

# Taking the Car out of Carbon

Smart City Kyoto

May 20, 2015

Projjal K. Dutta, AIA, LEED AP

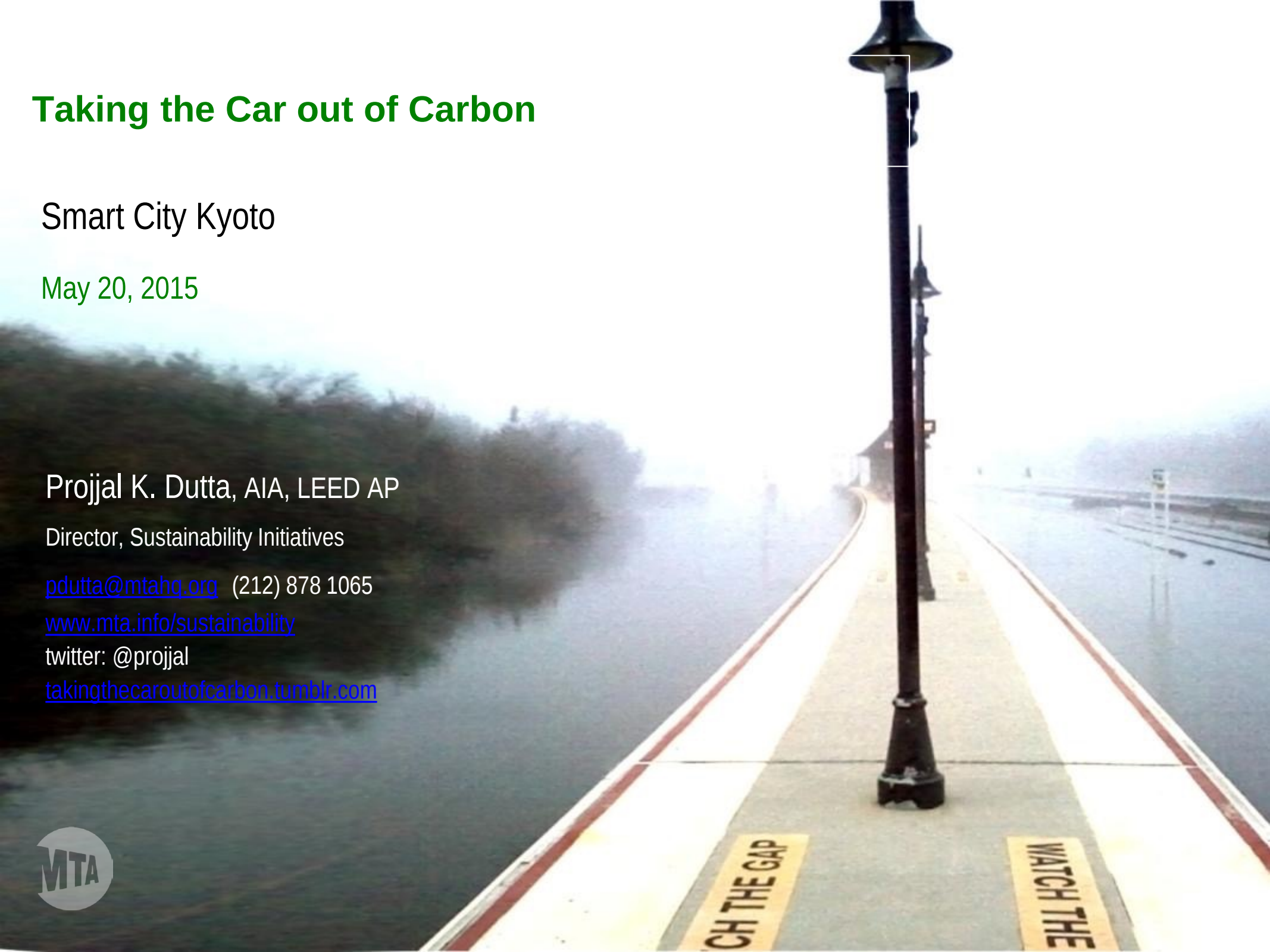
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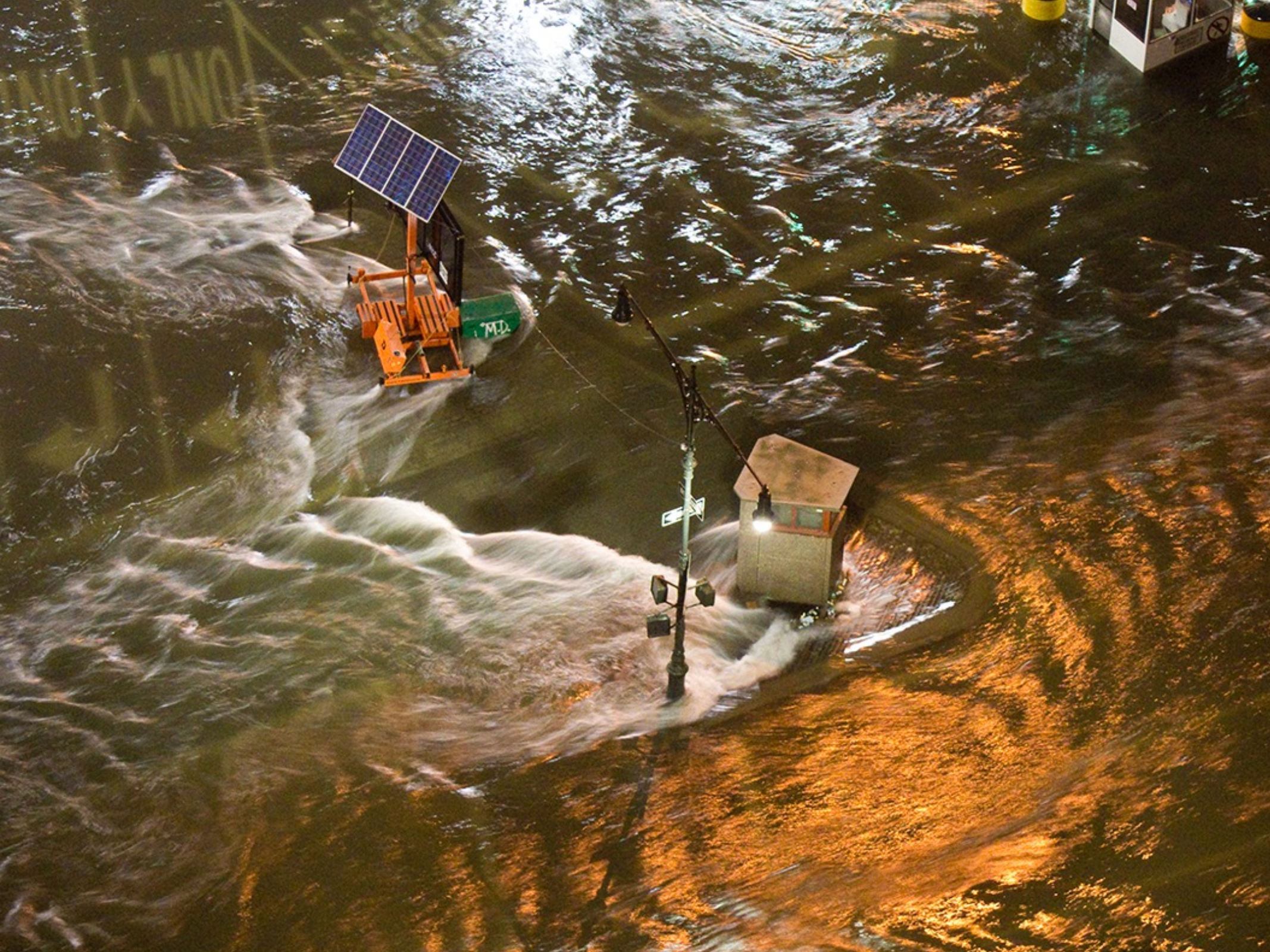


# Adaptation and Climate Change















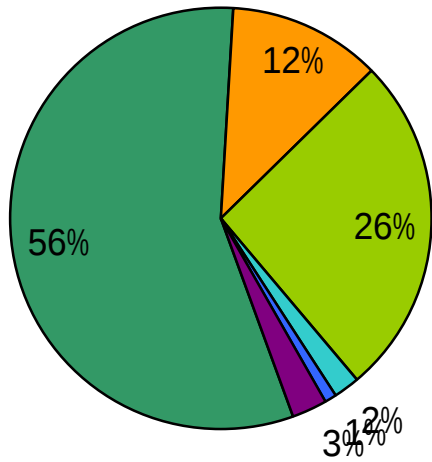


# **Energy Consumption & Sustainability: Macroview**

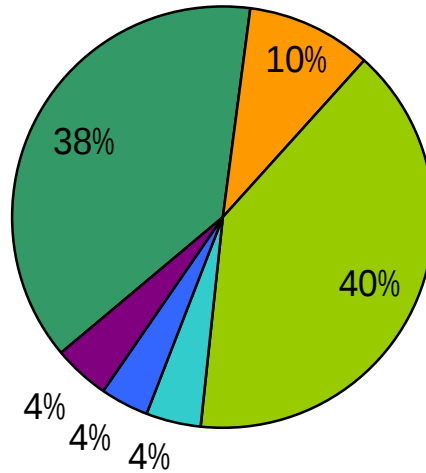


# Energy Consumption by Sector, 2005

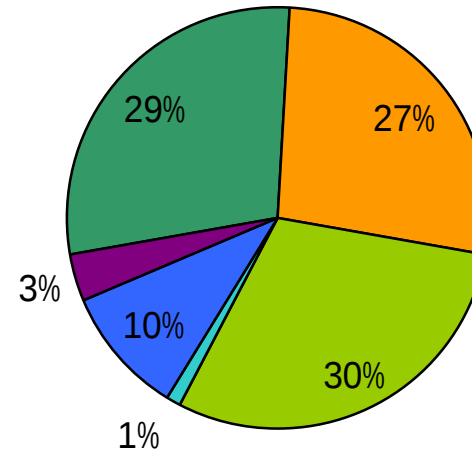
**India**



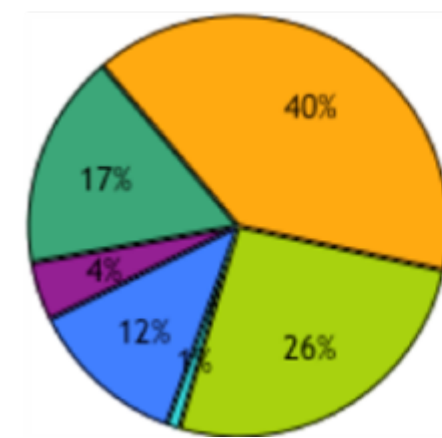
**China**



**Germany**



**USA**

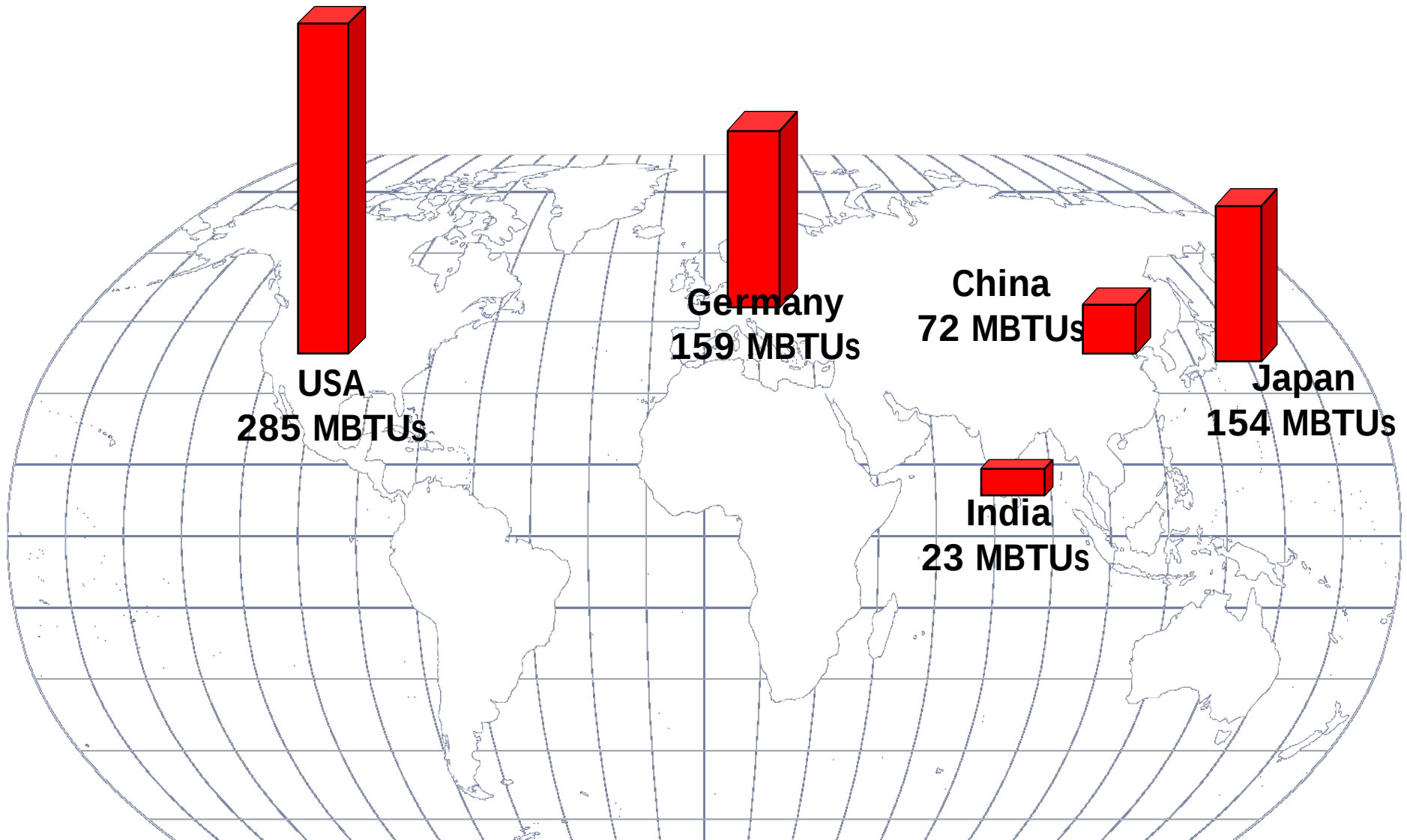


● Residential  
● Agriculture

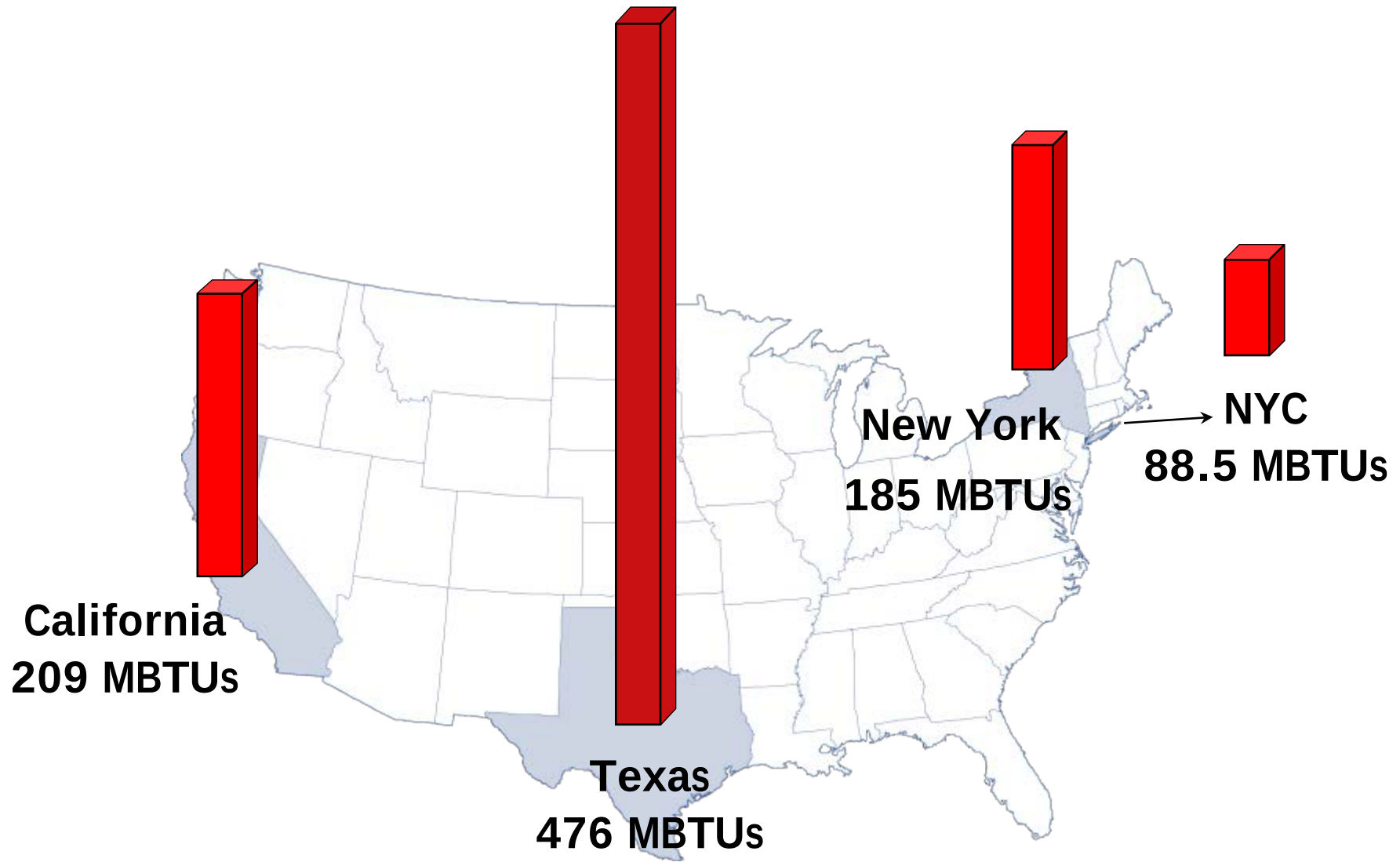
● Transportation  
● Commercial

● Industry  
● Other

# Total Energy Consumption per Capita, 2012



# Total Energy Consumption per Capita, 2011



# Energy Consumption & Sustainability: Microview



# Energy Consumption: Tall Urban Building vs. Low-Rise Office Park

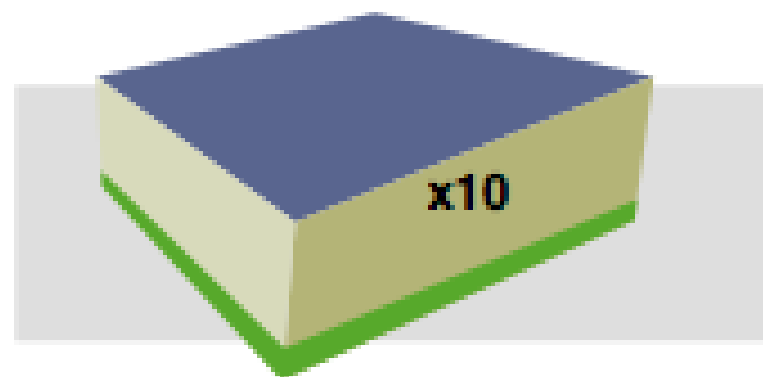
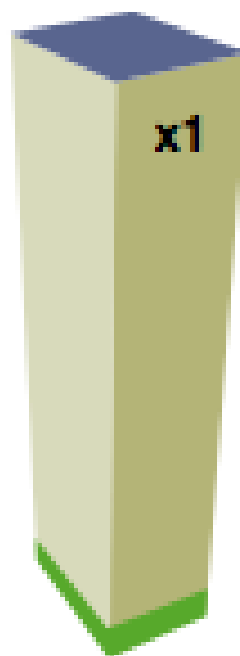


# Energy Consumption: Tall Urban Building vs. Low-Rise Office Park

**Number of buildings**

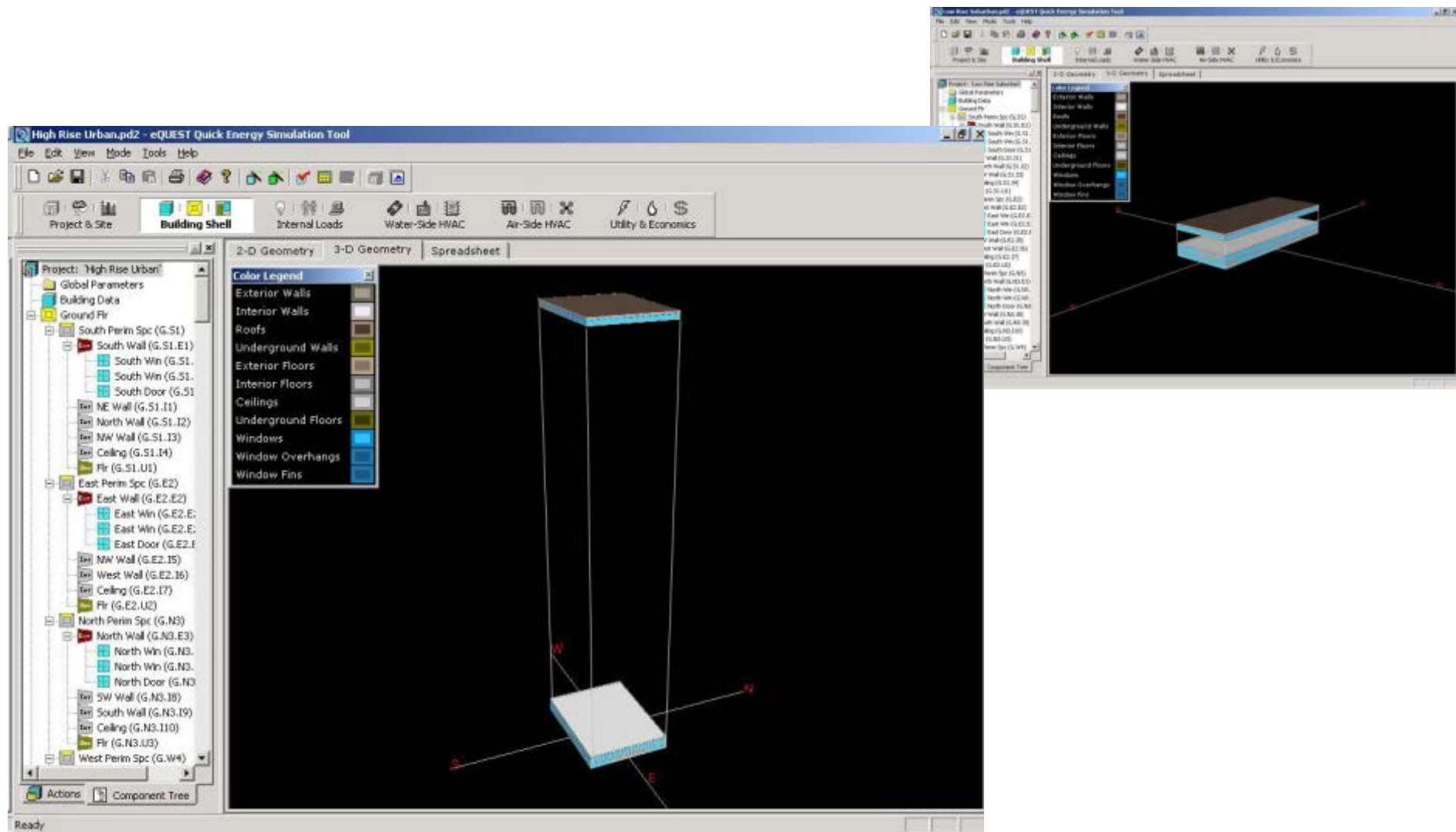
**High-Rise: 1**

**Low-Rise: 10**

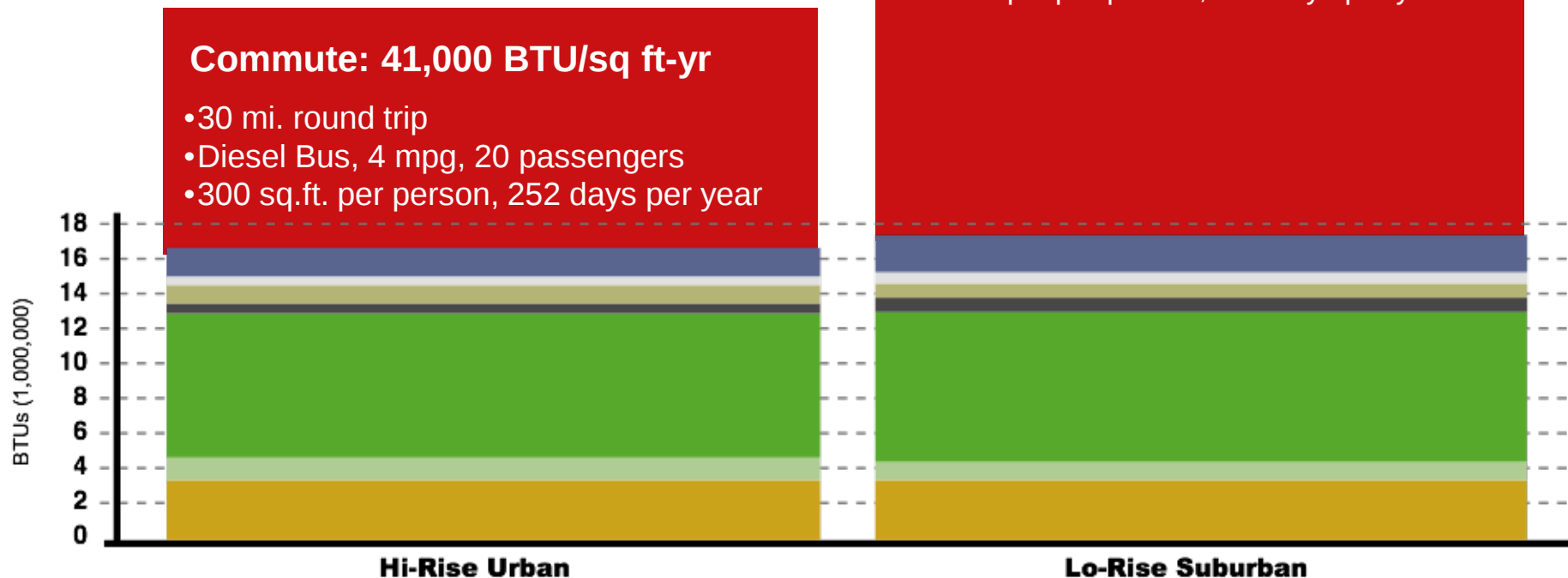


|                    |            |              |
|--------------------|------------|--------------|
| Average floor size | 30,612 sf  | 36,000 sf    |
| Area of roof       | 88,000 sf  | 375,000 sf   |
| Area of ext. wall  | 343,000 sf | 385,000 sf   |
| Area for parking   | 0 sf       | 1,837,500 sf |

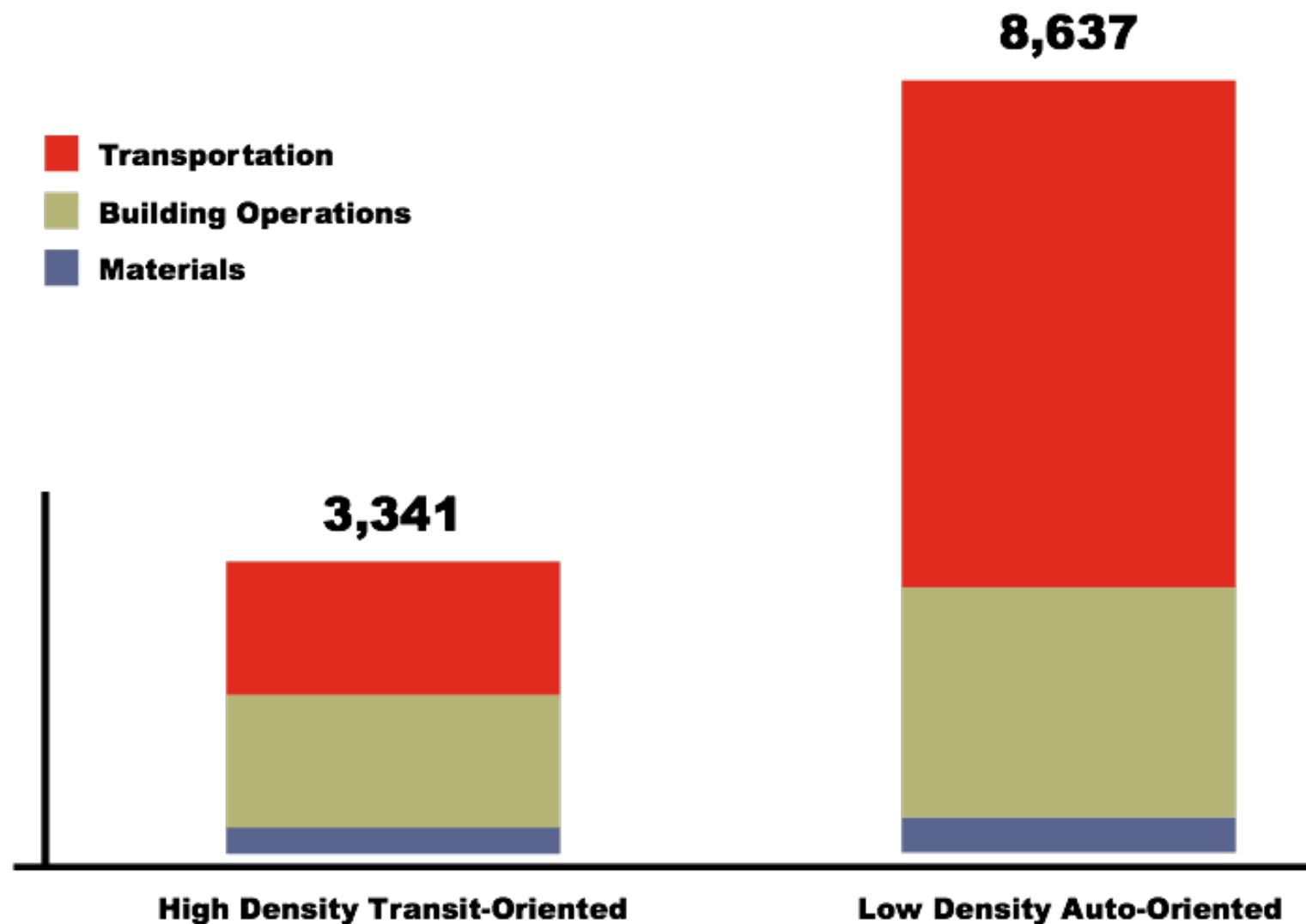
# Energy Consumption: Tall Urban Building vs. Low-Rise Office Park



# Energy Consumption: Tall Urban Building vs. Low-Rise Office Park



# GHG Per Person: Kg CO2E (Carbon dioxide equivalent) pa.



**Taking the carbon out of the car**

**Vs**

**Taking the car out of carbon**



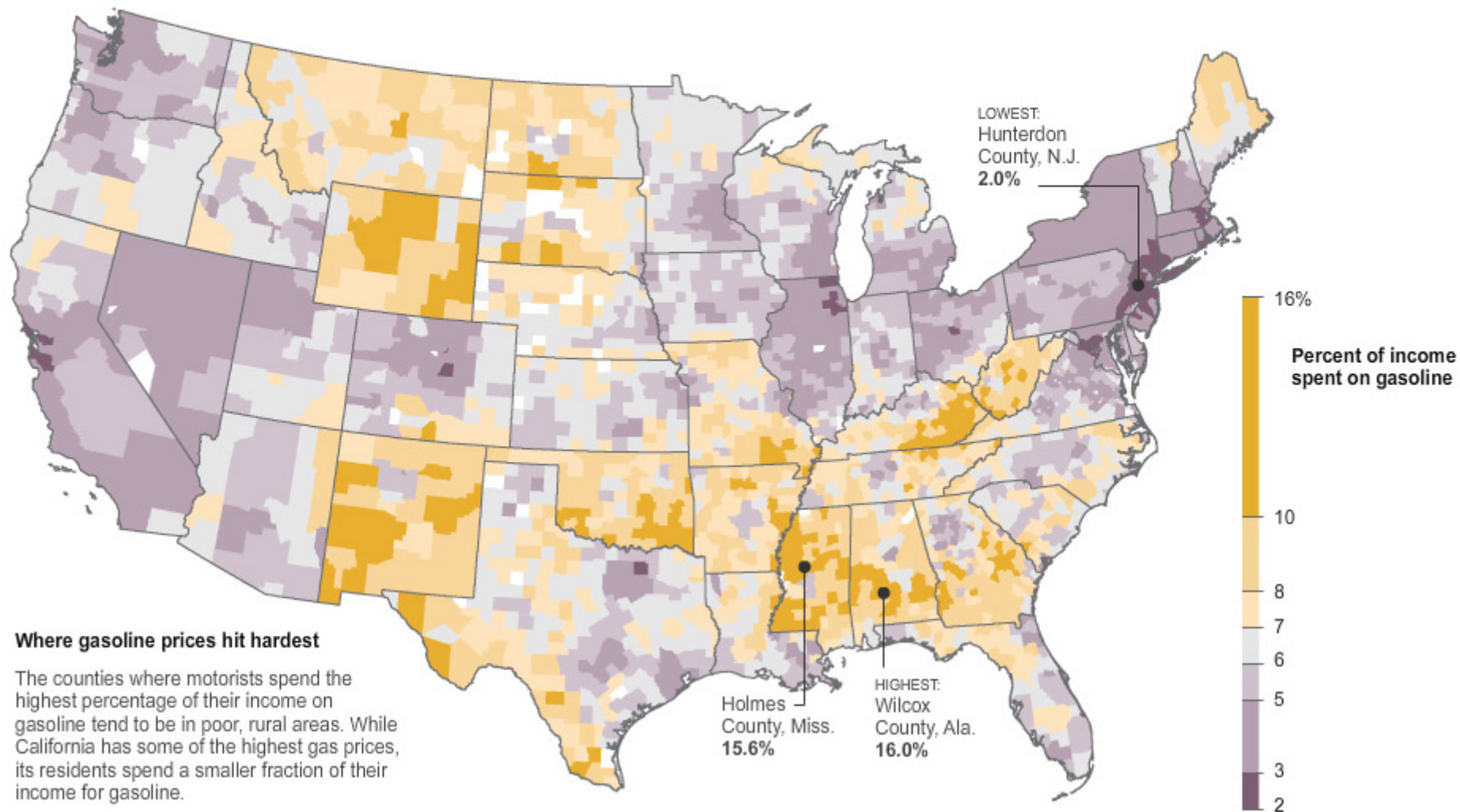
# The Varying Impact of Gas Prices

Gas prices are high throughout the country, but how hard they hit individual families depends on income levels, which vary widely.

PERCENT OF INCOME ON GAS

GAS PRICES

MEDIAN INCOME



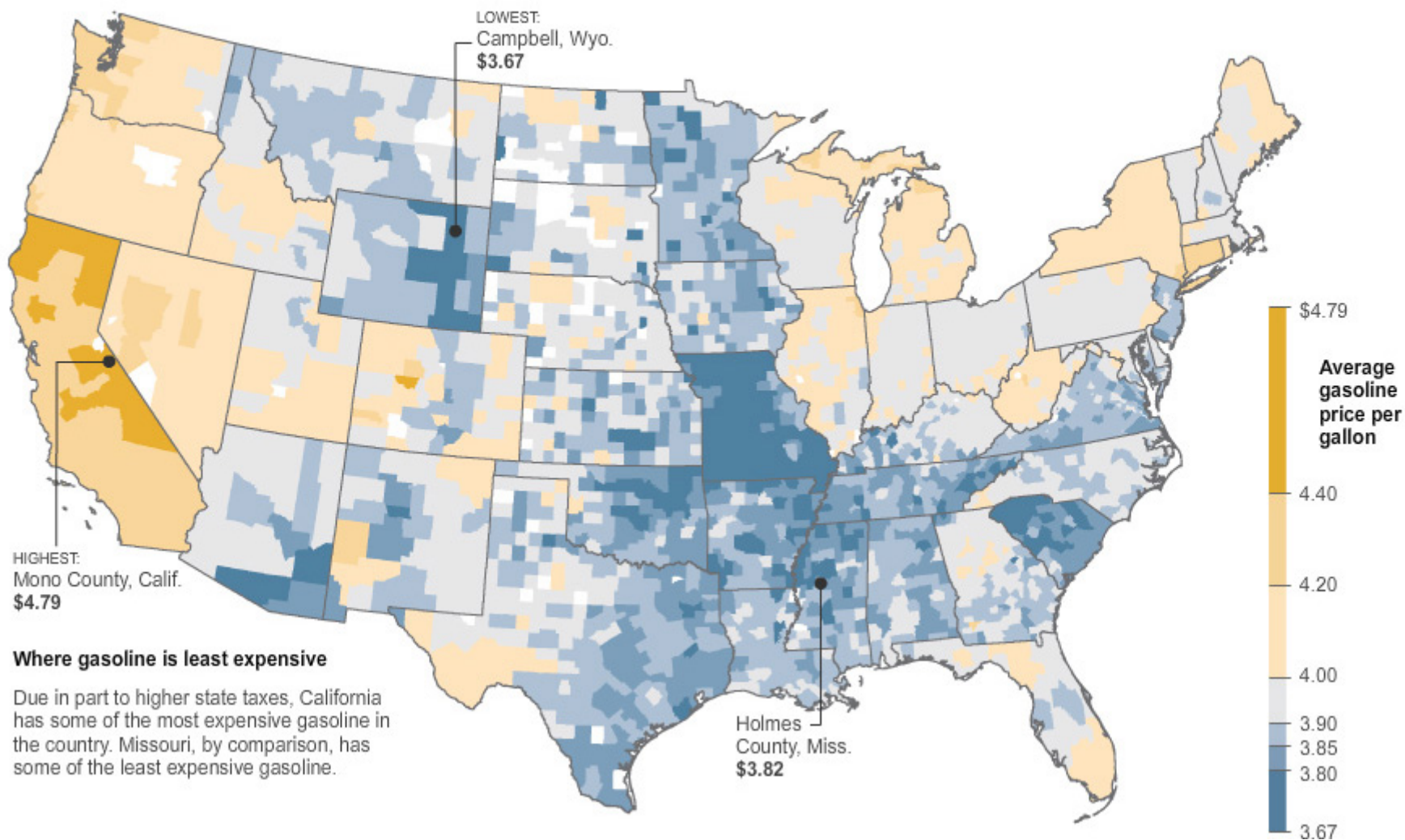
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PERCENT OF INCOME ON GAS

GAS PRICES

MEDIAN INCOME



# Public Transportation and Public Health

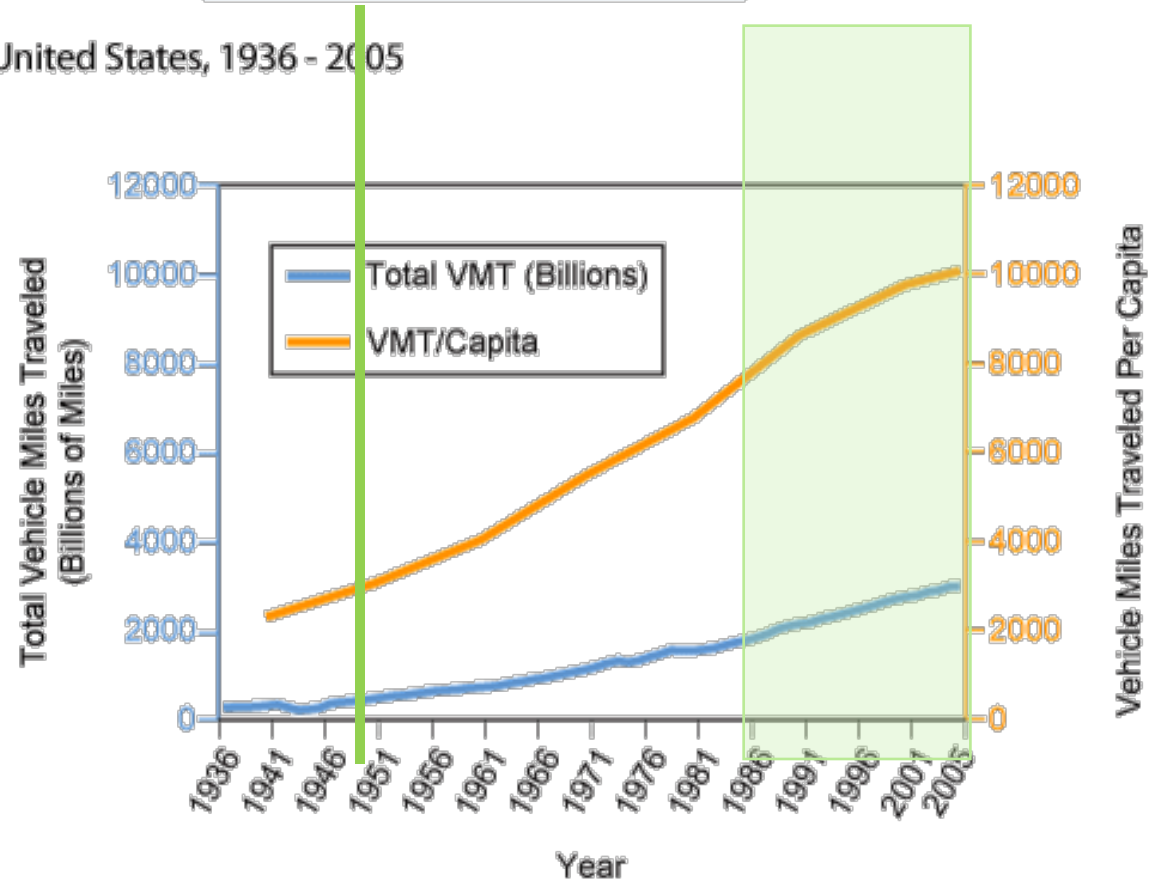




# Vehicle Miles Traveled trend-lines

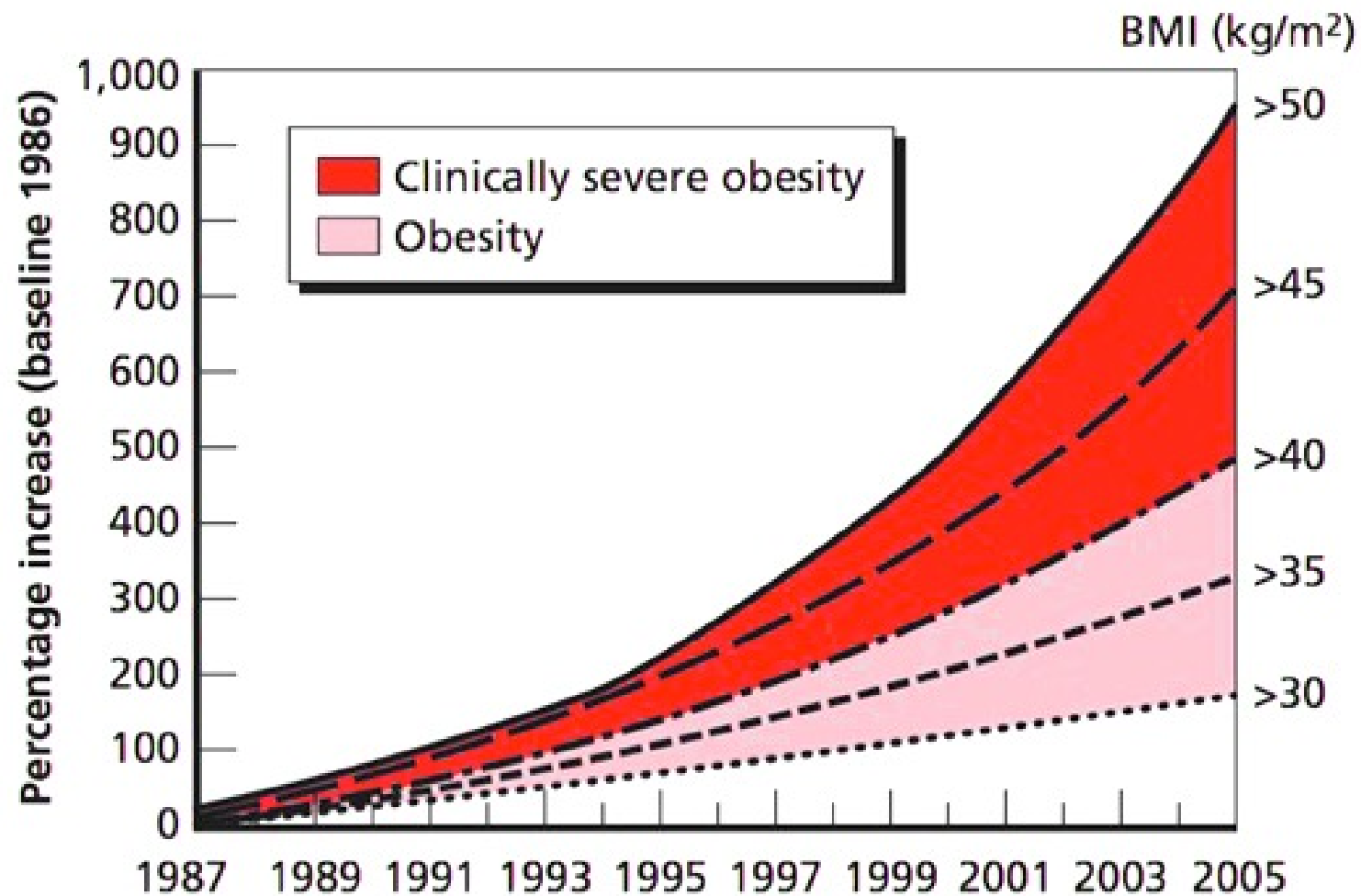
## Trends in Vehicle Miles Traveled

United States, 1936 - 2005

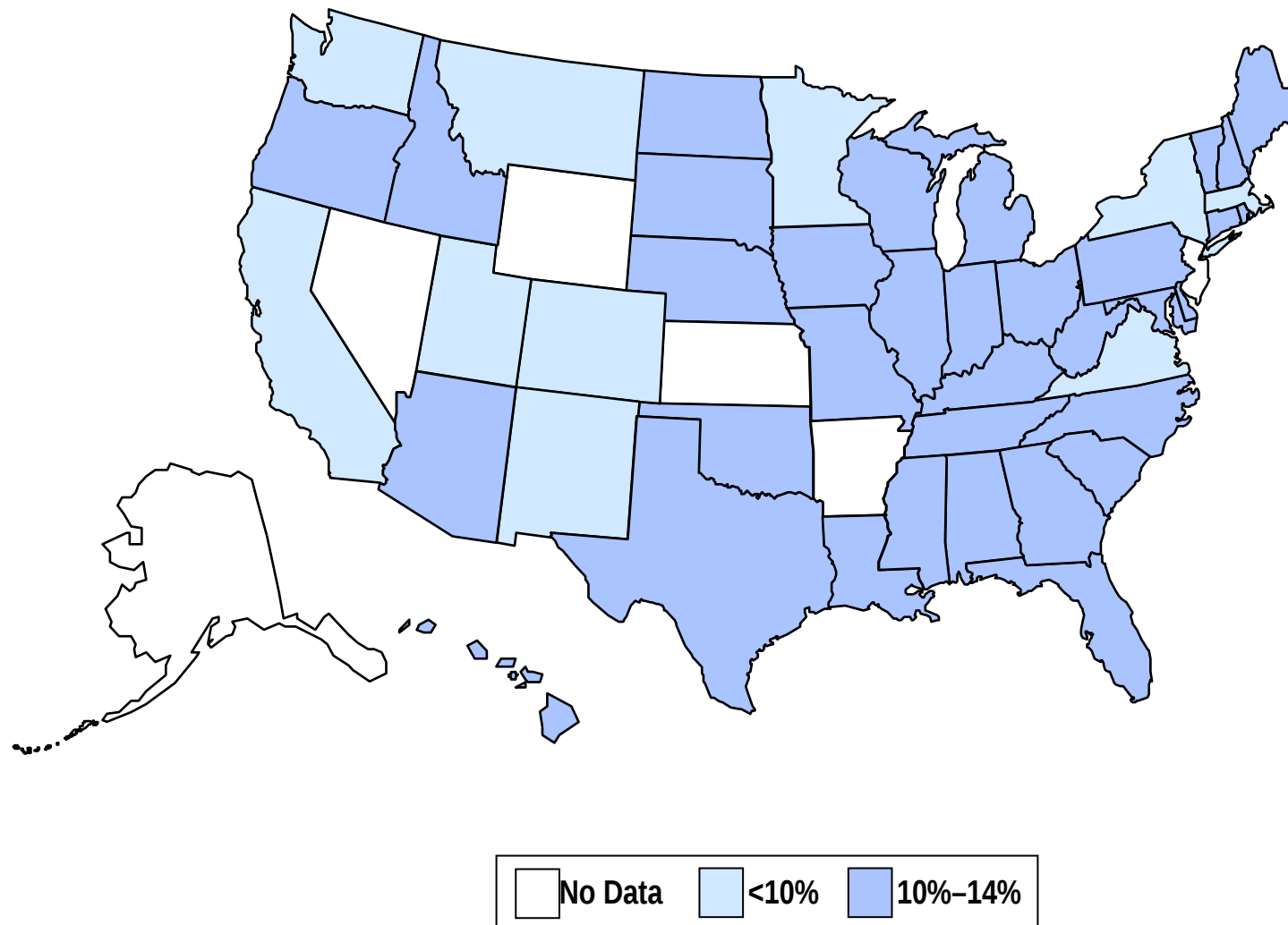


Sources: US DOT, Federal Highway Administration  
US Census Bureau

# Obesity Trend-lines

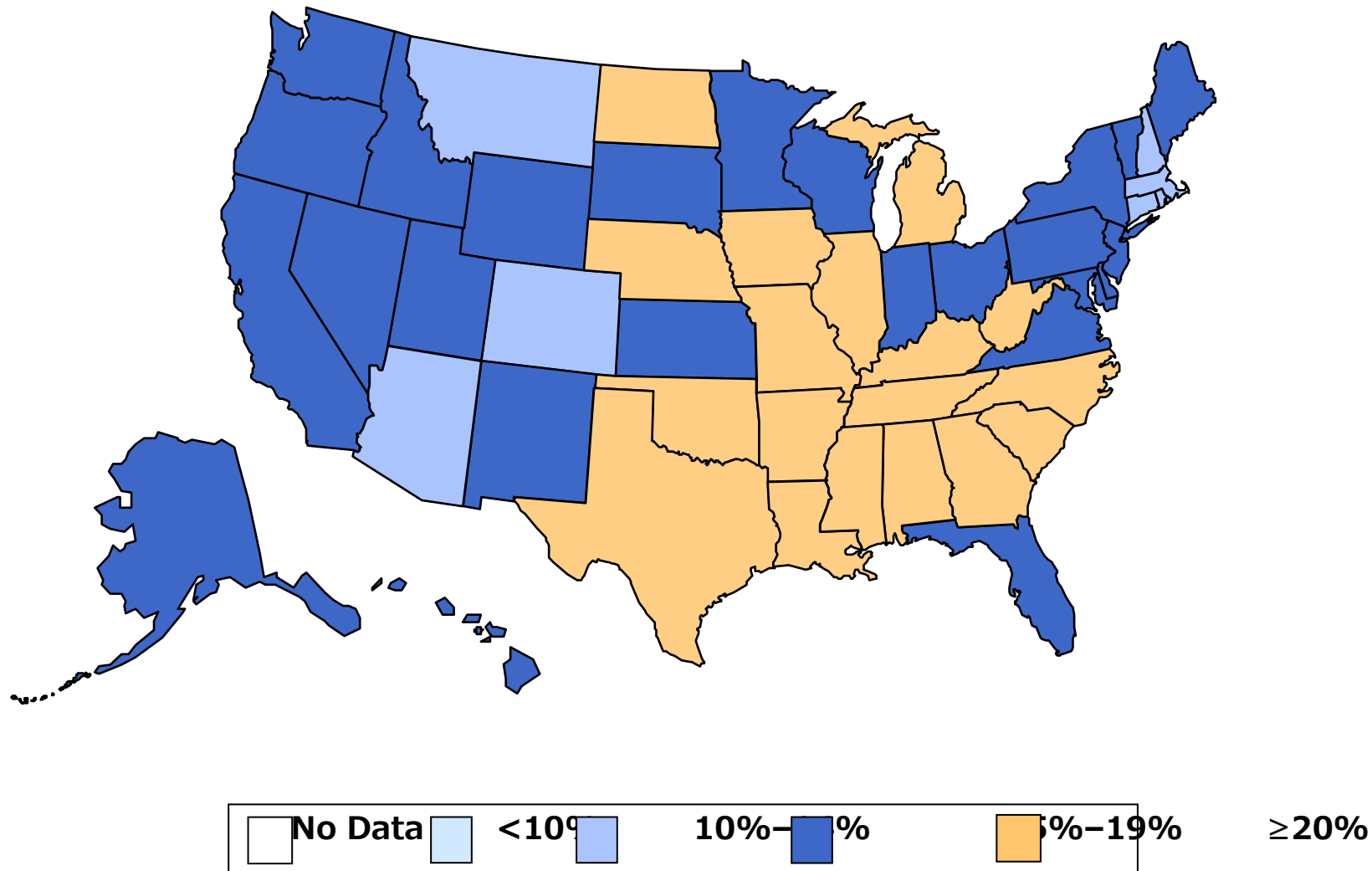


# Obesity Trends\* Among U.S. Adults BRFSS, 1990



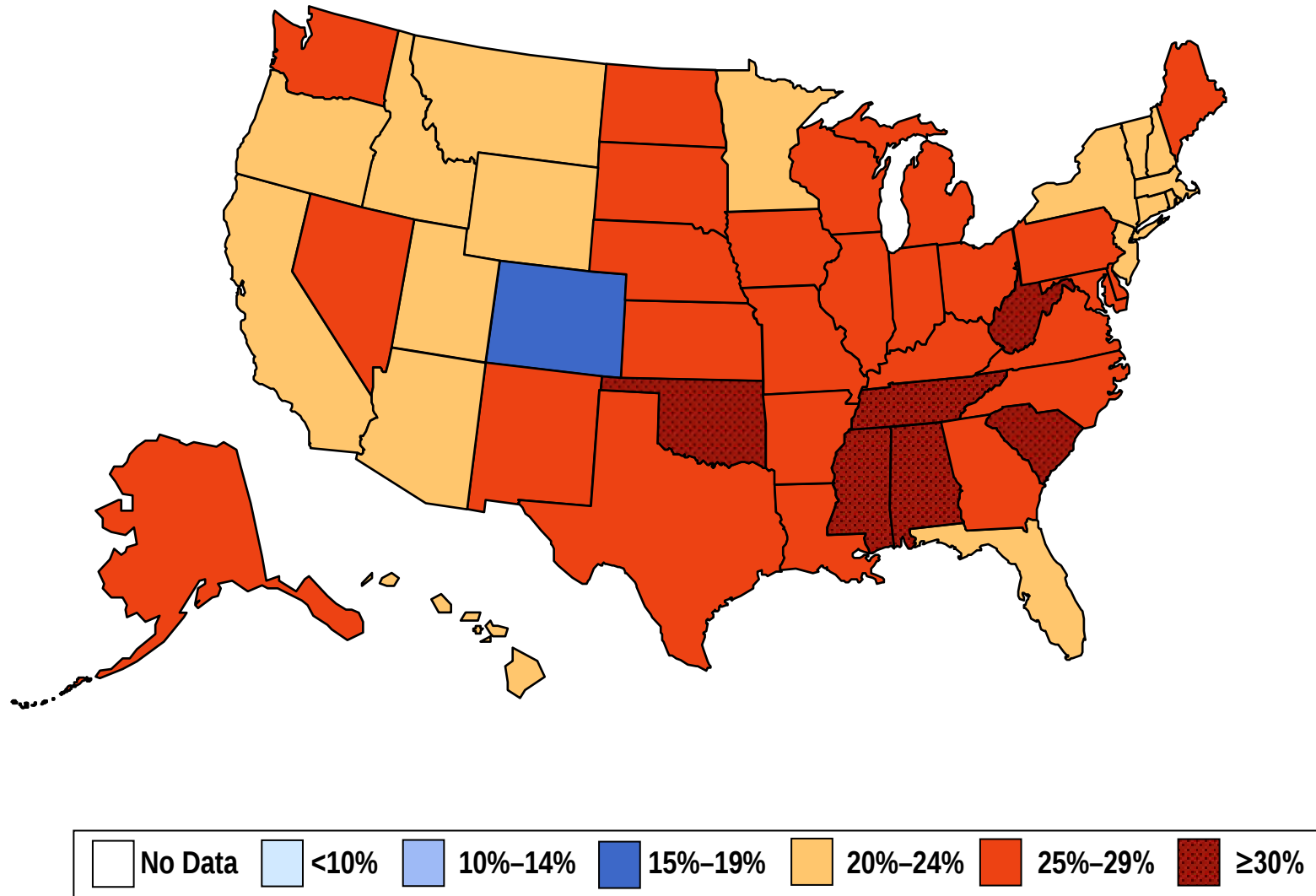
(\*BMI  $\geq 30$ , or ~ 30 lbs. overweight for 5' 4" person)

# Obesity Trends\* Among U.S. Adults BRFSS, 1999



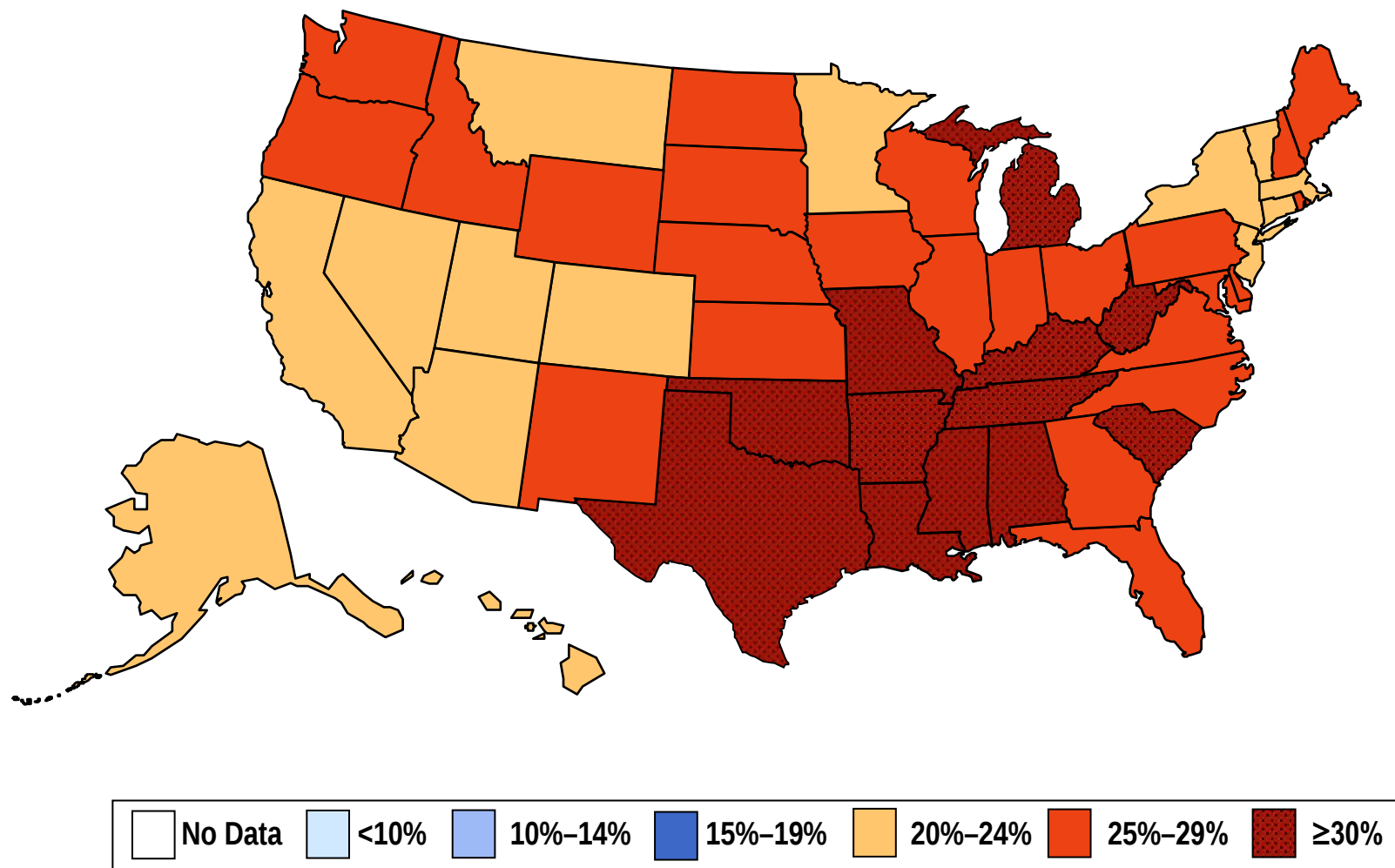
(\*BMI  $\geq 30$ , or ~ 30 lbs. overweight for 5' 4" person)

# Obesity Trends\* Among U.S. Adults BRFSS, 2008



(\*BMI  $\geq 30$ , or ~ 30 lbs. overweight for 5' 4" person)

# Obesity Trends\* Among U.S. Adults BRFSS, 2010

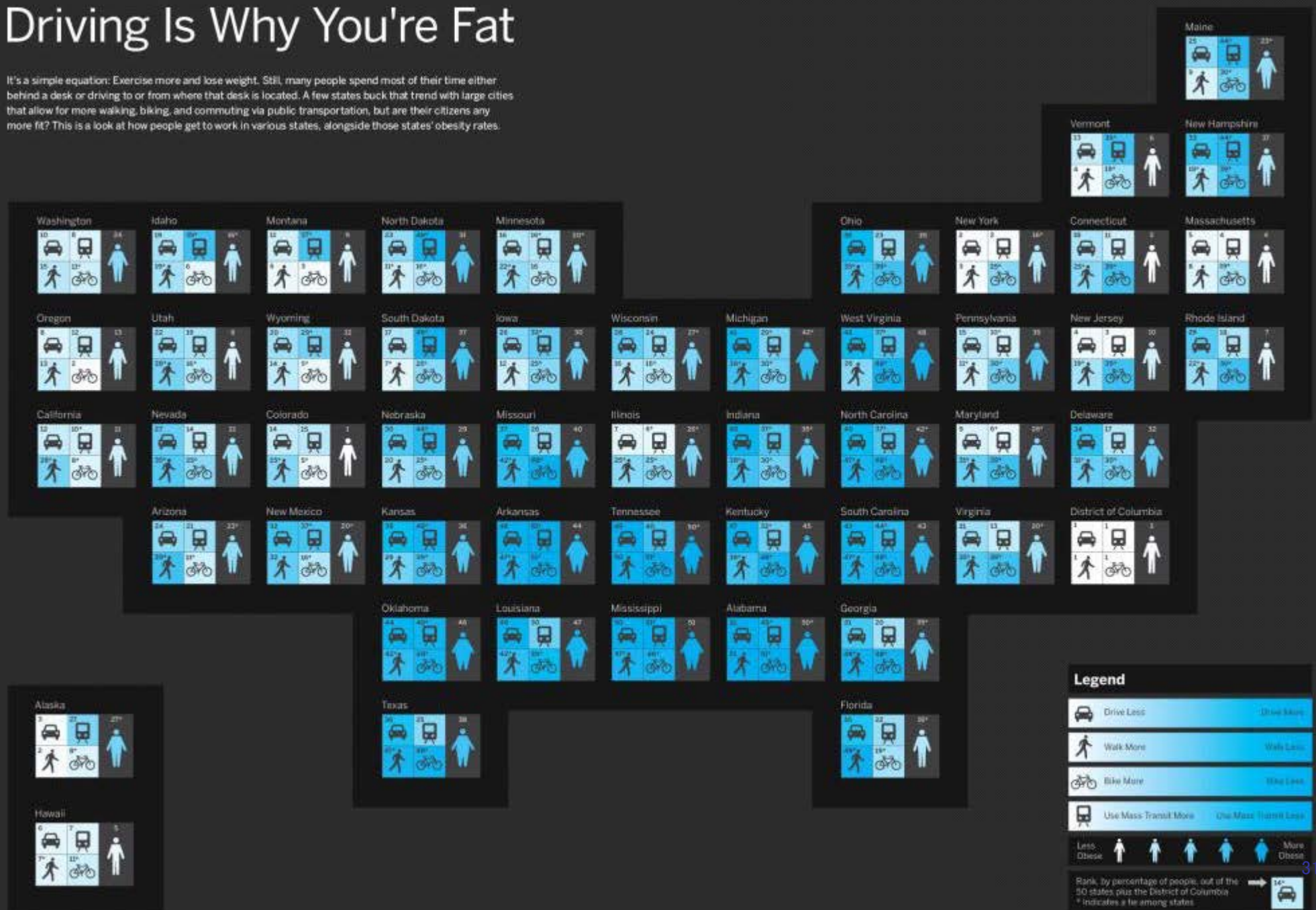


(\*BMI ≥30, or ~ 30 lbs. overweight for 5' 4" person)

# Obesity Trends\* Among U.S. Adults BRFSS, 2008

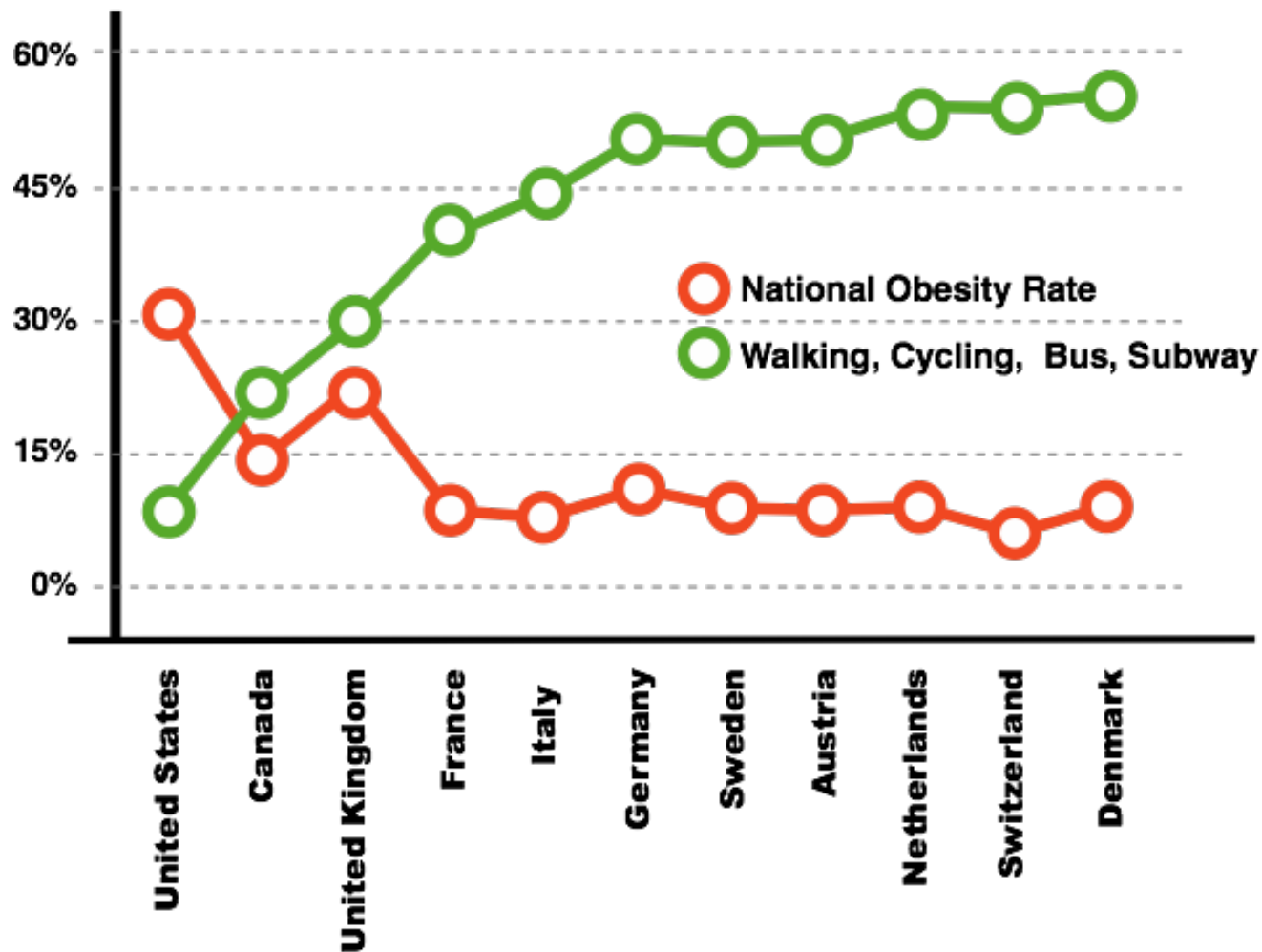
## Driving Is Why You're Fat

It's a simple equation: Exercise more and lose weight. Still, many people spend most of their time either behind a desk or driving to or from where that desk is located. A few states buck that trend with large cities that allow for more walking, biking, and commuting via public transportation, but are their citizens any more fit? This is a look at how people get to work in various states, alongside those states' obesity rates.



# Inverse Correlation

## Do Cars Make Us Fat?



Source: Professor John Pucher/Rutgers University  
CalorieLab.com

**Sustainable mobility = Transit + Bicycling + Walking**

**THIS ONE  
RUNS ON FAT  
AND SAVES YOU MONEY**



**THIS ONE  
RUNS ON MONEY  
AND MAKES YOU FAT**



# Sustainable mobility = Transit + Bicycling + Walking



**Sustainable mobility = Transit + Bicycling + Walking**

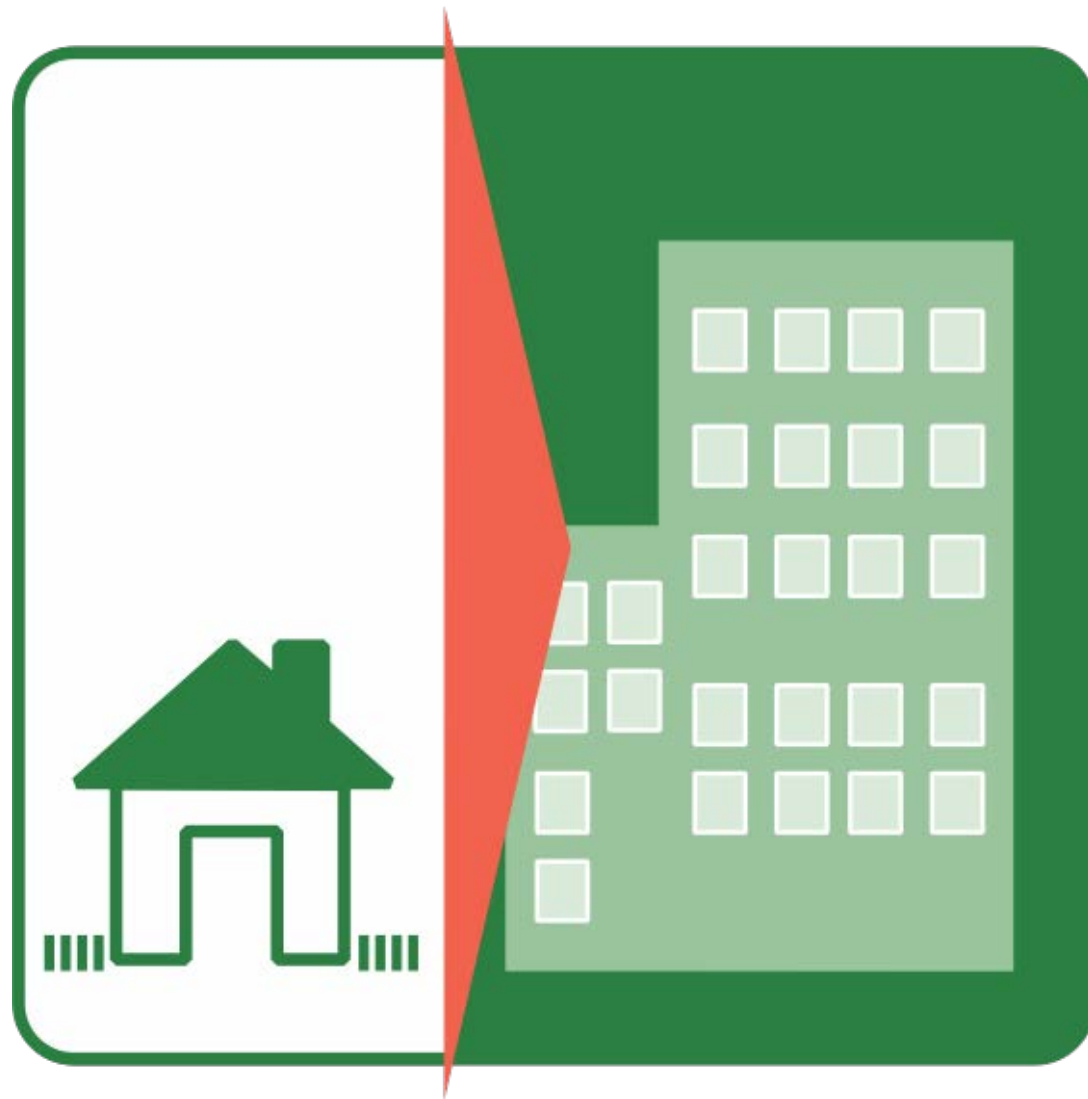


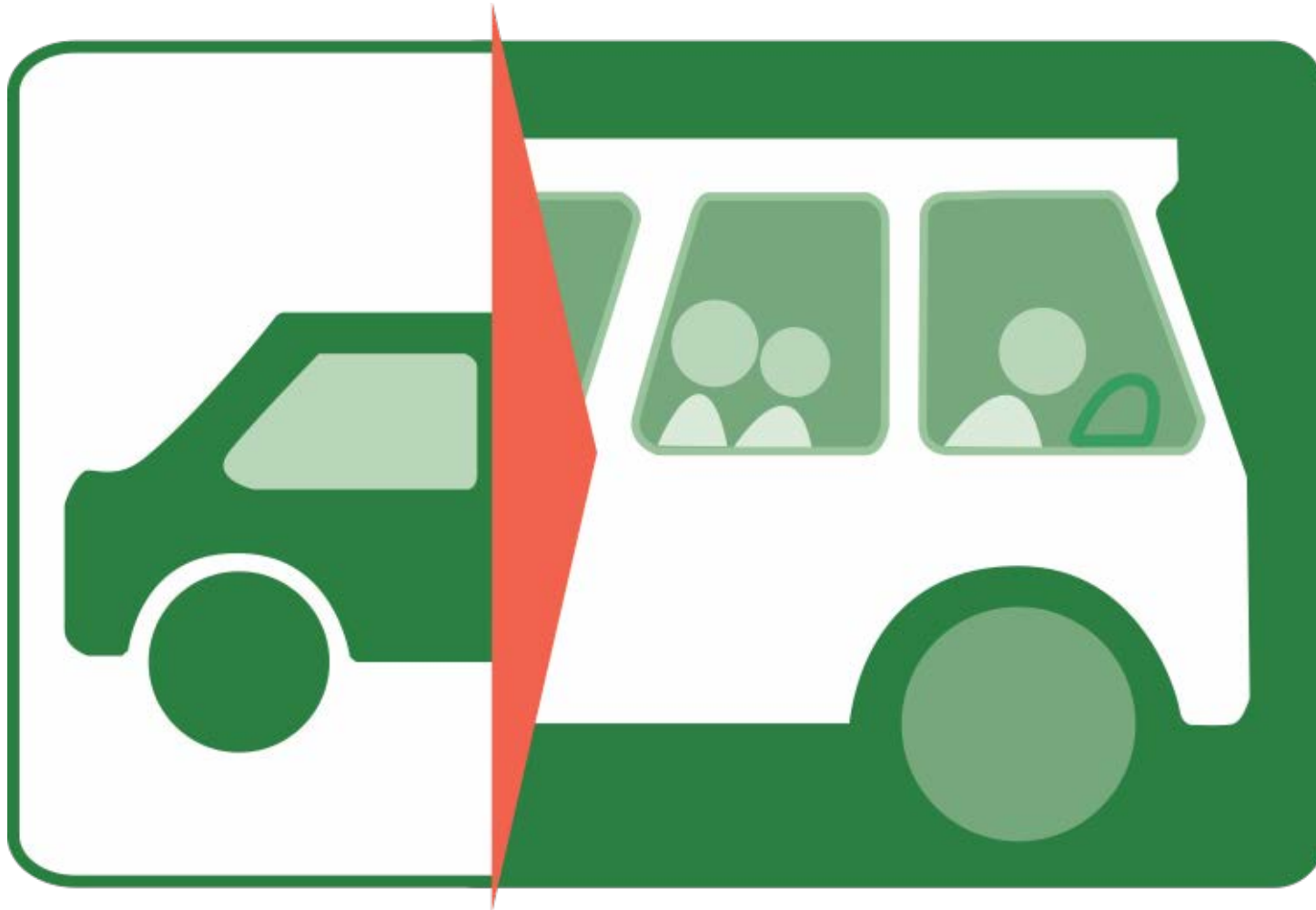
**Sustainable mobility = Transit + Bicycling + Walking**

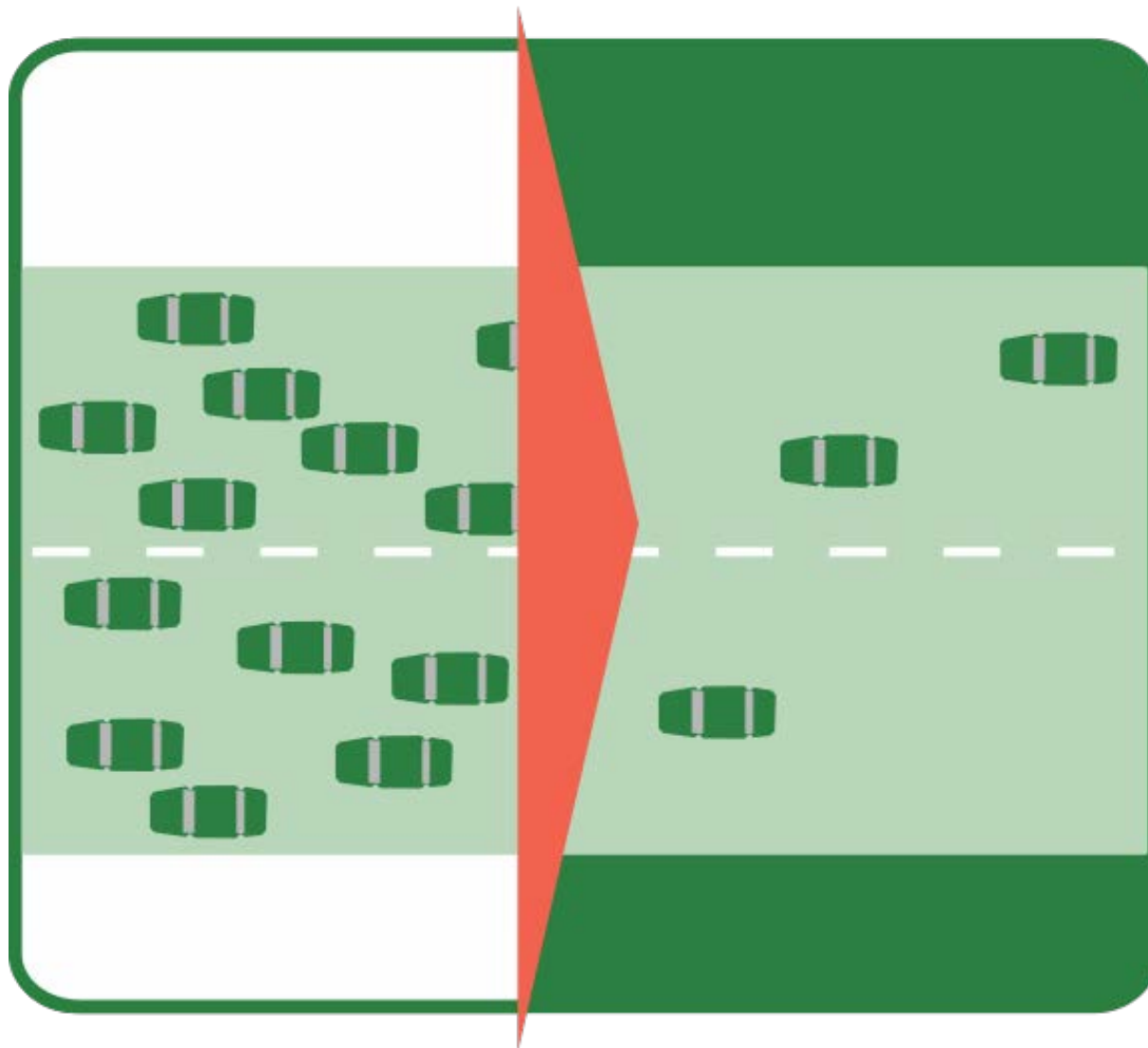


**Can sustainable mobility be  
valued in money?**









# Transit GHG Emissions Typology

## Emissions Produced by Transit

### Emissions from Transit

Tailpipe emissions from transit vehicles

Electricity use for traction

Maintenance yards, offices and other stationary sources

**Debit**

## Emissions Displaced by Transit

### Avoided Car Trips

Mode shift from private autos

### Land-Use Multiplier

Compact land-use-> shorter trips, more walk/bike trips

Trip chaining

Lower car ownership

### Congestion Relief

Improved fuel efficiency from reduced congestion

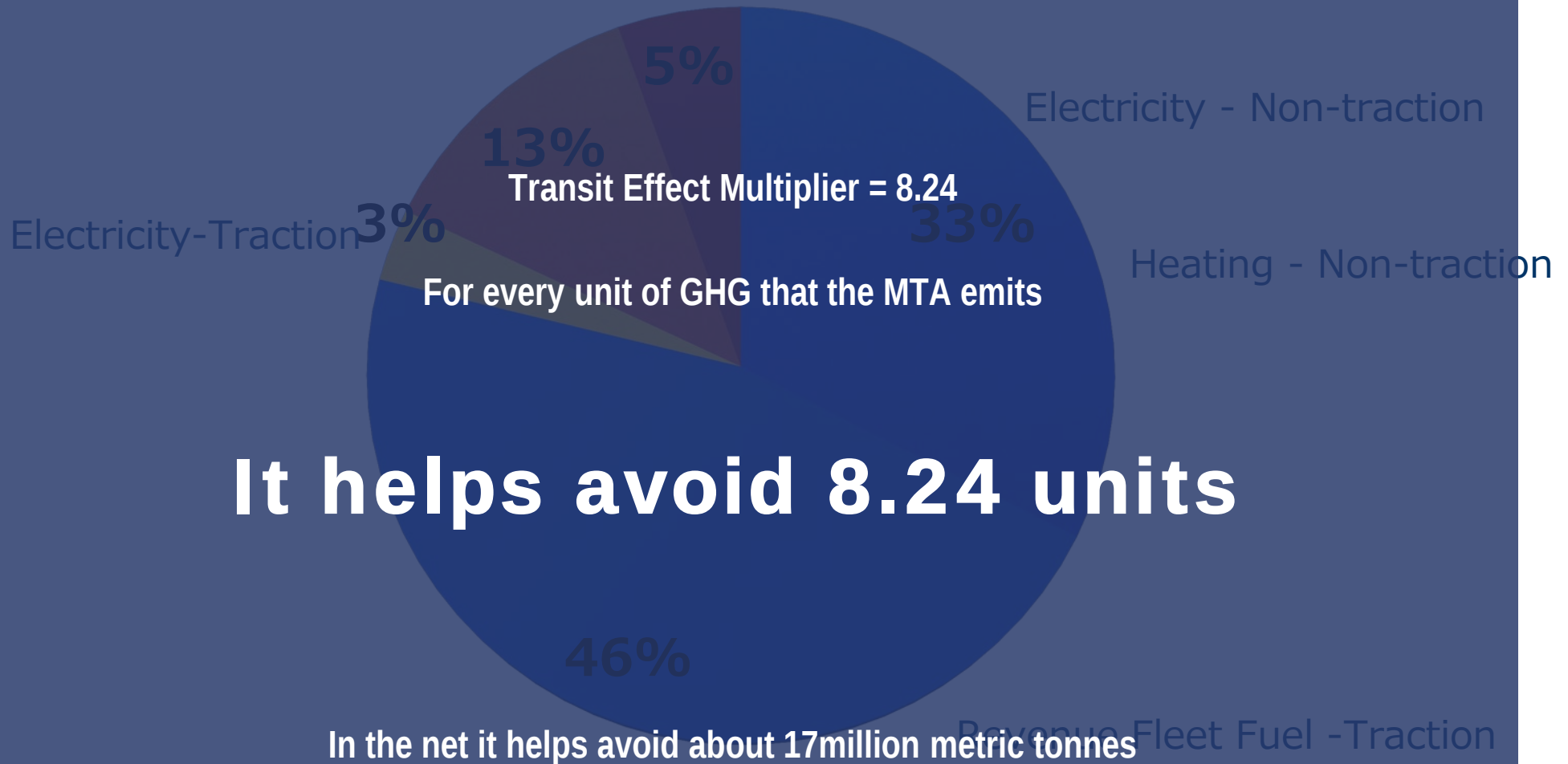
**Credit**

**Greenhouse Gas Impacts of Transit**



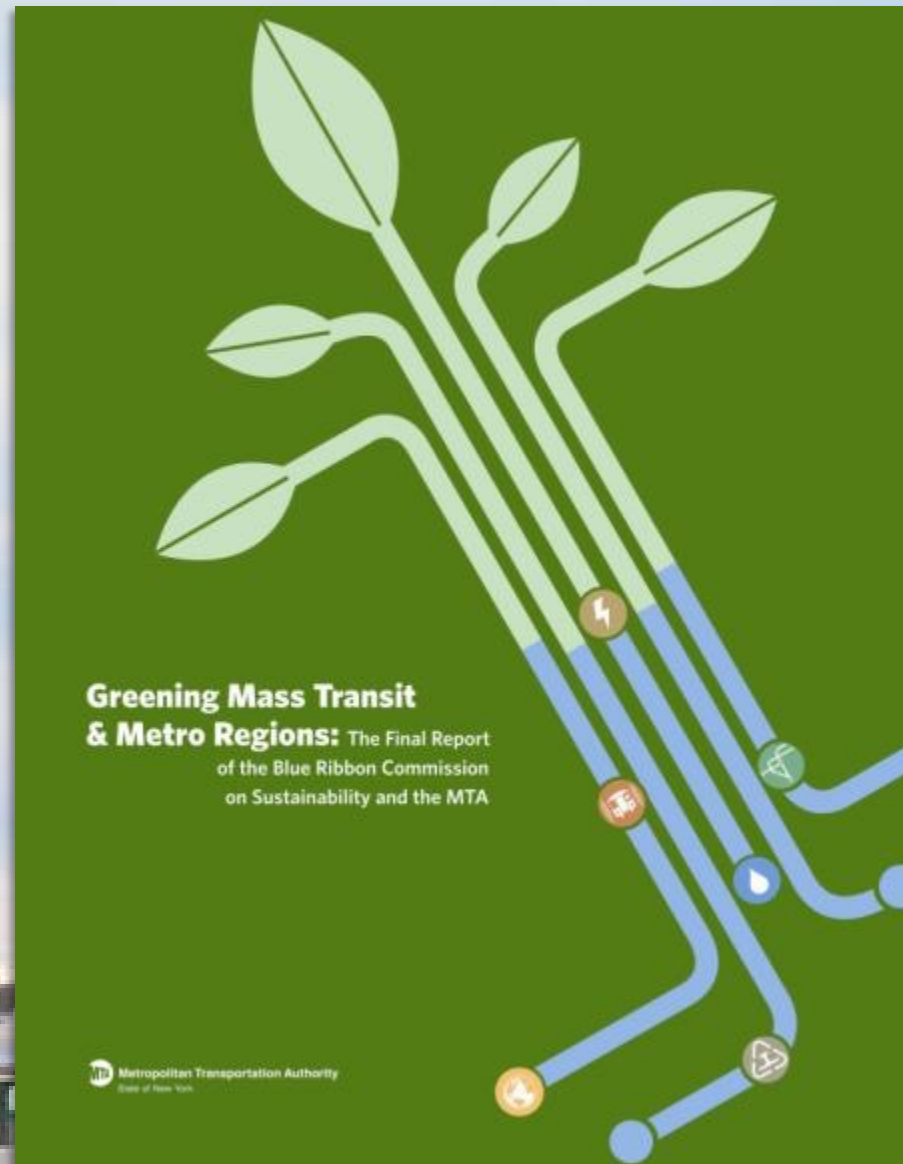
Total: 2.1 million metric tons

Non-Revenue Fleet -Traction



@ \$30 / ton ~ 500 million





[www.mta.info/sustainability](http://www.mta.info/sustainability)



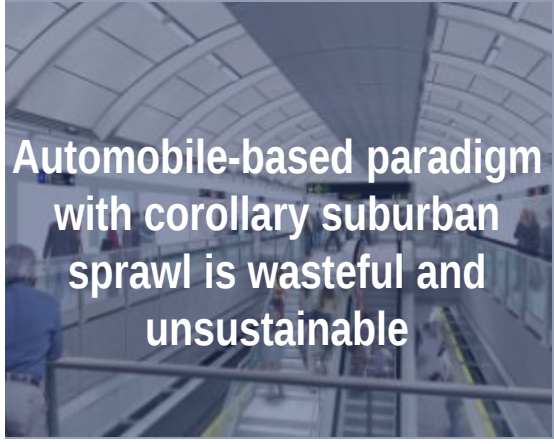
# Summary



As societies develop/industrialize, their energy needs rise.



Transportation emerges as a major consumer of energy.



Automobile-based paradigm with corollary suburban sprawl is wasteful and unsustainable



Sustainable Urban Growth has to embrace mass-transit and support density



Non-motorized transportation options have to be plentiful and inexpensive



Designing the right carbon-constrained system can generate resources to climate-proof transit





















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# Public Value of Smart Cities Initiatives: Taking the Car out of Carbon

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