2-26-2016

Parking Infrastructure: A Constraint on or Opportunity for Urban Redevelopment?

Mikhail Chester
Arizona State University

Let us know how access to this document benefits you.
Follow this and additional works at: http://pdxscholar.library.pdx.edu/trec_seminar

Part of the Transportation Commons, Urban Studies Commons, and the Urban Studies and Planning Commons

Recommended Citation
http://pdxscholar.library.pdx.edu/trec_seminar/20

This Book is brought to you for free and open access. It has been accepted for inclusion in TREC Friday Seminar Series by an authorized administrator of PDXScholar. For more information, please contact pdxscholar@pdx.edu.
Parking Infrastructure: A Constraint on or Opportunity for Urban Redevelopment?

MIKHAIL V. CHESTER
ASSISTANT PROFESSOR
CIVIL, ENVIRONMENTAL & SUSTAINABLE ENGINEERING
ARIZONA STATE UNIVERSITY

HTTP://WWW.TRANSPORTATIONLCA.ORG/LOSANGELESPARKING/
TRANSPORTATION
LIFE-CYCLE
ASSESSMENT
Life Cycle Assessment

VEHICLES
(Manufacturing & Maintenance)

INFRASTRUCTURE
(Construction, Maintenance, Rehabilitation, & Operation)

ENERGY PRODUCTION
(Primary fuel extraction, Processing, & Transport)

SUPPLY CHAINS
Life-cycle Assessment

US PARKING INFRASTRUCTURE
250 million vehicles in the U.S.

99% of trips start or end with free parking

Vehicles spend 95% of lives parked
## The U.S. Parking Space Inventory

<table>
<thead>
<tr>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
<th>Scenario 4</th>
<th>Scenario 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ known metered</td>
<td>+ known metered</td>
<td>+ known metered</td>
<td>+ 4 spaces/car (urban)</td>
<td>+ 8 spaces/car</td>
</tr>
<tr>
<td>+ 1 home</td>
<td>+ 1 home</td>
<td>+ 1 home</td>
<td>+ 2.2 spaces/car (rural)</td>
<td></td>
</tr>
<tr>
<td>+ 1 work</td>
<td>+ 1 work</td>
<td>+ zoning ft²</td>
<td>+ onstreet</td>
<td></td>
</tr>
<tr>
<td>+ zoning ft²</td>
<td>+ zoning ft²</td>
<td>requirements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>requirements</td>
<td>requirements</td>
<td>+ onstreet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>105 million</td>
<td>730 million</td>
<td>820 million</td>
<td>840 million</td>
<td>2 billion</td>
</tr>
</tbody>
</table>

1.4 billion
Embedded Air Emissions: PM$_{10}$

Sedan PM$_{10}$ Emissions in mg per Passenger Mile Traveled

- Vehicle Active Operation
- Vehicle Maintenance
- Infrastructure Operation
- Infrastructure Parking

- Vehicle Inactive Operation
- Vehicle Insurance
- Infrastructure Maintenance

- Vehicle Manufacturing
- Infrastructure Construction
- Fuel Cycle

- 105 Million Spaces
- 730 Million Spaces
- 820 Million Spaces
- 840 Million Spaces
- 2 Billion Spaces
Transportation: Network Growth

Environmental and Economic Consequences of Permanent Roadway Infrastructure Commitment: City Road Network Life-cycle Assessment and Los Angeles County, A Fraser and M Chester, ASCE Journal of Infrastructure Systems, Expected 2016, Volume and Issue Forthcoming, doi: 10.1061/(ASCE)IS.1943-555X.0000271
Cumulative Roadway Kilometers

[Graph showing cumulative roadway kilometers from 1900 to 2010, with 74% of the network being local roads.]

Environmental and Economic Consequences of Permanent Roadway Infrastructure Commitment: City Road Network Life-cycle Assessment and Los Angeles County, A Fraser and M Chester, ASCE Journal of Infrastructure Systems, Expected 2016, Volume and Issue Forthcoming, doi: 10.1061/(ASCE)IS.1943-555X.0000271
PARKING INFRASTRUCTURE
LOS ANGELES
Andrew Fraser
Doctoral Candidate
Civil, Environmental and Sustainable Engineering
Arizona State University

Juan Matute
Associate Director
UCLA Lewis Center and the Institute of Transportation Studies
University of California Los Angeles

Ram Pendyala
Professor
Civil and Environmental Engineering
Georgia Institute of Technology

Carolyn Flower
Undergraduate Researcher
Civil, Environmental and Sustainable Engineering
Arizona State University
<table>
<thead>
<tr>
<th>Property use</th>
<th>Pre-1936</th>
<th>1936–1960</th>
<th>Post-1960</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RESIDENTIAL</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single-family home</td>
<td>1 per DU</td>
<td>2 per DU</td>
<td>3 per DU</td>
</tr>
<tr>
<td>Condominium</td>
<td>0</td>
<td>DU≤10 then 1 per DU, DU&gt;10 then 1.25 per DU</td>
<td>DU≤10 then 2 per DU, DU&gt;10 then 2.5 per DU</td>
</tr>
<tr>
<td>Duplex (2 DU)</td>
<td>0</td>
<td>1 per DU</td>
<td>2 per DU</td>
</tr>
<tr>
<td>Duplex (3–4 DU)</td>
<td>1 per DU</td>
<td>1.5 per DU</td>
<td>2 per DU</td>
</tr>
<tr>
<td>Duplex (5+ DU)</td>
<td>0.5 per DU</td>
<td>1 per DU</td>
<td>1.5 per DU</td>
</tr>
<tr>
<td>Manufactured home</td>
<td>1.5 per DU</td>
<td>1.5 per DU</td>
<td>1.5 per DU</td>
</tr>
<tr>
<td>Mobile home</td>
<td>1 per DU</td>
<td>1.5 per DU</td>
<td>2 per DU</td>
</tr>
<tr>
<td>Apartment</td>
<td>0</td>
<td>1 per DU</td>
<td>2 per DU</td>
</tr>
<tr>
<td><strong>NONRESIDENTIAL</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Animal kennel</td>
<td>1 per 500 sq. ft.</td>
<td>1 per 500 sq. ft.</td>
<td>1 per 250 sq. ft.</td>
</tr>
<tr>
<td>Auto service centers, banks and service shops, department store, supermarket, miscellaneous commercial, mortuary, neighborhood shopping, regional shopping, retail store, service station, film/television/radio, nursery/greenhouse</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Bowling center</td>
<td>30</td>
<td></td>
<td>45</td>
</tr>
<tr>
<td>Fast food</td>
<td>1 per 70 sq. ft.</td>
<td>1 per 70 sq. ft.</td>
<td>1 per 33 sq. ft.</td>
</tr>
<tr>
<td>臂</td>
<td>1 per 1,000 sq. ft.</td>
<td>1 per 1,000 sq. ft.</td>
<td>1 per 33 sq. ft.</td>
</tr>
<tr>
<td>Medical facilities</td>
<td>1 per 400 sq. ft.</td>
<td>1 per 400 sq. ft.</td>
<td>1 per 33 sq. ft.</td>
</tr>
<tr>
<td>Parking lot/structure</td>
<td>1 per 330 sq. ft.</td>
<td>1 per 330 sq. ft.</td>
<td>1 per 33 sq. ft.</td>
</tr>
<tr>
<td>Restaurant, bar, skating rink</td>
<td>1 per 200 sq. ft.</td>
<td>1 per 200 sq. ft.</td>
<td>1 per 100 sq. ft.</td>
</tr>
<tr>
<td>Warehouse</td>
<td>1 per 2,000 sq. ft.</td>
<td>1 per 2,000 sq. ft.</td>
<td>1 per 1,000 sq. ft.</td>
</tr>
<tr>
<td>Golf course</td>
<td>90</td>
<td></td>
<td>180</td>
</tr>
<tr>
<td>Hospital</td>
<td>1 per 1,200 sq. ft.</td>
<td>1 per 1,200 sq. ft.</td>
<td>1 per 600 sq. ft.</td>
</tr>
<tr>
<td>Education</td>
<td>1 per 2,000 sq. ft.</td>
<td>1 per 2,000 sq. ft.</td>
<td>1 per 1,000 sq. ft.</td>
</tr>
<tr>
<td>Boat slips</td>
<td>0.15 per Slip</td>
<td>0.15 per Slip</td>
<td>0.3 per Slip</td>
</tr>
<tr>
<td>Open storage</td>
<td>4+1 per 12,000 sq. ft.</td>
<td>4+1 per 12,000 sq. ft.</td>
<td>4+1 per 6,000 sq. ft.</td>
</tr>
</tbody>
</table>
ONSTREET

SURFACE LOTS & STRUCTURES
Cumulative Spaces

18.6 million spaces
- 5.5 residential offstreet
- 9.6 million non-residential offstreet
- 3.6 million onstreet
14% of incorporated land area

1.4 times larger than roadway area

16 miles in diameter
2.3 million residents
900,000 homes
1 million workers
Annual Space Additions

Growth Relative to Vehicles

Changes in Spaces: 1950-2010

Minimum parking standards have been a success at encouraging greater automobility and probably a failure at lower traffic congestion.

Before 1975, vehicle adoption accelerated to fill residential offstreet spaces; after 1975 the vehicle to residential offstreet space ratio has hovered around unity.
Even if minimum parking requirements are reduced or reformed, the extensive parking infrastructure is likely to work against policy initiatives to curb the use of the car, reduce auto congestion, increase transit usage, and address equity issues.
However, there is likely to be a “drag” from existing parking infrastructure.

The current parking infrastructure may substantially reduce the positive impacts of major parking reforms.
Transitioning Parking Infrastructure

- Conversion of parking to housing, small business, industrial and commercial use, and recreational facilities.
- Replace surface lots with buildings.
- Conversion of parking structures to alternative uses.
- Allow “bootlegged” apartments amnesty.
- Focus parking reform on areas with high quality transit access.
http://www.citylab.com/cityfixer/2015/10/where-la-is-losing-parking-lots-to-transit-development/410590/
References

Environmental and Economic Consequences of Permanent Roadway Infrastructure Commitment: City Road Network Life-cycle Assessment and Los Angeles County, Andrew Fraser and Mikhail Chester, ASCE Journal of Infrastructure Systems, Expected 2016, Volume and Issue Forthcoming, doi: 10.1061/(ASCE)IS.1943-555X.0000271.


