

# Greenhouse Gas Emissions Inventory

**Geologic Sequestration Roundtable  
December 16, 2008**

**Tom Gross, Chief  
Air Monitoring and Planning Section**



# To Inventory

---

- The act of making a catalog or detailed listing
- The act or process of taking an inventory
- To summarize

# Why Inventory GHGs

---

- Decisions are being made on energy and climate change issues
- Need data to make informed decisions
- KDHE receives numerous requests for Kansas data
- Prepare for mandatory GHG reporting
  - EPA rule is late



# Inventory Methods

---

- Bottom Up – each source based on best available data for source
  - Continuous Emissions Monitors (CEMS)
  - Stack tests
  - Material balance
  - Emission factors
  - Engineering estimates
- Top Down – sectors based on aggregated or surrogate data
  - Fuel consumption
  - Vehicle miles traveled

# Data Sources

---

- IPCC: Climate Change 2007, Synthesis Report
- US EPA: Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2006
- Center for Climate Strategies: Draft Kansas Greenhouse Gas Inventory and Reference Case Projections 1990-2025
- KDHE: 2007 Kansas Point Source Voluntary Greenhouse Gas Emission Inventory
  - Direct actual GHG emissions at the permitted facility
  - Calendar year 2007 only



# GHGs in Kansas Inventory Projects

<b>Greenhouse Gas</b>	<b>CO<sub>2</sub> Equivalents</b>
■ Carbon dioxide (CO <sub>2</sub> )	1
■ Methane (CH <sub>4</sub> )	21
■ Nitrous oxide (N <sub>2</sub> O)	310
■ Hydrofluorocarbons (HFCs)	varies
■ Perfluorocarbons (PFCs)	varies
■ Sulfur hexafluoride (SF <sub>6</sub> )	23,900



# United States Summary

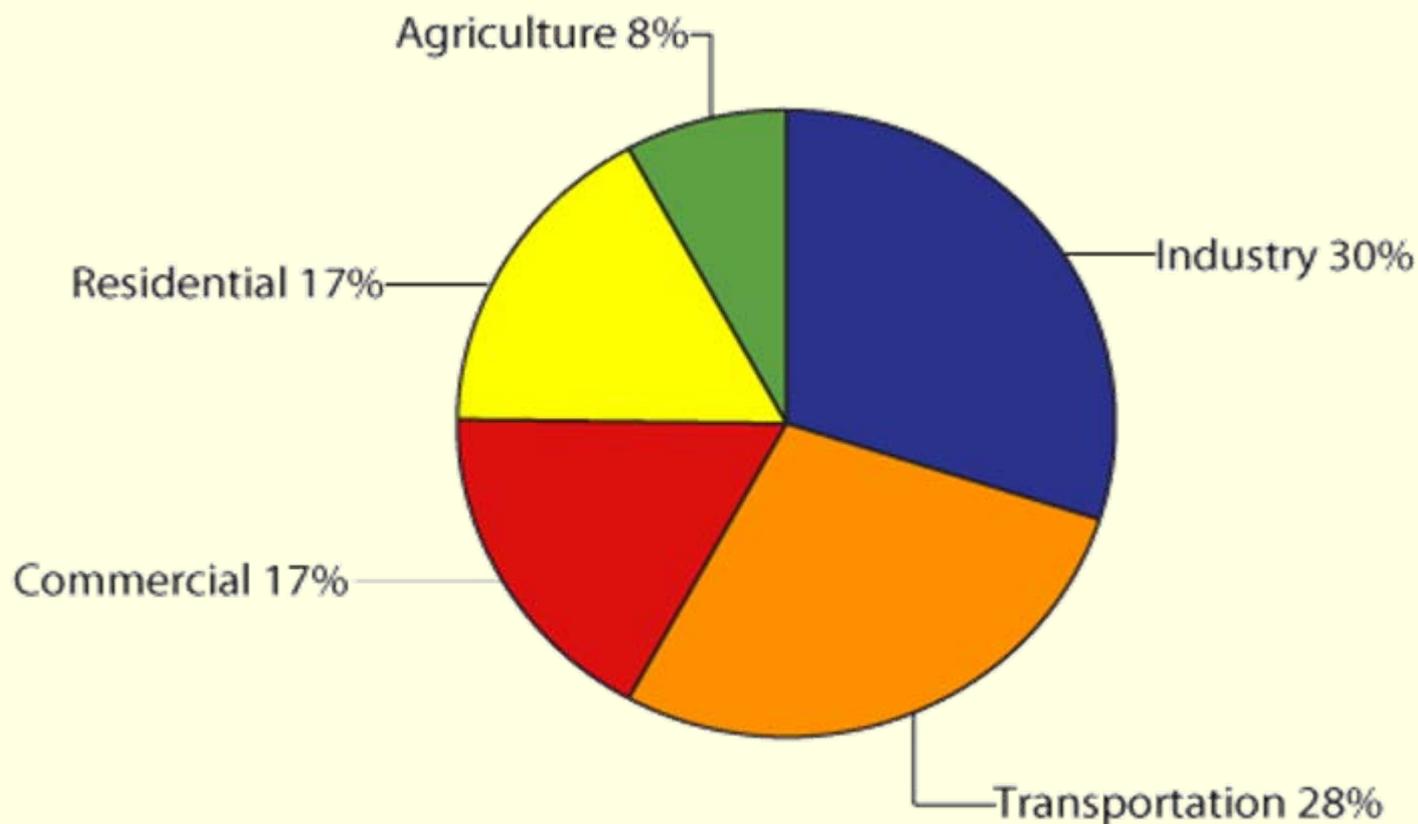
---

- US had 22% of global GHG emissions in 2004
- US emissions have risen by 14.7% from 1990 to 2006
- CO<sub>2</sub> from fossil fuel combustion is largest source of GHG emissions
- In 2006, China (6200 million tons) overtook US (5800 million tons) as world's biggest CO<sub>2</sub> emitter



# Greenhouse Gas Emissions by Sector

United States, 2004



Total Emissions\* = 7,074 MMT CO<sub>2</sub>E

\* Net Emissions (Sources + Sinks) = 6,204 MMT CO<sub>2</sub>E

\*\* High GWP Gases include: HFCs, PFCs, and SF<sub>6</sub>

Data expressed in Million Metric Tons of Carbon Dioxide Equivalent (MMT CO<sub>2</sub>E)

# GHG Planning Inventory Overview

---

- From 1990 through 2025
- EPA's State Inventory Tool Methodology with Targeted Improvements
- Time Frame
  - Started in mid-November, 2007
  - March 15, 2008 — draft inventory
  - Under review by KEEP members



# GHG Planning Inventory - Sectors

---

- Energy Supply
- Transportation
- Residential, Commercial, and Industrial (RCI)
- Land Use - Agriculture and Forestry
- Waste Management
- Power Consumption (all sectors)

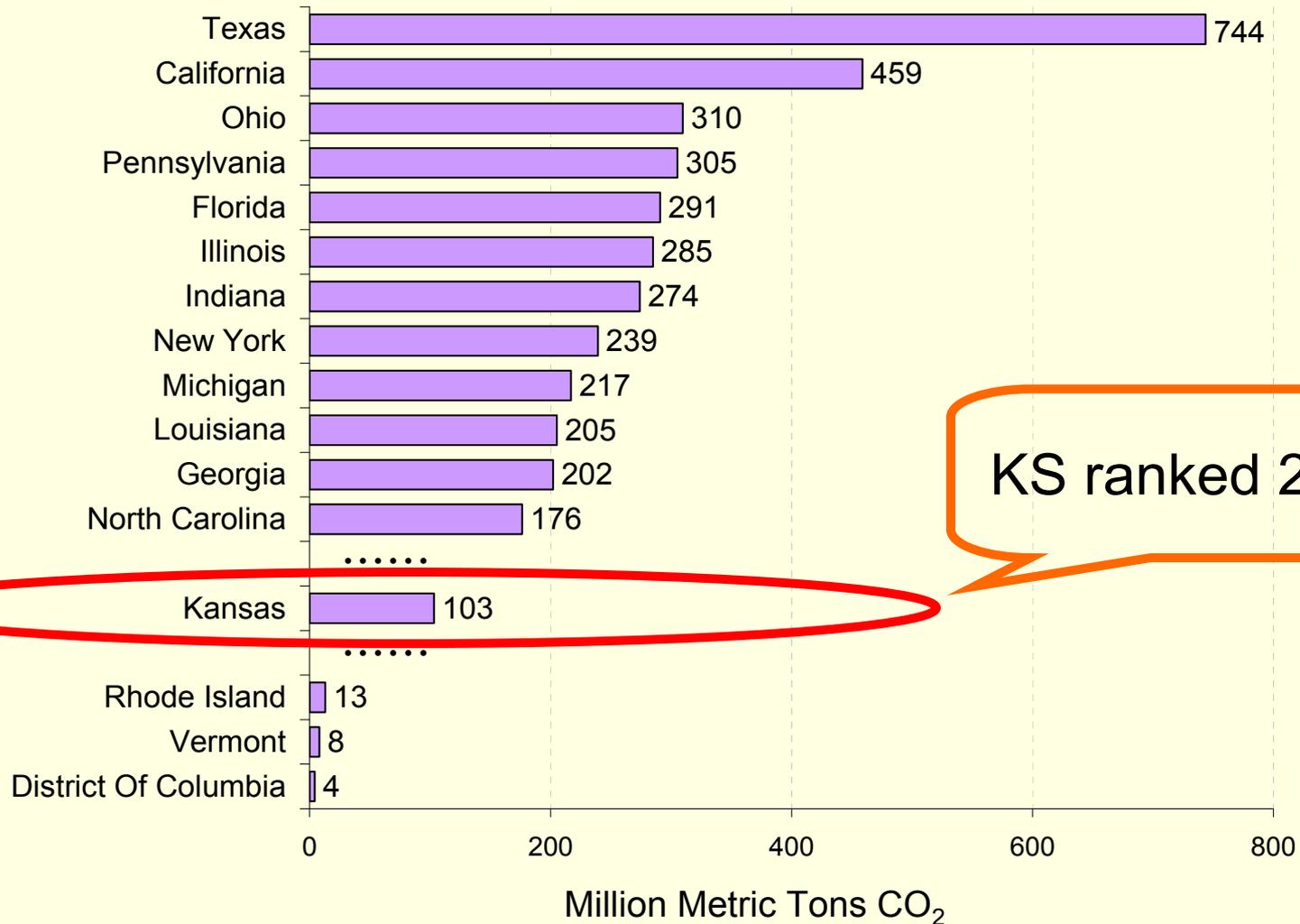


# Kansas GHG Emissions Summary

- Total 2005 GHG emissions: 103 MMt of gross CO<sub>2</sub>E
- About 1.4% of total US gross GHG emissions
- Increased ~8% from 1990 to 2005
- National GHG emissions rose by 16%
- Major growth: Electricity consumption, industrial process, and agriculture sectors



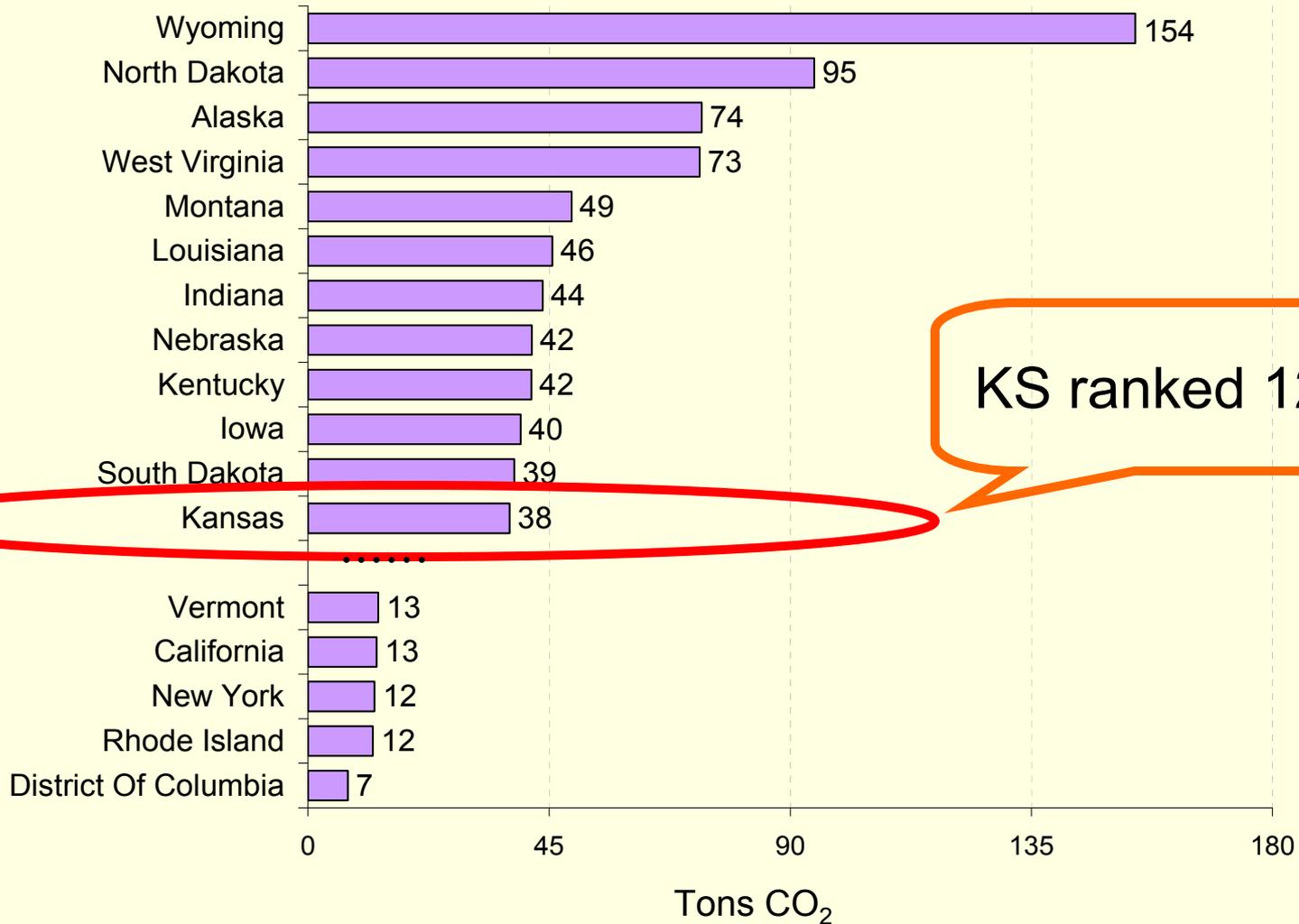
# Total GHG Emissions in 2005



KS ranked 26th



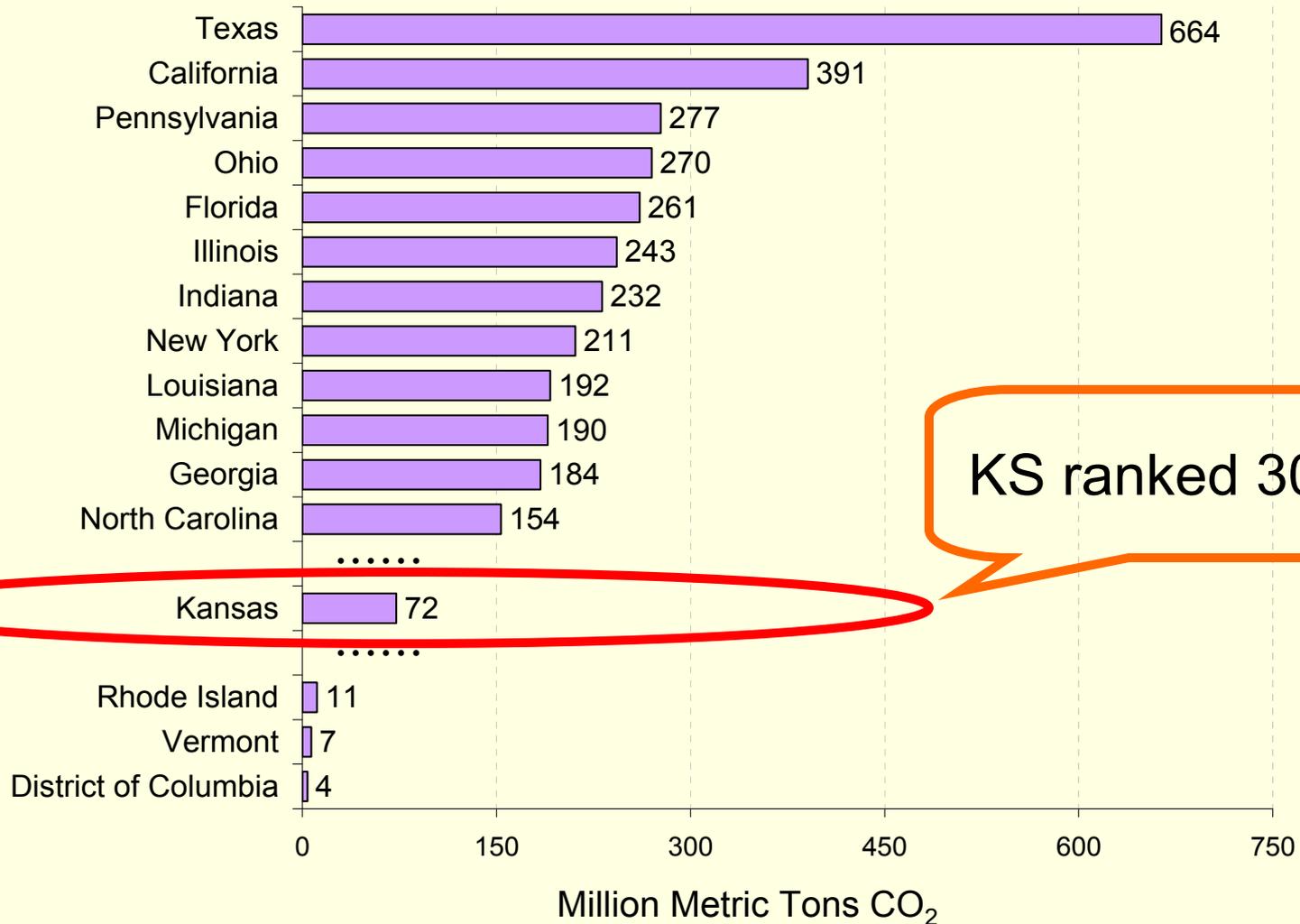
# Per Capita GHG Emissions in 2005



KS ranked 12th



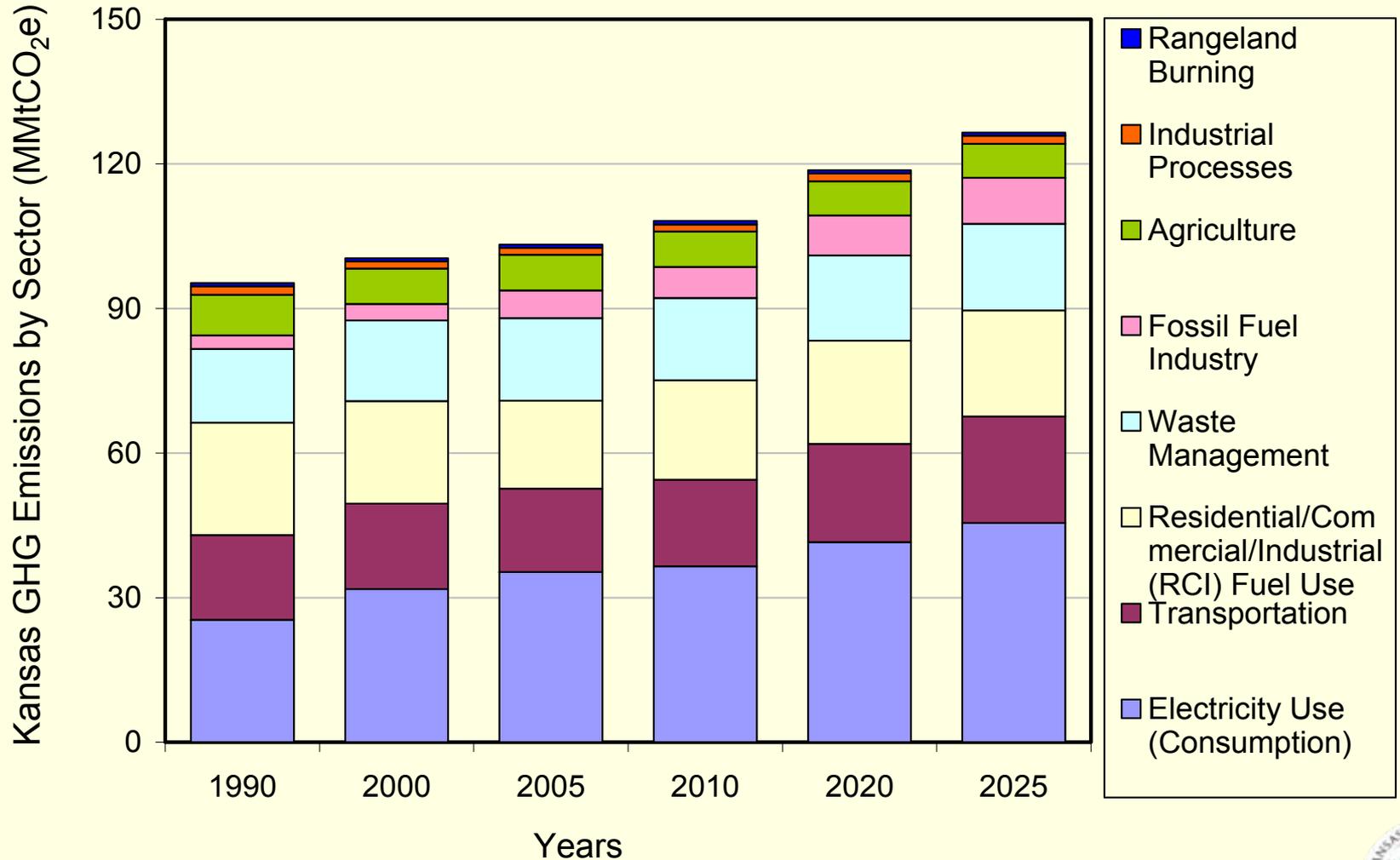
# CO<sub>2</sub> from Fossil Fuel Combustion (2005)



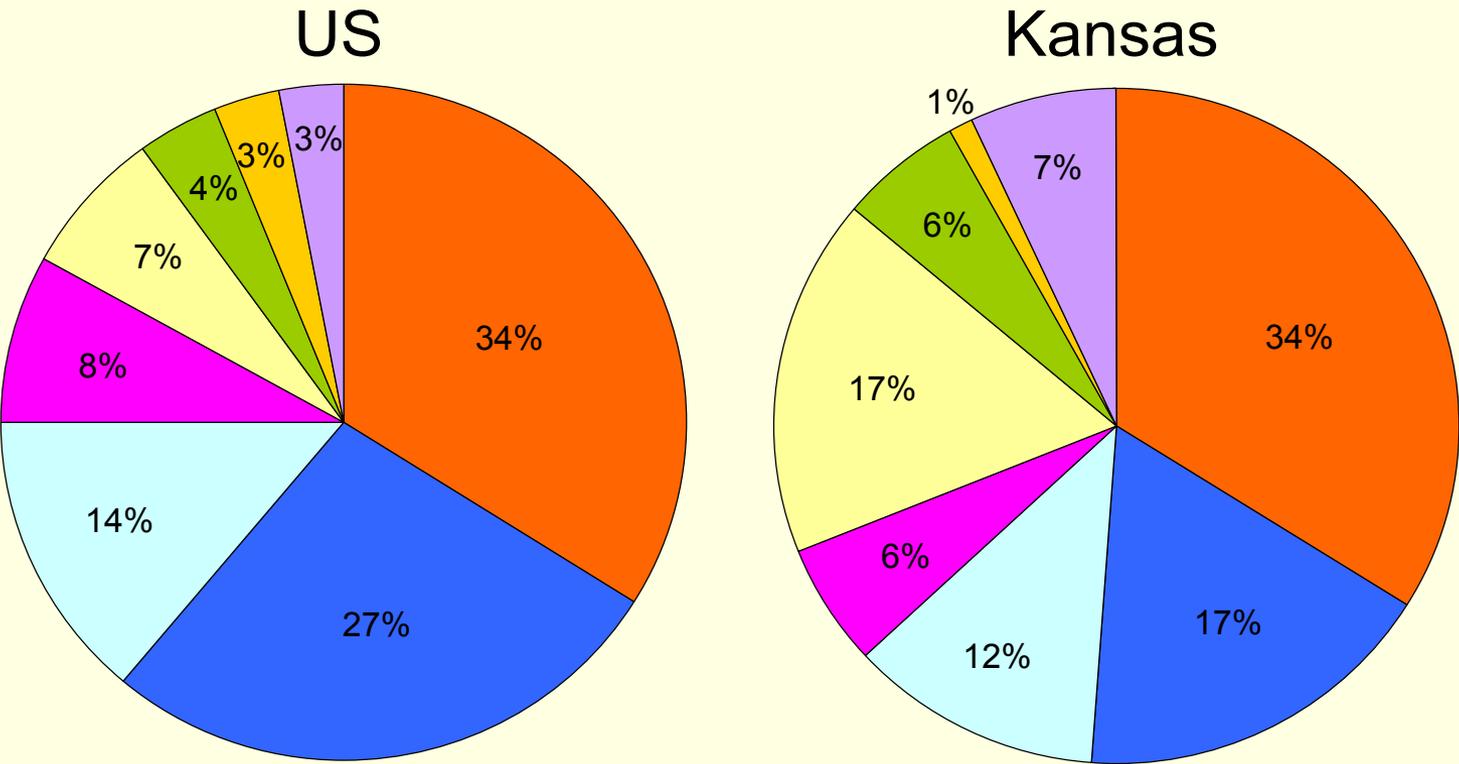
KS ranked 30th



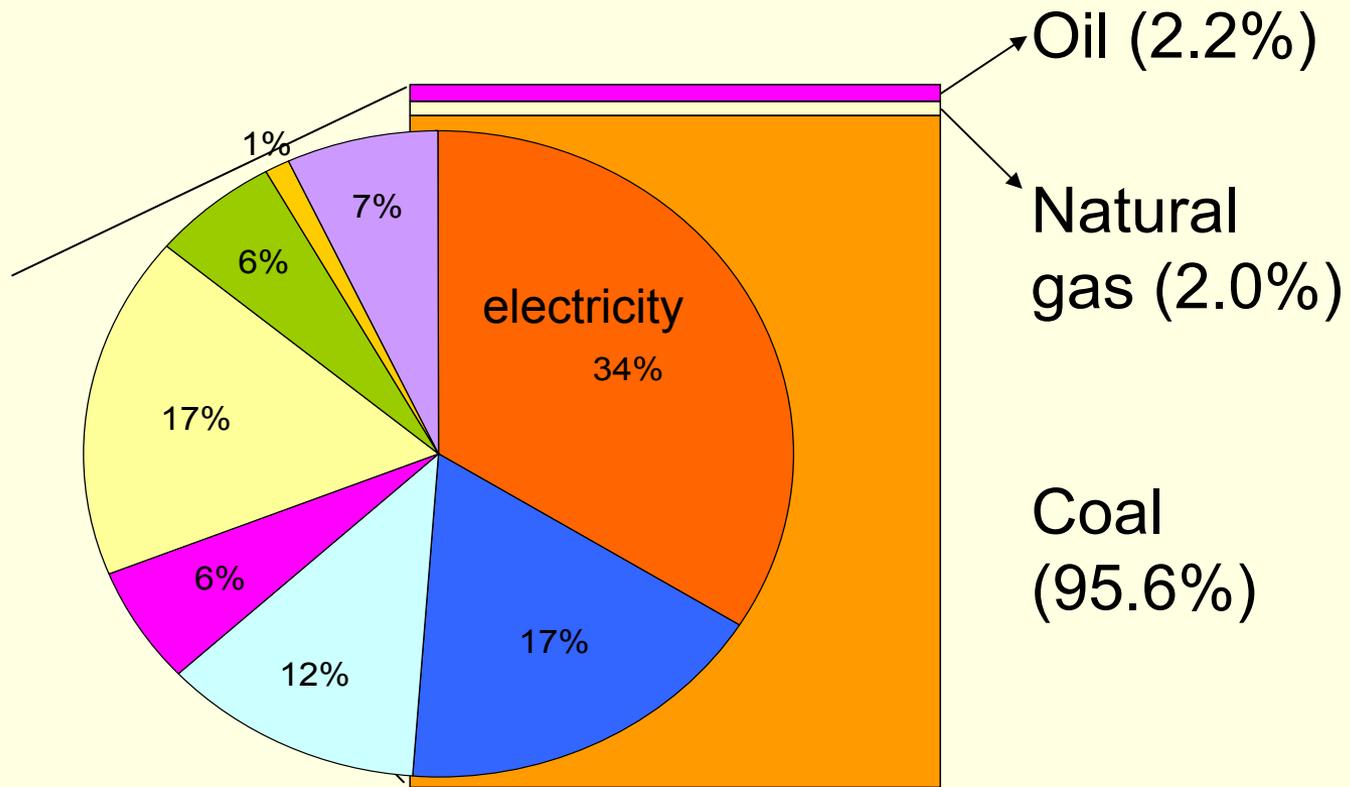
# Kansas GHG Emissions



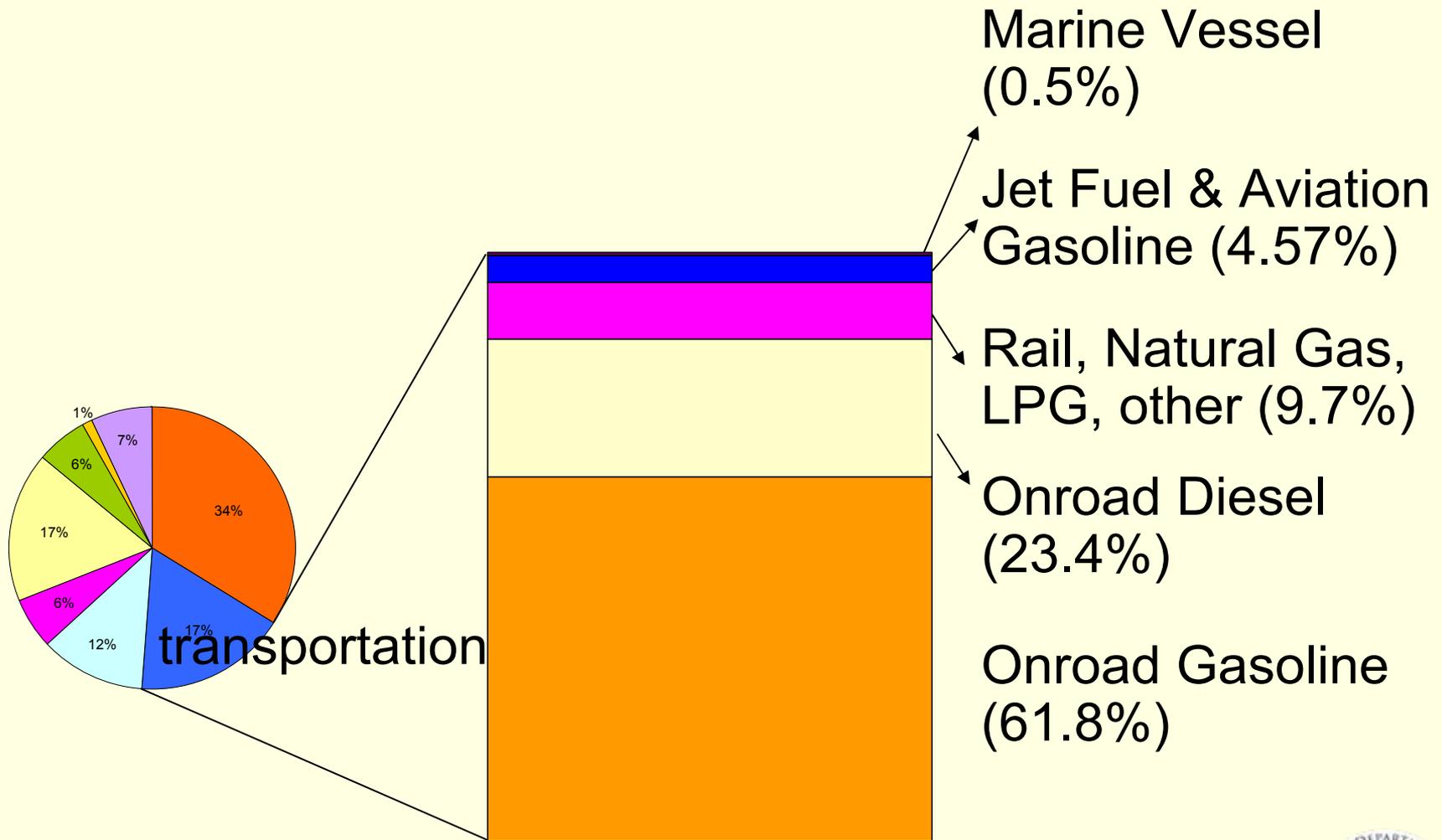
# 2005 GHG Emissions by Sector



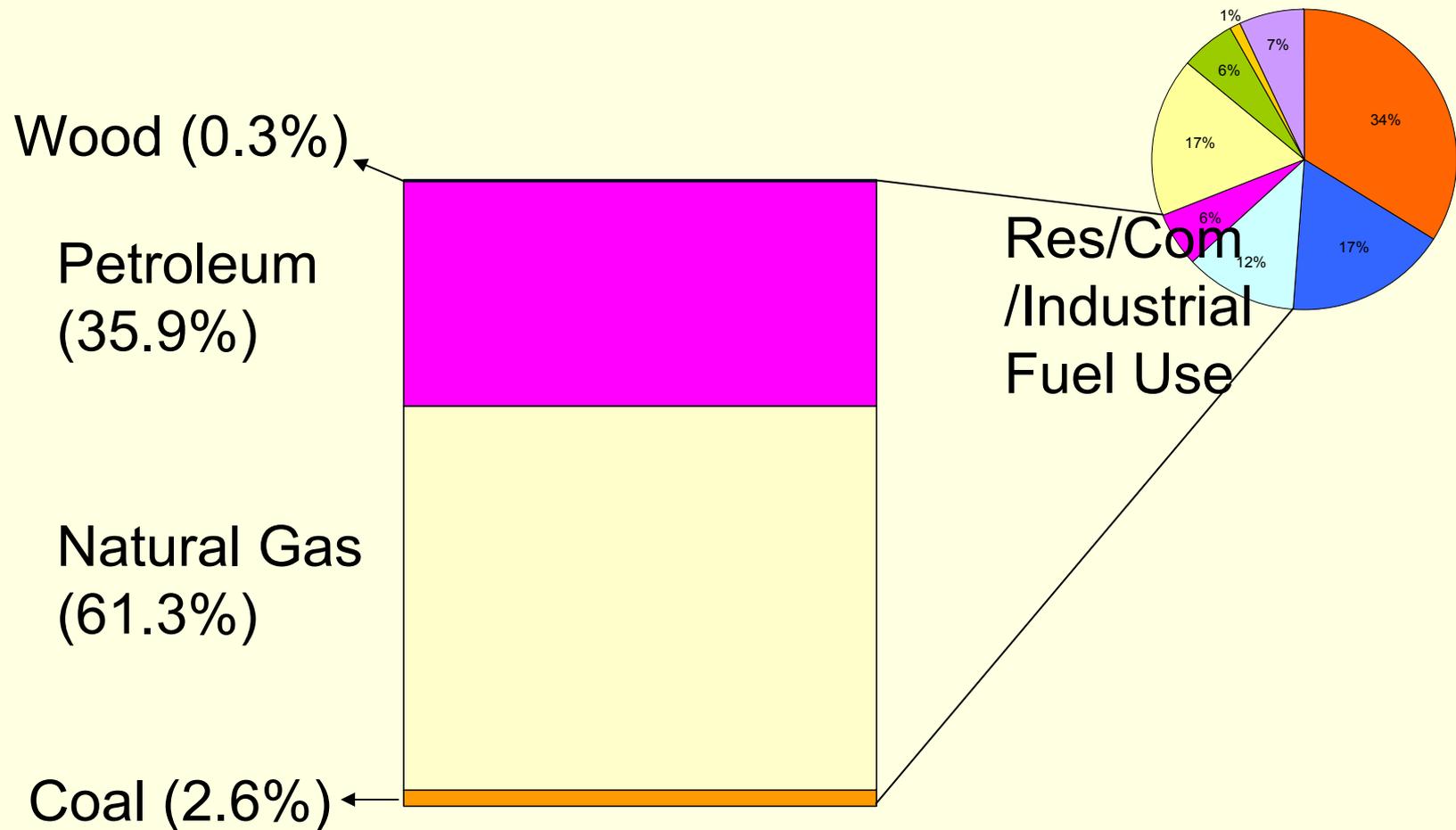
# Electricity Sector



# Transportation Sector



# Res/Comm/Industrial Fuel Use



# Agricultural/Rangeland Burning

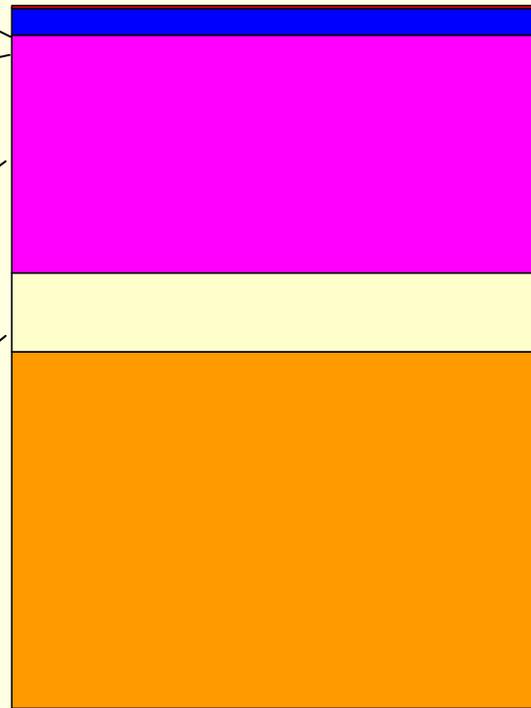
Agricultural  
burning (0.4%)

Rangeland  
burning (3.8%)

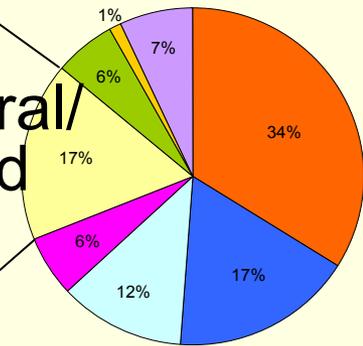
Enteric ferment.  
(33.8%)

Manure mgmt.  
(11.2%)

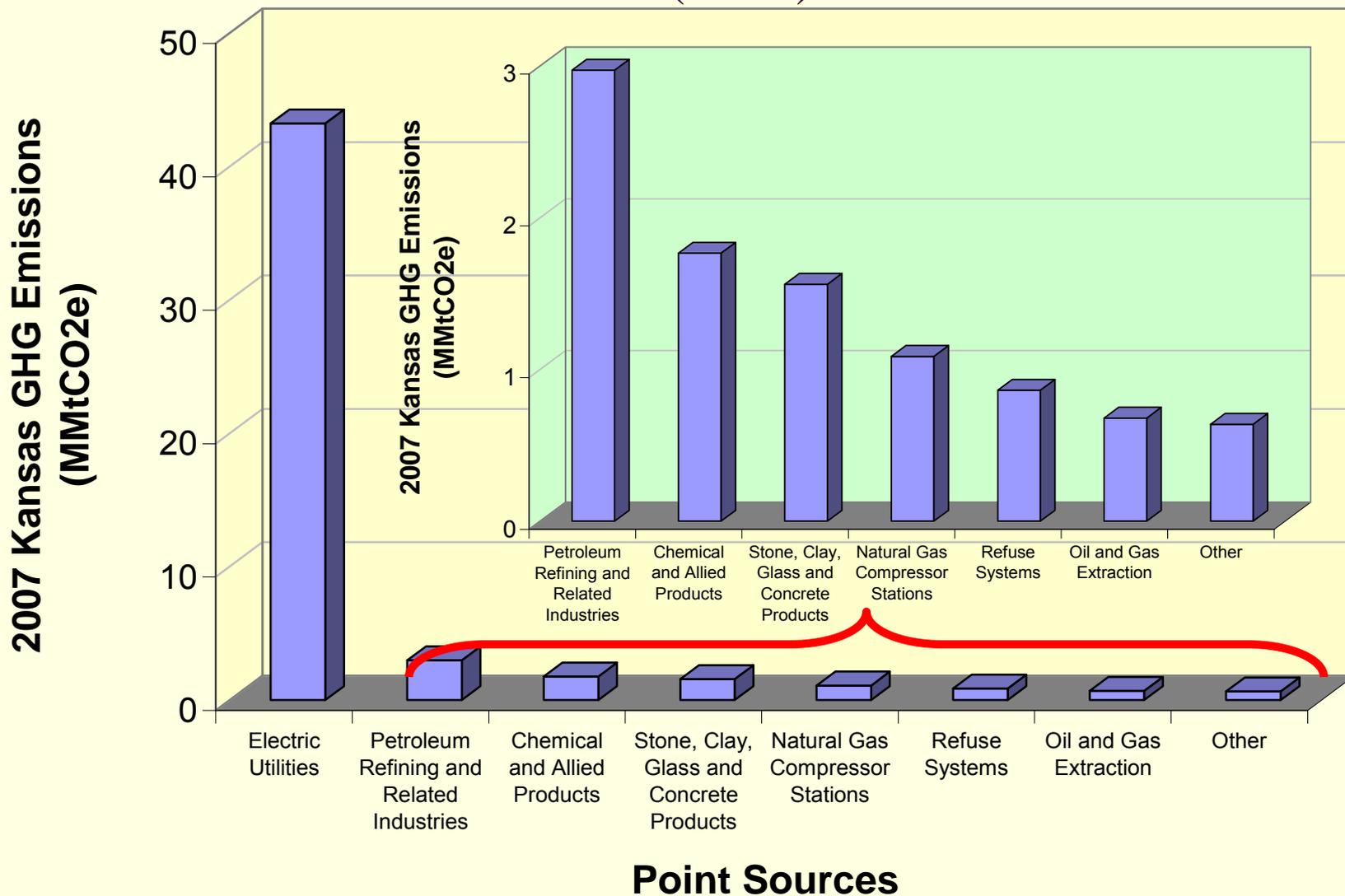
Agriculture  
soils (50.7%)



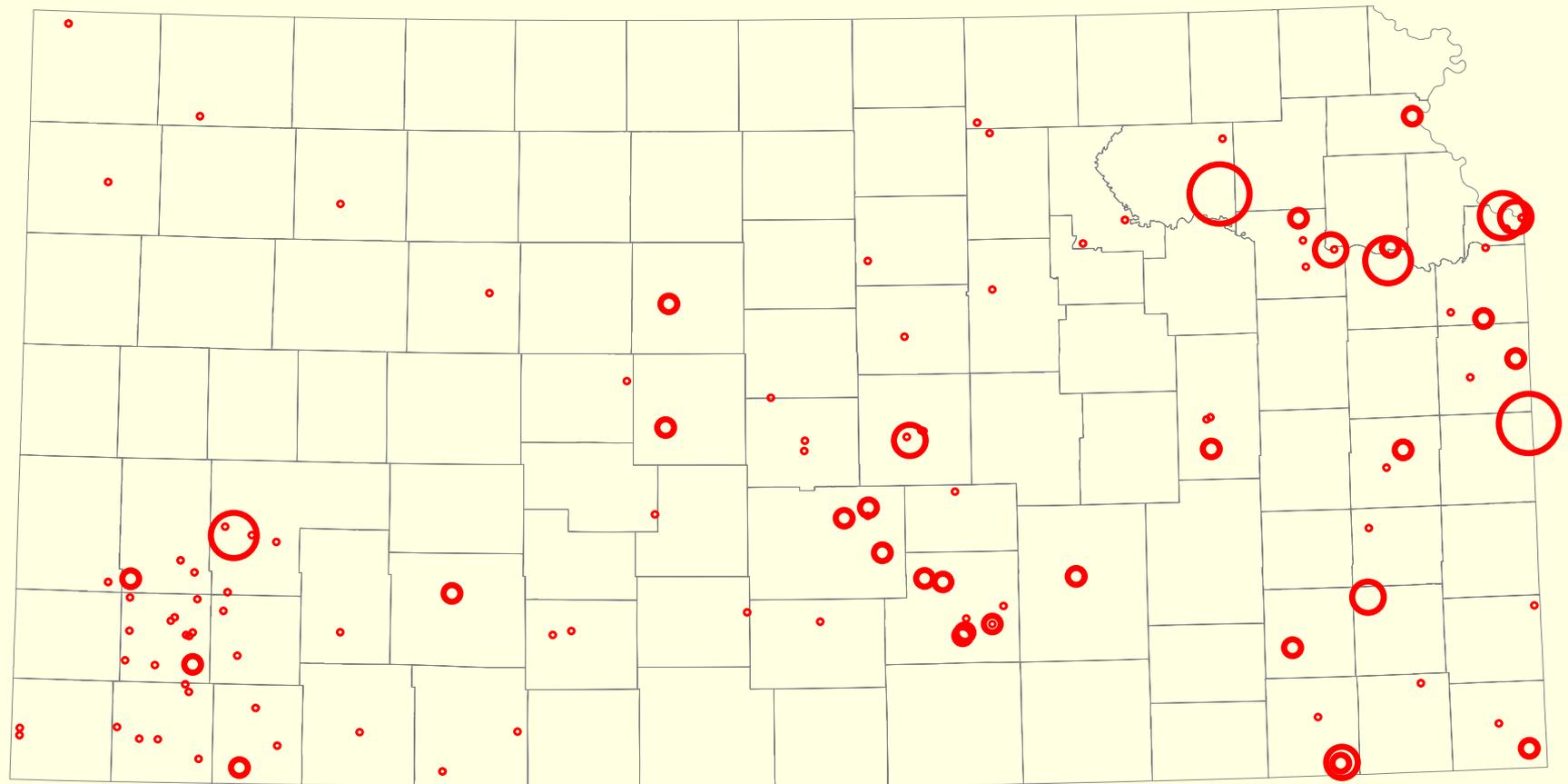
Agricultural/  
rangeland  
burning



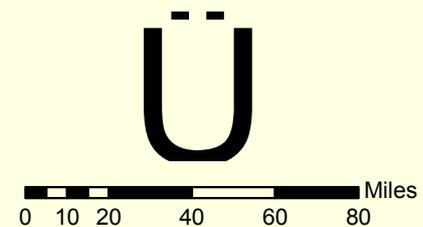
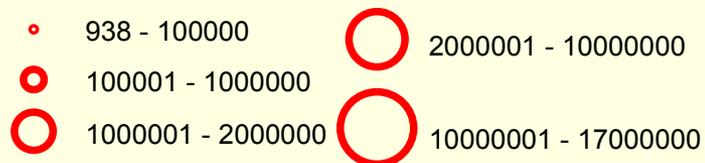
# Kansas GHG Emissions by Point Source (2007)



# 2007 Major Kansas GHG Point Sources



## Legend



# Questions?

