

# 2007 Carbon Footprint Analysis

---

The Ohio State University

**Niffy Ovuworie**

Major: Mechanical Engineering, College of Engineering

Student Assistant,  
Energy and Sustainability Office - Business And Finance

# Overview

---

- What is a carbon footprint and why conduct this analysis
- Methodology and scope
- Results of inventory
- Analysis and conclusions

# Why Conduct this Analysis

---

- Our climate is changing
- Humans are causing the change
- Kyoto Protocol Green House Gases
  - CO<sub>2</sub>, CH<sub>4</sub>, NO<sub>x</sub>, SF<sub>6</sub>, HFC's, and PFC's

# What is a Carbon Footprint?

---

- Powerful tool for analysis
  - Quantifies and qualifies emissions
  - Identifies sources of emissions
- Tool for decision making
  - Provides anchoring for projections
  - Tracks impact of changing policy

# Methodology

---

- Clean Air-Cool Planet  
Campus Carbon Calculator
- The eCO<sub>2</sub> standard

# Scope

---

- Columbus Campus, FY 2002-2006
  - Utilities
  - Transportation
    - University Vehicles
    - Commuters
  - Waste management
  - Refrigeration
  - Agriculture
    - Fertilizer

# Definitions

---

- Scope 1 – Direct sources of GHG emissions university controlled operations such as steam production
- Scope 2 – Emissions from imports such as purchased electricity
- Scope 3 – All other indirect sources such as waste disposal or university commuters

# Results of Inventory

eCO2 Summary (Metric Tons eCO2)

Fiscal Year	Energy			Transportation				Solid Waste	Emissions By Scope			Net Emissions (MT eCO2)
	Electricity	Steam	Total Energy	Fleet	Student Commuters	Faculty/Staff Commuters	Total Trans		Scope 1 Emissions	Scope 2 Emissions	Scope 3 Emissions	
2002	420,321	127,381	547,702	5,414	21,454	56,907	95,596	3,040	132,987	420,321	85,202	638,509
2003	431,592	139,406	570,998	5,306	20,700	54,536	91,739	2,997	144,997	431,592	81,980	658,568
2004	447,796	135,059	582,854	5,329	21,769	54,198	93,520	3,368	140,580	447,796	83,545	671,921
2005	475,905	135,836	611,741	5,494	18,289	58,252	92,723	3,200	141,522	475,905	83,742	701,169
2006	500,713	148,802	649,515	5,312	17,720	61,321	95,088	2,568	154,329	500,713	86,342	741,384
% Total eCO2												
	Electricity	Steam	Total Energy	Fleet	Student Commuters	Faculty/Staff Commuters	Total Trans	Solid Waste	Scope 1 Emissions	Scope 2 Emissions	Scope 3 Emissions	Emissions' increase
2002	65.83%	19.95%	85.78%	0.85%	3.36%	8.91%	14.97%	0.48%	20.83%	65.83%	13.34%	
2003	65.53%	21.17%	86.70%	0.81%	3.14%	8.28%	13.93%	0.46%	22.02%	65.53%	12.45%	3.14%
2004	66.64%	20.10%	86.74%	0.79%	3.24%	8.07%	13.92%	0.50%	20.92%	66.64%	12.43%	2.03%
2005	67.87%	19.37%	87.25%	0.78%	2.61%	8.31%	13.22%	0.46%	20.18%	67.87%	11.94%	4.35%
2006	67.54%	20.07%	87.61%	0.72%	2.39%	8.27%	12.83%	0.35%	20.82%	67.54%	11.65%	5.74%

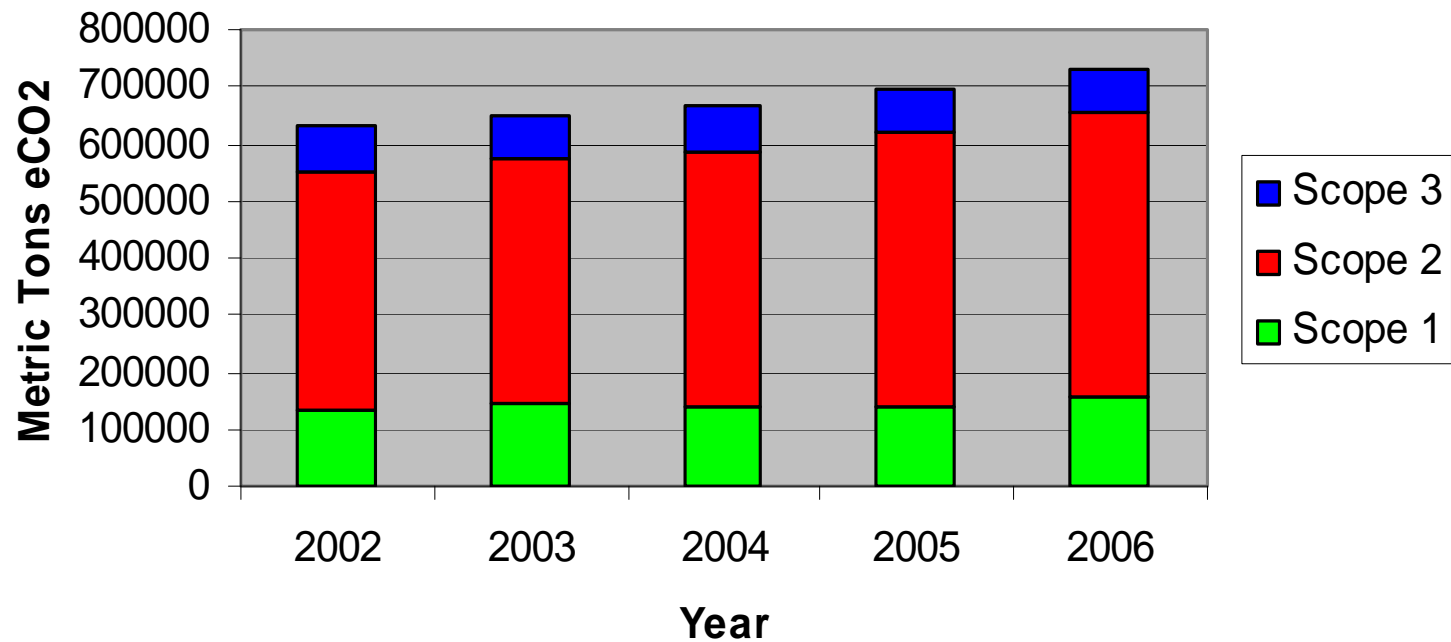
# Observations

---

- Electricity accounts for 66% of annual emissions
- Heating fuels account for 20%
- Energy activities account for a combined 86% of emissions

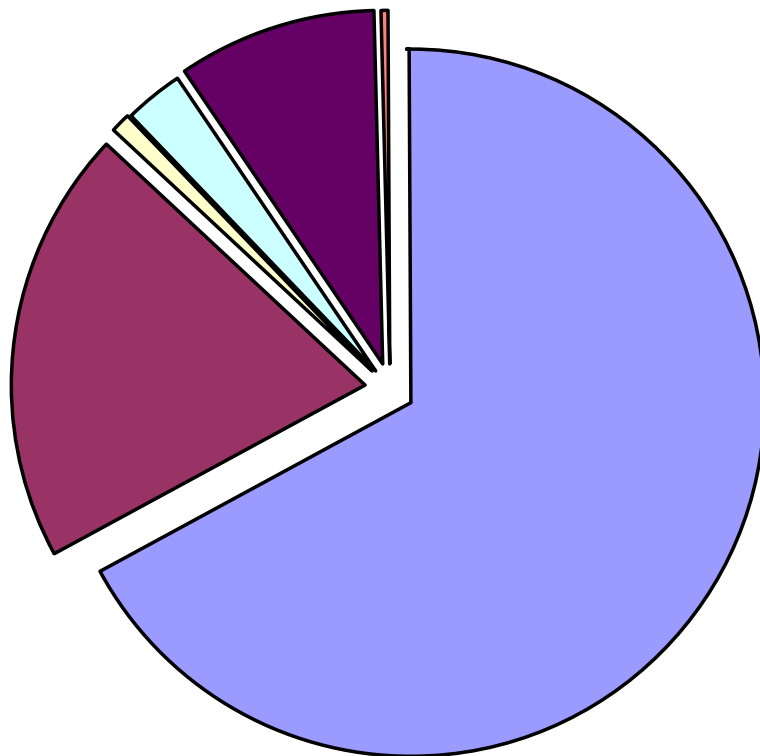
# Results of Inventory

eCO<sub>2</sub> Annual Emissions by Scope



# Results of Inventory

**Sources of eCO<sub>2</sub>**



- Electricity
- Steam Generation
- University Fleet
- Student Commuters
- Faculty/Staff Commuters
- Solid Waste

# Demographics

---

	MT eCO <sub>2</sub> per Student	MT eCO <sub>2</sub> per Community member	Kg eCO <sub>2</sub> per CSF
2002	12.85	9.42	32.9
2003	12.98	8.90	33.8
2004	13.18	9.52	34.3
2005	13.88	9.83	34.7
2006	14.31	10.11	35.9

# Observations

---

- Energy Usage Index
  - EUI: total energy usage divided by conditioned floor space
  - BTU/CSF
- Trending over 5 years of the study
  - EUI has increased 11%
  - Emissions,  $e\text{CO}_2/\text{CSF}$ , increased 9%

# The School Up North

---

- University of Michigan's EUI was 85% that of OSU but had less than 50% of the emissions

FY2005	KWh/CSF	KBTU/CSF	Kg eCO <sub>2</sub> /CSF
OSU	24.1	436	35
UM	27.3	370	16

# Analysis

---

- Analysis of increasing trend
  - Energy Intensive Construction
    - Labs, 24-hr Facilities
- Is UM Better?
  - Denser Campus
  - Co-Generation Plant
  - Gas vs. Coal Based Electricity

# Conclusions

---

- Must reduce the impact of energy activities
  - Reduce energy use
    - More efficient buildings and better controls
  - Find green energy sources
    - Reduce dependence on fossil fuels

# Limitations

---

- Model limitations
  - Credits for green space and biodiesel
- Validation of data
  - Third party information
  - Engineering Calculations
- Only main campus

# Future Work

---

- Expand scope to include all OSU owned properties
- More detailed presentation of data tailored to OSU need

# Future Work

---

- Sustainability is not just carbon
  - Credits for compost and recycling
  - Water ecology, land use
  - Sustainable building practices
  - Education and community outreach initiatives

# Questions?

---