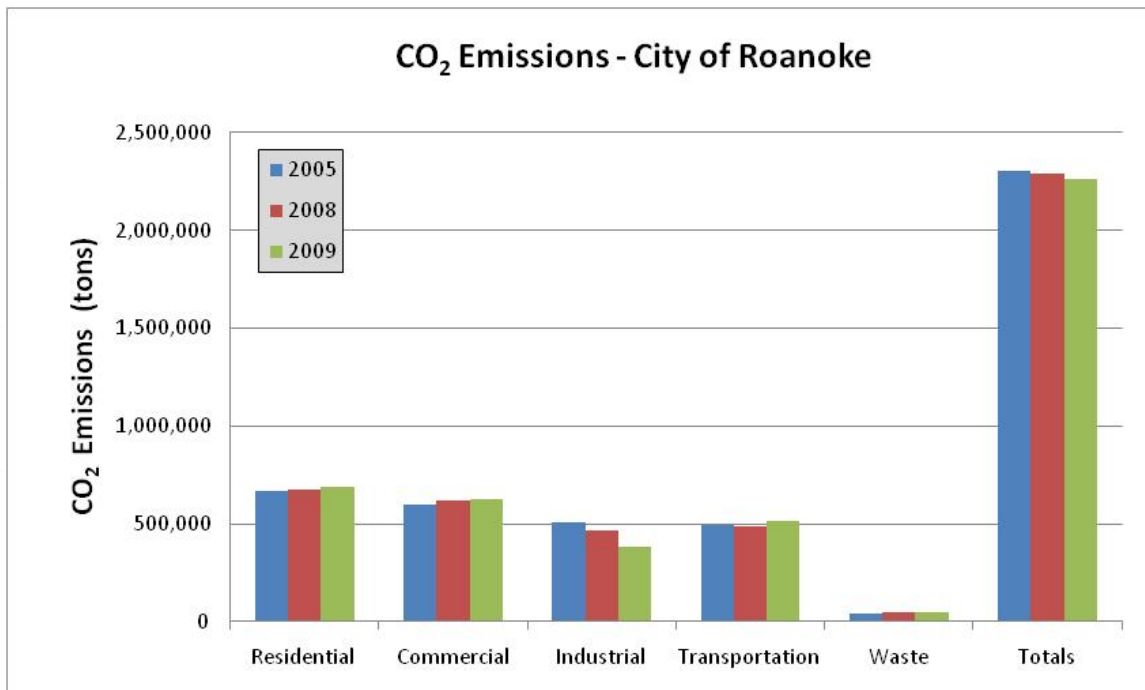
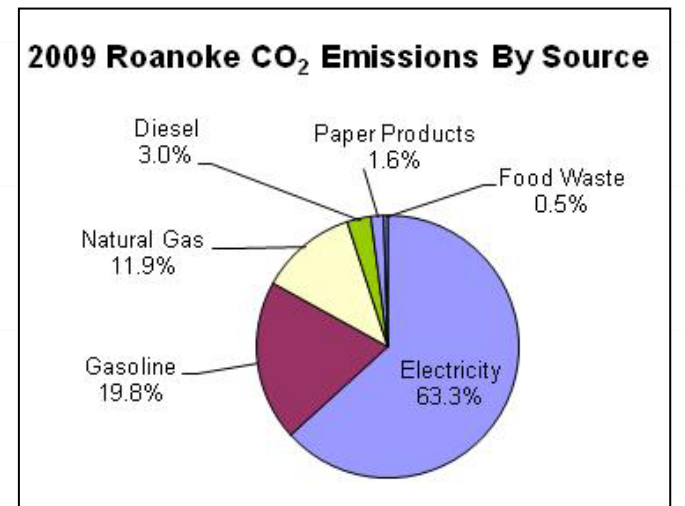
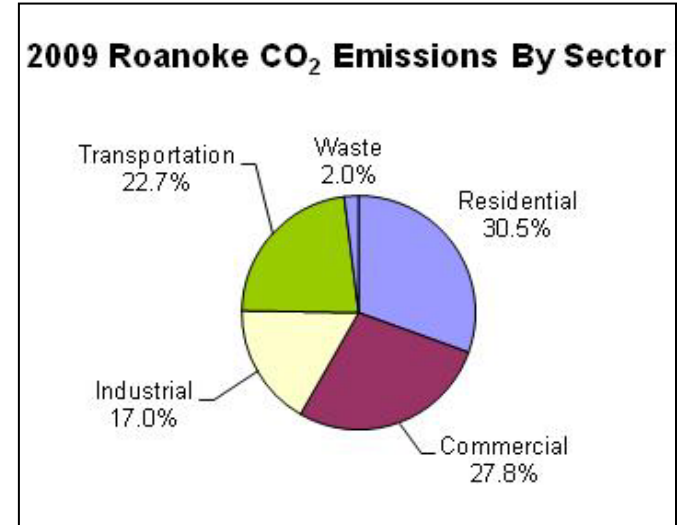


Roanoke Road VMT By Percentage



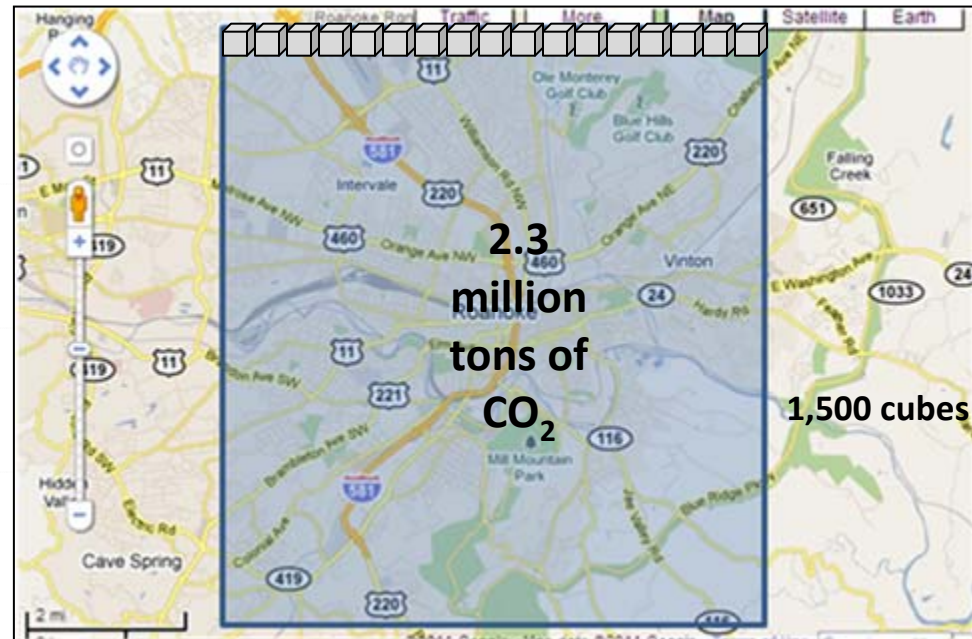
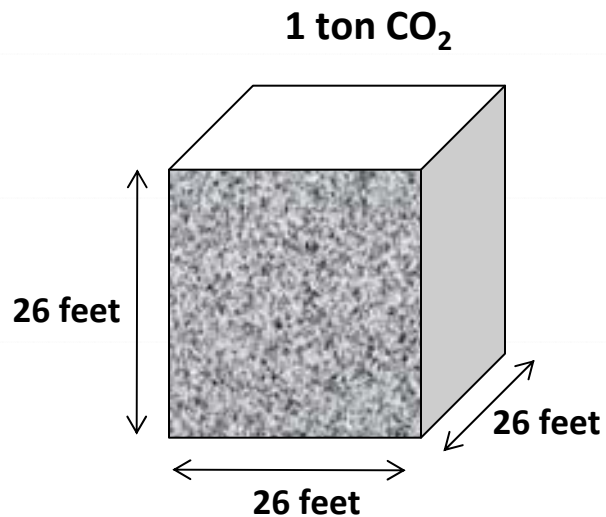
# Roanoke CO<sub>2</sub> Emissions

Sector	2005 (tons)	2008 (tons)	2009 (tons)	Difference (2009 vs 2005)
Residential	666,761	673,531	689,462	3.4%
Commercial	597,868	616,620	628,199	5.1%
Industrial	504,571	468,532	383,539	-24.0%
Transportation	493,183	489,771	514,042	4.2%
Waste	42,029	44,819	44,723	6.4%
<b>Totals</b>	<b>2,304,412</b>	<b>2,293,273</b>	<b>2,259,965</b>	<b>-1.9%</b>



# Roanoke CO<sub>2</sub> Emissions – Scale of Reduction

- 10% Carbon Dioxide Reduction = 230,000 tons
- City of Roanoke ~ 45,000 households
- 1 ton per household savings – “Save a ton”



1,500 cubes = 7.5 miles

# Community Scale Reduction Examples

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- It's important to understand the scale of CO<sub>2</sub> reduction committed to by Roanoke City Council. Here are a few examples based on some simple estimates:

## 1. Residential home weatherization

- *If an energy audit and weatherization (air sealing, insulation, and energy efficient systems) can reduce home energy use by 40%, we need this for action for ¼ of all residences in the city - **on the order of 10,000** - to get a 10% reduction in just this sector.*

## 2. Residential lighting efficiency - CFL bulbs

- *75W incandescent light bulbs can be replaced by 18W CFL bulbs for less than \$2 each. To get a 10% reduction in just the residential sector, we need on the order of 5 bulbs per residence in the City, **200,000 CFL bulbs total**, to be implemented.*

## 3. Transportation

- *Assume an automobile upgrade from a car with a fuel economy of 20 mpg to one with 35 mph. We need **1,200** such car upgrades to get a 10% reduction in this sector.*

# Questions?

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