City Trees & Transportation: Perceptions, Research & Safety

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Social Marketing

transportation data – Thursday AM

SM process – Thursday AM

city green social benefits – Friday AM

research, analysis & evidence!
DANGER AHEAD
FASTEN SAFETY BELTS
AND REMOVE DENTURES

GEVAAR VOOR
MAAK GORDELS WAS
EN VERWYDER KUNSTANDE
roadside trees = bad trees?
Presentation Outline

- City Trees & DOTs – perception/reality
- Trees, Livability & Value
- City Trees and Safety
- Design Opportunities
Clear Zone (U.S. policy):
Class 1- Least Risk

Solution to run-off-the-road crashes auto damage & driver injury
Class 3 Risk

Class 5 Risk
Class 7: Highest Risk
research on risk management
perceived versus actual risk
Presentation Outline

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- City Trees and Safety
- Design Solutions
trees make cities pretty . . . . .

More than beauty . . .
environment, economics, social benefits
Ecosystem / Environmental Services

- Stormwater Absorption & Quality
- Air pollutants reduction
- Nitrogen, phosphorus and sediment interception
- Carbon emission reduction, storage and sequestration
- Urban heat-island cooling
- Reduced “bad” ozone
- Wildlife habitat creation
Human Well-Being Benefits

- Stress reduction in urban lifestyles
- Higher job satisfaction and reduced absenteeism
- Reduced violence and more constructive conflict resolution in domestic conflict
- Improved surgery and illness recovery
- Greater creativity and modeling behavior in children’s play
- Reduced ADHD symptoms
Roadside Landscape & Traffic Stress Response

- Roadside Features - Driving Simulations
  - Forest, golf course, strip mall

- Physiological Response
  - E.g. heart beat, blood pressure

- Results
  - Nature scenes - return to baseline faster, less response to new stressors
  - Immunization effect

Americans travel 2.3 billion miles per day on urban freeways & highways
Physical Inactivity & Obesity

The majority of Americans are not active enough to meet the goal of 30 minutes per day of moderate activity to reduce risk factors for chronic diseases such as heart, stroke, cancer, and diabetes. This inactivity incurs significant costs to national health services.

- 310-580,000 deaths per year
- $100 billion medical costs (1995)
- 9.4% of all U.S. medical costs
* There are now more overweight than malnourished people in the world!
parks, open spaces & trails
need access & facilities
Make Room for Pedestrians
Walkable Neighborhoods
Streets Focused on Vehicles

need people space, and multi-modal mobility
Community Economics

• Improved consumer environments in business districts: + 9-12% product spending

• Residential real estate values:
  + 3-7% with trees in yard
  + 5-20% proximity to natural open space
  + 9% when adjacent to street tree plantings

• Commercial property rental rates: + 7%

• Air pollution mitigation

• Heating and cooling cost reductions
City Trees & Retail Behavior

Willing to pay 9-12% more

Wolf, J Forestry 2006, J Arb 2005
Image Categories (sorted by ratings)  
(cities of 10-20 K population)

Full Canopy  
mean 3.63

No Trees  
mean 1.65  
(lowest)

Scale : 1=not at all,  
5=like very much,  
26 images
1. **Place Perceptions**
   - Amenity and Comfort
   - Interaction with Merchants
   - Quality of Products
   - Maintenance and Upkeep

2. **Patronage Behavior**
   - travel time, travel distance
   - duration & frequency of visits
   - willingness to pay for parking

3. **Product Pricing**
   - higher willingness to pay for all types of goods
   - higher in districts with trees - 9-12%

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**most measures higher with trees**

*multiple studies, funded by US Forest Service & NUCFAC*
Tree Values & Benefits

- Ecosystem / Environmental Services
- Community Economic Development
- Human Dimensions & Social Benefits
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Problem!

Drivers run off the road and crash into trees
Total 2002 motor vehicle crashes: 6,316,000

Collisions with trees - 1.9% (120,000 per year)
Injury Comparison

All accidents

- No injury: 61%
- Possible injury: 14%
- Non-incapacitating injury: 12%
- Incapacitating injury: 12%
- Fatality: 1%

Trees only

- No injury: 29%
- Possible injury: 10%
- Non-incapacitating injury: 15%
- Incapacitating injury: 40%
- Fatality: 6%
Speed Comparison

- All crashes
- Trees only
# Roadside Trees & Safety

*U.S. traffic accident rates in 2002*

<table>
<thead>
<tr>
<th></th>
<th>U.S. Total</th>
<th>Tree Accidents</th>
<th>Urban Accidents</th>
<th>Urban Tree Accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Accidents</td>
<td><em>6,316,000</em> (100%)</td>
<td>1.9%</td>
<td>37%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Incapacitating</td>
<td>13%</td>
<td>0.9%</td>
<td>4.1%</td>
<td>0.04%</td>
</tr>
<tr>
<td>Injury and Fatality</td>
<td>1.2%</td>
<td>0.1%</td>
<td>0.4%</td>
<td>&lt;0.001%</td>
</tr>
<tr>
<td>Fatality</td>
<td>*43,005 (0.6%)</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

* NHTSA (2004) - %s may differ due to sampling and analysis procedures

Bratton and Wolf, Trans Research Board, 2005
Annual Fatality Risks:
M. Norris, Australia ISA, 2005

<table>
<thead>
<tr>
<th>Risk</th>
<th>Individual risk per person per year</th>
</tr>
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<tbody>
<tr>
<td>Smoking (20 cigarettes a day)</td>
<td>1:200</td>
</tr>
<tr>
<td>Cancers from all causes</td>
<td>1:500</td>
</tr>
<tr>
<td>Drinking alcohol</td>
<td>1:2,500</td>
</tr>
<tr>
<td>Travelling by Motor vehicle</td>
<td>1:7,000</td>
</tr>
<tr>
<td>Travelling by Train</td>
<td>1:33,000</td>
</tr>
<tr>
<td>Travelling by Aeroplane</td>
<td>1:100,000</td>
</tr>
<tr>
<td>Fires and accidental burns</td>
<td>1:100,000</td>
</tr>
<tr>
<td>Cataclysmic storms and storm flood</td>
<td>1:5,000,000</td>
</tr>
<tr>
<td>Lightning strike</td>
<td>1:10,000,000</td>
</tr>
<tr>
<td>Meteorite</td>
<td>1:1,000,000,000</td>
</tr>
</tbody>
</table>

fatal urban tree crash 1: 100,000
Urban/Rural Crash Rates
Injury Comparison

**All accidents**

- No injury: 61%
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- Incapacitating injury: 12%
- Fatality: 1%

**Trees only**

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Injury, Urban and Rural Differences
No sir, I was not talking on my cell phone.... I was watching a T.V. show on my iPod....
Behavior & Safe Driving!

- Crashes occur on weekends, late evening hours
- Winding rural roads, vehicle leaves road on outside of curves
- Male traffic fatalities outnumber female 2 to 1
- Drunk driving - about 50% of all traffic fatalities
- Seat belt use reduces risk of death by 42%
- Travel speed exceeds posted speed - about 30% of fatalities

Psychology division in transportation agencies?
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the
“green book”

AASHTO: policy vs standards

professional interpretation
Streets Focus on High-Speed

poor livability
Recent Urban Research

- Safety effects of three urban roadside design strategies:
  - widening paved shoulders
  - widening fixed-object offsets
  - livable (pedestrian oriented) street treatments

- Only livable streets variable was consistently, negatively associated with reduced roadside and midblock crashes

E. Dumbaugh, 2006, Trans Research Record
Recent Urban Research

- Consider vehicle speed & compatibility with other transportation modes

- Operating speed modeling, GPS recorded:
  - higher speed - 2 lane per direction vs. one lane (most significant factor)
  - reduced speed - on-street parking and sidewalks
  - reduced speed - increase in density of trees or utility poles, or decrease in their offsets
  - reduced speed - increase in density of driveways, T intersections

Wang, Dixon, Li, Hunter; 2006, Trans Research Record
Alternative!

Psychological Traffic Calming

“body language of the street”
“mental speedbumps” D. Engwicht

- complete streets
- home zones
Home Zones  (Dutch “woonerf”)
Integrating the Street into Everyday Life
Home Zones
Traffic Calming
Green Streets
Festival Planning
Play Spaces
Multi-modal Transport
www.completestreets.org/
Complete the Streets!
cars/pedestrians/bikes

multi-modal systems
Context Sensitive Solutions
national & state policy – U.S.

Barracks Row

8th Street Barracks Row, a 3/4 mile, 6 block stretch between Pennsylvania Avenue and M Street SE, is one of the District’s oldest commercial corridors. 8th Street’s turn of the century buildings give the street charm and character, but over the years the commercial strip had experienced economic decline. Vacant storefronts and loitering added to the perception that 8th Street was an unsafe place to be and shop after dark. Merchants complained that there was inadequate public parking. And time...
Context Sensitive Solutions
Mississippi

Mannsdale Road, Mississippi Route 463

Mannsdale Road is located west of the city of Madison northwest of Jackson, Mississippi. The road is about 8 mi long and is currently two lanes wide. Land use varies significantly along the short project length. Light commercial is prevalent at the beginning near the Interstate and shifts to existing and developing suburban areas along the middle of the corridor. The end of the project is primarily rural with very low density residential and agricultural uses. Most of the project area is rich in history with two early town areas, a former plantation, and two 150-year-old church congregations. To date, the local residents have been successful in influencing the character of the growth in the culturally rich area. Realizing the cultural significance of the area, the Mississippi Department of Transportation (MDOT) and the FHWA determined that the project should be developed following the principles of CSD. MDOT has chosen to implement and develop context sensitive solutions by utilizing the NEPA process. A multidisciplined project team was assembled to see the project from initial concept through the NEPA phase. Currently, the design team and the public have reached general consensus and are advancing two build alternatives through the NEPA process. Early in the project a Citizen’s Advisory Team (CAT) was assembled to represent the citizens in the corridor and work with the project development team to see that the project addressed citizens’ concerns.

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Context Sensitive Solutions

case study: Barracks Row, WA DC
Context Sensitive Solutions

case study: Barracks Row, WA DC
Goals for Roadside Trees?

- Common Transportation Perception: trees & landscape enhance beauty
- Evolving Understanding: green streets offer environmental, economic, and social benefits
- Do not compromise Safety! Reasonable Risk?
- Engineering, landscape, and tree professionals working together
Urban Streets Guidelines - 2008 –

- crash stats
- best practices
  (what is, not what could be)

still has a "clear zone" bias
Context Sensitive Solutions

U.S. national & state policy
e.g. Institute of Transportation Engineers

- Acknowledge & integrate community values
- Documentation of public process limits liability
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