

Vehicle Miles of Travel-Based Traffic Impact Assessment

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[BACKGROUND]

- Center for Multimodal Solutions
 - *Recurrent Congestion*
 - *Demand Modeling*
 - *Multimodal Strategies*

- VMT based Methodology also consistent with the goals of FDOT and US Department of Transportation Strategic Plan for 2003-2008.
 - “Improve coordination of land use and transportation decisions among state government, local governments, and metropolitan planning organizations.”¹
 - “advance accessible, efficient, intermodal transportation for the movement of people and goods.”²

1. FDOT-b, n.d.: 19

2. USDOT 2003: Chapter 7

[RESEARCH OBJECTIVES]

- Produce a VMT based draft methodology;
 - Using VMT and travel time rather than using only trip generation rates
 - Reflect the impacts of specific types of land uses and their location within the region.
 - Index complementary “indicator” land uses to indentify relationships.
- Implement methodology in local communities to measure impact of current development.
- Provide incentives for compact development that increases internal capture and non-automobile travel.

[CONTEXT]

- Data collected by National Household Travel Survey (NHTS)
- Three Locations
 - North-East Florida Household Travel Survey, 2000
 - South-East Florida Household Travel Survey, 1999
 - Tampa Bay Area Household Travel Survey, 1996
 - Volusia County Household Travel Survey, 2002

[PHASE I]

- Establish Review Panel
- Review of Existing Research
- Analyze Regional Travel Surveys
- Analyze Previous Studies
- Develop Draft Methodology

[PHASE II]

- Model Implementation
- Community Selection/ Establishment of Validation Methodology
- Model Training Meeting
- Model Testing/ Validation Method Development
- Model Testing/ Validation Implementation
- Implementation Expansion
- Draft Report
- Final Report

How Does Urban Design Effect Travel Behavior?

- A recent trend in transportation planning and land use integration literature has identified numerous relationships between travel patterns and the built environment.
- Findings
 - Low-density areas generate more automobile usage than high-density areas¹
 - Total VMT is lower at locations of higher regional accessibility or a higher degree of land-use mixing²
 - Modes other than automobile are more likely to be used for nonwork trips in a traditional neighborhood.³
 - Trip frequency is lower in traditionally designed communities compared to suburban communities

1. *Parsons, Brinkerhoff, Quade, Douglas (1993)*

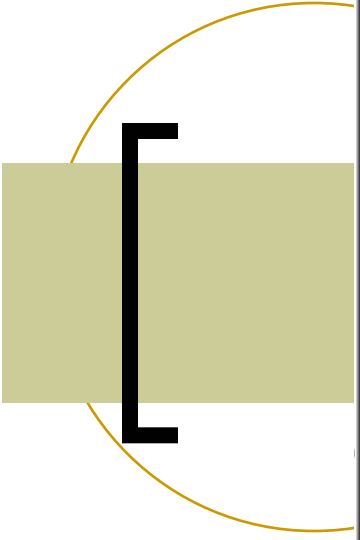
2. *Kockelman (1997)*

3. *Cervero, Radisch (1996)*

4. *Friedman, Gordon, Peers (1994)*



 Mall/Retail	 Apartment
 School	 House
 Route	



[Oregon's Example]

- Statewide Planning Goal 12
 - “To provide and encourage a safe, convenient, and economic transportation system.”
 - “To plan and develop facilities and services in close coordination with urban and rural development by:”¹
 - “Local Governments in MPO areas of larger than 1,000,000 shall evaluate alternative land use designations, densities, and design, standards to meet local and regional transportation needs.”²

1. OR.ADMIN.R.660-012-0000
2. OR.ADMIN.R.660-012-0035(2)

OREGON'S VMT

- Metropolitan Area Goals
 - 5% reduction in VMT in the Salem, Eugene, and Medford metropolitan areas.
 - Integrated transportation and land use to mitigate LOS
 - 10% reduction in parking spaces per capita

OREGON'S VMT

- “Metropolitan areas shall adopt TSP policies to evaluate progress towards achieving the standard or standards adopted and approved pursuant to this rule. Such evaluation shall occur at regular intervals corresponding with federally required updates of the regional transportation plan. This shall include monitoring and reporting of VMT per capita.”¹
 - Modal Share
 - VHT
 - Vehicle Trips per Capita
 - Measures of Accessibility
 - Peak Hour Commuting by SOV

1. *OR.AD.R.660-012-0035(5)(e)*

[SAN JOAQUIN, CA]

- Rule 9510 – Indirect Source Review (ISR)
 - “Achieve emissions reductions from the construction and use of development projects through design features and on-site measures.”¹
 - Produce a mechanism to reduce emissions through off-site measures.

- Rule applies to all development projects, transportation projects, and projects on contiguous or adjacent property.

[SAN JOAQUIN, CA]

- General Mitigation Requirements (On-Site)
 - Exhaust Emissions
 - Operational Emissions
- Emission Reduction Fee (Off-Site)
 - The applicant shall pay to the District a monetary sum necessary to offset the required construction emissions not reduced on-site.

[SAN JOAQUIN, CA]

Year	Cost of NOX Reductions (\$/ton)
2006	\$4,650.00
2007	\$7,100.00
2008 and beyond	\$9,350.00

Year	Cost of PM10 Reductions (\$/ton)
2006	\$2,907.00
2007	\$5,594.00
2008 and beyond	\$9,011.00

- Monies collected will be utilized to fund quantifiable and enforceable Off-site projects that reduce surplus emissions in an expeditious manner.

[Expected Findings]

- Implementation of a VMT-based traffic-impact methodology in the State of Florida.
- Identify simultaneous relationships of zonal level land-use patterns, socio-economic characteristics, and transportation system features.
- Recommended transportation and land use changes for increased accessibility.

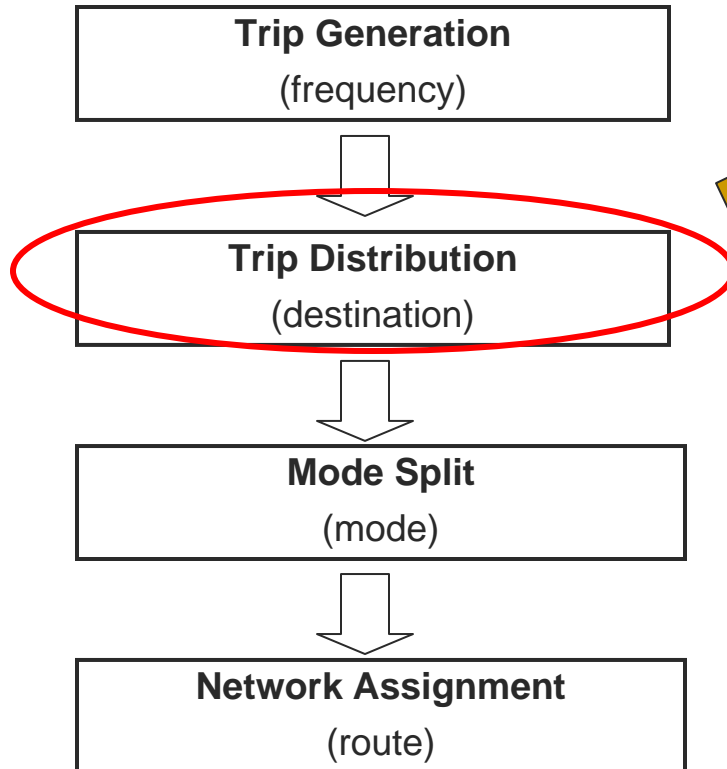
Project Timeline (1 YR)	1 st QTR	2 nd QTR	3 rd QTR	4 th QTR
Task I. Establish Review Panel				
• Establish Review Panel				
• Meeting with Review Panel				
Task II. Review of Existing Literature				
• Literature Review				
• Review of Professional Practice				
• Prepare Technical Memorandum				
Analyze Regional Travel Surveys				
• Analyze Data				
• Prepare Technical Memorandum				
Task IV. Analyze Previous Studies				
• Collect Examples from FDOT				
• Compile Summary of Practices				
• Prepare Technical Memorandum				
Task V. Develop Draft Methodology				

[METHODOLOGY]

1. Incorporating Land-Use Sensitivity in Four-Step Model
2. Models for Trip Lengths
3. Models for Household VMT

METHODOLOGY

Incorporating Land-Use Sensitivity in Four-Step Model



Destination-Choice Model

$$T_{ij} = P_i \left(\frac{\exp(V_{ij})}{\sum_k \exp(V_{ik})} \right)$$

$$V_{ij} = \beta_1 X_{1j} + \beta_2 X_{2j} + \dots + \beta_N X_{Nj} + \alpha_1 TT_{ij} + \alpha_2 TC_{ij}$$

METHODOLOGY

Modeling Trip Lengths

$$\ln(d_j) = \alpha_0 + \alpha_1 X_{1j} + \alpha_2 X_{2j} + \dots + \alpha_N X_{Nj} + \varepsilon_j$$

$X_{0j}, X_{1j}, \dots, X_{Nj}$ = Attributes characterizing the land use & transportation at zone j

$\beta_0, \beta_1, \dots, \beta_N$ = Coefficients on the attributes characterizing the land use at zone j

ε_j = Error term capturing the effects of unobserved factors on trip length

[METHODOLOGY]

Modeling Household VMT

$$\ln(VMT_h) = \alpha_0 + \alpha_1 X_{1h} + \alpha_2 X_{2h} + \dots + \alpha_N X_{Nh} + \varepsilon_h$$

$X_{0h}, X_{1h}, \dots, X_{Nh}$ = Attributes characterizing the household h
(including land - use around the household)

$\beta_0, \beta_1, \dots, \beta_N$ = Coefficients on the attributes characterizing households

ε_h = Error term capturing the effects of unobserved factors on VMT

METHODOLOGY

	Destination-Choice	Trip Length	Household VMT
Behavioral Realism	Destination choice for each trip is assumed to be made independently	Lengths for each trip is assumed to be made independently	Reflects household-level "net" change in behavior
Spatial Resolution of Land-Development Representation	TAZ	Any	Any
Application Data Needs	Trip Productions, TAZ-level landuse descriptors, & Interzonal transportation system characteristics	Additional trips generated (diverted) and land-use changes	Land-use & transportation around each household & a synthetic population (aggregations & approximations possible)
Trip Generation Requirements	Improvements preferred	Improvements preferred	Not needed
Spatial Resolution of Impact	Link-level	Local area of the development (facility-type level possible)	System-wide (facility-type level possible)
Application Tool	FSUTMS - modification of CUBE implementation	New Software -- Spreadsheet or GIS-based	New Software -- Spreadsheet or GIS-based

[INPUT]

- If you had a tool, what characteristics would you want it to include?
 - What would be your most common applications for a VMT-based traffic impact analysis tool?
 - What data would you like (or have available) to provide as inputs to this tool ?
 - What outputs would you like to obtain from this tool?
- How would you fit it into the rest of the tools you use?

[THANK YOU!!!]

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