Taking the Car out of Carbon:  

Presentation to the New Partners for Smart Growth Conference, San Diego
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Energy Consumption & Sustainability: Microview
# Energy Use: High-Rise vs. Low-Rise Development

<table>
<thead>
<tr>
<th></th>
<th>High-Rise</th>
<th>Low-Rise</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of buildings</strong></td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td><strong>Average floor size</strong></td>
<td>30,612 sf</td>
<td>36,000 sf</td>
</tr>
<tr>
<td><strong>Area of roof</strong></td>
<td>88,000 sf</td>
<td>375,000 sf</td>
</tr>
<tr>
<td><strong>Area of ext wall</strong></td>
<td>343,000 sf</td>
<td>385,000 sf</td>
</tr>
<tr>
<td><strong>Area of parking</strong></td>
<td>0 sf</td>
<td>1,837,500 sf</td>
</tr>
</tbody>
</table>
Energy Consumption: Low-Rise Office Park vs. Tall Urban Building
Energy Use: High-Rise vs. Low-Rise Development

Commute: 210,000 BTU/sqft-yr
- 30 mi. round trip
- Private Car, 15 mpg, 1 passenger
- 300 sq.ft. per person, 252 days per year

41,000 BTU/sqft-yr
- 30 mi. round trip
- Diesel Bus, 4 mpg, 20 passengers
- 300 sq.ft. per person, 252 days per year

Low-rise Suburban

High-rise Urban
GHG Per Person: Kg CO2E (Carbon dioxide equivalent) pa.

- High Density Transit-Oriented: 3,341
- Low Density Auto-Oriented: 8,637

Source: Journal of Urban Planning and Development, Norman, March 2006
GHG Emissions of Transportation Options

- SUV (solo driver)
- Car (solo driver)
- Airplane*
- Transit Bus (1/4 full)
- Prius (solo driver)
- Amtrak
- Rail Transit (25 riders/car)
- Carpool (3 occupants)
- Vanpool (6 occupants)
- Transit Bus (3/4 full)
- Rail Transit (50 riders/car)
- Intercity bus
- Walk/bike
- Additional traveller: transit, carpool, vanpool

Pounds CO2 (or equivalents per passenger mile) 0 0.2 0.4 0.6 0.8 1 1.2 1.4 1.6

Sightline Institute (http://www.sightline.org/maps/charts/climate-CO2byMode)
The Choice
Energy Consumption & Sustainability: Macroview
Energy Consumption by Sector, 2005

India
- Residential: 56%
- Agriculture: 31%
- Transportation: 4%
- Commercial: 4%
- Industry: 2%
- Other: 1%

China
- Residential: 38%
- Agriculture: 10%
- Transportation: 4%
- Commercial: 4%
- Industry: 1%
- Other: 2%

Germany
- Residential: 29%
- Transportation: 27%
- Commercial: 10%
- Industry: 7%
- Other: 4%

USA
- Residential: 40%
- Transportation: 17%
- Commercial: 12%
- Industry: 7%
- Other: 4%

Source: World Resources Institute
Total Energy Consumption per Capita, 2005

- USA: 340 MBTUs
- Germany: 178 MBTUs
- China: 31 MBTUs
- India: 14 MBTUs
Total Energy Consumption per Capita 2007

- California: 233 MBTUs
- New York: 209 MBTUs
- Texas: 496 MBTUs
- NYC: 88.5 MBTUs

Source: Energy Information Administration
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.

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<th>PERCENT OF INCOME ON GAS</th>
<th>GAS PRICES</th>
<th>MEDIAN INCOME</th>
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Where gasoline prices hit hardest

The counties where motorists spend the highest percentage of their income on gasoline tend to be in poor, rural areas. While California has some of the highest gas prices, its residents spend a smaller fraction of their income for gasoline.

Lowest: Hunterdon County, N.J. 2.0%

Highest: Wilcox County, Ala. 16.0%
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.

### Where gasoline is least expensive

Due in part to higher state taxes, California has some of the most expensive gasoline in the country. Missouri, by comparison, has some of the least expensive gasoline.

- **Mono County, Calif.**
  - Average price: $4.79
- **Campbell, Wyo.**
  - Average price: $3.67
- **Holmes County, Miss.**
  - Average price: $3.82

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Average gasoline price per gallon

- $4.79
- $4.40
- $4.20
- $4.00
- $3.90
- $3.85
- $3.80
- $3.67

*Source: Metropolitan Transportation Authority, State of New York*
**Who Framed Roger Rabbit?**

**Judge Doom (JD):** Toontown will be erased in a matter of minutes.

**Jessica Rabbit (JR):** I suppose you think no-one will notice that Toontown has disappeared.

**JD:** Who’s got time to wonder what happened to some ridiculous talking mice when you are driving by at 75 miles an hour.

**JR:** What are you talking about? There is no road past Toontown.

**JD:** Not Yet. Several months ago I had the good providence to stumble upon the plan of the City Council - a construction plan of epic proportions. They are calling it a Freeway.

**Eddie Valiant (EV):** Freeway? What the hell is a Freeway?

**JD:** Eight lanes of shimmering cement running from here to Pasadena. Smooth, safe, fast. Traffic jams will be a thing of the past.

**EV:** So that’s why you killed Acme Maroon? For this Freeway? I don’t get it!

**JD:** Of course not, you lack vision. I see a place where people get on and off the freeway. On and off, off and on, all day, all night. *(EV and JR look at each other incredulously)*. Soon, where Toontown once stood, will be a string of gas-stations, inexpensive motels, restaurants that serve rapidly prepared food, tire salons, automobile dealerships and wonderful, wonderful billboards reaching as far as the eye can see. My god, it’ll be beautiful!

**EV:** C’mon. Nobody is gonna drive on this lousy freeway, when they can take the Redcar for a nickel.

**JD:** They’ll drive, they’ll have to. You see, I bought the Redcar, so that I could dismantle it.

*From “**Who Framed Roger Rabbit**”. Robert Zemeckis, Director, 1988*
Vehicle Miles Traveled Trend-lines

Trends in Vehicle Miles Traveled

United States, 1936 - 2005

Sources: US DOT, Federal Highway Administration
US Census Bureau
Obesity Trends* Among U.S. Adults BRFSS, 1990

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults BRFSS, 1999

(*BMI ≥ 30, or ~ 30 lbs. overweight for 5’ 4” person)
Obesity Trends* Among U.S. Adults BRFSS, 2008

(*BMI ≥30, or ~ 30 lbs. overweight for 5’
Inverse Correlation

Do Cars Make Us Fat?

- National Obesity Rate
- Walking, Cycling, Bus, Subway

United States, Canada, United Kingdom, France, Italy, Germany, Sweden, Austria, Netherlands, Switzerland, Denmark

Source: Professor John Pucher/Rutgers University
Global Carbon Dioxide Emissions per Capita, 1990–2004

Source: US Department of Energy Carbon Dioxide Information Analysis Center (CDIAC)
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

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

Greenhouse Gas Impacts of Transit

Debit

Credit

APTA Climate Change Standards Working
Total: 2.4 million metric tons

Transit Effect Multiplier = 8.24
For every unit of GHG that the MTA emits
It helps avoid 8.24 units

In the net it helps avoid about 17 million metric tonnes

@ $30 / ton ~ 500 million

Currently un-recognized and un-compensated
Energy/Carbon
Facilities
Smart Growth/TOD
Materials Flow
Water Management
Climate Adaptation

Greening the MTA
Is Transit for Everywhere? Cincinnati’s Close Brush

[Map and chart with various rail lines and tunnels labeled, including South Portal Tunnel, Oak St. Tunnel, North Portal Old Tunnel, and more.]

Note: Information compiled from maps furnished by Pennsylvania R.R. Company.

Legend:
- Steam Railroads
- Steam Railroad Tunnel
- Suggested New Line
- Incompleted Tunnel
- Completed Tunnel Section
- Rapid Transit Line
- Rapid Transit Station
Is Transit for Everywhere? Cincinnati’s Close Brush
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Is Transit for Everywhere? What happened in NYC
Is Transit for Everywhere? What happened in NYC
Is Transit for Everywhere? Can LA become a Transit City?
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Conclusions

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.

It negates the good effects of “green” building methods and technologies.

Sustainable urban growth has to embrace mass-transit and support density.

Designing the right carbon-constrained system can make this happen.
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