Urban Transportation Sustainability

Samer Madanat
Institute of Transportation Studies
UC Berkeley
Levels of Analysis

Strategic Level: Planning and Policy

Tactical Level: Design Solutions

Operational Level: Management and Control Solutions
Relationship between tracks

Urban Structure & Activity

Balancing Mobility and Accessibility

Solution Space

Green Logistics

Alternatives

Safety Improvement

Exchange

Solution Space

Joint Design

Alternatives

Joint Design

Congestion Mitigation
Track 1: Balancing Accessibility and Mobility

- Tradeoff between auto-mobility and accessibility
- Engage partner cities: vision of their futures (Paris vs. LA?)
- Identify successful transportation policies and planning processes that balance the two paradigms
- Case study approach will examine indicators, analytical tools and institutional reforms
- Deliverables: policy and planning lessons learned from case studies, knowledge transfer to transportation planning organizations and institutional capacity building
Track 2: Sustainability of Urban Structures

• Develop quantitative relationships between sustainability metrics of different urban structures and their physical attributes (population, density, land use,…), using econometric methods
• In parallel, use macroscopic transportation theories to provide scientific support for empirical models
• These quantitative models will identify the attributes that are the most critical to both sustainability and mobility
• Provide input to public policy debates, and develop better menu of designs and management strategies
## Mode shares in Paris

<table>
<thead>
<tr>
<th>BY URBAN RING</th>
<th>Work at Home</th>
<th>Walk Only</th>
<th>Cycle Only</th>
<th>Auto Only</th>
<th>Public Transport Only</th>
<th>Multiple Modes</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ville-de-Paris</td>
<td>51,395</td>
<td>93,072</td>
<td>28,828</td>
<td>180,392</td>
<td>513,358</td>
<td>123,958</td>
<td>991,003</td>
</tr>
<tr>
<td>Petite Couronne (Inner Suburbs)</td>
<td>54,317</td>
<td>140,116</td>
<td>43,425</td>
<td>690,376</td>
<td>624,509</td>
<td>197,664</td>
<td>1,750,407</td>
</tr>
<tr>
<td>Grande Couronne (Outer Suburbs)</td>
<td>68,544</td>
<td>125,048</td>
<td>46,560</td>
<td>1,193,316</td>
<td>446,416</td>
<td>225,270</td>
<td>2,105,154</td>
</tr>
<tr>
<td>Ile-de-France</td>
<td>174,256</td>
<td>358,236</td>
<td>118,813</td>
<td>2,064,084</td>
<td>1,584,283</td>
<td>546,892</td>
<td>4,846,564</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MARKET SHARE</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ville-de-Paris</td>
<td>5.2%</td>
<td>9.4%</td>
<td>2.9%</td>
<td>18.2%</td>
<td>51.8%</td>
<td>12.5%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Petite Couronne (Inner Suburbs)</td>
<td>3.1%</td>
<td>8.0%</td>
<td>2.5%</td>
<td>39.4%</td>
<td>35.7%</td>
<td>11.3%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Grande Couronne (Outer Suburbs)</td>
<td>3.3%</td>
<td>5.9%</td>
<td>2.2%</td>
<td>56.7%</td>
<td>21.2%</td>
<td>10.7%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Ile-de-France</td>
<td>3.6%</td>
<td>7.4%</td>
<td>2.5%</td>
<td>42.6%</td>
<td>32.7%</td>
<td>11.3%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MARKET SHARE EXCLUDING MULTIPLE MODES &amp; WORK AT HOME</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ville-de-Paris</td>
<td>11.4%</td>
<td>3.5%</td>
<td>22.1%</td>
<td>62.9%</td>
<td>100.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Petite Couronne (Inner Suburbs)</td>
<td>9.4%</td>
<td>2.9%</td>
<td>46.1%</td>
<td>41.7%</td>
<td>100.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grande Couronne (Outer Suburbs)</td>
<td>6.9%</td>
<td>2.6%</td>
<td>65.9%</td>
<td>24.6%</td>
<td>100.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ile-de-France</td>
<td>8.7%</td>
<td>2.9%</td>
<td>50.0%</td>
<td>38.4%</td>
<td>100.0%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Track 3: Traffic Safety

- Objectives: identify design and management solutions to reduce traffic fatalities and injuries
- Tasks: identify organized stakeholders in traffic safety, develop a process to facilitate communication between them and work with these groups to develop context-sensitive solutions
- Range of solutions: from design (improved intersections, sidewalks, ...) to management (better enforcement, ...)
- Attention to non-motorized modes, pedestrians, etc.
Track 4: Green Logistics

- Reduce the environmental and congestion footprint of freight delivery in urban areas
- Design sustainable service systems; e.g.: consolidate delivery services in logistics centers on the periphery, use low-emission vehicles in city centers, etc.
- Use advanced telematics with dynamic management strategies
- Evaluation of benefits from proposed design and management solutions across stakeholder groups (operators, urban dwellers, government)
Track 5: Congestion Mitigation Strategies

- Traffic and public transit operational strategies to improve mobility
- Focus on urban bottlenecks to reduce length of queued vehicles → reduce vehicle emissions and energy consumption
- Strategies include traffic signal coordination, ramp metering, tolling strategies, transit priority at signalized intersections, etc.
- Interaction with partners will generate feasible solution space for each location
- Field testing of strategies
Transportation Sustainability Research at UCB

- Berkeley Center for Future Urban Transport – A Volvo Center of Excellence: focused on the interplay between policy and technology for achieving sustainable urban transport (PI: C. Daganzo)
- Air quality impacts of highway traffic (R. Harley)
- LCCA of passenger transportation modes and telecommuting (A. Horvath)
- Transportation Energy Research (A. Farrell, D. Kammen, T. Patzek)
- User evaluation of Hydrogen Fuel Cell cars (T. Lipman)