Transportation and Land Use Strategies for Reducing Greenhouse Gas (Part I): Policy

RailVolution 2008

Projjal Dutta, AIA, LEED Director of Sustainability Initiatives
Energy Consumption & Sustainability: Macroview
Energy Consumption by Sector, 2005

India
- Residential: 56%
- Agriculture: 12%
- Transportation: 26%
- Industry: 3%
- Commercial: 3%
- Other: 4%

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

Germany
- Residential: 29%
- Agriculture: 4%
- Transportation: 27%
- Industry: 10%
- Commercial: 1%
- Other: 3%

USA
- Residential: 17%
- Agriculture: 12%
- Transportation: 40%
- Industry: 17%
- Commercial: 4%
- Other: 26%

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

- **USA**: 340 MBTUs
- **Germany**: 178 MBTUs
- **China**: 31 MBTUs
- **India**: 14 MBTUs

Source: Energy Information Administration
Total Energy Consumption per Capita by State, 2005

- California: 232 MBTUs
- New York: 217 MBTUs
- Texas: 506 MBTUs
- NYC: 88.5 MBTUs

Source: Energy Information Administration
Total Carbon Dioxide Emissions per Capita, 2002

[Map showing carbon dioxide emissions per capita across the United States with color coding and legend for 2002 emissions.]
Global Carbon Dioxide Emissions per Capita, 1990-2004

Source: US Department of Energy Carbon Dioxide Information Analysis Center (CDIAC)
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>Number of buildings</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Average floor size</td>
<td>30,612 sf</td>
<td>36,000 sf</td>
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<tr>
<td>Area of roof</td>
<td>88,000 sf</td>
<td>375,000 sf</td>
</tr>
<tr>
<td>Area of ext wall</td>
<td>343,000 sf</td>
<td>385,000 sf</td>
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<tr>
<td>Area of parking</td>
<td>0 sf</td>
<td>1,837,500 sf</td>
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</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

High-rise Urban
Low-rise Suburban
The Choice
The Blue Ribbon Commission on Sustainability and the MTA
The Blue Ribbon Commission on Sustainability

- Energy/Carbon
- Facilities
- Materials Flow
- Water Management
- Smart Growth/TOD
Energy/Carbon
Energy Efficiency Measures: LED Lighting
MTA Bridges & Tunnels Verrazano-Narrows Bridge

LED Necklace & Aviation Lighting
Energy Efficiency Measures: Regenerative Braking
Energy Efficiency Measures: Fluorescent Lighting
Energy Efficiency Measures: Aluminum Rail
Onsite Renewable Generation: Solar Projects
Onsite Renewable Generation: Wind Power

MTA Territory Rich in Wind Potential
Wind & Power Generation
Wind Potential along LIRR ROW

Long Island (NE promontories)
Estimated Mean wind speed

<table>
<thead>
<tr>
<th>Height</th>
<th>mph</th>
<th>m/s</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>30m</td>
<td>10.1-12.3</td>
<td>4.5-5.5</td>
<td>1-2</td>
</tr>
<tr>
<td>50m</td>
<td>12.3-13.4</td>
<td>5.5-6.0</td>
<td>3-4</td>
</tr>
<tr>
<td>70m</td>
<td>14.5-16.8</td>
<td>6.5-7.5</td>
<td>5-6</td>
</tr>
<tr>
<td>100m</td>
<td>15.7-17.9</td>
<td>7.0-8.0</td>
<td>6-7</td>
</tr>
</tbody>
</table>
Wind Potential along Metro-North ROW

<table>
<thead>
<tr>
<th>Height</th>
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Facilities
MTA Carbon Footprint

HOW MUCH DIFFERENCE DOES TRANSIT MAKE?

343 MBTU Annually

Average American

88 MBTU

New Yorker

ESTIMATED SHARES OF GHG BY MTA AGENCY (in metric tonnes)

LEGEND

- NYC Transit Subways
- NYC Transit Buses
- Metro-North
- LIRR
- MTA Bus
- LI Bus
- B&T
- HQ/Misc

45%
16%
12%
5%
2%
2%
1%
MTA NYCT Corona Maintenance Facility
North America’s first LEED-certified Transportation Facility

- Hydrogen Fuel Cell
- Rainwater Collection & Reuse
- Natural Ventilation
- Natural Lighting
- Photovoltaic Cells
- Heat Recovery Units

200 kW => 26%
100 kW => 10%
Platform Edge Doors

Paris Métro: Station Saint Lazare
High Performance Roofs

Chicago, IL
High Performance Roofs
Materials Flow
Smart Fleets
Green Office
Water Management
Drinking Water
Smart Growth
Density & Community
Population Density
Brooklyn
Long Island City, Queens
Transit Oriented Development: Beacon, NY
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.

Metropolitan Transportation Authority Going your way