# Greenhouse Gas Emissions from Freight Trucks

International Emissions Inventory Conference

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# Overview

- **Characterize the magnitude of growth in freight truck GHG emissions, based on data from EPA *Inventory of U.S. Greenhouse Gas Emissions and Sinks***
- **Discuss factors affecting the rise in truck GHGs**
- **Implications**

## Primary Data Source - *Inventory of U.S. GHG Emissions and Sinks*

- **Prepared annually by EPA under United Nations Framework Convention on Climate Change (UNFCCC)**
- **Coordinated by EPA Office of Atmospheric Programs Includes transportation estimates developed by EPA Office of Transportation and Air Quality**
- **Relies extensively on data provided by the Energy Information Administration (EIA) of the U.S. Department of Energy**

# Accounting for Transportation GHGs in the Inventory

## Included in Transportation Sector Estimates

- Tailpipe emissions (from use of energy to power vehicles)
- HFCs from mobile air conditioners
- Natural gas used to power pipelines, but not electricity

## Not Included

- Ozone-depleting substances, which are not counted in national totals
- Agriculture and construction equipment (generally represented in the industrial sector)
- Most lifecycle GHGs
- International bunker fuels
  - Reported in Inventory
  - Not included in national GHG totals or transportation estimates

# Growth in U.S. GHG Emissions by Economic Sector

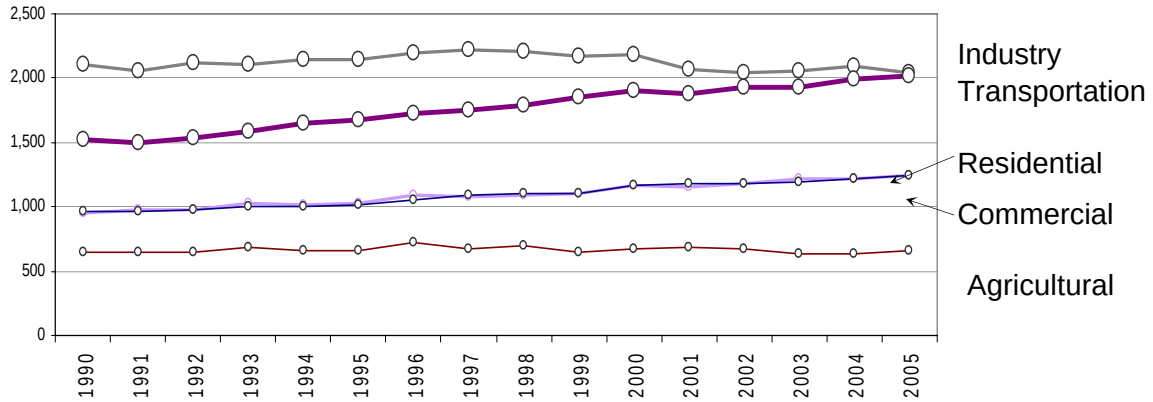
**1990-2005**

- Total U.S. GHG Emissions up 16 percent (annualized rate of just over 1 percent)
- Transportation GHG emissions up 32 percent (annualized rate of 1.87 percent)
- Transportation accounted for 49 percent of the growth in total U.S. GHG emissions since 1990

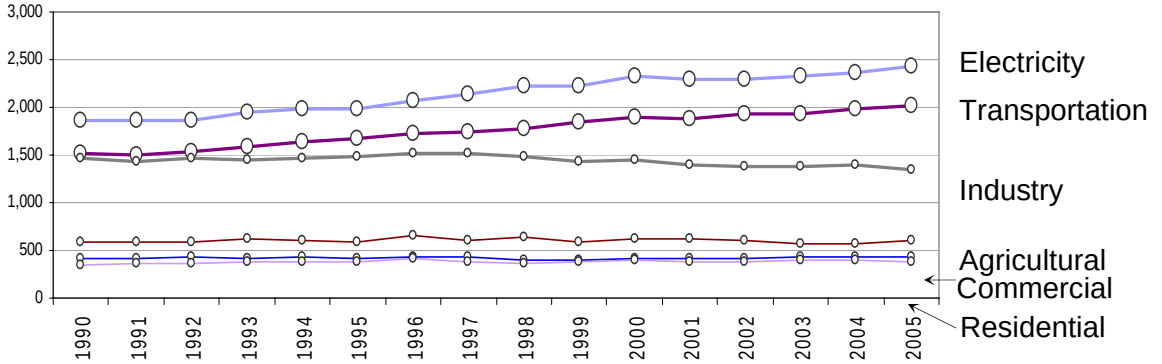
**2004-2005**

- Total U.S. GHGs up 0.8 percent
- Transportation GHGs up 1.4 percent

U.S. Greenhouse Gas Emissions by End-Use Economic Sector




U.S. Greenhouse Gas Emissions by Economic Sector



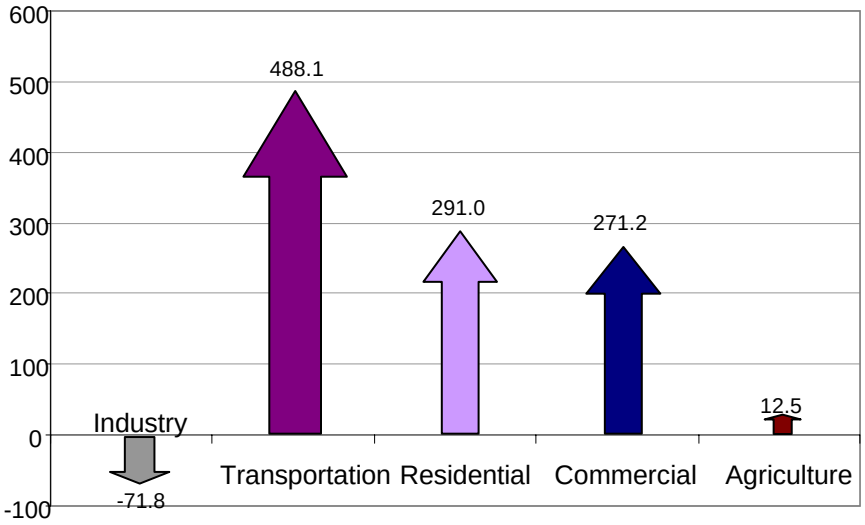

Estimates do not include emissions from U.S. Territories

Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2005

# Growth in U.S. GHG Emissions by Economic Sector

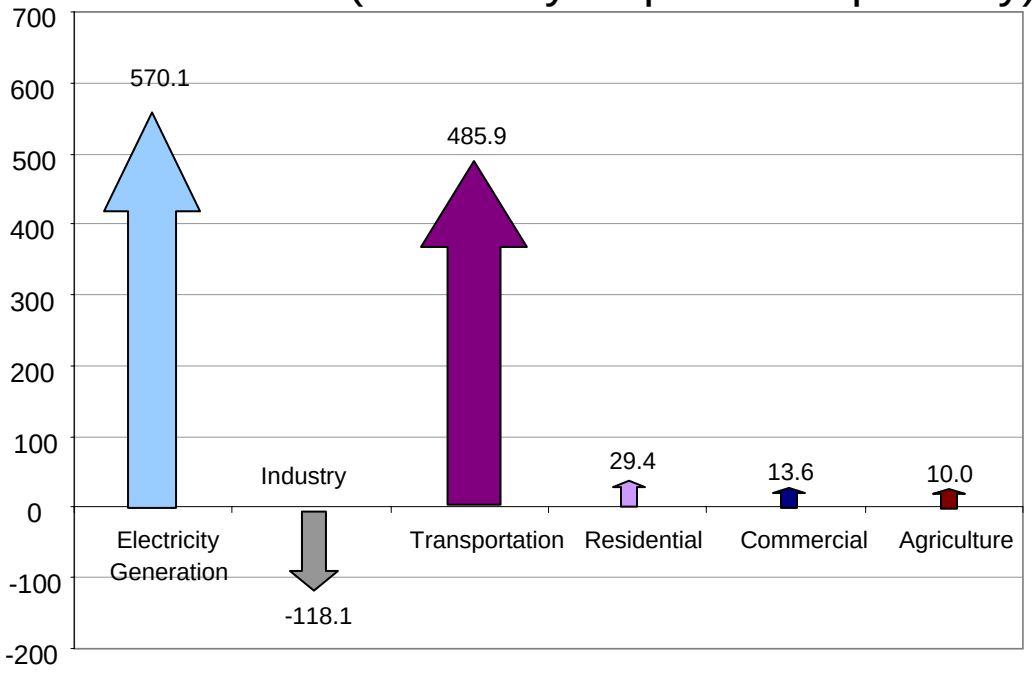
End-Use Economic Sectors

(Electricity Distributed)




Economic Sectors

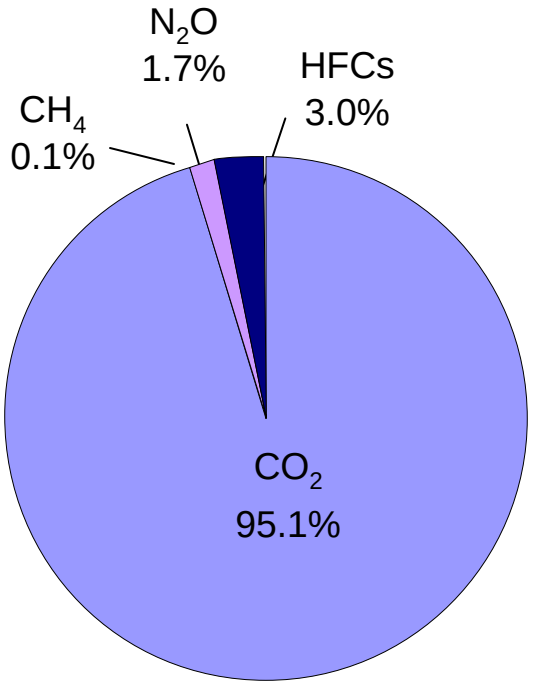
(Electricity Reported Separately)




Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2005

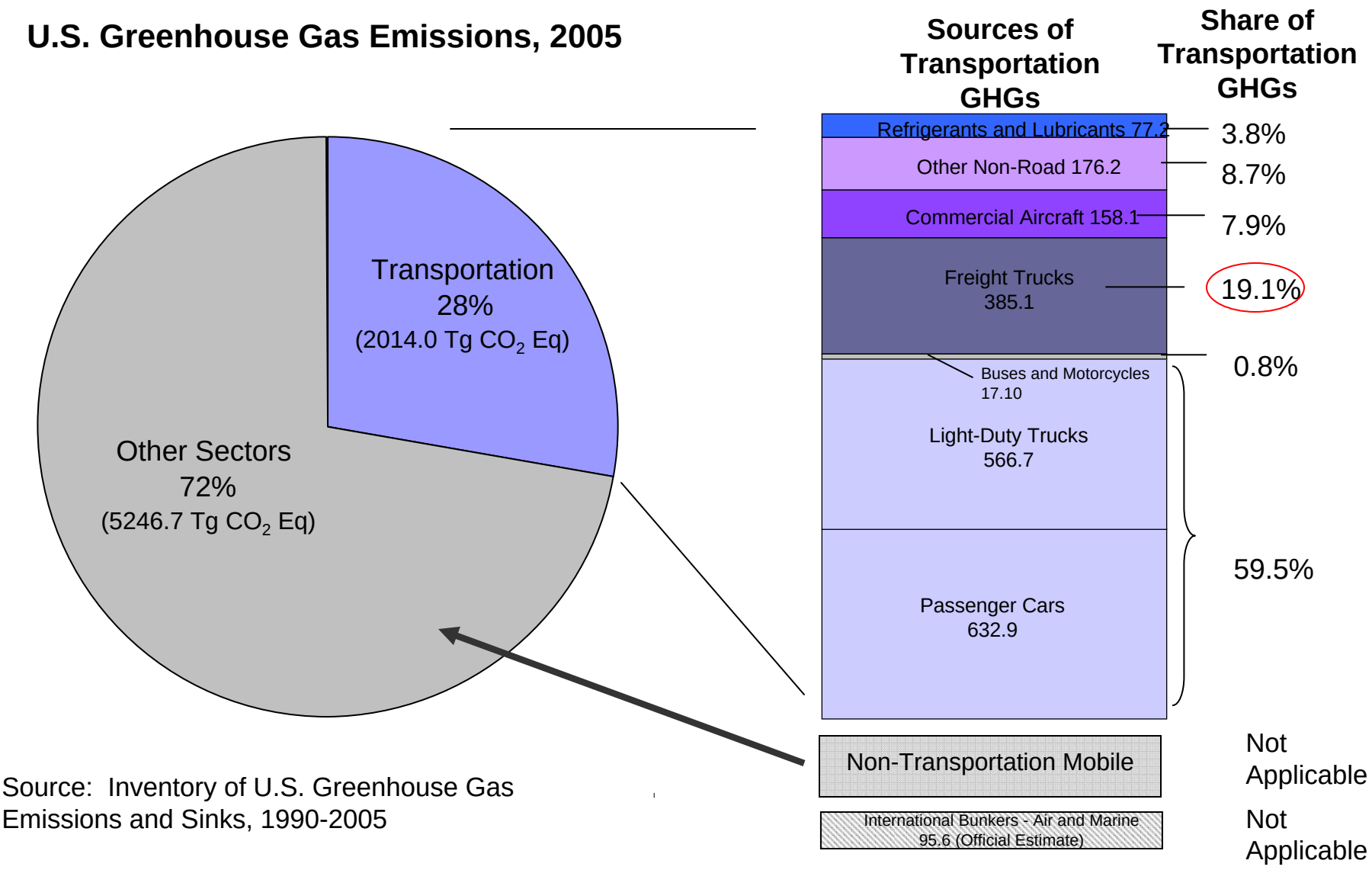
# GHGs from the U.S. Transportation Sector

- Since most transportation GHGs are in the form of CO2, transportation GHGs correlate closely with energy consumption
- HFCs from refrigerants
- CH4 and N2O affected by tailpipe control technologies



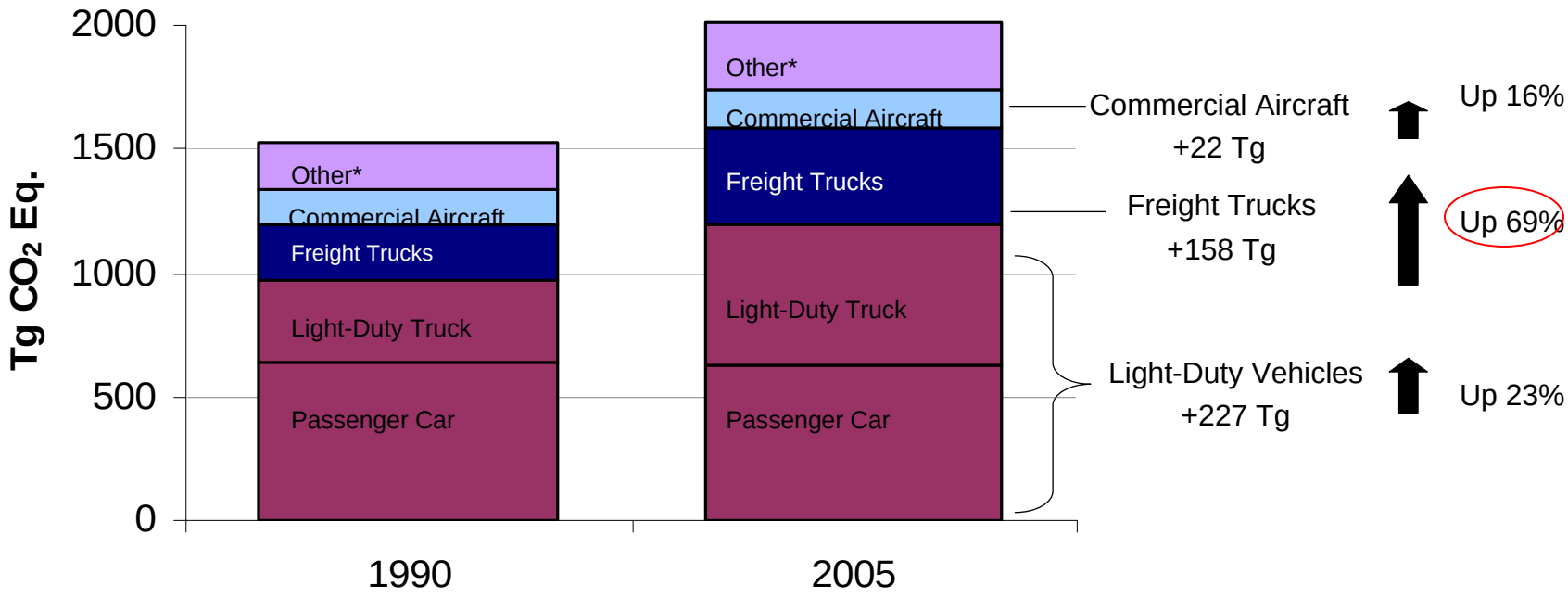

Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2005

# Transportation Source GHGs Relative to Total U.S. Emissions




Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2005

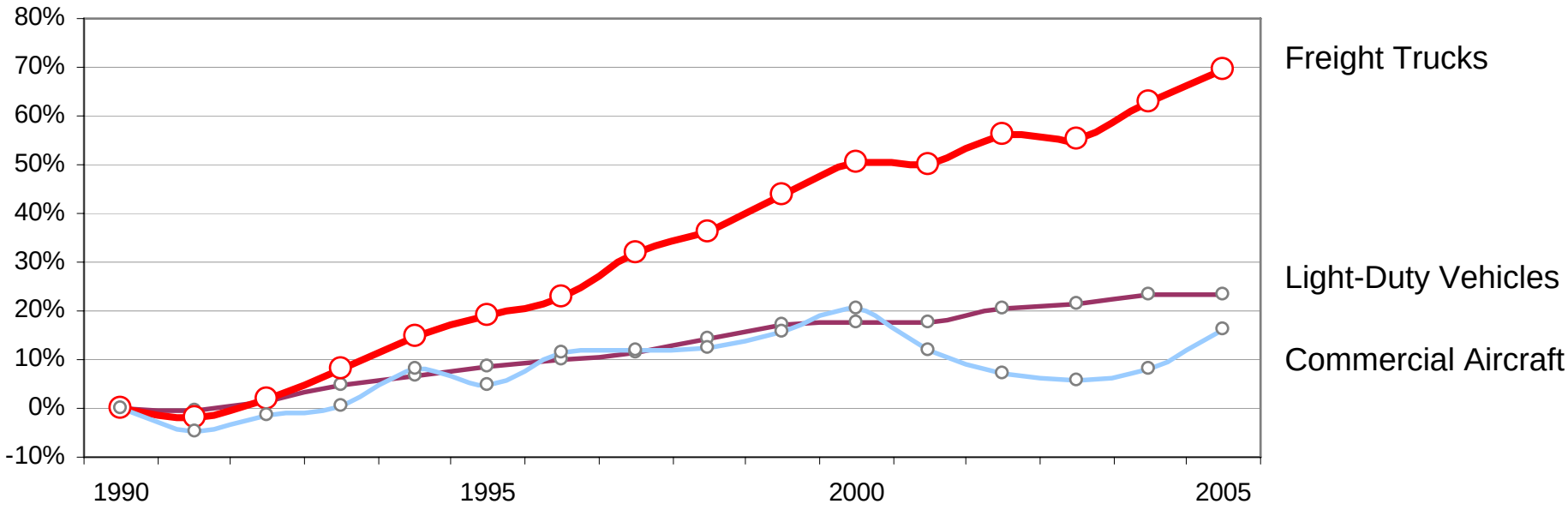
# Transportation GHG Emissions by Major Source, 1990 and 2005




*Includes emissions from HFCs (including mobile AC and refrigerated transport), lubricants boats and ships, locomotives, pipelines, general aviation aircraft, military aircraft, motorcycles, buses. HFCs were introduced in the early 1990s as a replacement for CFCs and HCFCs.

Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2005

# Change in GHGs from Major Transportation Sources, 1990-2005




Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2005

**1990-2005**

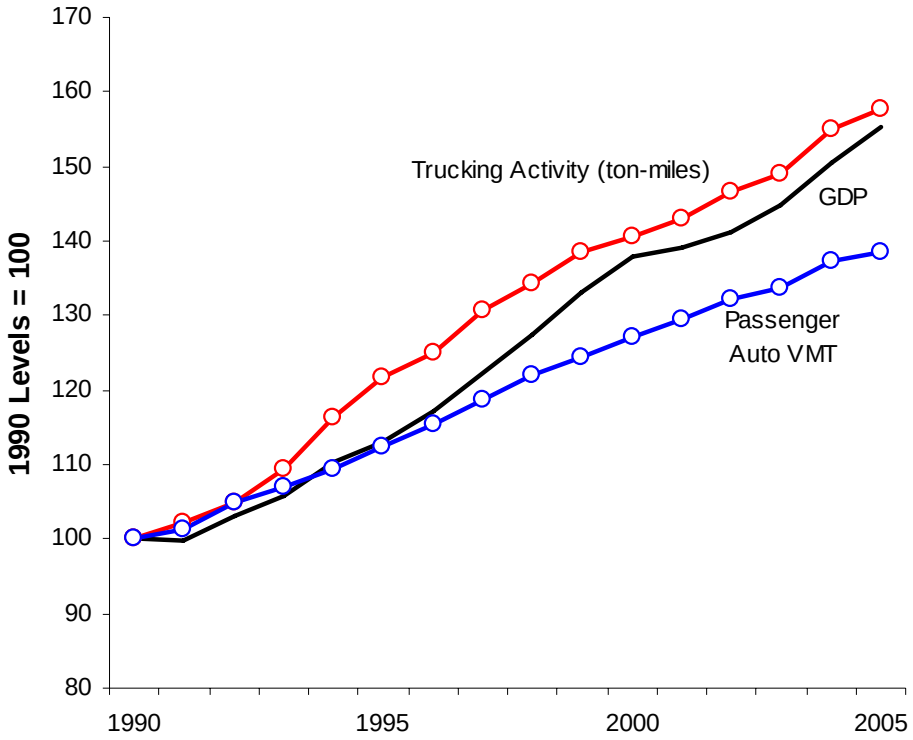
Freight Truck GHGs increased 69.4 percent (3.6 percent annualized)

**2004-2005**

GHGs increased 4.3 percent

- Fuel prices not enough to trigger improvements in fuel economy, operational efficiencies or affect mode shifts

# Variables affecting travel activity (Passenger and Freight)



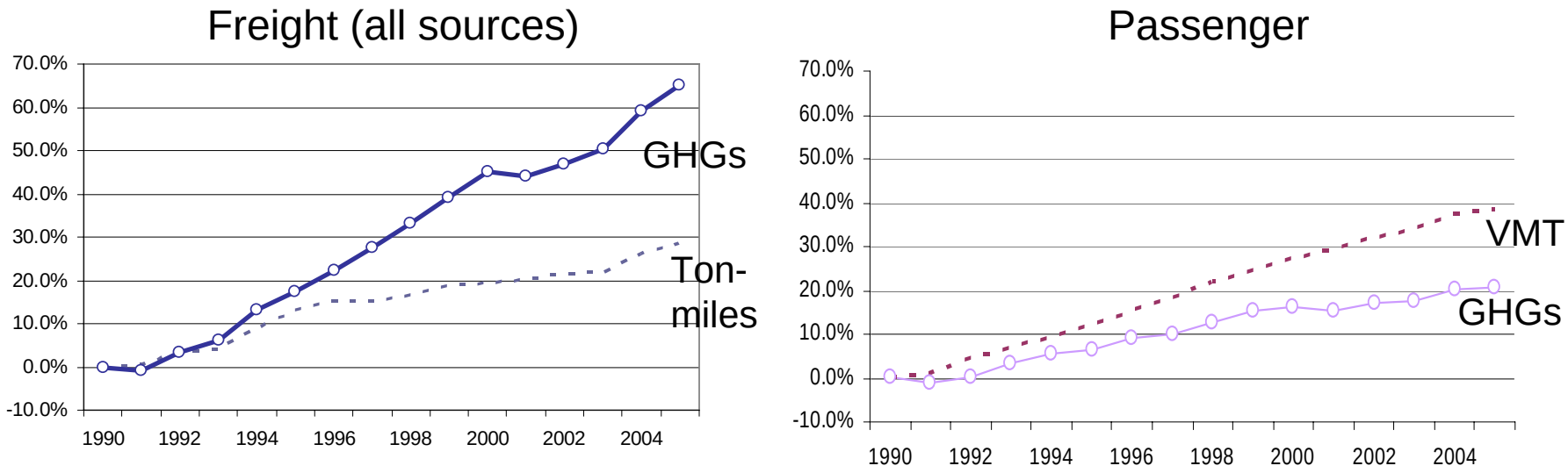

Source: BTS Transportation Statistics 2005

**Conventional wisdom**:

Freight movement correlated with GDP

Passenger travel correlated with population growth

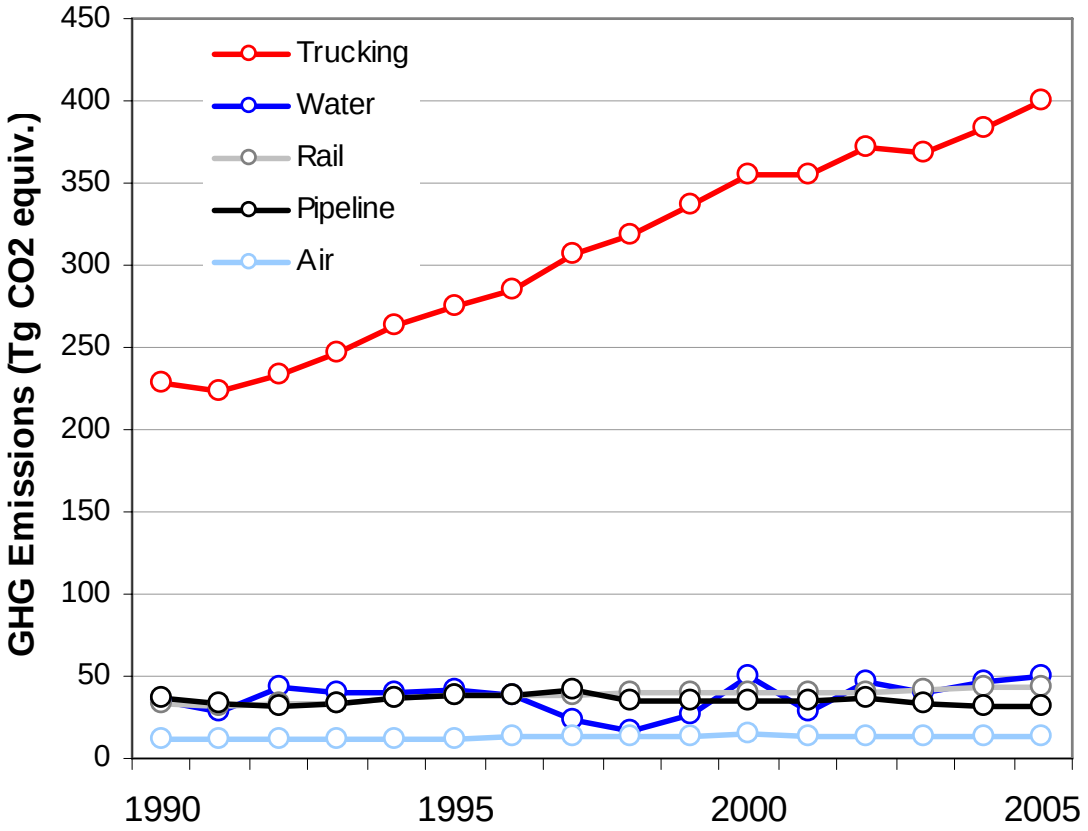
# GHG Emissions and Activity – Passenger and Freight




Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2005

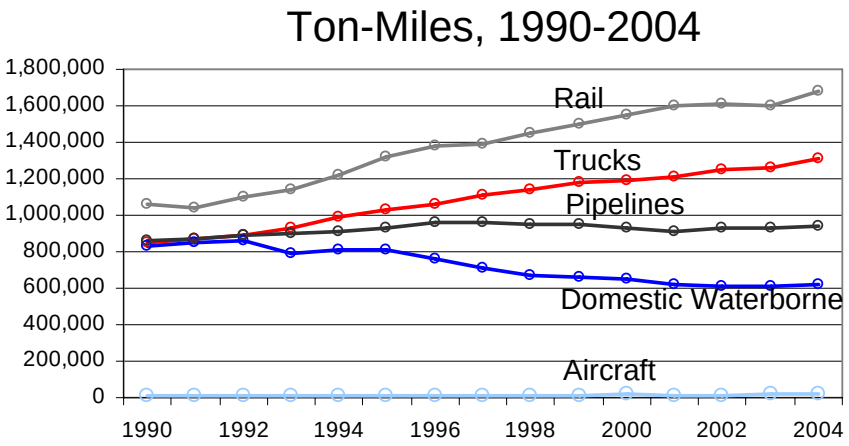
Freight movement is increasingly reliant on energy-intensive modes – especially freight trucks

# GHG Emissions by Freight Mode, 1990-2005



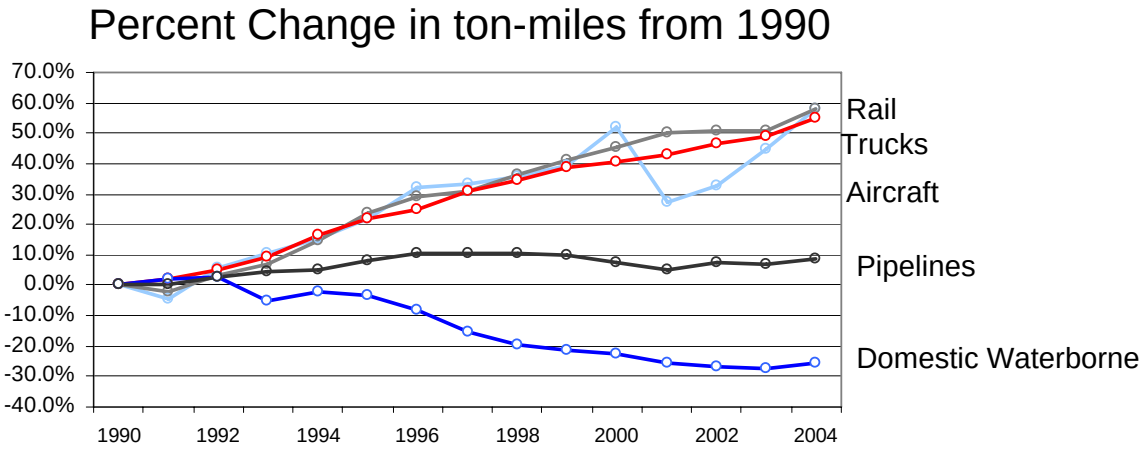

Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2005

# Freight Activity by Mode



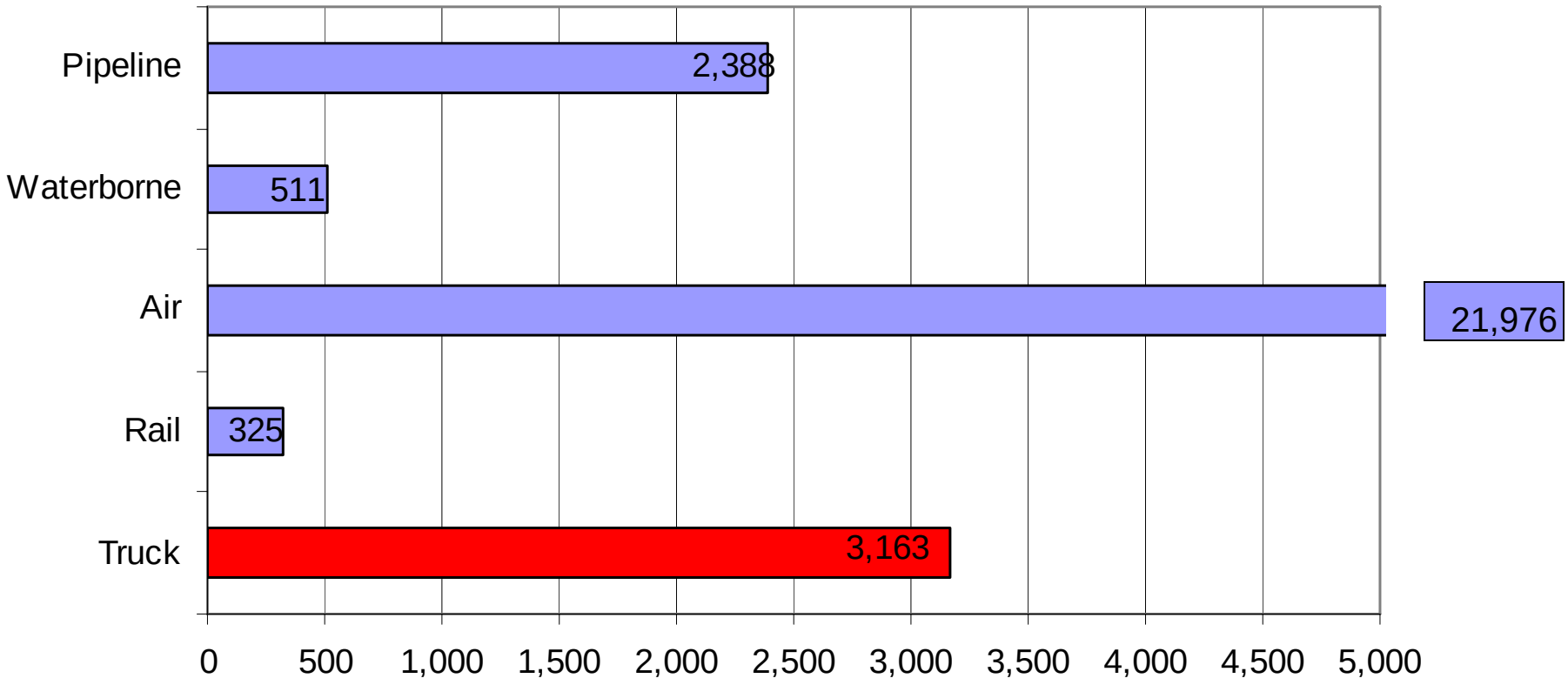

Truck ton-miles increased substantially, but…

- Growth was less than rail in absolute terms
- Growth rate was comparable to rail and aircraft



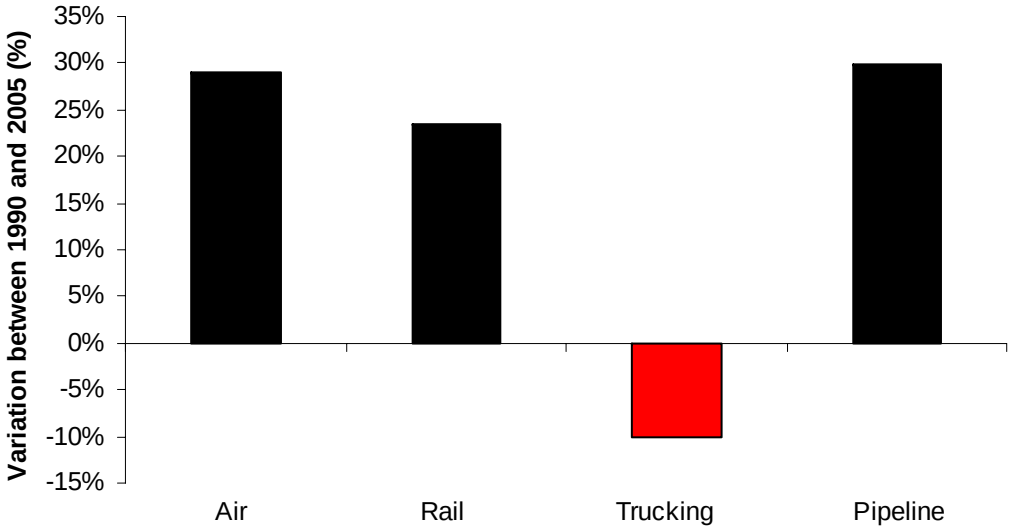

Source: BTS Transportation Statistics 2005

# Energy Intensity of Freight Modes in 2004 (BTU / ton-mile)




Source: PNNL 2004

# Change in Energy Efficiency by Mode, 1990 to 2005




Tractor trailers became 12 percent less fuel efficient

Calculated from BTS 2005

# Mechanical explanations for the decreased fuel efficiency of combination trucks

- *Not* increased vehicle age:  the average truck seems to be getting newer (5.4 years in 2002, vs. 6.4 years in 1992
- Demand for more powerful engines?
- Implementation of $NO_X$ and PM control devices?

# Operational factors affecting Trucks' measured energy efficiency

- Growth in the number of small shipments

(just-in-time)

- Increase in the number of "empty miles" traveled (result of globalized trade)
- Increase in the amount of idling because of congestion in certain urban areas

# Impact of Fuel Costs on Truck Fuel Efficiency and Utilization

- Fuel prices not enough to trigger improvements in fuel economy, operational efficiencies or affect mode shifts
- In 2003, fuel represented 8 percent of trucking costs
  - Wages and benefits 46 percent
  - Equipment 27 percent

Has truck fuel efficiency bottomed out?

Thank
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