Automobile Alternatives

S. Handy
TTP282 Transportation Orientation Seminar
12.1.17
Federal Transportation Policy

1910

1960

1960

2010
Level of Service

TRB’s Highway Capacity Manual

Table 1
Signalized Intersection Level of Service Criteria

<table>
<thead>
<tr>
<th>Level of Service</th>
<th>Control Delay per Vehicle (sec/veh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>≤ 10</td>
</tr>
<tr>
<td>B</td>
<td>&gt;10-20</td>
</tr>
<tr>
<td>C</td>
<td>&gt;20-35</td>
</tr>
<tr>
<td>D</td>
<td>&gt;35-55</td>
</tr>
<tr>
<td>E</td>
<td>&gt;55-80</td>
</tr>
<tr>
<td>F</td>
<td>&gt; 80</td>
</tr>
</tbody>
</table>


LOS = f (volume/capacity)  ➔  How to increase LOS?
Result: Massive Intersections
OR
get people to do something other than drive
Why worry about them?
### U.S. Mode Split in 2009

<table>
<thead>
<tr>
<th></th>
<th>Share of Person Trips</th>
<th>Share of Person Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transit</td>
<td>1.9%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Walking</td>
<td>10.4%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Biking</td>
<td>1.0%</td>
<td>0.2%</td>
</tr>
</tbody>
</table>

Source: 2009 National Household Travel Survey (NHTS)
Percent of Trips by Public Transport, Bicycle, and Walking in Selected OECD Countries

Source: John Pucher
Non-Motorized Modes
aka Active Travel
aka Walking and Bicycling
(and sometimes Transit)
Benefits of a Bicycle

- Puts a big fat smile on your face
- Shapes up that body
- Zero emissions
- Slows global warming
- Whizzes past traffic jams
- Gives you legs of steel
- The Earth sends a little extra love to those on bicycles
- No need to pay for gas, parking fees, or auto insurance...hurray!
- It carries your goodies home
- It feels like flying
- Faster and easier than walking
- It's as quiet as a mouse

www.cicle.org

http://www.diseaseproof.com/bicycle-benefits-image.jpg
What factors explain walking and bicycling as *modes of transportation*?

**Individual Factors:**
Age, gender, attitudes, experience, comfort?

**Social Environment Factors:**
Family, friends, neighbors, crime?

**Physical Environment Factors:**
Sidewalks, crosswalks, land-use mix, design?
Walking to Store vs. Distance

Handy, Cao, and Mokhtarian, 2006.
Walking to Store vs. Walk Preference

Handy, Cao, and Mokhtarian, 2006.
Percent Biking Last Week by “Major streets have bike lanes”

Source: Xing, Buehler, and Handy, 2008
Percent Biking Last Week vs. Comfort Biking to Grocery Store

Source: Xing, Buehler, and Handy, 2008
Percent Biking Last Week vs. “I like riding a bike”

Source: Xing, Buehler, and Handy, 2008
Mode to Soccer Games in Davis

What share of kids bike or walk to their games?

Source: Tal and Handy, 2008
Share of bike trips by women

Source: Pucher and Buehler (eds.) *City Cycling*. Cambridge, MA: MIT Press, 2012; UC Davis observations
So why do women bicycle less?

• Convenience is more of a factor? maybe
• Comfort and confidence are lower? yes
• Liking of biking is lower? yes
How can we increase walking and bicycling?
IMPROVE ENVIRONMENT

MOTIVATE PEOPLE
Principle 1: Distance (1/2)

• Increase proximity
  • Change land use patterns
  • Encourage people to move

• Increase connectivity
  • Focus on missing links
  • Bridge key barriers
  • Address intersections

Source: Handy, 2017
Principle 1: Distance (2/2)

• Leverage current trip patterns
  • Identify concentrations of bike-able trips
  • Extend distances with e-bikes
• Decreased *perceived* distance
  • Improve aesthetics
  • Improve comfort
Principle 2: Protection (1/3)

• Protected facilities
  • Quiet streets to simple lanes to separated paths
  • Intersection treatments to grade-separated crossings

• Traffic management
  • Speed limits
  • Vehicle restrictions
  • Vehicle types
Principle 2: Protection (2/3)

A challenge:
protection versus distance and convenience
Principle 2: Protection (3/3)

• Personal security...
• Bicycle security...
Principle 3: Integration

• Bicycling with transit
  • Bicycling as access mode
  • On-street conflicts

• Bicycling with walking
  • Shared versus separated facilities
  • Traffic calming for bikes
# Walking vs. Biking Potential

<table>
<thead>
<tr>
<th></th>
<th>People Potential</th>
<th>Trip Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking</td>
<td>No equipment needed</td>
<td>Only 2-5 mph so not many destinations within time available</td>
</tr>
<tr>
<td></td>
<td>Almost everyone does it some</td>
<td></td>
</tr>
<tr>
<td>Bicycling</td>
<td>Bicycle needed</td>
<td>Faster at 5-15 mph so more destinations within time available</td>
</tr>
<tr>
<td></td>
<td>Many people don’t have skills or confidence to do it</td>
<td></td>
</tr>
</tbody>
</table>
## Short Trips in the US

<table>
<thead>
<tr>
<th>Trip Length</th>
<th>Share of Trips</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 mile</td>
<td>25 %</td>
</tr>
<tr>
<td>&lt; 2 miles</td>
<td>40 %</td>
</tr>
</tbody>
</table>

Source: John Pucher
# The 4 E’s of Bicycle Planning

<table>
<thead>
<tr>
<th>Engineering</th>
<th>![Image of bicycle and road]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>![Image of people riding bicycles]</td>
</tr>
<tr>
<td>Encouragement</td>
<td>![Image of text: WHEELING WALKS]</td>
</tr>
<tr>
<td>Enforcement</td>
<td>![Image of car and road]</td>
</tr>
</tbody>
</table>
## Bicyclist Types

<table>
<thead>
<tr>
<th>Type</th>
<th>Facility Preference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learners</td>
<td>Separated</td>
</tr>
<tr>
<td>Recreationalists/casual</td>
<td>Separated or on street</td>
</tr>
<tr>
<td>Commuters/confident</td>
<td>On street</td>
</tr>
</tbody>
</table>
Trendy Bike Ideas in U.S. Cities

Cycletracks

Buffered bike lanes

Bike share systems
Safe Routes to School

http://www.saferoutesinfo.org/
Odense, Denmark
Percent Biking to Work in Smaller Cities

Source: Handy, Heinen, and Krizek, forthcoming
Boom in Cycling to Work

Bicycling culture

Riding away from a bar crawl

In Sickness and in Health, Long After the Bike Is Due Back

The New York Times
Cities rack up public artwork with bike racks

11/2/2008
“I’ve been riding a bicycle as my principal means of transportation in New York since the early 1980s.”
Electric-Assist Bicycles – e-bikes, pedelecs
Parents using e-bikes...

“I love my bike. It’s my car!”
Bike sharing
55 operations* in the U.S. by 2016

Transit complement or substitute?
Equity of access?

*With at least 10 stations and 100 bikes
Bike Sharing – e-bikes
Dockless Bikshare...
Dockless Bikeshare...

https://www.theguardian.com/uk-news/2017/nov/25/chinas-bike-share-graveyard-a-monument-to-industrys-arrogance
Skateboards and e-skateboards

https://www.youtube.com/watch?v=wiQE8QrQtd8

See dissertation by Kevin Fang
Public Transit
The Role of Transit

• Public transit provides an essential alternative to driving for...
  • “Captive riders” ... those who can’t drive
  • “Choice riders”... those who prefer not to drive”
Transit Characteristics

• What do potential transit riders care about?
  • Cost
  • Speed
  • Frequency
  • Reliability
  • Comfort
  • Safety
Rail Options

• Light Rail Transit
• Rapid Transit
• Commuter Rail
• High Speed Rail
California High Speed Rail
Bus Rapid Transit

BRT System Elements

Vehicles

Bus Ways

Stations

Systems

Source: http://www.mta.info/mta/planning/brt/whatis.htm
Walking and Biking to Transit
Micro-transit on demand

e.g Bridj, Chariot, Leap

Competing with public transit?
Getting people out of their cars?

http://www.bizjournals.com/sanfrancisco/blog/2015/03/leap-transit-commuter-bus-san-francisco-loup.html
Macro-transit on schedule
e.g. Google buses, Megabus

Competing with public transit?
Impacts on neighborhoods?
Ride-Sharing

e.g. Über, Lyft, etc.

Reducing car ownership?
Competing with transit?
Single or shared rides?
Ride-Sharing – Shared Rides

e.g. Uber Pool, Lyft Line, etc.

User willingness?
Feasibility in rural areas?
It’s all about...

LAND USE
The Role of Community Design

By designing communities more like they used to be, we can reduce auto dependence

• Neighborhoods should be built around a commercial center
• Neighborhoods should be linked by a regional transit system
Interrelated ideas...

• New Urbanism
• Transit-oriented development
• Infill development
• Main Street programs
• Redevelopment

• Smart Growth
New Urbanism

“New Urbanist developments create walkable neighborhoods, rather than large, single-use developments connected by streets hostile to pedestrians.”

- The Congress for the New Urbanism website
“Transit-Oriented TOD’s focus of locating new construction and redevelopment in and around transit nodes is viewed by many as a promising tool for curbing sprawl and the automobile dependence it spawns.”
- TCRP Report 102
The Role of Information and Communications Technologies (ICT)

• Substitution?
• Inducement?
• Complimentarity?
Individually owned cars?
Shared cars individually used?
Shared cars with shared rides?
Transportation Planning Philosophy

The Old Way:
Make it easier to drive
Focus on “level of service”
Planning for mobility

The New Way:
Make it easier to NOT drive
Focus on “livability”
Planning for accessibility
“With walkers and in strollers, on hopalongs and (in the case of quite a few happily panting dogs) on leashes, Portlanders packed a series of previews Sunday of Tilikum Crossing, the first bridge in the United States to carry buses, bikes, trains, streetcars and people walking but no private cars.”

“Anyone hoping to cruise San Francisco’s motley main drag of Market Street, whether driving through or simply gawking, will likely have to do it aboard Muni, in a taxi, on a bicycle or on foot.”
L.A. will add bike and bus lanes, cut car lanes in sweeping policy shift

“City leaders say the plan reflects a newfound view that simply widening streets is no longer feasible or, in many cases, desirable. They contend that if even a small share of motorists change their travel behavior, choosing alternatives to the car, the city can make a big dent in the overall number of miles traveled.”

Next Up