Lesson 15: Transportation

February 8th, 2006

ENVIR 202: Lesson No. 15

Transportation and Sprawl

February 8th, 2006

Gail Sandlin
University of Washington
Program on the Environment

Urban Transportation Modes

One Hour Commuting Distance

Source: Adapted from Hugill (1993), p. 213. 5 km ~ 3 miles
Density & Mobility

Spatial Evolution of the City

Mobility ~ Industrial Age
Lesson 15: Transportation

Env. Burdens of Transportation

- 3000 horse-drawn buses
- 500 million passengers per year
- 1000 horse drawn vehicles per hour
- 25 lbs of manure and urine per horse per day deposited onto the city streets
- Animal carcasses clogged the streets; 15,000 in NYC in 1880

Death Rate in the Industrial Age City

<table>
<thead>
<tr>
<th></th>
<th>Population</th>
<th>Persons/Dwelling</th>
<th>Deaths</th>
<th>Death Rate (per 1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1880</td>
<td>1889</td>
<td>1890</td>
<td>1889</td>
</tr>
<tr>
<td>New York</td>
<td>1,046,379</td>
<td>1,075,031</td>
<td>21.32</td>
<td>26.01</td>
</tr>
<tr>
<td>London</td>
<td>2,418,493</td>
<td>2,591,519</td>
<td>7.8</td>
<td>11.51</td>
</tr>
<tr>
<td>Philadelphia</td>
<td>846,180</td>
<td>1,046,240</td>
<td>5.79</td>
<td>17.75</td>
</tr>
<tr>
<td>Brooklyn</td>
<td>564,687</td>
<td>614,305</td>
<td>9.11</td>
<td>13.22</td>
</tr>
<tr>
<td>Boston</td>
<td>362,323</td>
<td>420,000</td>
<td>8.26</td>
<td>8.412</td>
</tr>
<tr>
<td>2001 NYC</td>
<td>2.5</td>
<td>6.9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Traffic Congestion ~ 1900’s

Fig. 78, Dense traffic, Park Row Square, May 24, 1900
**Traffic Congestion**

- City Planning & the Problems of Congestion
  - 1909-Washington, D.C.
  - Disease, poverty, darkness & vice of cities caused by the scourge of high density living
  - Urban transportation planners must build public transit to the outlying areas to lower density and improve living conditions
  - Transportation improvements seen as a source of environment benefits not environmental pollutants.

**The Automobile**

- A solution to the ‘horse problem’
- Clean and environmentally benign

**Exodus from the Urban Center**

- Baltimore
  - 1889 first horse car line
  - 1895 electric street car
  - 1925 Mass produced Model T
  - 1962 Baltimore beltway completed

http://science.nasa.gov/headlines/y2002/11oct_sprawl.htm
Expressways & Housing:

- Urban Renewal
  - Dan Ryan Expressway, Chicago
  - 1950’s-60’s
  - Slum clearance
  - Suburbanite access

---

Cabrini Green

---

Expressways & Housing:

- Suburban Living
  - More family advantages
  - More personal comfort and security
  - More friends and fun
  - More home for a woman to enjoy
  - More for a man to come home to...

—From Park Forest marketing brochure, about 1955
Lesson 15: Transportation

**Land Metamorphosis**
- A single country lane
- The automobile enters the scene
- A divided road
- Increasing density
- Then a 4 lane road

**The Expressway and Population Health**

- **Urban**
  - Loss of community integrity
  - Proximity to traffic
  - Noise, air pollution, public safety

- **Suburban**
  - Auto dependence
  - Commuting stress
  - Not pedestrian oriented; related to obesity

**Regional Growth**

<table>
<thead>
<tr>
<th>Period</th>
<th>Population</th>
<th>Employment</th>
<th>VMT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980-1992</td>
<td>90.5</td>
<td>79.4</td>
<td>70.3</td>
</tr>
<tr>
<td>1992-2004</td>
<td>104.5</td>
<td>80.9</td>
<td>73.9</td>
</tr>
</tbody>
</table>

Lesson 15: Transportation

Air Pollution

- Air Pollution Sources in Washington
- Emissions: vehicle and industrial
- Other sources: industrial and other
- Percentages: vehicle 88%, industrial 12%

Freeway Air Sheds

- Open/Complex Built Environment Dispersion Patterns

http://julian.jmarshall.us/
### Proximity to Traffic

<table>
<thead>
<tr>
<th>Mobile Source Pollutants</th>
<th>Ambient Air Regulatory Limits</th>
<th>Adverse Health Effects</th>
<th>Source/Environmental Health Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM₁₀</td>
<td>15 μg/m³</td>
<td>65 μg/m³</td>
<td>150 μg/m³</td>
</tr>
<tr>
<td>PM₂.₅</td>
<td>35 μg/m³</td>
<td>150 μg/m³</td>
<td>1000 μg/m³</td>
</tr>
<tr>
<td>Urban toxins</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ozone</td>
<td>0.08 ppm</td>
<td>0.06 ppm</td>
<td>0.11 ppm</td>
</tr>
<tr>
<td>NO₂</td>
<td>45 ppm</td>
<td>90 ppm</td>
<td>450 ppm</td>
</tr>
<tr>
<td>VOC's</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PM₁₀</td>
<td>15 μg/m³</td>
<td>50 μg/m³</td>
<td>150 μg/m³</td>
</tr>
<tr>
<td>PM₂.₅</td>
<td>30 μg/m³</td>
<td>70 μg/m³</td>
<td>250 μg/m³</td>
</tr>
<tr>
<td>Ultrafine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrogen</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sulfur</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volatile organic compounds (VOCs)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ultrafine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aldehydes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PM₁₀</td>
<td>15 μg/m³</td>
<td>50 μg/m³</td>
<td>150 μg/m³</td>
</tr>
<tr>
<td>PM₂.₅</td>
<td>30 μg/m³</td>
<td>70 μg/m³</td>
<td>250 μg/m³</td>
</tr>
</tbody>
</table>

### Air Pollution & Health

- [Animation](http://www.ucsusa.org/assets/animation/toxicair_lung.swf)

### Freeway Air Pollution Sheds (FAPS)

- [Map of FAPS](#)
  - [King County, Washington](#)
Lesson 15: Transportation

Census tract 104; Block Group 4

- Assume homogenous distribution
- To determine population in FAP
- Divide housing units in FAPS by housing units in the Block Group
- Percent distribution of Block Group demographics

Questions
Toxics and Chronic Diseases