Do Standard Trip Generation Rates Overstate Impact of Commercial Uses?

Presentation Overview

1. Introduction
2. Trip Characteristics Database
3. TOA Demand Adjustment
4. Other Approaches
5. Summary
Impact Fee = Demand x Cost - Credit

Introduction

Demand Component

- Vehicle Miles of Travel includes the following components:
  - Trip Generation Rate (TGR)
  - Trip Length (TL)
  - Percent New Trips (PNT)
Introduction
Main Question

• Do Standard Trip Generation Rates Overstate Impact of Commercial Uses?
  – Measure local conditions
  – Impact should be measured by vehicle miles of travel (VMT)
  – Must include trip rate, trip length and percent new trips
  – Ensures equity between land uses

Introduction
Key Concepts

• A trip to restaurant is not the same as a trip to work

<table>
<thead>
<tr>
<th>State Road</th>
<th>County Road</th>
<th>Local City Road</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 mile</td>
<td>3 miles</td>
<td>1 mile</td>
</tr>
<tr>
<td>Restaurant</td>
<td>Work</td>
<td></td>
</tr>
</tbody>
</table>
Introduction
Key Concept

Life Cycle of Development

Developing Area
- Long Distances
  - Fewer Trips
  - Longer Distance

Mature Area
- Short Distances
  - More Trips
  - Shorter Distance

Equivalent Vehicle Miles of Travel

Introduction
Key Concept

Study Mature Areas

Residential

Commercial

Office

Study Mature Areas

Residential

Commercial

Office
Introduction
Vehicle Miles of Travel Example

Fast Food Restaurant Land Use

- Trip Rate = 522.62
- Trip Length = 2.05
- Percent New Trips = 58%
- Daily VMT* = 621.40

*VMT: Vehicle Miles of Travel

Introduction
Vehicle Miles of Travel (Fast Food Restaurant Example)

- Daily VMT per Land Use
  \[ \frac{621.40}{2} = 310.70 \]
Introduction
Vehicle Miles Traveled

Polk County, FL
Transportation Impact Fee (2009)

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Unit</th>
<th>Net VMT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retail (100k sf/ga)</td>
<td>1,000 sf</td>
<td>36.11</td>
</tr>
<tr>
<td>Bank w/Drive-In</td>
<td>1,000 sf</td>
<td>71.66</td>
</tr>
<tr>
<td>High-Turnover Rest.</td>
<td>1,000 sf</td>
<td>131.60</td>
</tr>
<tr>
<td>Fast Food Rest.</td>
<td>1,000 sf</td>
<td>286.75</td>
</tr>
</tbody>
</table>

Introduction
Transportation Impact Fee Cost Example – Polk County Fast Food

One 1,000 sf of Fast Food Restaurant consumes ~287 vehicle miles per day

Total Credit ~$29,000

1,000 sf of Fast Food Restaurant consumes ~94,710 of roadway (330 x 287)

A vehicle mile of capacity costs $330 (3,200,000/9,800)

One Lane Mile costs ~$3.2 M to construct

Fee ~ $65,710

Cost of Capacity Consumed by 1000 Sq. Ft. of a Fast Food Restaurant
Polk County, FL
Transportation Impact Fee (2009)

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Unit</th>
<th>Impact Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retail (100k sfgla)</td>
<td>1,000 sf</td>
<td>$6,754</td>
</tr>
<tr>
<td>Bank w/Drive-In</td>
<td>1,000 sf</td>
<td>$14,377</td>
</tr>
<tr>
<td>High-Turnover Rest.</td>
<td>1,000 sf</td>
<td>$30,168</td>
</tr>
<tr>
<td>Fast Food Rest.</td>
<td>1,000 sf</td>
<td>$65,096</td>
</tr>
</tbody>
</table>

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Trip Characteristics Database

Demand Variables

- Over 200 studies on 40 different residential and non-residential land uses since 1989

**Fast Food Restaurant w/Drive-Thru**

- Trip Length (TL) = 2.15
- Percent New Trips (PNT) = 58%
- Trip Generation Rate (TGR) = 522.62

Trip Characteristics Database

Data Collection Process

- **Trip Generation Rate** – Manual and Machine Counts
- **Trip Length** – Origin-Destination survey
- **Percent New Trips** – O/D survey data
Trip Characteristics Database
Data Collection Process

Machine/Manual Counts

- Full hours of operation
- Vehicles entering and exiting site
- Count in 15 minute intervals
- Strategic location to observe all vehicles (main entrance)
- Machine/Manual count calibration

Trip Characteristics Database
Data Collection Process

Origin-Destination Survey Form

- Origin Location
- Stops to Site
- Stops after leaving Site
- Final Destination
- Need to be able to plot trip on a map (Google Earth, Google Maps, Streets & Trips Software)
Trip Characteristics Database
Correctly Classifying and Measuring Trips

Measuring Travel Characteristics for Transportation Impact Fees

Trip Characteristics Database
Data Reduction Process

Trip Length Reduction Example:
Presentation Overview

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TOA Demand Adjustment Approaches
TGR, TL and PNT adjustments

- Institute of Transportation Engineers (ITE) Handbook and Florida Studies Blending - (TGR)
- Retail/Commercial Land Use Analysis
  - Trip generation rate
  - Trip length
  - Percent new trips
- City of Tampa Sub-areas – (TL)
- City of Bozeman
  - TL adjustment (local data)
  - Trip exchange district, linked trips
TOA Demand Adjustment Approaches

Trip Generation Rate Blending Process

Fast Food Restaurant Land Use

<table>
<thead>
<tr>
<th>TGR</th>
<th>Size (1,000 sf)</th>
<th>Rate x Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- TOA FL Studies: ≈564 ≈40 sf 22,560
- ITE 8th Edition: ≈496 ≈63 sf 31,248
- Total: 103 sf 53,808

Weighted Average TGR:

>> 53,808 / 103 ≈ 522 trips per sf

TOA Demand Adjustment Approaches

ITE 8th Edition – Shopping Center TGR

Shopping Center

Average Vehicle Trip Ends vs. 1600 Sq. Feet Gross Leasable Area
On a: Weekday

Number of Studies: 300
Average 1600 Sq. Feet/UA: 920
Directional Distribution: 50% entering, 50% exiting

Trip Generation per 1600 Sq. Feet Gross Leasable Area
Average Days: 12/24
Change in Rates: Standard/Discrete

Data Plot and Equation

Tindale-Oliver & Associates, Inc.
November 6, 2009

National Impact Fee Roundtable
Trip Generation Rates for Commercial Uses
TOA Demand Adjustment Approaches
TGR Regression Example – Shopping Center

Shopping Center TGR Comparison

TOA Data Points
TOA (Linear-Log)
ITE 8th Edition

TOA Demand Adjustment Approaches
TL Multi-State Regression – Shopping Center

Shopping Center - ITE LUC 820
Straight Line Regression

\[ y = 0.0009x + 2.4996 \]
TOA Demand Adjustment Approaches
Trip Length Variation across Transportation Districts

1989 Office Trip Length Factor

Variation from Base
- Highest
- Mid-Range
- Lowest

1989 Retail Trip Length Factor

Variation from Base
- Highest
- Mid-Range
- Lowest
TOA Demand Adjustment Approaches
Use of TCS database in other jurisdictions

- City of Bozeman, MT Transportation Impact Fee Study, 2008
  - Bozeman TCS data (11 studies)
  - TOA Florida TCS data (+200 studies)

<table>
<thead>
<tr>
<th>Land Use</th>
<th>TL Adj. Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>55%</td>
</tr>
<tr>
<td>Office/Institutional</td>
<td>43%</td>
</tr>
<tr>
<td>Retail</td>
<td>62%</td>
</tr>
<tr>
<td>Industrial</td>
<td>43%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Land Use</th>
<th>FL Trip Length</th>
<th>TL Adj. Factor</th>
<th>Bozeman TL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hotel</td>
<td>6.26</td>
<td>55%</td>
<td>3.44</td>
</tr>
<tr>
<td>Hospital</td>
<td>6.40</td>
<td>43%</td>
<td>2.75</td>
</tr>
<tr>
<td>Retail (100k sfgl)</td>
<td>2.54</td>
<td>62%</td>
<td>1.57</td>
</tr>
<tr>
<td>Fast Food Rest.</td>
<td>2.05</td>
<td>62%</td>
<td>1.27</td>
</tr>
<tr>
<td>Light Industrial</td>
<td>5.13</td>
<td>43%</td>
<td>2.21</td>
</tr>
</tbody>
</table>
City of Bozeman
TED* Retail (100-199K) = $5,182
Non-TED Retail (100-199K) = $9,331
TED Quality Restaurant = $6,009
Non-TED Quality Restaurant = $22,036
*Trip Exchange District

<< Lake County TCS

TOA Demand Adjustment Approaches
Downtown PNT Adjustments (Linked Trips)
**Other Approaches**

**VMT Adjustment Approach**

- Actual VMT per unit of development
  - Based on actual trip characteristics data
  - Satisfies “most recent and localized data” requirement
- VMT Adjustment approach
  - Aggregate VMT of system based on incomplete traffic counts
  - VMT of existing developments listed in the property appraisers database
  - Calibrate VMT per unit of development based on validation

**Other Approaches**

**ITE and NHTS Data Approach**

- **National Data:**
  - ITE – Institute of Transportation Engineers – TGR and PNT
  - NHTS – National Household Travel Survey – TL
- **Local Data:**
  - Travel Demand Model = develop trip length relationships within a county or city
  - City of Tampa (six TIF benefit districts)
  - TCS database
  - Collection of trip characteristics studies
  - TGR, TL and PNT data for individual land uses
  - TGA blends local data with ITE, where applicable, to increase sample
Other Approaches
ITE and NHTS Data

- ITE – Institute of Transportation Engineers
- NHTS – National Household Travel Survey

<table>
<thead>
<tr>
<th>Land Use</th>
<th>ITE / NHTS Approach</th>
<th>TCS Florida Studies Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TGR</td>
<td>TL(1)</td>
</tr>
<tr>
<td>Single Family</td>
<td>9.57</td>
<td>10.41</td>
</tr>
<tr>
<td>Bank</td>
<td>148.15</td>
<td>6.61</td>
</tr>
<tr>
<td>Restaurant</td>
<td>127.15</td>
<td>6.61</td>
</tr>
<tr>
<td>Fast Food</td>
<td>496.12</td>
<td>3.31</td>
</tr>
</tbody>
</table>

1) Source: NHTS trip length data
2) Gross VMT = TGR x TL x PNT / 2

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Summary

• Do Standard Trip Generation Rates Overstate Impact of Commercial Uses? 
  Maybe, Maybe Not
  – Best to measure local conditions
  – Impact should be measured by VMT (trip rate X trip length X percent new trips)
  – Ensures equity between land uses

Thank You

National Impact Fee Roundtable
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www.tindaleoliver.com
Trip Characteristics Database
Retail Shopping Center – TOA Studies

Marion County (1 Study)
Citrus County (2 Studies)
Lake County (2 Studies)
Hernando County (1 Study)
Pasco County (2 Studies)
Pinellas County (6 Studies)
Hillsborough County (6 Studies)
Sarasota County (5 Studies)
Charlotte County (3 Studies)
Collier County (2 Studies)

Trip Characteristics Database
Bank w/ Drive-In – TOA Studies

Marion County (5 Studies)
Hernando County (1 Study)
Pinellas County (3 Studies)
Hillsborough County (2 Studies)
Collier County (3 Studies)
**Introduction**

**Vehicle Miles of Travel Example**

**Single Family Residential Land Use**

- Trip Rate = 7.81
- Trip Length = 6.62
- Percent New Trips = 100%
- Daily VMT* = 51.70

*VMT: Vehicle Miles of Travel

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**Introduction**

**Vehicle Miles of Travel (Single Family Residential Example)**

- Daily VMT per Land Use
  
  \[
  \frac{51.70}{2} = 25.85
  \]
Introduction
Transportation Impact Cost Example – Polk County SFR

One Home consumes ~26 vehicle miles per day

One Lane provides capacity for ~9,800 vehicles per day

One Lane Mile costs ~$3.2 M to construct

A vehicle mile of capacity costs $330 (3,200,000 / 9,800)

Total Credit ~$3,700

One Home consumes ~$8,600 of roadway (330 x 26)

Fee ~ $4,900

Capacity Consumed by One Home