Overview of TDM

MODULE GOALS
1. Define TDM.
2. Understand the reasons why TDM is important in meeting community needs.
3. Relate the importance of TDM to federal initiatives.
4. Summarize the relationship between congestion management systems and TDM.

ASSUMPTIONS
1. Participants deal with TDM issues on a regular basis.
2. TDM has received new emphasis because of ISTEA, CAAA, and the public's understanding that we can no longer build our way out of congestion.

MODULE INFORMATION

TDM is defined as

TDM can be classified into three categories:
1.
2.
3.

Five Reasons Why TDM Has Grown In Importance:
1. Growth in vehicle miles traveled
2. Energy usage of the SOV
3. Transportation project funding shortfalls
4. Urban density trends
5. Air pollution caused by vehicle emissions
Transportation provisions of the Clean Air Act Amendments of 1990 are:

1.

2.

3.

4.

5.

The 10 Commandments of ISTEA

1. Thou shalt implement intermodalism

2. Thou shalt be flexible

3. Thou shalt be more efficient

4. Thou shalt support the National Highway System

5. Thou shalt enhance the environment

6. Thou shalt promote safety

7. Thou shalt innovate

8. Thou shalt promote creative investment

9. Thou shalt take seriously plans and the planning process

10. Thou shalt create new partnerships


1. Employer may pay up to $60/month for rideshare expenses

2. Reduce American oil vulnerability

   -Alternative fuels and electric vehicles

   -Telecommuting study authorized
A Congestion Management System is defined as: _________

Seven key CMS elements:
1. 
2. 
3. 
4. 
5. 
6. 
7. 

What geographic areas must CMS cover?
1. Must cover entire state.
2. Areas where traffic congestion is or will be occurring
3. All corridors and facilities that are or will be congested
4. Entire metro planning area in non-attainment TMAs
5. Sufficient size to show effects of policy on system performance

CMS measurement systems must:
1. 
2. 
3.
Good performance measures should be:
1. Clearly understood
2. Sensitive to modes
3. Sensitive to time
4. Not too difficult or costly to collect
5. Forecasted into future
6. Sensitive to the impact of congestion mitigation strategies

Possible performance measures:
1.
2.
3.

A performance monitoring plan:
1. Documents measures, collection, and analytical procedures
2. Identifies agency responsibilities
3. Identifies count measurement frequency
4. Fosters coordination and complementary use of resources

Congestion management strategy plans:
1.
2.
3.
4.
5.
6.
Classes of congestion management strategies:
1.
2.
3.

Evaluating Effectiveness

Primary Measures
1. Change in vehicle occupancy for targeted corridors
2. Change in mode split and average vehicle ridership (AVR) at work sites
3. Change in distribution in volumes (work schedules)

Techniques
1. Work place surveys
2. Vehicle occupancy counts on specific facilities
3. Volume counts documenting peak spreading

Factors Impacting Effectiveness
1. Employer size
2. Transit service levels
3. Income levels
4. Management style of ETC
Possible answers:

What is TDM?

TDM is defined as a set of specific strategies that foster increased efficiency of the transportation systems and resources by influencing employee travel behavior by mode, time frequency, trip length, cost or route.

The goals of TDM are to reduce traffic congestion, improve air quality, reduce dependence on fossil fuels, enhance employee mobility, reduce commuter expenditures and expand access to labor.

TDM is a process aimed at relieving congestion.

TDM actions can be classified into three categories:

1. Actions that reduce the number or length of trips.
2. Actions that shift trips to more efficient modes;
3. Actions that shift trips to off-peak hours or uncongested routes.

Key CMS elements:

1. Area of application
2. Transportation System Definition
3. Performance Measures
4. Performance Monitoring Plan
5. Identification and Evaluation of Strategies
6. Implementation and Management
7. Monitoring of Strategy Effectiveness

Possible Performance Measures:

1. Measure the extent of congestion
2. Evaluate strategy effectiveness
3. Established cooperatively
Classes of congestion management plans:

1. Demand Management
   - Transportation Demand Management
   - HOV Strategies
   - Transit operational improvements
   - Non-motorized and non-traditional modes
   - Congestion pricing
   - Growth management

2. Operational Management
   - Traffic operational improvements
   - Access management
   - Incident management
   - IVHS

3. Capital intensive improvements
   - Lane additions
   - Transit capital improvements
TDM IMPACTS ON BUSINESS

Module Goals

- To identify the benefits of TDM to employers.

- To provide information about the relative importance of transportation to corporate relocation decisions.

- To demonstrate how to estimate the cost of turnover and relate it to investment in TDM strategies.

Assumptions

- Employers are more receptive to TDM strategies when the benefits are described in terms of interest to a business.

- Workshop participants have little experience in estimating the potential impact of the program on issues of importance to businesses.

Benefits of TDM to Employers:

Businesses use transportation demand management strategies to:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Site Selection Criteria

The functioning of the transportation system has a direct bearing on an area's economic development potential. The real estate adage of "location, location, location" is giving way to "access, access, access". Location alone is not sufficient. What is important is the access to the facility by customers, clients, suppliers, and employees. For example, advances in telecommunications have and will continue to make it less important where a business is located but how one can access the services and products of that business.

The reasons for relocating a business seem to focus on reducing costs as much as increasing market opportunities.

COMPANY REASONS FOR GROUP MOVE

<table>
<thead>
<tr>
<th>Reason</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consolidation of operations</td>
<td>59.3%</td>
</tr>
<tr>
<td>Division or subsidiary reorganization and relocation</td>
<td>57.6%</td>
</tr>
<tr>
<td>Company wanted a lower-cost operating environment</td>
<td>27.1%</td>
</tr>
<tr>
<td>Corporate relocation</td>
<td>23.7%</td>
</tr>
<tr>
<td>Company wanted to attract qualified employees</td>
<td>23.7%</td>
</tr>
<tr>
<td>Closer proximity to markets</td>
<td>20.3%</td>
</tr>
<tr>
<td>Opening of a new sales territory</td>
<td>15.3%</td>
</tr>
<tr>
<td>Other</td>
<td>15.3%</td>
</tr>
<tr>
<td>Improve company image</td>
<td>10.2%</td>
</tr>
</tbody>
</table>

Source: Runzheimer International

According to a survey of 150 personnel executives by Runzheimer International, the five most important criteria during the site selection phases of the corporate relocation process are high quality workers, low operating costs, quality of life, geographical locale, and proximity to markets.

MOST IMPORTANT SITE SELECTION CRITERIA

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available high quality workers</td>
<td>67%</td>
</tr>
<tr>
<td>Low operating costs</td>
<td>59%</td>
</tr>
<tr>
<td>Quality of life</td>
<td>46%</td>
</tr>
<tr>
<td>Geographical locale</td>
<td>39%</td>
</tr>
<tr>
<td>Proximity to markets</td>
<td>38%</td>
</tr>
</tbody>
</table>

Source: Runzheimer International

As the following examples illustrate, transit and TDM strategies contribute to most of these criteria.

- Carpooling and vanpooling link long distance commuters with potential employers. Transit services from the downtown can link transit dependent populations in the city with jobs in the suburbs. Thus, these modes expand the pool of candidates from which to attract high quality workers.

- Transit and TDM can reduce operating costs by
decreasing demand to build additional parking which can range from $2,000 per space for a surface lot to $20,000 per space for an underground garage.

- Telecommuting programs reduce office space requirements.
- High occupancy vehicle lanes can reduce commuting time for commuters and increase opportunities for residential choices.

List the top quality of life factors that affected site selection decisions

<table>
<thead>
<tr>
<th>QUALITY OF LIFE FACTORS THAT AFFECTED SITE SELECTION DECISIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local incentives offered to transferring companies that influenced their relocation decision</td>
</tr>
<tr>
<td>Tax abatements</td>
</tr>
<tr>
<td>Free land</td>
</tr>
<tr>
<td>Low interest loans</td>
</tr>
<tr>
<td>Employee relocation assistance</td>
</tr>
<tr>
<td>Financial Assistance</td>
</tr>
<tr>
<td>Labor training</td>
</tr>
<tr>
<td>Tax credits</td>
</tr>
<tr>
<td>Waiver of permits</td>
</tr>
</tbody>
</table>

What TDM strategies or services could be inducements to relocate to your area?
The High Cost of Turnover

The need for good employees is a never ending quest for businesses of all types. Without high quality employees, businesses will find it difficult to grow.

Why should companies worry about finding replacement workers? Problems associated with new employees can include:

Many employers think they miscalculated when they find turnover costs of __________ per employee. Simply having a large pool of potential job applicants is not enough. The cost of employee turnover is likely to be hidden, because it rarely shows up as a budget line item. The direct costs associated with employee turnover such as the pay and benefit costs are only a portion of the total costs. The high costs of turnover are found in the indirect costs.

The following table lists the components of the high cost of turnover. The accompanying tables illustrate how to estimate the cost of turnover. The final tables show that seemingly small impacts on mitigating turnover can pay big dividends to employers. The challenge to the TDM program is to tailor its services to meet the specific needs of employers and their workforce.

COST OF TURNOVER

1. Incoming employee inefficiency
2. Inefficiency of those closely associated with incoming employee
3. Departing employee inefficiency
4. Inefficiency of those closely associated with departing employee
5. Inefficiency of position being filled while vacant
6. Out-of-pocket processing costs
7. Human resources processing costs
8. Non-human resources employee processing costs
9. Relocating costs

Requiring employers to invest time and resources in TDM programs or activities can be compared to other investments. The following tables provide reference guides to help understand that TDM strategies that contribute to reduced employee turnover (e.g., transit subsidies) can have “bottom line” impacts on the business.
EMPLOYEE TURNOVER AVOIDANCE REQUIRED PER $100,000 INVESTMENT WITH 12 MONTHS PAYBACK (NUMBER OF EMPLOYEES)

<table>
<thead>
<tr>
<th>ANNUAL SALARY</th>
<th>0.25</th>
<th>0.50</th>
<th>0.75</th>
<th>1.00</th>
<th>1.25</th>
<th>1.50</th>
<th>1.75</th>
<th>2.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>$15,000</td>
<td>53</td>
<td>27</td>
<td>18</td>
<td>13</td>
<td>11</td>
<td>9</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>$20,000</td>
<td>40</td>
<td>20</td>
<td>13</td>
<td>10</td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>$25,000</td>
<td>32</td>
<td>16</td>
<td>11</td>
<td>8</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>$30,000</td>
<td>27</td>
<td>13</td>
<td>9</td>
<td>7</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>$40,000</td>
<td>20</td>
<td>10</td>
<td>7</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>$50,000</td>
<td>16</td>
<td>8</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

No. of employees = \[\frac{($100,000 \text{ investment} +$100,000 \text{ savings})}{(\text{salary} \times \text{cost of turnover to salary ratio})}\]


MAXIMUM INVESTMENT ALLOWED TO REDUCE COST OF TURNOVER WITH A 12 MONTH PAYBACK ($ PER TURNOVER)

<table>
<thead>
<tr>
<th>COST OF TURNOVER</th>
<th>10%</th>
<th>15%</th>
<th>20%</th>
<th>25%</th>
<th>30%</th>
<th>35%</th>
<th>40%</th>
</tr>
</thead>
<tbody>
<tr>
<td>$10,000</td>
<td>$500</td>
<td>750</td>
<td>1,000</td>
<td>1,250</td>
<td>1,500</td>
<td>1,750</td>
<td>2,000</td>
</tr>
<tr>
<td>$20,000</td>
<td>1,000</td>
<td>1,500</td>
<td>2,000</td>
<td>2,500</td>
<td>3,000</td>
<td>3,500</td>
<td>4,000</td>
</tr>
<tr>
<td>$30,000</td>
<td>1,500</td>
<td>2,250</td>
<td>3,000</td>
<td>3,750</td>
<td>4,500</td>
<td>5,250</td>
<td>6,000</td>
</tr>
<tr>
<td>$40,000</td>
<td>2,000</td>
<td>3,000</td>
<td>4,000</td>
<td>5,000</td>
<td>6,000</td>
<td>7,000</td>
<td>8,000</td>
</tr>
<tr>
<td>$50,000</td>
<td>2,500</td>
<td>3,750</td>
<td>5,000</td>
<td>6,250</td>
<td>7,500</td>
<td>8,750</td>
<td>10,000</td>
</tr>
<tr>
<td>$60,000</td>
<td>3,000</td>
<td>4,500</td>
<td>6,000</td>
<td>7,500</td>
<td>9,000</td>
<td>10,500</td>
<td>12,000</td>
</tr>
<tr>
<td>$70,000</td>
<td>3,500</td>
<td>5,250</td>
<td>7,000</td>
<td>9,000</td>
<td>10,500</td>
<td>12,250</td>
<td>14,000</td>
</tr>
<tr>
<td>$80,000</td>
<td>4,000</td>
<td>6,000</td>
<td>8,000</td>
<td>10,500</td>
<td>12,000</td>
<td>14,000</td>
<td>16,000</td>
</tr>
</tbody>
</table>

\$ per turnover = (Cost of turnover \times (1- \text{turnover cost reduction target})

Source: Personnel Journal, "The Price Tag of Turnover", December 19
SUMMARY OF EMPLOYERS' COST AND BENEFITS

The following checklist summarizes the key areas when evaluating the costs and benefits of TDM strategies on employers.

Effectiveness

Change in output or deliverables
- Quantity
- Quality

Change in employment costs
- Salary and expenses
- Support staff
- Office space and overheads
- Core team response
- Health and energy

Changes in productivity
- Time
- Time lost to illness
- Training costs

Change in motivation
- Hours worked
- Recruitment
- Retention

Changes in Costs
- Office space
- Home/remote office costs
- Reuse of existing space
- Heat, light and power
- Travel
- Parking

Value of Dispersed locations
- Customer contact
- Colleague contact

Compliance
- Regulatory
- Clean Air Act
- Zoning

Changes in Image
- Public image
- Employee loyalty
Example: Benefits to Employers from Telecommuting

1. More hours worked per day. Less time is consumed by commuting and socializing at the water cooler.

2. More work done per hour. Less distractions from co-workers.

3. Ability to work at peak hours. Morning persons and night owls can accommodate their internal clocks.

4. Expanded coverage. Flexibility offers the opportunity to expand telephone coverage to customers and clients in different time zones with existing resources.

5. Less incidental absence. A poll by the Detroit News found the following percentages of people agreed that it was okay to stay home for the following reasons.

Fever 60%
Sprained ankle 59%
Arthritis 28%
Stomach ache 18%
Visible bruises 12%
Sunburn 11%
Lack of sleep 9%
Hangover 8%
Headache 7%
"Blah" feeling 7%
Runny nose 3%

Example: Benefits to Employers from Reduced Parking Expenditures

1. Reduce capital expenditures.

2. Reduce maintenance expenditures.

3. Allow room for more expansion on-site.

Costs of Parking Construction and Operation

A simple amortization table covering parking construction and operating costs

<table>
<thead>
<tr>
<th>PARKING DATA</th>
<th>Surface Lot</th>
<th>2 Level Garage</th>
<th>3 Level Garage</th>
<th>Underground Garage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost per space</td>
<td>$1,830.00</td>
<td>$8,180.00</td>
<td>$10,240.00</td>
<td>$18,560.00</td>
</tr>
<tr>
<td>Annual interest rate</td>
<td>10.00%</td>
<td>10.00%</td>
<td>10.00%</td>
<td>10.00%</td>
</tr>
<tr>
<td>Term in years</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Payments per year</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

PERIODIC PAYMENT

Calculated annual payment: $194.13 $88.79 $1,094.25 $1,968.83

Annual Operating Costs

Monthly revenue per space to equal costs

2-7
### INCOMING EMPLOYEE INEFFICIENCY

<table>
<thead>
<tr>
<th>Efficiency Level</th>
<th>Months Required</th>
<th>X</th>
<th>Average Efficiency</th>
<th>=</th>
<th>Months of Full Productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 25%</td>
<td>1.7</td>
<td>x</td>
<td>0.125</td>
<td>=</td>
<td>0.2</td>
</tr>
<tr>
<td>25 - 50%</td>
<td>1.9</td>
<td>x</td>
<td>0.375</td>
<td>=</td>
<td>0.7</td>
</tr>
<tr>
<td>50 - 75%</td>
<td>3.5</td>
<td>x</td>
<td>0.625</td>
<td>=</td>
<td>2.4</td>
</tr>
<tr>
<td>75 - 100%</td>
<td>4.8</td>
<td>x</td>
<td>0.875</td>
<td>=</td>
<td>4.2</td>
</tr>
<tr>
<td>Cumulative Months</td>
<td>11.9</td>
<td></td>
<td></td>
<td>=</td>
<td>7.5</td>
</tr>
</tbody>
</table>

Therefore, on average, it required almost 12.0 months to reach full productivity, during which only 7.5 months of equivalent full performance was achieved, resulting in 4.4 months of lost efficiency.

\[ X_t = A \times B \]

Where:

- **A** = Months of lost productivity due to learning curve
- **B** = Monthly Salary and Benefits of Incoming employee

### CASE STUDY

\[ X_1 = $18,600 \]

INEFFICIENCY OF THOSE CLOSELY ASSOCIATED WITH INCOMING EMPLOYEE

<table>
<thead>
<tr>
<th>Position</th>
<th>Percent Time Required</th>
<th>Average Monthly Salary</th>
<th>Months to Reach Full Efficiency</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervisor</td>
<td>14%</td>
<td>X</td>
<td>11.9</td>
<td>=</td>
</tr>
<tr>
<td>Exempt</td>
<td>12%</td>
<td>X</td>
<td>11.9</td>
<td>=</td>
</tr>
<tr>
<td>Non-exempt</td>
<td>8%</td>
<td>X</td>
<td>11.9</td>
<td>=</td>
</tr>
<tr>
<td>Cumulative Cost</td>
<td></td>
<td></td>
<td></td>
<td>$11,700</td>
</tr>
</tbody>
</table>

\[ X_2 = (C + D + E) \text{ MONTHS REQUIRED TO REACH FULL EFFICIENCY} \]

Where:

\[ C = \text{Pct. time of supervisor helping incoming employee reach full efficiency multiplied by monthly salary and benefits of supervisor} \]

\[ D = \text{Pct. of time other dept. exempt staff member spends helping incoming employee reach full efficiency multiplied by the monthly salary and benefits of the exempt staff member} \]

\[ E = \text{Pct. of time dept. non-exempt staff member spends helping incoming employee reach full efficiency multiplied by the monthly wages and benefits of non-exempt staff member} \]

CASE STUDY

\[ X_2 = \$11,700 \]

<table>
<thead>
<tr>
<th>Efficiency Level</th>
<th>Weeks At Level</th>
<th>X</th>
<th>Average Efficiency</th>
<th>=</th>
<th>Weeks of Full Productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 - 75%</td>
<td>2.6</td>
<td>x</td>
<td>0.875</td>
<td>=</td>
<td>2.2</td>
</tr>
<tr>
<td>75 - 50%</td>
<td>1.4</td>
<td>x</td>
<td>0.625</td>
<td>=</td>
<td>1.0</td>
</tr>
<tr>
<td>50 - 25%</td>
<td>1.1</td>
<td>x</td>
<td>0.375</td>
<td>=</td>
<td>0.4</td>
</tr>
<tr>
<td>25 - 0%</td>
<td>4.8</td>
<td>x</td>
<td>0.125</td>
<td>=</td>
<td>4.2</td>
</tr>
<tr>
<td>Cumulative Weeks</td>
<td>6.3</td>
<td></td>
<td></td>
<td></td>
<td>3.8</td>
</tr>
<tr>
<td>Equivalent Months</td>
<td>1.5</td>
<td></td>
<td></td>
<td></td>
<td>0.9</td>
</tr>
</tbody>
</table>

Therefore, a departing employee began to lose productivity about 1.5 months prior to departure. During that 1.5 months, only an equivalent of about one month of about one full month of full productivity was achieved, resulting in 0.6 months of lost efficiency.

\[ X_3 = F \times G \]

Where:

- \( F \) = Months of lost productivity of departing employee
- \( G \) = Monthly Salary and Benefits of departing employee

**CASE STUDY**

\[ X_3 = $2,200 \]


---

University of South Florida
Center for Urban Transportation Research

March, 1994
### Inefficiency of Those Closest Associated with Departing Employee

<table>
<thead>
<tr>
<th>Position</th>
<th>Percent Time Required</th>
<th>X</th>
<th>Average Monthly Salary</th>
<th>X</th>
<th>Months of Declining Efficiency</th>
<th>=</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervisor</td>
<td>10%</td>
<td>x</td>
<td></td>
<td>x</td>
<td>0.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exempt</td>
<td>10%</td>
<td>x</td>
<td></td>
<td>x</td>
<td>0.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-exempt</td>
<td>8%</td>
<td>x</td>
<td></td>
<td>x</td>
<td>0.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cumulative Cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ X_2 = (H + I + J) \text{ MONTHS REQUIRED TO REACH FULL EFFICIENCY} \]

Where:

- \( H = \text{Pct. time of supervisor time related to departing employee activities during declining efficiency multiplied by monthly salary and benefits of supervisor} \)
- \( I = \text{Pct. of time other dept. exempt staff time related to departing employee activities during declining efficiency multiplied by the monthly salary and benefits of the exempt staff member} \)
- \( J = \text{Pct. of time dept. non-exempt staff related to departing employee activities during declining efficiency multiplied by the monthly wages and benefits of non-exempt staff member} \)

### Case Study

\[ X_4 = \$800 \]

<table>
<thead>
<tr>
<th>Position</th>
<th>Percent of position efficiency sacrificed while vacant</th>
<th>Weekly Value (Salary and Benefits) of Vacant Position</th>
<th>Duration of vacancy in weeks</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacancy</td>
<td>67%</td>
<td>x</td>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Position</th>
<th>Avg. Hours Devoted to Vacant Position</th>
<th>Hourly Salary and Benefits</th>
<th>Duration of vacancy in weeks</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervisor (regular hours)</td>
<td>x</td>
<td>x</td>
<td>18</td>
<td>=</td>
</tr>
<tr>
<td>Exempt (regular hours)</td>
<td>x</td>
<td>x</td>
<td>18</td>
<td>=</td>
</tr>
<tr>
<td>Non-exempt (regular hours)</td>
<td>x</td>
<td>x</td>
<td>18</td>
<td>=</td>
</tr>
<tr>
<td>Exempt (overtime hours)</td>
<td>x</td>
<td>x</td>
<td>18</td>
<td>=</td>
</tr>
<tr>
<td>Non-exempt (overtime hours)</td>
<td>x</td>
<td>x</td>
<td>18</td>
<td>=</td>
</tr>
</tbody>
</table>

Cumulative Cost

University of South Florida
Center for Urban Transportation Research
March, 1994
\[ X_5 = (K + L) \]

Where:

\[ K = K_1 (K_2 \times K_3) \]

\[ L = [(L_1 \times L_2) + (L_3 \times L_4) + (L_5 \times L_6) + (L_7 \times L_8) + (L_9 \times L_{10})]K_1 \]

Where:

\[ K_1 = \text{Duration of vacancy in weeks} \]
\[ K_2 = \text{Percent of position efficiency sacrificed while vacant} \]
\[ K_3 = \text{Weekly value (salary and benefits) of vacant position} \]
\[ L_1 = \text{Hourly salary and benefits of supervisor} \]
\[ L_2 = \text{Average regular hours per week supervisor devotes to position} \]
\[ L_3 = \text{Hourly salary and benefits of exempt staff} \]
\[ L_4 = \text{Average regular hours per week exempt staff devotes to position} \]
\[ L_5 = \text{Hourly wages and benefits of nonexempt staff} \]
\[ L_6 = \text{Average regular hours per week nonexempt staff devotes to position} \]
\[ L_7 = \text{Average weekly hours subject to overtime (1.5x)} \]
\[ L_8 = \text{Overtime hourly wages and benefits of exempt staff} \]
\[ L_9 = \text{Average weekly hours subject to overtime for nonexempt staff} \]
\[ L_{10} = \text{Overtime hourly wages and benefits of nonexempt staff} \]

**CASE STUDY**

\[ X_5 = $19,000 \]

## OUT-OF-POCKET PROCESSING HIRING COSTS

Includes orientation costs, agency search and outplacement fees. Advertising costs and travel costs for recruiters and candidates.

\[ X_0 = (M + N + O + P) \]

Where:

- \( M = M_1 + M_2 \)
- \( N = [(N_1 \times N_2) + N_3] \times N_4 \)
- \( O = O_1 + O_2 \)
- \( P = (P_1 \times P_2 + P_3) \times P_4 \)

Where:

- \( M_1 = \) Average expenses via recruiting
- \( M_2 = \) Hires via recruiting/total hires
- \( N_1 = \) Agency fee as a percent of annual salary
- \( N_2 = \) Average annual salary of hires via agency
- \( N_3 = \) Average expenses other than search fee via agencies
- \( N_4 = \) Hires via agencies/total hires
- \( O_1 = \) Average expenses via other sources
- \( O_2 = \) Hires via other sources/total hires
- \( P_1 = \) Average agency outplacement fee as a percent of salary
- \( P_2 = \) Average salary of outplacements
- \( P_3 = \) Average expenses other than agency outplacement fee
- \( P_4 = \) Outplacements/total terminations

### CASE STUDY

\[ X_0 = $2,400 \]

### HUMAN RESOURCES PROCESSING COSTS

\[ X_7 = \left( \frac{Q \times R}{S} \right) \]

Where:
- \( Q = \) Percent of department time devoted to processing incoming and departing exempt employees
- \( R = \) Annual department salaries, wages, benefits and expenses
- \( S = \) Total hires

### CASE STUDY

\[ X_7 = $900 \]

## NON-HUMAN RESOURCES EMPLOYEE PROCESSING TIME

<table>
<thead>
<tr>
<th>Position</th>
<th>Avg. Hours Devoted to Processing Replacement Position</th>
<th>X</th>
<th>Hourly Salary and Benefits</th>
<th>=</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervisor</td>
<td>40</td>
<td>x</td>
<td></td>
<td>=</td>
<td></td>
</tr>
<tr>
<td>Exempt</td>
<td>34</td>
<td>x</td>
<td></td>
<td>=</td>
<td></td>
</tr>
<tr>
<td>Non-exempt</td>
<td>10</td>
<td>x</td>
<td></td>
<td>=</td>
<td></td>
</tr>
<tr>
<td><strong>Cumulative Cost</strong></td>
<td><strong>$2,500</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ X_8 = T + U + V \]

Where:

\[ T = T_1 \times T_2 \]

\[ U = U_1 \times U_2 \]

\[ V = V_1 \times V_2 \]

Where:

\[ T_1 = \text{Hourly salary and benefits of hiring supervisor} \]

\[ T_2 = \text{Hours supervisor devoted to processing a replacement} \]

\[ U_1 = \text{Hourly salary and benefits of other department exempt employees} \]

\[ U_2 = \text{Hours exempt employees devote to processing a replacement} \]

\[ V_1 = \text{Hourly wages and benefits of department nonexempt employees} \]

\[ V_2 = \text{Hours nonexempt staff devotes to processing a replacement} \]

### CASE STUDY

\[ X_8 = $2,500 \]
COST OF TURNOVER

\[ T = X_1 + X_2 + X_3 + X_4 + X_5 + X_6 + X_7 + X_8 + X_9 \]

<table>
<thead>
<tr>
<th>Where:</th>
<th>Case Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>( X_1 ) = Incoming employee inefficiency</td>
<td>$18,600</td>
</tr>
<tr>
<td>( X_2 ) = Inefficiency of those closely associated with incoming employee</td>
<td>11,700</td>
</tr>
<tr>
<td>( X_3 ) = Departing employee inefficiency</td>
<td>2,200</td>
</tr>
<tr>
<td>( X_4 ) = Inefficiency of those closely associated with departing employee</td>
<td>800</td>
</tr>
<tr>
<td>( X_5 ) = Inefficiency of position being filled while vacant</td>
<td>19,000</td>
</tr>
<tr>
<td>( X_6 ) = Out-of-pocket processing costs</td>
<td>2,400</td>
</tr>
<tr>
<td>( X_7 ) = Human resources processing costs</td>
<td>900</td>
</tr>
<tr>
<td>( X_8 ) = Non-human resources employee processing costs</td>
<td>2,500</td>
</tr>
<tr>
<td>( X_9 ) = Relocating costs</td>
<td>0</td>
</tr>
<tr>
<td>Total cost of turnover</td>
<td>$58,100</td>
</tr>
<tr>
<td>Average salary of position being filled</td>
<td>$39,800</td>
</tr>
<tr>
<td>Ratio of salary to turnover costs</td>
<td>1.5</td>
</tr>
</tbody>
</table>

ESTABLISHING THE BASELINE

MODULE GOALS

1. To understand the interrelationship between the traditional planning process and the Deming Quality Improvement Cycle.

2. To understand how to facilitate buy-in to the TDM plan through such activities as charrettes and the nominal group technique.

3. To understand the data requirements to develop a TDM plan.

4. To be able to collect your own data set.

5. To be able to analyze a data set.

ASSUMPTIONS

1. Customer service is paramount.

2. An interrelated and structured process has a better chance to succeed.

3. Background materials can provide important insight into the problems and perceptions.

4. Getting buy-in to the plan and process makes implementation easier.

5. Let the data do it.

6. A good plan requires good data.

7. What you can't find in other sources you can collect.

THE PDCA CYCLE
1. Issue Formulation
   --Project Initiation Activities
   --Define key issues

2. Data Collection and Analysis
   --Existing conditions scan
   --Issue analysis

3. Goal Setting
   --Develop goals and objectives

4. Strategic Plan
   --Plan Development
   --Implementation Strategies

**ISSUE FORMULATION**

**Project Initiation Activities**

1. Define purpose
2. Background scan
3. Advisory committee

**Define Key Issues**

1. Establish buy-in
   --Charrettes
   --Nominal group technique

2. Review of relevant legislation
   --Fulfill requirements

3. Refine purpose

4. Basic understanding of key issues

**ESTABLISH BUY-IN**

**Charrette**

1. A one-time public event (public forum) aimed at solving transportation related problems or issues.

2. Facilitates public involvement by providing private citizens with an opportunity to openly and freely discuss transportation issues and problems
A successful charrette
1. Ample time and space
2. Background materials
3. Materials
   --Large maps
   --Large newsprint pads and markers
   --Site photographs
   --Outline basic goals, rules, and time constraints
4. Adequate staffing
   --Competent leader
   --Individuals who have previous experience with the problem or issue
   --Individuals who are familiar with the derivation and use of the data
5. Good organization
   --An agreement on the process and timing
   --Finding an experienced leader
   --Setting up space for an informal discussion

Nominal Group Technique
1. Designed to discourage discussion until all issues are listed
2. Four step process
   --Silent idea generation
   --Round-robin reporting of ideas
   --Discussion for clarification
   --Ranking of problem/solution importance
3. Guided group discussion
4. All topics mentioned, many discussed
5. Input from all
6. Drawback: Not all topics get exhaustive treatment

How to use the Nominal Group Technique
1. Give all participants 3 X 5 index cards.
2. Ask them to respond to a question or a problem statement
3. Have each person share one of their responses. Go around the table as many times as necessary until all responses are recorded. Write all responses down on the poster boards.
4. No discussion is allowed until all responses have been shared.
5. After all points are listed, discussion by group to clarify or elaborate.
6. Using new 3 x 5 cards, each participant ranks the top five to ten issues listed on the master sheet.

7. Cards are collected and the results of the voting are tabulated.

8. Group discussion is then permitted on each one of the issues.

9. Again, each participant ranks the issues which then become the results of the group.

KNOWING WHAT YOU NEED

1. Data Needs
   --Current transportation conditions
   --Commuter travel patterns
   --Site/service area characteristics
   --Identification of congested areas

2. Collection Methods
   --Periodic employee transportation survey
   --Driveway counts/survey
   --Traffic counts/surveys

DATA CHOICES

- Demand Volume
- Average Travel Speed
- Average Travel Time
- Volume/Capacity Ratio (v/c)
- Vehicle Miles Traveled (VMT)
- Person Miles Traveled
- Average Vehicle Occupancy (AVO)
- Average Queue Lengths
- Maximum Queue Lengths
- Vehicle Hours of Delay
- Level-of-service (LOS)
- Peak-Hour Factor (PHF)
- Roadway Congestion Index (RCI)
- Average Daily Traffic (ADT)
- Average Weekday Traffic (AWT)
- Average Annual Daily Traffic (AADT)
- Average Annual Weekday Traffic (AAWT)

The TDM planner must determine: (1) what data is to be collected, (2) locations for data collection, and (3) the period for data collection (e.g., hourly, daily, weekly, monthly, etc.) such that effectiveness measures can be recorded and monitored. Appropriate selection of these data characteristics will minimize effort and produce meaningful, measurable results.
Demand Volume:
The number of vehicles or persons that desire to traverse a particular section of roadway or facility during a specified period of time. Can only be measured where available capacity does not constrain the demand.

Average Travel Speed:
Total distance divided by total time needed to traverse a given roadway segment or travel corridor, averaged for more than one vehicle-trip.

Average Travel Time:
Total time, including stopping, needed to traverse a given roadway segment or travel corridor averaged for more than one vehicle-trip.

Volume/Capacity (v/c) Ratio:
A measure of facility usage or congestion, where demand volume or flow is divided by the designed facility capacity. Capacity should be in terms of person-carrying capacity. A ratio of 1.0 signifies that measured volume equals capacity. Likewise, the greater a ratio is below 1.0, the more the facility is under-utilized.

Vehicle-Miles Traveled (VMT):
An estimated measure of travel activity from network or roadway segment studies.

Level-of-Service (LOS):
A letter designation (A through F) that describes a range of operating conditions on a particular transportation facility. LOS “A” describes a free-flowing condition where individual vehicles are not influenced by the presence of other vehicles in the traffic stream. LOS “F” describes breakdown operations which occur when traffic flow arriving at a point is greater than the facility’s capacity to discharge flow and queues develop.

Level-of-service is a performance parameter and its measure of effectiveness varies depending on the type of facility and/or the type of flow. For example, for uninterrupted flow facilities (i.e., freeways and multi-lane highways), level-of-service is measured in terms of vehicle density, vehicle or person flow rates and average travel speed. For interrupted flow facilities (i.e., signalized intersections, arterials, transit and pedestrian facilities), level-of-service is measured in terms of average stopped delay, average travel speed, load factor (persons per vehicle seating capacity) and space (square feet per sidewalk pedestrian).

Peak-hour factor (PHF):
A factor that indicates the relationship between hourly volume and the maximum rate of flow within the peak-hour. For 15-minute
periods of flow, the PHF is defined as the hourly volume divided by 4 times the maximum 15-minute rate of flow. The maximum value is 1.0, the minimum value is 0.25, and the typical range of values is between 0.70-0.98 (with lower values signifying a greater degree of variation in traffic flow during the peak-hour).

Roadway Congestion Index (RCI):
A relative measure of urban mobility levels, developed by the Texas Transportation Institute, intended to be areawide representations not site-specific locations of spot congestion. The RCI combines the daily vehicle-miles of travel per lane-mile (DVMT) for freeways and principal arterials in a ratio comparing the existing DVMT to calculated DVMT values identified with congested conditions.

An RCI value of 1.0 or greater indicates that congested conditions exist areawide. Assumed capacity for freeway sections is taken as 13,000 vehicles per lane per day, and 5,000 vehicles per lane per day for principal arterial roadways.

Average Daily Traffic (ADT):
Average 24-hour traffic volume at a given location for a period of at least two days but less than one year.

Average Weekday Traffic (AWT):
Average 24-hour traffic volume, occurring on weekdays only, for at least two days but less than one year. Depending on the type of land use activity being monitored, AWT may be more critical than ADT (e.g., office building during weekdays vs. shopping center on weekends).

Average Annual Daily Traffic (AADT):
Average 24-hour traffic volume at a given location over a full 365-day year, or the total number of vehicles passing a given location in a year divided by 365.

Average Annual Weekday Traffic (AAWT):
Average 24-hour traffic volume occurring on weekdays only over a full year, or the total number of vehicles passing a given location in a year for weekdays only divided by 260.

Average Vehicle Occupancy (AVO)
-Defined as: Number of Employees arriving at work site during the peak-hour.

AVO is typically measured for an area (i.e., Central Business District) or region of many work sites, whereas average passenger occupancy (APO) is measured for a single work site. The need to examine both or one should be stipulated. For purposes of this example discussion, AVO will be used.
Single-occupancy vehicle (SOV) users often do not regard the full costs of operation when making their travel decisions. They tend to consider the out-of-pocket costs only (parking, tolls, fuel, oil), and disregard the costs of vehicle ownership, depreciation, maintenance, insurance, taxes, and fees. Further, many times parking at the employment site is free or heavily subsidized, and would greatly offset the perceived cost advantage of driving if it had to be paid by the employee. The closer the AVO is to 1.0, the higher the percentage of single-occupant vehicles in the mode split (or the greater the potential for congestion and mobility problems). The goal of TDM is to determine the desirable AVO.

**AVO measures are generally represented in four categories:**

- **1.0-1.05** common for many new, low-density suburban growth areas
- **1.10** a little less auto dependency and maybe some use of carpooling, with little or no transit use. Determined to be the national average for commute trips.
- **1.15** common in established suburban corridors and activity centers, with some transit use.
- **1.30+** common for a radial corridor into a CBD, involving varying degrees of transit use.

During the peak-hour, the expected average vehicle occupancy for a carpool is 2.5, 12 for a vanpool, and 50 for a bus. These AVO’s can vary substantially depending on the “incentives” (i.e., travel time savings, cost savings, availability of alternative modes, etc.) provided to the user. The following examples, using the aforementioned vehicle occupancies, describe the levels of mode shift that would be needed for achieving desired average vehicle occupancies for a work site.

**Example A:** For a work site with 100 employees, if existing AVO = 1.05 and desired AVO = 1.3, then instead of 95 (100/1.05) vehicles entering the work site during the peak-hour, 19 fewer vehicles or 76 (100/1.3) vehicles would enter during the peak-hour.

The necessary carpool program to achieve the desired AVO would require 60 SOV’s (60 employees) and 16 carpools (40 employees, 16 * 2.5), or a mode shift of 40% ((100-60)/100) to carpool.

**Example B:** For a work site with 500 employees, if the existing AVO = 1.05 and the desired AVO = 1.3, then instead of 476 (500/1.05) vehicles entering the work site during the peak-hour, 92 fewer vehicles or 384 (500/1.3) vehicles would enter during the peak-hour.
The necessary vanpool program to achieve the desired AVO would require 373 SOV's (373 employees) and about 11 vanpools (132 employees, 11 * 12), or a mode shift of 25.4% \((500-373)/500\) vanpool.

**Example C:** For a work site with 2,000 employees, if the existing AVO = 1.05 and the desired AVO = 1.3, then instead of 1,905 \((2,000/1.05)\) vehicles entering the work site during the peak-hour, 367 fewer vehicles or 1,538 \((2,000/1.3)\) vehicles would enter during the peak-hour.

The necessary bus transit program to achieve the desired AVO would require about 1,528 SOV's (1,528 employees) and about 10 buses (500 employees, 10 * 50), or a mode shift of 23.6% \((2,000-1,528)/2,000\) to buses.

**VEHICLE MILES TRAVELED**

**Background**

One of the outputs of transportation network analysis is an estimate of the total vehicle-miles traveled (VMT) on the network during the period of interest. The estimate of VMT assumes that a vehicle counted on a network link travels the entire length of the link. This is considered to be a reasonable assumption because while some vehicles traveling only a portion of the link will be counted, others will not since they do not all cross the specific counting location.

A 24-hour VMT estimate requires that the counts be taken and averaged over at least two, 24-hour periods. Further, peak-hour or daily VMT cannot be expanded to annual VMT without knowledge of seasonal variations that exist. Control counts are used to monitor and quantify daily and seasonal (or monthly) volume variation patterns. Such control counts may be taken at permanent-count stations or at control-count stations. Permanent-count stations are counted 24 hours each day, 365 days per year. Control counts are used to supplement the information obtained from permanent-count stations. Control counts are typically one-week counts taken during each month of the year for a continuous seven-day or five-day period using portable mechanical counters.

Count locations for permanent and control counts should be representative of the various roadway classes (i.e., principal arterial, minor arterial, major collector, minor collector, etc.) in the transportation network for estimates of network-level VMT. On the other hand, specific roadway VMT estimates should have counts taken at a location where traffic flows do not vary (e.g., mid-block, away from short segments of major “point loadings”). Generally, a coverage count should be taken on each two-mile segment of the roadway or network.
Annual VMT can be estimated using the average annual daily traffic (AADT) estimates computed for each coverage count. For example, for each coverage count:

\[
\text{AVMT} = \text{AADT} \times L \times 365
\]

where \(\text{AVMT}\) = annual vehicle-miles traveled,

\(\text{AADT}\) = 24-hour count on a particular day \(\times\) daily variation factor \(\times\) monthly variation factor (see sample tables below), and \(L\) = length of the segment, in miles

**Volume/Capacity Ratio**

The volume/capacity (v/c) ratio is a measure of facility usage or congestion, where demand volume or flow is divided by the designed facility capacity. Capacity is typically noted in terms of passenger-car equivalents per hour per lane for roadway facilities, people per hour per lane for transit facilities, and people per minute per foot for pedestrian facilities. (See attached Tables). Volume is a point measure, or the rate at which vehicles (or people) pass a particular point.

The volume/capacity ratios are used to determine the facility level-of-service, or capacity efficiency. A ratio of 1.0 signifies that measured volume equals capacity, and that there is a need for improvement (i.e., spreading the demand volume). Likewise, the greater a ratio is below 1.0, the more the facility is under-utilized. The goal in TDM planning is to establish a standard for level-of-service, or tolerable v/c ratio. The evaluation process then becomes understanding what type and intensity of TDM measure is needed to adjust the v/c to the desired level-of-service.

**STEP 1 - Calculate V/C Ratio**

**Example A:** A single-lane HOV, buses only, able to accommodate level-of-service C. Estimated design person-carrying capacity during the peak-hour would be:

60 buses/hour \(\times\) 45 passengers/bus = 2,700 passengers/hour

If peak-hour headways are actually 2 minutes (due to lack of adequate "return" route, number of buses available, etc.), and buses are only two-thirds filled, the volume would be:

30 buses/hour \(\times\) \((2/3 \times 45 \text{ passengers/bus})\) = 900 passengers/hour, and the v/c ratio would be 0.33.

**Example B:** A 4-lane roadway with a design speed of 50 mph, able to accommodate the maximum LOS "D" volume. Estimated capacity during the peak-hour would be:

1,500 vehicles/hour/lane \(\times\) 4 lanes = 6,000 vehicles/hour
If the peak-hour volumes are measured at 5,700 vehicles/hour, the v/c ratio would be 0.95.

Step 2 - Determine V/C Adjustment Requirements

Example A: The HOV facility is very under-utilized, and a significant adjustment (or increase in volume) is required. Since the facility is designed to accommodate LOS “C”, and the desired v/c ratio is 0.85, an additional 1,400 passengers/hour need to be attracted to the facility.

Example B: The roadway facility is operating at 95% of its design capacity. Since the desired v/c ratio is 0.85, approximately 600 vehicles/hour need to be encouraged to select a high-occupancy mode of travel or encouraged to travel at another time of the day.

Step 3 - Determine Most Effective TDM Measure

Example A: The most effective TDM measure to select to remedy this under-utilized facility is one that would be most expected to increase HOV usage by 1,400 passengers/hour (or if AVO = 1.2, then 1,166 SOV’s). Therefore, the selection of the most appropriate TDM measure can best be determined by the level of non-HOV traffic on the facility. For example, if the traffic volume is at least 32,000 vehicles/hour, then employer support of transit could apply (1,166/0.36 = 32,388). If the traffic volume is at least 15,000 vehicles/hour, then vanpooling could apply (1,166/.075 = 15,546). The maximum level of employer support and employee participation is assumed for all cases.

Example B: The most effective TDM measure to select to remedy this over-utilized facility is one that would be most expected to reduce vehicle-trips by approximately 10.5% (600/5700). Assuming a CBD/Corridor environment and maximum level of employer support and employee participation, alternative work schedules and transit service improvements can be expected to reduce vehicle trips up to 9% (the most of any other TDM measure excluding SOV surcharges).
ADDITIONAL NEEDS

1. Transit Service
   --Availability
   --Routes

2. Peak-Period Volumes

3. Parking
   --Location
   --Types
   --Costs

4. Employment Distribution
   --Identify Activity Centers
   --Target Areas

5. Major Employers
   --Activities
   --# of employees

6. Growth Trends

7. Non-Motorized Access

8. Residential Locations

9. Access Points
NOTES
MEASURING PERFORMANCE

Module Goals

- To explore the need for evaluation and examine the results of several TDM performance evaluations.
- To demonstrate how to use the FHWA/FTA tools.
- To provide additional resources to facilitate participants' further understanding.

Assumptions

- Evaluation is good.
- Transportation professionals can improve TDM performance. We can learn from the successes and failures of others as well as ourselves.
- We recognize the importance of performing reasonable and defensible evaluations of TDM impacts to establish TDM's credibility.
- We share a common interest in, and commitment to, developing a broad-based coalition of public and private interests to advocate TDM implementation.

Goal Setting

Goals and objectives may be established throughout the planning process, but the primary goal setting effort should be focused after data collection and analysis for the following reasons.

1.
2.
3.
The Use of Benchmarks in Goal Setting

Benchmarking information and data refer to processes and results that represent superior practices and performance. Benchmarks encourage TOM programs to set targets that stretch.

1. To encourage creativity and represent a clear challenge to "beat the best," rather than only gradually refining the existing approach.

2. To place the emphasis of program benchmarks on achieving superior program offerings and low costs of operation.

3. To help improve communication with other organizations interested in TDM by providing a common language for assessing performance.

4. To serve as a working tool for planning, training, and other uses.

Sources of comparisons and benchmarking data might include: (1) information obtained from other TDM programs through the direct sharing of information; (2) prior experience of the TDM
program; and (3) published reports such as annual reports of TDM programs.

Selecting the right benchmarks is critical, and benchmarks should be reviewed periodically for appropriateness.

Using the above graph, the following characteristics of clear and effective benchmark data are presented (Data are for illustrative purposes only):

- the trend line report data for a key performance requirement for TDM programs
- both axes and units of measurement are clearly labeled
- results are presented over several years to indicate trends affecting the organization and its industry
- meaningful comparisons are clearly shown

What comments on the graphed results would be appropriate?

Identifying Goals

Successful TDM programs exhibit several core values and concepts. These values and concepts are the foundation for integrating performance requirements of the customer with that of the TDM program. The core values and concepts are:

1. Leadership
2. Customer driven quality
3. Management by fact
4. Design quality
5. Continuous improvement
6. Employee participation and development
7. Long-range outlook
8. Partnership development
9. Public responsibility
LEADERSHIP

This goal category examines how the TDM Board and other stakeholders become personally involved in visible activities such as:

- planning
- communications
- review of TDM program performance
- recognizing employees for quality achievement

CUSTOMER-DRIVEN QUALITY

The ultimate success of the TDM program will depend on how it focuses on and satisfies its "customer" needs. The goals set for this category should consider methods how to track customer satisfaction, monitor current trends, assess levels of satisfaction and measure retention.

TDM programs must have a constant sensitivity to changing commuter and employer requirements. This includes increasing awareness of developments in technology and rapid and flexible response to customer and market requirements.

Who are the "Customers"?

1. ___________________________
2. ___________________________
3. ___________________________
4. ___________________________
5. ___________________________
6. ___________________________
7. ___________________________
MANAGEMENT BY FACT

Management by fact requires a framework of data, analysis, and measurement. Facts and data needed for quality improvement and quality assessment, include:

- customer profiles,
- product and service performance,
- operations,
- the market,
- competitive comparisons,
- suppliers,
- employee-related, and
- cost and financial.

Analysis refers to the process of extracting larger meaning from data to support evaluation and decision making at various levels of the TDM program. Such analysis may entail using data to reveal information—such as trends, projections, and cause and effect—that might not otherwise be evident.

Performance measures or indicators should be derived from program strategies and encompass all key activities and outputs. A system of measures or indicators tied to customer satisfaction and program performance provides a clear and objective basis for aligning activities with TDM goals and objectives.

DESIGN QUALITY AND PROBLEM PREVENTION

In general, costs of preventing problems at the design stage are much lower than costs of correcting problems that occur later. This requires paying attention to TDM program suppliers including:

- carpool and vanpool drivers,
- regional commuter assistance programs (CAP) and TMA/TMOs,
- transit agencies,
o taxicab companies for guaranteed ride home programs, and

o third-party vanpool providers for the provision of vans and maintenance support.

CONTINUOUS IMPROVEMENT

Achieving the highest levels of quality and competitiveness requires a well-defined and well-executed approach to continuous improvement. Opportunities for improvement have four major sources:

1. 
2. 
3. 
4. 

Improvements may be of several types:

o enhancing value to customers through new and improved products and services;

o reducing errors;

o improving responsiveness;

o improving productivity and effectiveness in the use of all resources; and

o improving the TDM program's leadership position in fulfilling its public responsibilities.

EMPLOYEE PARTICIPATION AND DEVELOPMENT

A TDM program's success in improving performance depends on the skills and motivation of its work force.

o Employee success depends on having meaningful opportunities to learn and practice new skills.
TDM programs need to invest in development of the work force through education, training, and creating opportunities for continuing growth.

LONG-RANGE OUTLOOK

Achieving quality and deeper market penetration requires a strong future orientation and willingness to make long-term commitments to all stakeholders—customers, employees, suppliers, the public, and the community.

Planning needs to determine or anticipate many types of changes including:

- customers' expectations of products and services,
- technological developments,
- changing customer segments,
- evolving regulatory requirements, and
- community/societal expectations.

Other major parts of the long-term commitment are:

- developing of employees,
- improving relationships with suppliers,
- fulfilling responsibilities to the taxpayer, and
- serving as a community role model.

PARTNERSHIP DEVELOPMENT

TDM programs should seek to build partnerships to better accomplish their overall goals. These partnerships blend a TDM program's skills or leadership capabilities with complementary strengths and capabilities of partners, thereby enhancing overall capability, including speed and flexibility. These partnerships might involve:

- Employee Transportation Coordinators (ETC),
- local public transit providers, or
- business associations.
PUBLIC RESPONSIBILITY

A TDM program’s objectives should stress responsibility and accountability to the public. This responsibility refers to basic expectations of the TDM program to:

- protect public health,
- enhance mobility for all, and
- conduct realistic, defensible evaluations of the public resources.

Inclusion of public responsibility as a core value means meeting all local, state, and federal laws and regulatory requirements. It also means treating these and related requirements as areas for continuous improvement beyond mere compliance.

APPLY IT!

What ideas presented in this session do you plan to put into action?

1. ___________________________________________
2. ___________________________________________
3. ___________________________________________
4. ___________________________________________
TDM EVALUATION

Why Evaluate?

There are many reasons for developing a system to monitor progress, as follows:

1. 
2. 
3. 
4. 
5. 
6. 
7. 
8. 
9. 
10. 
11. 
12. 

What Does Evaluation Do?

A successful evaluation will use procedures that determine one or more of the following:

1. The extent to which the program has achieved its stated objectives (e.g., increases in average vehicle ridership).

2. The extent to which the accomplishment of the objectives can be attributed to the program (direct and indirect effects).

3. Degree of consistency of program implementation to plan (relationship of planned activities to actual activities).

4. The relationship of different tasks to the effectiveness of the program (productivity).
Measures of Performance

1. Measuring the extent to which the program has achieved its stated objectives (e.g., increases in AVR) will include methods to determine:
   - How many people were placed into a carpool per year or per 100 employees?
   - How many new vanpools were formed?
   - How many people were placed as riders into new and existing vanpools per year?
   - How many customers were served?
   - How many requests for assistance were filled?
   - How many transit passes were sold? What was the sales value?
   - What was the change in Average Vehicle Occupancy over the year?

2. Measuring the extent to which the accomplishment of the objectives can be attributed to the program (direct and indirect effects).
   - What is the estimated change in Vehicle Miles Traveled?
   - What is the estimated change in Vehicle Trips?
   - How has demand for parking been affected?
   - What reduction in pollutants is estimated?
o How much money did our commuters save as a result of the program?

o What were the above outcomes for commuters who were influenced to try an alternate mode as a result of marketing efforts, but not directly attributable to any specific program or service of the agency? (e.g., commuters who form a vanpool on own).

Some research indicates the indirect effects of a program may equal or exceed the direct effects.

3. Evaluating the degree of consistency of program implementation to plan (relationship of planned to actual activities) may determine whether, for example, the number of matchlists produced were sufficient to form new carpools.

o Which implementation tactics were the most effective?

o Where all planned activities carried out on time and within budget?

o Where the number of carpool formation meetings adequate?

o Was customer response time within performance goal (e.g., requests received by 10:00 a.m. will be filled the same day for 95% of the employees)?

o What level of staffing did it take to form and maintain a carpool?

4. The relationship of different tasks to the effectiveness of the program (productivity).

The CAP and taxpayers will want to see that the investment in the program is being used efficiently and effectively. Benefit/cost ratios or productivity matrices can be produced to provide this measure.
Methods of Evaluation

There are several different methods for collecting the data for evaluation purposes. Some of the most commonly used methods involve:

- Employee surveys
- Program participation documentation (e.g., registrations for preferential parking; applications for subsidies)
- Vehicle or average vehicle occupancy counts
- Time sheets/Activity logs

The evaluation method and data collection requirements depend on the measures of effectiveness being used.

ON DEATH AND TDM EVALUATION*
THE FIVE STAGES OF COPING WITH A POOR TDM EVALUATION

1. Denial and Isolation
   "No, not us, the data cannot be true!"

2. Anger, Rage, Envy and Resentment
   "Your survey is faulty." "Why us? DOT spills more money than what we get!"

3. Bargaining
   "Okay, so your evaluation of our TDM program found that we didn’t change the behavior of thousands of commuters overnight. What about all the other things we do like provide traffic advisories, identify sites for bus shelters and encourage the provision of sidewalks? How about giving us credit for these activities?"

4. Depression
   "Our TDM program had so much potential.

5. Acceptance
   "I’m happy. We can only improve."

* Our apologies to Elisabeth Kubler-Ross, author of On Death and Dying
Use of Surveys in Transportation Research

Surveys are often used in transportation research to determine how a group of people (commuters, residents in a certain part of town, etc.) travel now and how they might change their travel behavior if certain changes are implemented (new roads, transit routes, transit costs, etc.).

There are four major types of survey research. These are characterized in the table on the next page.

Survey Sampling, Analysis and Uncertainty

Survey results always have an element of uncertainty, based on the fact that we haven’t polled everyone to find out what they want. Clearly, because of expense and time constraints, it is not possible to survey everyone. Therefore, one key decision must be made: How many people should be surveyed?

There are two key factors that will determine the answer to this question:
1. The budget that is allocated to surveying the population, and
2. The amount of uncertainty that you are willing to accept from the surveys

The budget will generally give you an absolute maximum to the number of people you can survey. However, within that maximum, you may find that you don’t need the amount of precision that will come out of doing all of the surveys that the budget allows.

Suppose, for instance, that you want to know approximately how many people will use a new tollway. You have a budget of $20,000 to survey the population. You are quoted a rate of $5,000 overhead and $10 per interview completed. Should you conduct 1,500 interviews, as the budget allows?

You probably want an answer that is reliable within a range of 5 percentage points. In other words, if you get a result of 32.5% from the survey, you want to be able to say confidently that between 30% and 35% of the population will use the new
tollway. This means that your amount of uncertainty is plus or minus 2.5 points around the 32.5% result. A mathematical formula is used to determine the uncertainty from survey results. For a proportion, as we are discussing here, that formula is:

\[
\text{amount of uncertainty around the result} = 1.96 \times \frac{P(1-P)}{N^{0.5}}
\]

where

- \( P \) is the proportion (in this case 32.5%)
- \( N \) is the sample size of the survey
- 1.96 is the standard multiplier used to achieve a 95% confidence level.

A "Confidence level" means that you are 95% sure that the "true" results will indeed fall within the uncertainty range. If you want to be 99% sure, that number changes to 2.576; if you want to be 90% sure, it falls to 1.645.

The "amount of uncertainty" is generally referred to as the Confidence Interval, and is associated with the confidence level. When you hear the term "a 95% confidence interval" used by statisticians, this is what they mean. When you see national polls on TV, this is the formula used to determine what the "plus or minus" amount of the result is, as in "25% of Americans actually believe results from national polls, with an error rate of + or - 3.5%".

Solving for \( N \), we get:

\[
N = \frac{(P(1-P))}{(\text{amount of uncertainty}/1.96)^2}
\]

\[
N = \frac{(0.325 \times (1-0.325))}{(0.025/1.96)^2}.
\]

\[
N = 1,348, \text{ which is the sample size needed to achieve this result.}
\]

So, in fact, yes you should do just about all of 80.7 the surveys if you want an answer as precise as 2.5 percentage points around the result.

A lot of times you can't afford to do 1,500 surveys. You may
only have a budget for 350 surveys. So, let's turn the problem around. Suppose you contract to have 350 surveys conducted, and you get 32.5% (or 65 people) saying that they would use the new tollway. What is the error rate associated with this result? The formula says that the error rate is 1.96*[(.325*(1-.325))/350]0.5, or 4.9%, so that you can say with 95% confidence that between 27.6% and 37.4% of the population will use the tollway.

Because of the way the formulas are set up, in order to double your precision (that is, to reduce the error rate by half), you need to get four times as many interviews completed.

Now let's suppose that you aren't interested in a proportion, but rather in a mean result, such as Average Vehicle Occupancy. Let's say you surveyed 350 people, and got an Average Vehicle Occupancy of 1.12. Suppose the mean has a standard deviation of 0.35 (the standard deviation refers to how much the answers vary around the mean result. About 60% of the survey responses will fall within 1 standard deviation of the mean). How do you determine the error rate in this case?

The formula is actually very much the same as the proportion formula.

\[1.96\times\left(\frac{S}{N}\right)^{0.5} = \text{amount of uncertainty},\]

where S, the standard deviation, replaces P(1-P) from the proportion formula. In this case, the result would be 1.96*(0.35 / 350)^0.5 = 0.06. So we could say that the AVO is between 1.06 and 1.18 at a 95% confidence level.

An interesting property of survey sampling is that the amount of precision has only to do with the size of the sample, not with the size of the population it is drawn from. If you sample 300 people, your results are just as accurate if the population is 10 million as they are if the population is 100,000. There is no need to survey 1%, or 5%, or 10% of the population. You only need to get a random sample of sufficient size to reduce the error to an acceptable level. (Note that this property becomes invalid if you survey a large proportion of the total population,
say 50% to 70%. In those rare cases, your level of precision will actually be greater (and your error rate lower) than the sample size would indicate.

One of the most important ways in which surveys are used is to compare trends from one survey to the next to see if there has been a change in behavior. Typically there will be a requirement that a statistically significant change be measured through a survey. "Statistically significant" means that the change in the survey results must not be due to the uncertainty arising from the sampling, but instead accurately reflect a change in the behavior of the population.

Trending and change detection requirements place serious constraints on the sample sizes you can use. If you expect a program to have an impact of a 5% increase, in, say, bus ridership, you need to conduct enough surveys so that if in fact a 5% change has occurred in the population, you can detect. If you only interview 100 people, the error from sampling will be so large that a 5% change in the behavior of the population may well be completely masked by uncertainty from the small sample size.

Suppose you want to know if the changes in the survey results (Using AVO again, say from an AVO of 1.06 to an AVO of 1.10) are significant (i.e. not due to error arising from the size of the sample). These formulas are very involved. A safe rule of thumb is to add the uncertainty levels from the two samples together, and if the change is larger than this sum, it is significant. This will overstate the size of change needed for a statistically significant result which should be fine - you will err on the side of caution.

The method of determining this is:

Step 1. Assume the second survey had a sample size of 500, AVO of 1.10, standard deviation of 0.35

Step 2. Calculate change needed from first survey to the next.

\[
= 1.96 \times (std \ dev \ 1/sample \ size \ 1 + std \ dev \ 2/sample \ size \ 2)^{0.5}
\]

\[
= 1.96 \times (.35/350+.35/500)^{0.5}
\]
This represents how much change you need to see from one survey to the next to report an increase in AVO. In this case, the change was only 0.04 (1.10-1.06), so the change in the survey results may be due to the uncertainty arising from the sampling, and may not have anything to do with a change in the behavior of the population. For instance, we may have, by random chance, interviewed a few more carpoolers in our second sample that we did in our first sample, even though the proportion of carpoolers in the whole population did not change. This situation becomes especially problematic as sample sizes get down into the 75-100 respondent range.

Another way to use this formula is to decide how much sample you will need to detect a given change in behavior. Suppose we are again working with the above problem, but now we want to know, if we expect an increase in AVO from 1.06 to 1.10, how many people we should sample?

We will assume that we are doing this analysis before the program starts, and, to simplify the problem, we want to survey the same number of people before and after program implementation. The formula is:

\[
\text{Amount of change} = 1.96 \times (\text{std dev 1/sample size 1} + \text{std dev 2/sample size 2})^{0.5}
\]

\[
= 1.96 \times (2 \times \text{std dev/sample size})^{0.5}
\]

(since sample size 1 and 2 are assumed to be equal, as are std dev 1 and 2)

Solving for the sample size yields:

\[
\text{sample size} = \frac{(1.96/\text{change needed})^2 \times (2 \times \text{std dev})}{1.96}
\]

so, assuming a standard deviation of 0.35 (you may have to look through some prior research results to get an idea of what a reasonable guess for what the standard deviation will be), use the following formula.

\[
\text{sample size} = \frac{(1.96/0.04)^2 \times (2 \times 0.35)}{1.96} = 1,681 \text{ respondents per survey.}
\]

*Remember, to double the precision, we have to quadruple the*
sample size, as this example and the last example fairly well demonstrate.

For proportions, the formula is a lot more involved.

\[
\text{Change needed} = 1.96 \times \frac{((\text{sample size 1} + \text{sample size 2})/\sqrt{\text{sample size 1} \times \text{sample size 2}}) - (Y \times (1-Y))^{0.5}}{\sqrt{\text{sample size 1} \times \text{sample size 2}}}
\]

where:

\[
Y = \frac{(\text{sample size 1} \times \text{proportion 1} + \text{sample size 2} \times \text{proportion 2})}{\text{sample size 1} + \text{sample size 2}}
\]

and the sample size needed to find a given change can be determined by:

\[
\text{Sample size} = \frac{(1.96^2 \times ((2 \times \text{estimated proportion}) + \text{change needed}))}{(\text{change needed})}
\]

So to be sure a change from 32.5% to 37.5% was significant, we would need 1,075 respondents per survey.

There is a subtle difference between a “statistically significant change” and a minimum change of, say, 5% within the population. A “statistically significant change” means that there is at least some difference, even if you aren’t sure what that difference is. Essentially, it means that there was an increase of more than 0 points. To show a minimum change of 5%, you need to perform a slightly different calculation.

Take the base number you are trying to find a change from, and use the above formula for “amount of change needed” but use 1.282 instead of 1.96 in the formula (the reasons for using 1.282 instead of 1.96 have to do with the probability distributions.) Find the number needed for a significant change, add 5 points to it, and then solve the “amount of change needed” (Original proportion + sig. change + .05). Use the same formula with 1.282, and also use the number of respondents in the second survey, and your result needed to show a minimum 5% change is given by (Original proportion + sig change 1 + .05 + sig change 2).

You can use the same logic to determine if you had a change
of "at least X" as you would for proportions. You will have to assume that the standard deviation doesn't change in the second survey.

RELATIVE EFFECTIVENESS OF TDM STRATEGIES

Based on research sponsored by FHWA and FTA, the most important factors in reducing vehicle trips appear to be:

- Parking management
- Subsidies
- Travel Allowance
- Carpooling
- Legal Requirements

The moderately important factors appear to be:

- Vanpooling/Buspooling
- Site location and Density
- Transit Services

The least important factors appear to be:

- Personalized Assistance and Ridematching
- Employee Transportation Coordinators
- Employer Size
- Promotion
- Flexible Work Hours

Other factors not explicitly identified in the analysis include:

- Bicycling and Walking
- Telecommuting
- Guaranteed Ride Home

The following pages summarize the impact of TDM on trip reduction and costs on several employers.

Additional research and guidance materials should be available in early 1995 on the cost-effectiveness of TDM. The project is funded under the Transit Cooperative Research Program.
### COST EFFECTIVENESS SUMMARY: EMPLOYER TDM PROGRAMS

<table>
<thead>
<tr>
<th>Site</th>
<th>Trip Reduction</th>
<th>TDM Strategies Applied</th>
<th>Annual Net Cost (per day one-way trip)</th>
</tr>
</thead>
</table>
| 1. Travellies Insurance Hartford, CT | 3930 (47.5%) | - Restricted Parking  
- Charge for Parking  
- Inverted Fee Structure  
- Transit Subsidies  
- Vanpool Program | - $54,600  
(-$0.03)  
-$7,128,600  
(-$3.48) |
| 2. U.S. West Bellevue, Wash. | 436 (47.1%) | - Restricted On-site Parking  
- Charge for Parking,  
- Inverted Fee Structure  
- Reserved HOV Spaces  
- Flextime  
- Coordinator | $85,419  
(-$0.38) |
| 3. Nuclear Regulatory Commission North Bethesda Montgomery Co., MD | 535 (41.6%) | - Restricted Parking  
- Charge for Parking  
- Guaranteed Parking for Carpools  
- County-supplied Transit Subsidies | $756,694  
(-$2.64) |
| 4. GEICO Friendship Heights Montgomery Co., MD | 965 (38.6%) | - Restricted Parking  
- Charge for Parking  
- Free CPVP Parking  
- Subsidized VP Program  
- Reserved CPVP Parking  
- Transit Subsidies  
- County Supplying Transit Subsidies  
- Flextime | $589,825  
(-$1.17) |
| 5. CH, M Hill Bellevue, Wash. | 133 (35.7%) | - $40 Transp. Allowance  
- Charge for Parking  
- Carpool Fee Parking  
- Transit Subsidy | $31,880  
(-$0.33) |
| 6. State Farm Orange Co., CA | 276 (30.4%) | - Carpool Subsidies  
- Rideshare Program  
- Subsidized Van Service | $107,181  
(-$0.75) |
| 7. Pacific Bell Bishop Ranch, CA | 1394 (27.5%) | - Restricted Parking  
- Full-time On-site Coordinator  
- Rideshare Matching Program  
- Vanpool Program  
- Contract Shuttle  
- Rideshare Facility  
- Flextime | $239,768  
($0.34)  
$913,070  
($1.29)  
(Savings, not net cost) |
| 8. Hartford Steam Boiler Hartford, CN | 197 (26.5%) | - Restricted Parking  
- Charge for Parking,  
- Inverted Fee Structure  
- Vanpool & Transit Subsidies | $163,296  
($1.59) |

* Not FHWA Case Study  
** No information on employer administration/program costs  
*** Represents market value of lead  
**** Implementing Transportation Demand Management Programs, Presented by the Institute of Transportation Engineers Association for Commuter Transportation for FTA & FHWA, June 1993, Section III.
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</tr>
</thead>
<tbody>
<tr>
<td>9. Swedish Hospital</td>
<td>387 (26.1%)</td>
<td>- Restricted Parking&lt;br&gt; - Charge for Parking&lt;br&gt; - Carpool &amp; Transit Subsidy&lt;br&gt; - Contract Transit Subsidy&lt;br&gt; - Guarantee Ride Home&lt;br&gt; - Flexible Work Hours</td>
<td>- $673,800 (-$3.32)</td>
</tr>
<tr>
<td>Seattle, WA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0. Bellevue City Hall</td>
<td>127 (25.8%)</td>
<td>- Charge for Parking&lt;br&gt; - Free Parking for HOVs&lt;br&gt; - Priority HOV Parking&lt;br&gt; - Alternate Mode Subsidies</td>
<td>-$54,084 (-$0.82)</td>
</tr>
<tr>
<td>Bellevue, WA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. San Diego Trust &amp; Savings</td>
<td>76 (22.7%)</td>
<td>- Parking Subsidy, Higher for HOV's&lt;br&gt; - Transit Subsidy&lt;br&gt; - Ride Matching&lt;br&gt; - Flexible Work Hours</td>
<td>$160,140 ($4.04)</td>
</tr>
<tr>
<td>San Diego, CA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Pasadena City Hall</td>
<td>90 (21.0%)</td>
<td>- Parking Fees&lt;br&gt; - Parking Subsidy/HOVs&lt;br&gt; - Transp. Allowance&lt;br&gt; - Free Transit Pass&lt;br&gt; - Vanpool Subsidies&lt;br&gt; - Bike/Walk Subsidies&lt;br&gt; - Guarantee Ride Home&lt;br&gt; - Childcare Subsidy</td>
<td>$165,000 ($3.51)</td>
</tr>
<tr>
<td>Pasadena, CA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. TransAmerica</td>
<td>377 (20.0%)</td>
<td>- Charge for Parking&lt;br&gt; - HOV Parking Discounts &amp; Subsidies&lt;br&gt; - Vanpool Assistance&lt;br&gt; - Preferential Parking&lt;br&gt; - Transit Subsidy</td>
<td>$384,900 (-$ 1.95)</td>
</tr>
<tr>
<td>Los Angeles, CA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. ARCO</td>
<td>341 (19.1%)</td>
<td>- Charge for Parking&lt;br&gt; - Transp. Allowance&lt;br&gt; - CDVP Parking Subsidy&lt;br&gt; - Vanpool Subsidy&lt;br&gt; - Active RBS Program&lt;br&gt; - Guarantee Ride Home</td>
<td>-$187,341 ($ 1.05)</td>
</tr>
<tr>
<td>Downtown, L.A.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Varian</td>
<td>490 (17.7%)</td>
<td>- On-Site, Discount Transit Pass Sales&lt;br&gt; - Award Program for Transit/HOV users&lt;br&gt; - Transp. Coordinator&lt;br&gt; - Bike/Walk Facilities</td>
<td>$102,123 ($0.40)</td>
</tr>
<tr>
<td>Palo Alto, CA</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Not FHWA Case Study
** No information on employer administration/program costs
*** Represents market value of land
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<tr>
<td>16. AT &amp; T</td>
<td>486 (13.4%)</td>
<td>- Restricted Parking&lt;br&gt;- Rideshare Promotion &amp; Matching&lt;br&gt;- Preferential Parking&lt;br&gt;- Flextime</td>
<td>-$ 64,940&lt;br&gt;(-$ 0.26)&lt;br&gt;-$ 306,270&lt;br&gt;(-$ 1.20)</td>
</tr>
<tr>
<td>Pleasanton, CA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Ventura County Gov't</td>
<td>325 (13.0%)</td>
<td>- &quot;Bonus Point Subsidy&quot;&lt;br&gt;- Guarantee Ride Home&lt;br&gt;- Preferential Parking&lt;br&gt;- Bike/Walk Facilities</td>
<td>$ 223,500&lt;br&gt;($ 1.31)</td>
</tr>
<tr>
<td>Ventura County, CA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. COMSIS Corporation</td>
<td>10 (10.5%)</td>
<td>- Restricted Parking&lt;br&gt;- Transp. Allowance&lt;br&gt;- CP &amp; TR Subsidies w/County Match</td>
<td>-$ 1,300&lt;br&gt;(-$ 0.24)</td>
</tr>
<tr>
<td>Silver Spring&lt;br&gt;Montgomery Co., MD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. 3M Company</td>
<td>1,130 (9.7%)</td>
<td>- Vanpool Assistance&lt;br&gt;- Staggered Work Hours</td>
<td>Unknown</td>
</tr>
<tr>
<td>St. Paul, MN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Allergan</td>
<td>76 (7.0%)</td>
<td>- Subsidized Vanpool Program&lt;br&gt;- 100% Transit Sub.&lt;br&gt;- Preferential Parking&lt;br&gt;- Paid Holiday HOV Incentive&lt;br&gt;- Comprehensive Employer Support Measures&lt;br&gt;- Flexible Work Hours</td>
<td>$ 197,950&lt;br&gt;($ 4.99)</td>
</tr>
<tr>
<td>Irvine, CA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. UCLA</td>
<td>828 (5.5%)</td>
<td>- Restricted Parking&lt;br&gt;- Charge for Parking&lt;br&gt;- Vanpooling Program (65 vans)&lt;br&gt;- Carpool Matching&lt;br&gt;- Campus Shuttle Service&lt;br&gt;- Park-N-Ride Service</td>
<td>$ 1,766,289&lt;br&gt;($ 4.09)&lt;br&gt;$ 1,079,049&lt;br&gt;($ 2.50)</td>
</tr>
<tr>
<td>Los Angeles, CA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Chevron</td>
<td>76 (3.7%)</td>
<td>- Transit Shuttle Service&lt;br&gt;- Vanpool Assistance&lt;br&gt;- Rideshare Matching&lt;br&gt;- Preferential Parking&lt;br&gt;- Employer Support&lt;br&gt;- Flexible Work Hours</td>
<td>$ 38,600&lt;br&gt;($ 0.97)</td>
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<tr>
<td>Concord, CA</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Not FHWA Case Study
** No information on employer administration/program costs
*** Represents market value of land
**** Implementing Transportation Demand Management Programs, Presented by the Institute of Transportation Engineers Association for Commuter Transportation for FTA & FHWA, June 1993, Section III.
PROJECTED EFFECTIVENESS OF INDIVIDUAL TDM STRATEGIES

The following information is adapted from Implementing Effective Travel Demand Management Measures: A Series on TDM as published by the Institute of Transportation Engineers and sponsored by FHWA and FTA.

**Step 1** Determine the Setting, in terms of density, average vehicle ridership, average vehicle occupancy, or mode split. Using the table below, determine the operating environment.

<table>
<thead>
<tr>
<th>Modal Split</th>
<th>(1) Low Density Suburb</th>
<th>(2) Activity Center</th>
<th>(3) Regional CBD/Corridor</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOV</td>
<td>85%</td>
<td>66%</td>
<td>41%</td>
</tr>
<tr>
<td>Transit</td>
<td>7%</td>
<td>16%</td>
<td>30%</td>
</tr>
<tr>
<td>Rideshare</td>
<td>8%</td>
<td>18%</td>
<td>28%</td>
</tr>
<tr>
<td>Avg. Veh. Occupancy</td>
<td>1.05</td>
<td>1.20</td>
<td>1.35</td>
</tr>
<tr>
<td>Avg. Veh. Ridership</td>
<td>1.13</td>
<td>1.35</td>
<td>1.90</td>
</tr>
</tbody>
</table>

**Step 2** Determine Modal Bias, i.e., whether the AVR is comprised of a modal split that is initially tilted in favor of transit use, rideshare use, or is mode neutral.

Using the table below, determine whether site is "mode neutral", "transit heavy", or "rideshare heavy".

<table>
<thead>
<tr>
<th></th>
<th>Low-Density Suburb</th>
<th>Activity Center</th>
<th>Regional CBD</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVR</td>
<td>1.12</td>
<td>1.35</td>
<td>1.90</td>
</tr>
<tr>
<td>AVO = &quot;Mode Neutral&quot;</td>
<td>1.05</td>
<td>1.20</td>
<td>1.35</td>
</tr>
<tr>
<td>AVO = &quot;Transit Heavy&quot;</td>
<td>1.02</td>
<td>1.04</td>
<td>1.04</td>
</tr>
<tr>
<td>AVO = &quot;Rideshare Heavy&quot;</td>
<td>1.10</td>
<td>1.24</td>
<td>1.60</td>
</tr>
<tr>
<td>AVO = &quot;Transit Heavy&quot;</td>
<td>1.02</td>
<td>1.04</td>
<td>1.04</td>
</tr>
<tr>
<td>AVO = &quot;Rideshare Heavy&quot;</td>
<td>1.10</td>
<td>1.24</td>
<td>1.60</td>
</tr>
</tbody>
</table>
Step 3  Determine Regulatory Environment, i.e., whether employers would be implementing these efforts under Mandatory or Voluntary conditions.

"Mandatory" represents an environment where employers are compelled to make good faith efforts by law.

"Voluntary" represents an environment where employers are simply requested to participate.

The "Full Participation" category represents an ideal environment where all employers would participate. This scenario represents the theoretical upper limit.

Step 4  Determine Level of Employer Support for each mode, using the following descriptions.

For Transit:

Level 1:  Provision of a transit information center on site, plus a 1/4-time transportation coordinator.

Level 2:  Level 1 plus adoption of a policy of schedule flexibility to allow employees to synchronize work schedules with transit schedules.

Level 3:  Level 2 plus provision of on-site transit pass sales (does not include employer discounting of transit fare), and increase in the effort of the transportation coordinator to part-time.

Level 4:  Level 3 plus adoption of a guaranteed ride home program, and provision of a full-time transportation coordinator.
For **Carpool**:

**Level 1:** Provision of information on carpooling opportunities (tied in with area-wide matching efforts) and general promotion of carpooling on-site, plus a 1/4-time transportation coordinator.

**Level 2:** Level 1 plus in-house carpool matching services and/or personalized carpool get-togethers (e.g., Zipcode Parties).

**Level 3:** Level 2 plus preferential parking privileges for carpools (reserved, enclosed, or particularly convenient), adoption of a policy of work-hours flexibility to allow employees to conform to carpool schedules, and an increase in the effort of the transportation coordinator to part-time.

**Level 4:** Level 3 plus adoption of a guaranteed ride home program, and provision of a full-time transportation coordinator.

For **Vanpool**:

**Level 1:** Provision of information on vanpooling opportunities (tied in with area-wide matching efforts and/or third-party vanpools), plus a 1/4-time transportation coordinator.

**Level 2:** Level 1 plus in-house vanpool matching services and/or personalized vanpool candidate get-togethers (e.g., Zipcode Parties), plus non-monetary vanpool development activities, and adoption of a policy of work-hour flexibility to allow employees to conform to vanpool schedules.

**Level 3:** Level 2 plus offering financial assistance to vanpool development, including vehicle purchase loan guarantees, consolidated purchase of insurance (or self-insurance), start-up subsidy (generally at least two forms of financial assistance), and additional assistance such as van washing and preferential parking privileges for vanpools (reserved, enclosed, or particularly convenient), plus an increase in the effort of the transportation coordinator to part-time.

**Level 4:** Level 3 plus adoption of a guaranteed ride home program, major financial assistance, such as employer purchase of vehicles with favorable leaseback, employer-supplied maintenance, fuel or insurance, or empty-seat subsidies, plus provision of a full-time transportation coordinator.
Step 5  **Determine Vehicle Trip Reduction** from the following tables based on the earlier steps and specific requirements or assumptions for the individual strategy.

**Transit Service Improvements** - Improving transit service or reducing its time of travel for the user, therefore involves the following measures to overcome or reduce the impacts of these disadvantages.

- **Direct Routing** to eliminate circuitous travel paths;

- **Broader Coverage** to reduce the impediments to accessing the service by bringing the service closer to home and/or destination;

- **More Frequent Service** to reduce the wait imposed by schedule on the user; and,

- **Travel on High Occupancy Vehicle Facilities** to give the traveler an en-route travel time advantage over mixed traffic.

Generally, Table 3.3-4, Transit Service Improvements, shows

- Transit service improvements that reduce Out-of-Vehicle travel time are clearly much more effective in attracting ridership than In-Vehicle improvements.

- Transit improvements of either type -- OVT or IVT -- are not very effective in suburban areas, defined as those locations where Average Vehicle Ridership is 1.20 or less. It would take substantial service offerings to begin to compete with the private single occupant vehicle (SOV), the difficulty of providing which is compounded by the sprawled, low density nature of suburban environment.

- Transit is primarily an important strategy in activity centers, corridors and downtowns, (AVR of more than 1.20), and because of the cost of providing transit service, is best conceived as targeted service improvements to key concentrated market segments.
Table 3.3-1
Employer Support of Transit

<table>
<thead>
<tr>
<th>AVR Setting</th>
<th>Maximum Participation</th>
<th>Mandatory Participation</th>
<th>Voluntary Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level of Support</td>
<td>Level of Support</td>
<td>Level of Support</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 2 3 4</td>
<td>1 2 3 4</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>AVR1 CP</td>
<td>1.13 79.5 0.5 18.3 1.7</td>
<td>0.2 0.5 1.5 2.0</td>
<td>0.2 0.5 1.4 1.8</td>
</tr>
<tr>
<td>AVR1 EV</td>
<td>1.13 85.0 7.0 7.3 0.7</td>
<td>0.2 0.5 1.6 2.2</td>
<td>0.2 0.5 1.5 2.0</td>
</tr>
<tr>
<td>AVR1 TR</td>
<td>1.13 86.6 9.0 4.1 0.3</td>
<td>0.2 0.5 1.6 2.2</td>
<td>0.2 0.5 1.5 2.0</td>
</tr>
<tr>
<td>AVR2 CP</td>
<td>1.35 60.2 5.0 31.2 3.6</td>
<td>0.2 0.5 1.6 2.1</td>
<td>0.2 0.5 1.4 1.9</td>
</tr>
<tr>
<td>AVR2 EV</td>
<td>1.35 66.2 16.0 16.1 1.7</td>
<td>0.2 0.6 1.8 2.4</td>
<td>0.2 0.5 1.6 2.2</td>
</tr>
<tr>
<td>AVR2 TR</td>
<td>1.35 73.7 25.0 1.1 0.2</td>
<td>0.3 0.7 2.0 2.7</td>
<td>0.2 0.6 1.8 2.4</td>
</tr>
<tr>
<td>AVR3 CP</td>
<td>1.90 30.7 10.0 53.1 6.2</td>
<td>0.2 0.6 1.7 2.2</td>
<td>0.2 0.5 1.5 2.0</td>
</tr>
<tr>
<td>AVR3 EV</td>
<td>1.90 41.3 30.0 25.8 2.9</td>
<td>0.3 0.7 2.1 2.9</td>
<td>0.3 0.6 1.9 2.6</td>
</tr>
<tr>
<td>AVR3 TR</td>
<td>1.90 50.8 45.0 3.8 0.4</td>
<td>0.4 0.9 2.7 3.6</td>
<td>0.3 0.8 2.5 3.3</td>
</tr>
</tbody>
</table>
# Table 3.3-2

## Employer Support of Carpooling

Table Shows Percent Vehicle Trip Reduction

<table>
<thead>
<tr>
<th>AVR Setting</th>
<th>Starting Mode Shares</th>
<th>Maximum Participation</th>
<th>Mandatory Participation</th>
<th>Voluntary Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Level of Support</td>
<td></td>
<td>Level of Support</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1  2  3  4</td>
<td></td>
<td>1  2  3  4</td>
</tr>
<tr>
<td>AVR1 CP</td>
<td>1.13 79.5 0.5 18.3 1.7</td>
<td>0.2 0.5 1.4 2.8</td>
<td>0.2 0.4 1.7 2.6</td>
<td>0 0.1 0.4 0.6</td>
</tr>
<tr>
<td>AVR1 EV</td>
<td>1.13 85 7 7.3 0.7</td>
<td>0.2 0.4 1.7 2.6</td>
<td>0.2 0.4 1.6 2.3</td>
<td>0 0.1 0.4 0.5</td>
</tr>
<tr>
<td>AVR1 TR</td>
<td>1.13 86.6 9 4.1 0.3</td>
<td>0.2 0.4 1.7 2.6</td>
<td>0.2 0.4 1.6 2.4</td>
<td>0 0.1 0.4 0.5</td>
</tr>
<tr>
<td>AVR2 CP</td>
<td>1.35 60.2 5 31.2 3.6</td>
<td>0.2 0.5 2 3</td>
<td>0.2 0.5 1.8 2.7</td>
<td>0 0.1 0.4 0.6</td>
</tr>
<tr>
<td>AVR2 EV</td>
<td>1.35 66.2 16 16.1 1.7</td>
<td>0.1 0.4 1.4 2.1</td>
<td>0.1 0.3 1.3 1.9</td>
<td>0 0.1 0.3 0.4</td>
</tr>
<tr>
<td>AVR2 TR</td>
<td>1.35 73.7 25 1.1 0.2</td>
<td>0.2 0.4 1.7 2.6</td>
<td>0.2 0.4 1.6 2.4</td>
<td>0 0.1 0.4 0.5</td>
</tr>
<tr>
<td>AVR3 CP</td>
<td>1.9 30.7 10 53.1 6.2</td>
<td>0.2 0.4 1.6 2.4</td>
<td>0.2 0.4 1.5 2.2</td>
<td>0 0.1 0.3 0.5</td>
</tr>
<tr>
<td>AVR3 EV</td>
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<td>0.1 0.2 0.8 1.2</td>
<td>0.1 0.2 0.7 1.1</td>
<td>0 0 0.2 0.2</td>
</tr>
<tr>
<td>AVR3 TR</td>
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<td>0 0.1 0.3 0.5</td>
<td>0 0 0.1 0.1</td>
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</tbody>
</table>
Table 3.3-3
Employer Support of Vanpooling

<table>
<thead>
<tr>
<th>AVR Setting</th>
<th>Starting Mode Shares</th>
<th>Maximum Participation</th>
<th>Mandatory Participation</th>
<th>Voluntary Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AVR</td>
<td>DA</td>
<td>TR</td>
<td>CP</td>
</tr>
<tr>
<td>AVR1 CP</td>
<td>1.13</td>
<td>79.5</td>
<td>0.5</td>
<td>18.3</td>
</tr>
<tr>
<td>AVR1 EV</td>
<td>1.13</td>
<td>85.0</td>
<td>7.0</td>
<td>7.3</td>
</tr>
<tr>
<td>AVR1 TR</td>
<td>1.13</td>
<td>86.6</td>
<td>9.0</td>
<td>4.1</td>
</tr>
<tr>
<td>AVR2 CP</td>
<td>1.35</td>
<td>60.2</td>
<td>5.0</td>
<td>31.2</td>
</tr>
<tr>
<td>AVR2 EV</td>
<td>1.35</td>
<td>66.2</td>
<td>16.0</td>
<td>16.1</td>
</tr>
<tr>
<td>AVR2 TR</td>
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<td>73.7</td>
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<td>30.7</td>
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<td>30.0</td>
<td>25.8</td>
</tr>
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<td>3.8</td>
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</tbody>
</table>

Table Represents Percent Vehicle Trip Reduction
### Table 3.3-4
Transit Service Improvements

**In-Vehicle Time Savings**

The table shows percent vehicle trip reduction.

<table>
<thead>
<tr>
<th>Mode Shares</th>
<th>Avg</th>
<th>Da</th>
<th>Tr</th>
<th>Cp</th>
<th>Vp</th>
<th>Time Savings in Minutes</th>
</tr>
</thead>
<tbody>
<tr>
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<td>I</td>
<td></td>
<td></td>
<td></td>
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<td>1</td>
</tr>
<tr>
<td>CP</td>
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</tr>
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<td>7</td>
<td>7.3</td>
<td>0.7</td>
<td>0.1</td>
</tr>
<tr>
<td>TR</td>
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<td>9</td>
<td>4.1</td>
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<td>0.2</td>
</tr>
<tr>
<td>CP</td>
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<td>60.2</td>
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<td>31.2</td>
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<tr>
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<td>66.2</td>
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<td>16.1</td>
<td>1.7</td>
<td>0.3</td>
</tr>
<tr>
<td>TR</td>
<td>1.35</td>
<td>73.7</td>
<td>25</td>
<td>1.1</td>
<td>0.2</td>
<td>0.5</td>
</tr>
<tr>
<td>CP</td>
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<td>30.7</td>
<td>10</td>
<td>53.1</td>
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<td>0.2</td>
</tr>
<tr>
<td>EV</td>
<td>1.9</td>
<td>41.3</td>
<td>30</td>
<td>25.8</td>
<td>2.9</td>
<td>0.6</td>
</tr>
<tr>
<td>TR</td>
<td>1.9</td>
<td>50.8</td>
<td>45</td>
<td>3.8</td>
<td>0.4</td>
<td>0.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mode Shares</th>
<th>Avg</th>
<th>Da</th>
<th>Tr</th>
<th>Cp</th>
<th>Vp</th>
<th>Time Savings in Minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>CP</td>
<td>1.13</td>
<td>79.5</td>
<td>0.5</td>
<td>18.3</td>
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<td>0</td>
</tr>
<tr>
<td>EV</td>
<td>1.13</td>
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<td>7</td>
<td>7.3</td>
<td>0.7</td>
<td>0.3</td>
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<tr>
<td>TR</td>
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<td>86.6</td>
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<td>4.1</td>
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<tr>
<td>EV</td>
<td>1.35</td>
<td>66.2</td>
<td>16</td>
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<td>1.7</td>
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<td>TR</td>
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<td>73.7</td>
<td>25</td>
<td>1.1</td>
<td>0.2</td>
<td>1.2</td>
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<tr>
<td>CP</td>
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<td>10</td>
<td>53.1</td>
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<td>0.5</td>
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<tr>
<td>EV</td>
<td>1.9</td>
<td>41.3</td>
<td>30</td>
<td>25.8</td>
<td>2.9</td>
<td>1.5</td>
</tr>
<tr>
<td>TR</td>
<td>1.9</td>
<td>50.8</td>
<td>45</td>
<td>3.8</td>
<td>0.4</td>
<td>2.2</td>
</tr>
</tbody>
</table>

### Out-of-Vehicle Time Savings

The table shows percent vehicle trip reduction.

<table>
<thead>
<tr>
<th>Mode Shares</th>
<th>Avg</th>
<th>Da</th>
<th>Tr</th>
<th>Cp</th>
<th>Vp</th>
<th>Time Savings in Minutes</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td>1</td>
</tr>
<tr>
<td>CP</td>
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<td>79.5</td>
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<td>18.3</td>
<td>1.7</td>
<td>0</td>
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<td>EV</td>
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<td>85</td>
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<td>7.3</td>
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<td>0.3</td>
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<tr>
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<td>86.6</td>
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<td>4.1</td>
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<td>0.4</td>
</tr>
<tr>
<td>CP</td>
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<tr>
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<td>73.7</td>
<td>25</td>
<td>1.1</td>
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<td>45</td>
<td>3.8</td>
<td>0.4</td>
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</tr>
</tbody>
</table>

4 - 31
**HOV Priority Lanes** provide en-route time savings that will benefit users of both transit and rideshare modes. This time savings can be in the form of an HOV lane on a highway, a system of HOV lanes, and priority treatment at ramps and interchanges.

The issues important in quantifying the vehicle trip reduction benefit received from HOV facilities include:

- **Time Saved** in comparison to the usual trip.

- **Beneficiaries of the Savings**, whether the HOV facility permits only transit vehicles or transit and carpools/vanpools.

- **Minimum Number Per Pool**, whether carpools of 2, 3 or 4+ people are allowed to use the HOV facility.

Generally, Table 3.3-5, High Occupancy Vehicle (HOV) Lanes shows:

- In a low or medium AVR environment, the greatest reductions in vehicle trips occur when the occupancy restriction is kept at the minimum, i.e., HOV 2 or greater. Setting the restriction higher results in fewer people using the lane, and less impact.

- In high AVR environments, where there is already an appreciable level of transit use, setting the occupancy restriction at a higher level (HOV 3+ or HOV 4+) results in more vehicle trip reductions.

- Provision of time savings to all high-occupancy vehicle travelers produces a greater impact on vehicle trip reduction than with transit service improvements.
Table 3.3-5
High Occupancy Vehicle (HOV) Lanes

Tables Shows Percent Vehicle Trip Reduction

<table>
<thead>
<tr>
<th>Setting</th>
<th>Time Savings (HOV 2+ &amp; Transit) in Min.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
<tr>
<td>AVR1 CP</td>
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<tr>
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<tr>
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<td>AVR2 EV</td>
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</tr>
<tr>
<td>AVR2 TR</td>
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<td>AVR3 CP</td>
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</tr>
<tr>
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<table>
<thead>
<tr>
<th>Setting</th>
<th>Time Savings (HOV 3+ &amp; Transit) in Min.</th>
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</thead>
<tbody>
<tr>
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</tr>
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</tr>
<tr>
<td>AVR1 EV</td>
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<tr>
<td>AVR2 TR</td>
<td>0.6</td>
</tr>
<tr>
<td>AVR3 CP</td>
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<tr>
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<td>1.2</td>
</tr>
<tr>
<td>AVR3 TR</td>
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<table>
<thead>
<tr>
<th>Setting</th>
<th>Time Savings (HOV 4+ &amp; Transit) in Min.</th>
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<tbody>
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<td>AVR1 CP</td>
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<td>AVR1 EV</td>
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<td>AVR1 TR</td>
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<tr>
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<tr>
<td>AVR3 TR</td>
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</table>
**Preferential Parking for HOVs** is another way to provide time savings to users of high-occupancy vehicles by providing special parking privileges at the work site. Though parking located closer to the entrance to the building may decrease some of the out-of-vehicle time, the difference in the time savings is minute.

The issues of importance are:

**HOV Time Savings** resulting from a parking location closer to the entrance.

**SOV Time Penalty** resulting from HOV parking being placed closer to the entrance.

The largest vehicle trip reductions due to preferential parking occur in the medium AVR environment. The lowest reductions appear in the low AVR environment. In the high AVR environment and its high level of transit use, preferential parking may contribute to a shift from transit to carpools and vanpools. Large reductions in vehicle trips may be possible if HOV users were given access to on-site parking but SOV commuters would be required to park off-site and the resulting time differential would be large.
Table showing percent vehicle trip reduction for different levels of occupancy and maximum occupancy vehicles (HOVs).
Travel Cost Incentives can be offered commuters in the form of carpool, vanpool, or transit subsidies to reduce the cost of travel and favor non-SOV modes.

Transit Subsidies may be offered in the form of reduced fares or employee subsidies.

HOV Subsidies are considered to be offered to all HOV users including vanpoolers and members of carpools.

HOV subsidies seem to have about the same impact as Transit Subsidies in the low AVR setting but progressively less in settings where transit is in greater existing use. The decline in effectiveness in the high AVR setting occurs if subsidies are offered only to HOV users and riders are taken out of transit.

SOV Surcharges are the most effective, single TDM strategy for reducing vehicle trips by diverting commuters from the SOV is the surcharge. This is because the surcharge "pushes" some people out of the SOV mode rather than "pulling" them to non-SOV modes through the use of incentives or subsidies. Other observations include:

- In the low AVR case, progressive increases in subsidies and surcharges continue to produce increases in vehicle trip reduction, except that at SOV surcharge levels of $3 or greater, the application of subsidy and surcharge results in a diminishing return in trip reduction.

- In the medium AVR case, trip reduction benefits increase with each added application of subsidy/surcharge, though at an increasingly declining rate as higher levels of subsidy/surcharge are applied. At the highest level of surcharge ($4), any increases in subsidy beyond $3 meet with no further gains in trip reduction.

- In the high AVR case, all surcharge/subsidy applications result in an increase in trip reduction but at an ever-declining rate. At the $3 and $4 levels of surcharge, increases in subsidy have little or no additional trip reduction impact.
Table 3.3-7  
Effects of Subsidies and Surcharges  
Table Shows Percent Vehicle Trip Reduction

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<tr>
<th>AVR</th>
<th>Daily Transit Subsidy</th>
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<td>15.1</td>
<td>25.3</td>
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<td>42.6</td>
<td>56.7</td>
<td>70.6</td>
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* Carpool / Vanpool only
Table 3.3-8
HOV/Transit Subsidies and SOV Surcharges (Daily Per Capita)
Table Shows Percent Vehicle Trip Reduction

| AVR | HOV & Transit Subsidy = 10 | SOV Surcharges | | AVR | HOV & Transit Subsidy = 11 | SOV Surcharges |
|-----|-----------------------------|----------------|----|-----------------------------|----------------|
|     | Setting                     | $0$ | $1$ | $2$ | $3$ | $4$ | Setting                     | $0$ | $1$ | $2$ | $3$ | $4$ |
|     | AV1 CP                       | 0.0 | 5.9 | 13.1 | 21.0 | 28.6 | AV1 CP                       | 5.8 | 12.0 | 20.9 | 28.5 | 35.0 |
|     | AV1 EV                       | 0.0 | 6.5 | 15.1 | 25.3 | 36.1 | AV1 EV                       | 5.6 | 13.9 | 23.8 | 34.4 | 44.5 |
|     | AV1 TR                       | 0.0 | 8.7 | 15.7 | 26.7 | 38.8 | AV1 TR                       | 6.5 | 14.1 | 24.8 | 36.8 | 48.3 |
|     | AV2 CP                       | 0.0 | 10.8 | 21.4 | 30.7 | 37.9 | AV2 CP                       | 10.2 | 20.8 | 30.0 | 37.2 | 42.4 |
|     | AV2 EV                       | 0.0 | 12.3 | 26.1 | 37.0 | 46.8 | AV2 EV                       | 10.5 | 23.1 | 34.9 | 44.8 | 52.2 |
|     | AV2 TR                       | 0.0 | 14.3 | 30.5 | 49.8 | 61.4 | AV2 TR                       | 11.3 | 27.2 | 43.8 | 58.6 | 70.9 |
|     | AV3 CP                       | 0.0 | 12.4 | 21.7 | 28.2 | 32.5 | AV3 CP                       | 11.3 | 20.6 | 27.2 | 31.6 | 34.4 |
|     | AV3 EV                       | 0.0 | 17.5 | 31.8 | 42.6 | 50.0 | AV3 EV                       | 14.5 | 29.1 | 40.0 | 47.7 | 52.8 |
|     | AV3 TR                       | 0.0 | 22.5 | 42.6 | 58.7 | 70.6 | AV3 TR                       | 18.1 | 38.6 | 55.6 | 68.2 | 76.9 |

| AVR | HOV & Transit Subsidy = 12 | SOV Surcharges | | AVR | HOV & Transit Subsidy = 13 | SOV Surcharges |
|-----|-----------------------------|----------------|----|-----------------------------|----------------|
|     | Setting                     | $0$ | $1$ | $2$ | $3$ | $4$ | Setting                     | $0$ | $1$ | $2$ | $3$ | $4$ |
|     | AV1 CP                       | 13.0 | 20.8 | 28.4 | 34.9 | 40.0 | AV1 CP                       | 28.2 | 34.7 | 39.8 | 43.4 | 45.8 |
|     | AV1 EV                       | 12.7 | 22.4 | 32.8 | 42.9 | 51.5 | AV1 EV                       | 29.9 | 39.8 | 46.4 | 55.2 | 60.0 |
|     | AV1 TR                       | 12.6 | 22.9 | 34.5 | 46.1 | 55.5 | AV1 TR                       | 30.5 | 42.0 | 52.5 | 61.0 | 67.4 |
|     | AV2 CP                       | 20.1 | 29.3 | 36.6 | 41.8 | 45.4 | AV2 CP                       | 35.4 | 40.7 | 44.3 | 48.6 | 49.1 |
|     | AV2 EV                       | 21.2 | 33.0 | 42.9 | 50.4 | 55.9 | AV2 EV                       | 39.3 | 47.0 | 52.5 | 56.2 | 58.6 |
|     | AV2 TR                       | 24.0 | 40.5 | 55.8 | 68.6 | 78.3 | AV2 TR                       | 50.0 | 63.8 | 74.6 | 82.4 | 87.7 |
|     | AV3 CP                       | 19.6 | 28.2 | 30.6 | 33.5 | 35.3 | AV3 CP                       | 29.0 | 31.8 | 33.7 | 34.8 | 35.5 |
|     | AV3 EV                       | 26.3 | 37.5 | 45.4 | 50.7 | 54.1 | AV3 EV                       | 40.9 | 46.4 | 50.0 | 52.3 | 53.7 |
|     | AV3 TR                       | 34.8 | 52.3 | 65.6 | 74.9 | 81.1 | AV3 TR                       | 60.0 | 70.5 | 77.7 | 82.3 | 85.3 |
COST EFFECTIVENESS MEASURE:
COST PER PASSENGER TRIP

The cost per trip reduced and other efficiency factors are useful for comparing progress from one year to the next or measuring against other TDM programs. Another measure is TDM program cost effective relative to other alternatives such as the cost to add highway capacity or providing other forms of transit service.

The operating expense per unlinked passenger trip is one performance measure used by the transit industry to measure cost effectiveness. A comparable measure can be estimated for TDM programs to provide a low cost basis for planners and funders to quickly evaluate the cost effectiveness of TDM programs.

By converting the TDM program results of placing people into non-single occupant vehicle modes to "passenger trips" and allocating the costs of the programs to those units, these parties will have a basis of comparison of TDM programs to other transit alternatives. However, a cautionary note is required.

Clearly, there are significant market differences between transit and TDM programs and this sketch planning tool should not be the sole basis used for allocating funds.

Furthermore, there are several issues to be resolved; some of the issues reduce or increase the comparable transit cost.

Unlike TDM programs, transit agencies offset some of their costs through the collection of passenger revenue. Comparing the operating costs would clearly give the misleading impression that the bus average cost per trip of $1.82 is significantly less cost effective than TDM programs. The exclusion of some forms of revenue (e.g., passenger fares) for transit appears to provide a reasonable basis for comparison. As an alternative, planners or funding agencies might treat only the State and Federal grant shares for transit as a comparative standard.

Other issues are the exclusion of capital cost depreciation for transit, and the fact that unlinked passenger trips overstate the number of person trips from origin to ultimate destination by excluding transfer. Accounting for these issues would increase the cost
basis for transit.

Another issue is the duration rate for pool formation. The "investment" in the people placed into a pool or bus should be allocated over the life of that pool, regardless of the reporting period.

**Number of customers:** Number of different commuters who have used the TDM agency's services over the reporting period. Usually, this is not the same as the total number of customers in the database as some of them may have been registered with the TDM program for longer than the reporting period.

**Placement Rate:** Percentage of customers who form a pool or ride transit as a direct or indirect result of the TDM program's efforts. The placement rate may be determined from surveys of the customers. There are three types of placement rates to be identified: customer direct placement rate; customer indirect placement rate; and, general public indirect placement rate. The direct placement rate focuses on those customers who change their travel behavior as a direct result of a TDM program or service. The customer indirect placement rate refers to those who change travel behavior but do not attribute the change to a specific service. The remaining group, the general public indirect placement rate, refers to those who are affected by marketing of the program or take advantage of a service (e.g., use a new bikepath) that never make direct contact with the TDM program.

**Frequency:** Average number of days per week a person placed into a pool or on a bus actually uses this mode to commute. TDM programs also should strive to increase the frequency of use of these options.

**Duration:** The average life of the carpool, for example, may be shorter or longer than the funding period. Some studies report a carpool duration average of two years. Including pool duration as an important variable in the effectiveness equation also recognizes the need and funding required to maintain existing pools and bus ridership.
EXAMPLE: TDM, Inc., a non-profit transportation management organization with a budget of $100,000 served 2,500 commuters in 1994. Research found that 15 percent of these commuters were placed into a non-SOV mode. These commuters used these options an average of 3 times per week. Additional research found that commuters only remained in this arrangement for 6 months. Based on this information, TDM, Inc.'s cost per passenger trip is $1.71, one way.*

*Cost per passenger trip = $100,000/(2,500 commuters x 15% x 3 days per week x 2 trips per day x 52 weeks per year x 0.5 year duration)

Operating Expense Per Unlinked Passenger Trip by Mode 1988-1992

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</table>

Source: National Transit Summaries and Trends: From the 1992 National Transit Database
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TRANSIT ORIENTED DEVELOPMENTS

MODULE GOALS

1. To introduce transit-friendly land use designs.
2. To understand the relationship between land use and transportation.
3. To provide the knowledge to review site plans for transit, bicycle and pedestrian access.

ASSUMPTIONS

1. Participants have a basic knowledge of planning.
2. A picture is worth a thousand words.
3. Future development must be transit-friendly.

PERCENTAGE OF TRIPS AND AVERAGE TRAVEL DISTANCES

1. Shopping, religious and education 24% 5 miles
2. Services and personal business 15% 7.7 miles
3. Social and recreational 20% 10.7 miles
4. Work and related activities 33% 10.6 miles

WHERE DO DOWNTOWN WORKERS GO DURING LUNCH?

1.
2.
3.
4.

IMPORTANT RIDESHARE INCENTIVES FOR EMPLOYEES

1. Lunchtime shuttles
2. Employee cafeteria
3. On-site childcare
4. Other on-site services
TEN REASONS WHY NEW COMMUNITIES ARE BETTER:

1. Recreational facilities 27%
2. Organization of land uses 25%
3. Attractiveness of community 16%
4. Street design 16%
5. Shopping facilities 15%
6. Open space/lack of crowding 15%
7. Preservation of natural features 14%
8. Schools 12%
9. Social programs 5%
10. Variety of housing types 3%

WHY OUR COMMUNITIES ARE NOT PEDESTRIAN FRIENDLY:

1. A quarter mile walk takes the average person five minutes.
2. Conventional zoning isolates uses and discourages easy flow.
3. Many streets are not designed to accommodate foot traffic.
4. Most blocks are too long, or do not have sidewalks.
5. The average household averages 14 auto trips per day.
6. Residential streets are subjected to higher speed design standards.
   - Broad turning radii
   - Gradual curves
   - Lane widths 12 feet or greater

THE EDICTS OF ANDRES DUANY

1. Reduce infrastructure costs through clustering.
2. Preserve natural space.
3. Facilitate pedestrian and recreational activity.
4. Improve connectivity.
5. Provide multiple paths.
NEOTraditional Town Design

Linked Versus Single-Purpose Trips

CSD: Single Purpose Trips

NTD: Linked Trips


1. No street hierarchy.
2. Street corners as commercial enclaves.
3. Linked trips.

Comparison of travel speeds and travel times

<table>
<thead>
<tr>
<th>Trip Purpose</th>
<th>Conventional Suburban Design</th>
<th>Neotraditional Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home-Shop</td>
<td>21 mph, 3.1 minutes</td>
<td>13 mph, 2.7 minutes</td>
</tr>
<tr>
<td>Home-Office</td>
<td>23 mph, 4.6 minutes</td>
<td>10 mph, 4.8 minutes</td>
</tr>
<tr>
<td>Home-School</td>
<td>21 mph, 3.7 minutes</td>
<td>13 mph, 2.8 minutes</td>
</tr>
</tbody>
</table>

The Village Cluster Design Features

Highest Density Housing

Village Center

Open Space

Nearby Parkland

Nearby Park
1. Transit routes on collectors not arterials.
2. Each neighborhood has variety of housing types.
3. Community centers provide services for all.
4. Pedestrian movement is easiest.
5. Village center has services that require highest volume of people.
CALTHORPE DESIGNS:

1. Everything relies on hierarchy of transit.
2. Communities/neighborhoods served by bus, connected to rail.
3. Bus stops as neighborhood centers.
4. Rail stops as activity centers.
5. Outlying areas served by park and ride at end of busline.
6. Higher densities within quarter mile of stops.
7. Maximum distance to transit stop is one mile.
8. Neighborhood centers have commercial and office on arterial.
9. Transit stops off arterial and integrated with parks.
10. High densities which support transit.

TRANSPORT CORRIDOR DISTRICTS

GENERAL LOCATION OF TRANSIT CORRIDOR DISTRICTS

Arterial Street

Transit-Only Sections of Corridor Thru-Way

CONTROL OF THROUGH AUTO TRAFFIC


1. Special travel corridors designed to provide transit time savings.
2. Non-HOV vehicles prohibited from sections of roadway.
3. Arterials remain as is for autos only.
4. Transit stop reoriented to special corridors.
5. Transit way is surrounded by higher density housing.
6. Commercial uses linked to transit stops.


5-8
TRANSIT-RELATED DEVELOPMENT

AUTOMOBILE-RELATED DEVELOPMENT


1. Restricted through travel.
2. Pedestrian protection.
3. Parking on-street and behind buildings.
4. Buildings oriented to street.
5. Human scale.
6. Auto given lower priority than pedestrians.
7. Park and walk v. drive, park, and drive

TRANSIT DESIGN GUIDELINES

<table>
<thead>
<tr>
<th>Land Use Type</th>
<th>Minimum Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>2,400 dwelling units</td>
</tr>
<tr>
<td>Commercial</td>
<td>375,000 square feet</td>
</tr>
<tr>
<td>Office</td>
<td>150,000 square feet</td>
</tr>
<tr>
<td>Industrial</td>
<td>1,400,000 square feet</td>
</tr>
</tbody>
</table>
TRANSIT ACCESS STANDARDS

THE BELMONT CASE: NEOTRADITIONAL V. LAND USE LAWS
The neotraditional design
1. Variable paths to choose from.
2. Mixing of uses.
3. Reduced number of higher speed roadways.
4. Provision of many types of uses.

The required design variances:

<table>
<thead>
<tr>
<th>Feature</th>
<th>VDOT Standard</th>
<th>Variance requested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design speed</td>
<td>35-45 mph</td>
<td>20-35 mph</td>
</tr>
<tr>
<td>Landscaping</td>
<td>Not allowed in ROW</td>
<td>Within ROW</td>
</tr>
<tr>
<td>Streets</td>
<td>12 feet</td>
<td>10 feet</td>
</tr>
<tr>
<td>ROW Width</td>
<td>40-90 feet + sidewalks</td>
<td>34-70 incl. sidewalk</td>
</tr>
<tr>
<td>On-street parking</td>
<td>Yes-Removed as Needed</td>
<td>Yes-Permanent</td>
</tr>
</tbody>
</table>

The refined Belmont design

1. Lots of cul-de-sacs
2. Segregation of uses
3. Services only on arterial
4. More high speed streets
5. Cleared right-of-way
6. Loss of character
SITE PLANNING ALTERNATIVES

1. Poor
   Pedestrian access through parking
   Lot is lengthy & unprotected

2. Better
   Pedestrian access along landscaped
   Median is lengthy but protected

3. Best
   Pedestrian access is short & protected


FLEXIBLE ZONING ORDINANCES

1. Usually incorporates land use percentages
2. Higher densities
3. Building setback maximums
4. Self-sufficiency
PARKING MANAGEMENT

Module Goals

- This module investigates and reflects on seven aspects of parking policy and its effects:
  1. Parking's role in inducing and sustaining travel related to both pattern and volume, especially with respect to encouraging single-occupant vehicle (SOV) travel;
  2. Parking's use as a governmental control for land use and zoning;
  3. Parking's purpose in local government revenue generation;
  4. Parking's role and function in economic growth and development attractiveness from both public and private sector perspectives;
  5. Parking's roles in institutional issues such as development financing and joint development;
  6. Parking's place in the ISTEA era of transportation planning, programming, and funding;
  7. How parking management strategies could be considered as a real option to alleviate traffic congestion.

Assumptions

- The relationship of parking to mode choice is generally understood by participants.

- The TDM community would benefit from a broader understanding of parking's relationship to the community.

Parking Management Defined

Parking management is a set of strategies used to balance the supply and demand for parking. Parking management strategies, especially parking pricing, also are some of the most effective tools that can be used for modifying mode choice. The decision of commuters to drive alone, carpool, vanpool, or use mass transit is strongly influenced by the ____________ , ____________ , and ____________ .
Much of the following material was prepared for the Metro Dade MPO by the Center for Urban Transportation Research.

INTRODUCTION

When commuters have difficulty finding low cost, convenient parking, the common perception is that area has a "parking problem". When people are stuck in traffic in their vehicle among a sea of other single-occupant vehicles, they tend to perceive that the area has a "highway congestion problem". Yet, in many cases these two situations are symbolic of an important and interconnected relationship - the overall effects of parking policies on urban transportation issues. Too little parking creates excess traffic in many urban areas as drivers "circle the block" looking for an available spot to park. On the other hand, too much parking encourages excessive use of the single occupant vehicle (SOV) as the primary commuter travel mode, clogging the arteries of an urban area and wasting valuable resources.

Even the creation of a rapid mass transit system may affect actual or perceived parking issues both within and outside of the transit corridors. A slight miscalculation of ridership patterns may result in one transit node having insufficient parking for a large ridership, resulting in commuter parking spillover into nearby residential areas. At the same time, parking facilities in excess of current ridership may have prematurely been installed at another node, giving the impression of administrative waste and mismanagement.

The public policy issue is: How to balance the needs of parking users with publicly mandated goals such as improved access to places of employment or markets, traffic congestion mitigation, and air pollution abatement. Governmental agencies and officials are faced with an imposing central question: How much parking is enough to satisfy commuters, visitors, shoppers, developers, and public policy objectives?

This module reviews the national literature that has been developed over the last decade. That time period has seen a change in the attitude of government agencies that have traditionally been the public sector regulating authorities over parking issues in their local areas. This shift has involved slow change from the mandated supply of "more parking" to one of regulation of parking supplies in limited attempts to affect the behavior of parking users. Another reason for
this incremental change in attitude has been the recognition that transportation policy and parking policy are interrelated and inseparable.

 Obviously, public policy change is not made overnight. The presence of many actors, issues of equity and development, recognition of environmental responsibility, and conflicting interest groups can create the perception that change comes too slowly. Yet, the very nature of the institutions by which the democratic process performs its specific functions has allowed progress to be made in many significant public policy areas. Change in parking policy has been incremental; it has been evolving ever since at least 1923.

**Historical Overview**

The development of parking policies has historically followed the rise of the motorcar as the dominant mode for moving people from place to place. Beginning with a 1923 zoning ordinance requiring parking be provided for multi-family dwellings in Columbus, Ohio (Zoning Applied to Parking, LeCraw and Smith, 1947), and continuing with the 1935 introduction of the first parking meter in downtown Oklahoma City, Oklahoma, cities and towns attempted to control and regulate the where, when, how, and at what cost, of urban automobile parking.

These policies were generally developed to aid the commercial growth of town and city central business districts, as described in "Parking as a Factor in Business" (1954) and "What Parking Means to Business" (1955) both from the Highway Research Board. Parking policy-making expanded to include additional jurisdictional areas through the promulgation of zoning regulations covering parking space requirements for new commercial and residential developments in expanding urban and suburban areas. However, parking policy-maker's primary focus was on downtown commercial centers and major trip generators.

Scientific approaches to determining the quantity, size, and location of parking spaces were developed by the Institute of Transportation Engineers (ITE), including *Industrial Plant Parking, A Recommended Practice* (1959) and *Parking Facilities for Industrial Plants* (1969), while "rules of thumb" were adopted by developers and lenders as to the "correct" number of parking spaces that would make developments competitive in the marketplace. Thus, on one hand, governmental statutes, ordinances, and regulations attempted to provide some intra-
jurisdictional consistency in parking policies; on the other hand, commercial rules of thumb worked towards leveling the commercial market's perceived playing fields.

During the first three Post-War decades, the onset of suburbia produced a series of publications examining parking as both a stand-alone phenomena and as one factor in the examination of overall municipal policies. The U.S. Department of Commerce devised their Parking Study Manual (Bureau of Public Roads, 1957) as an instruction manual calling for consistency in parking policy study methodology for public administrators and planning and zoning officials; while the Eno Foundation created a series of publications regarding the subject: Parking Authorities (Mogren, 1953); Parking: Legal, Financial, Administrative, 1956; Parking (Burrage and Mogren, 1957); Traffic Design of Parking Garages (Ricker, 1957); Access and Parking for Institutions (Smith, 1960); Zoning, Parking, and Traffic (Witheford and Kanaan, 1972); and Parking and Access at General Hospitals (Kanaan, 1973). The Highway Research Board published Parking Principles while the American Planning Association added Off-Street Parking Requirements (Bergman) to the basic literature on parking, both in 1971 (the latter revised twenty years later).

Two events coincided to add a significant amount of literature on this subject in the 1970s: the creation of the Environmental Protection Agency (EPA) and the Oil Crisis. Both of these events pointed out America's co-dependent relationship with the petroleum-powered automobile. The Federal Energy Administration published Guidelines for Travel Demand Analysis of Program Measures to Promote Carpools, Vanpools and Public Transportation (Cambridge Systematics, 1976). Also in the same year, the EPA issued Parking Management Strategies for Reducing Automobile Emissions (J. Dern, et al; U.S. EPA). Central Missouri State University looked at the legitimacy of government-induced commuter parking regulations in an article titled “Parking Restrictions: Commuter Parking” (The National Traffic Law News 4, November 1977).


Municipal planners had sought to alleviate traffic congestion in urban business and residential districts across the country through zoning regulations to ensure that developers supplied adequate off-street parking to meet perceived peak user demands. The idea was that sufficient parking would take commuter vehicles off city streets, reduce excessive circulation as commuters searched out parking spaces ("cruising"), cut down noxious exhaust emissions from idling automobiles, and eliminate gridlock in city cores. It was assumed that by regulating supply in one market (the parking user) that another market (the SOV user) could be managed. The October 1978 article by Donald Shoup and Don Pickrell, “Problems with Parking Requirements in Zoning Ordinances”, in the Eno Foundation’s Traffic Quarterly (Vol.32, no.4) skillfully addressed the erroneous assumption that drove this concept, which was that increasing supply would lessen demand. The market had reacted, not by parking off-street and relieving traffic woes, but by driving more single occupant vehicles and adding to urban congestion. The Shoup and Pickrell article was a turning point in the use of zoning regulation of parking supply provision as a city planning instrument for alleviating traffic congestion.

The decade of the 1980s saw a broadening and deepening of the investigative nature of parking research as transportation demand management (TDM) programs began to be instituted via transportation management associations (TMA) and through other public policy initiatives. However, the literature often reflected a desire to create additional parking through better management of existing facilities and revised design and construction techniques, including Parking Management (Emery Hines, 1982). The ITE published the leading reference books of parking space determination: Parking Generation in 1985; Employment Center Parking Facilities in 1988; and Parking Management, A Toolbox for Alleviating Traffic Congestion in 1989. The Downtown Research & Development Center published Better Parking Downtown: Increasing Supply and Managing It Better (Laurence A. Alexander, editor; 1987).

The National Association of Industrial and Office Parks (NAIOP) published an extensive nationwide study which was one of the first compilations of direct research into the effects of parking policies on developers and lenders. The survey results of the NAIOP Parking for Industrial and Office Parks (John A. Casazza, 1986) was abstracted for this module. The survey suggests more communication is needed
between the actors who affect parking policies, namely developers, lenders, governmental zoning and planning personnel, and parking administrators. By developing an areawide parking policy and encouraging consistent policy administration, developers, lenders and employers on one hand, and public administrators on the other, can cooperate on reducing wasted space that is given over to underutilized parking while at the same time creating opportunities for increased commuter usage of alternatives to the single-occupant vehicle and for assisting traffic mitigation programs. This was one of the only national studies available which asked direct questions of the developers and lenders and brought to the fore the nature of the rule of thumb which governed developer and lender preferences in parking quantities.


Within the last ten years there has been a shift in the sense and tone of publications regarding parking issues as traffic congestion and mitigation, resource conservation and environmental awareness, urban revitalization, mass transit, and public equity issues have usurped the half-century old concept of “more parking” on the urban policy landscape. The literature on parking is rich, broad, deep and varied.

Two journals in particular address parking issues on a regular basis and many of the works cited in this study are from these two sources. One is ITE Journal (Institute of Transportation Engineers, published monthly by the ITE, 525 School Street, S.W., Suite 410, Washington, DC 20024-2797) “…by and for transportation engineers, transportation planners, and others responsible for the safe and efficient movement of people and goods on our surface transportation system.” The second is Transportation Quarterly (Eno Transportation Foundation, Inc., 4421 Slatestone Court, Lansdowne, Virginia 22075) pub-
lished "...to provide those many experts and professionals of long experience in the field...with a medium for the expression and distribution of their ideas and views." These two journals are the most consistent contributors to the study of parking policies.

Of particular interest are the publications produced from two symposia held in Seattle, Washington, one in 1990 and the second in 1993. The first, Proceedings of the Commuter Parking Symposium, includes a series of presentation papers authored by the primary experts in the field of parking policy, most of which are included in this module as abstracts. The second, "Managing Employee Parking in a Changing Market", but is not a study per se, rather the abstract takes the form of a series of quotes from the symposium participants.

Additionally, a number of spontaneous and unstructured telephone interviews were conducted during the national search for recent parking studies that may have been done by the more progressive jurisdictions in the area of parking policy reform and implementation. Interviews were conducted with parking or transportation demand management (TDM) program administrators in: Montgomery County, Maryland; San Francisco and Pleasanton, California; Bellevue and Seattle, Washington; and Portland, Oregon. These interviews revealed that, other than parking inventories, studies on the stand-alone effects of parking policy or policy reforms are no longer being conducted. Rather, parking policies have been fully integrated into overall TDM programs to such an extent that these analyses are no longer separating out the effects of parking measures within transportation management programs. The studies that are available treat parking policy measures as one of many tools in the overall traffic congestion mitigation toolbox. Therefore, the most recent public sector-sponsored literature does not directly address before-and-after effects of stand-alone parking policy implementation.

Literature Review

The literature review investigates seven aspects of parking policy:

1. Parking's role in inducing and sustaining travel related to both pattern and volume, especially with respect to encouraging single-occupant vehicle (SOV) travel;

2. Parking's use as a governmental control for land use and
zoning;

3. Parking's purpose in local government revenue generation;

4. Parking's role and function in economic growth and development attractiveness from both public and private sector perspectives;

5. Parking's roles in institutional issues such as development financing and joint development;

6. Parking's place in the ISTEA era of transportation planning, programming, and funding;

7. How parking management strategies could be considered as a real option to alleviate traffic congestion.

The books, articles, and papers that are referenced below was selected for its scope, timeliness, relevance, and importance to this module; yet each is unique, reflecting the authors' area of specialization or interest.

The publications as a group were also chosen for their potential impact on parking policy reform even though none specifically addressed all of the problems associated with such reform. Therefore, each of the articles cited below and can only by analyzed in its own context. However, information gained from reading the abstract or the individual publication in its entirety may still be applied to parking policy formation, administration, implementation, and enforcement at the local level.

1. Parking's role in inducing and sustaining travel related to both pattern and volume, especially with respect to encouraging single-occupant vehicle (SOV) travel.

According to many of the authors, the simple fact is that "free" (employer-provided) parking is the greatest incentive for single occupant vehicle (SOV) use. However, it was not until studies clearly analyzed the effects and defined the flaws in the use of "more parking" zoning ordinances that this fact could be addressed.

In "Problems with Parking Requirements in Zoning Ordinances"
Shoup and Pickrell (1978) suggested that the practice of numerical detailing of minimum quantities of parking spaces in parking provision zoning regulations for new developments implies that zoning officers and planners are the final authorities on parking. They indicated the impacts from the use of land-use zoning rules to regulate the SOV user market: zoning requirements created a parking oversupply, encouraging more SOV use; the "rules of thumb" were inconsistent across jurisdictions; and zoning ordinances gave the impression that traffic congestion problems can be solved without the expenditure of public funds.

Shoup and Pickrell studied municipal zoning regulations that required developers to oversupply the parking user market in an attempt by public policy makers to mitigate traffic congestion. Well-intentioned planners assumed that more off-street parking would result in more cars being taken off the city streets. The planners did not recognize that the parking user market would react as it did, even though development-induced demand for parking did exist. The unintended consequences of the planners’ use of zoning land-use regulations to affect a traffic-oriented objective supplied evidence to suggest that opposite measures (reducing parking supply) could potentially reduce traffic congestion. Planners began to look at reducing parking supplies to force changes in commuter mode share selections.

Donald Shoup and Richard Willson have been the most productive authors in articulating the inherent traffic congestion problems caused by employer-paid parking. They argue in “Employer-Paid Parking: The Influence of Parking Prices on Travel Demand” (Shoup & Willson, 1990) that “free” parking is an insidious form of subsidy that supports the myth of “one man/one car” and encourages the single occupant vehicle commute. Shoup and Willson developed the concept of the “parking cashout” where employers would be required to offer employees the option of taking the fair market value of their subsidized parking as a taxable cash travel allowance. Individually and collectively the two authors successfully promoted federal tax policy revisions aimed at discouraging SOV use and expanding the implementation of carpool/vanpool programs. The authors’ “Employer-Paid Parking: The Problem and Proposed Solutions” (Shoup & Willson, 1992) argued for federal taxation of “free” employer-paid parking to discourage SOV use. The Internal Revenue Service (IRS) made some parking-oriented tax law revisions effective for 1994 Internal Revenue Code section 132 (f).

Any reading of parking-related publications reflects the contention that parking availability and cost (the supply) are the dominant variables in
# How Employer Parking Subsidies Affect Solo Driving

<table>
<thead>
<tr>
<th>Case Study and Type</th>
<th>Solo Driver Mode Share</th>
<th>Decrease in solo drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Employer pays for parking</td>
<td>Driver pays for parking</td>
</tr>
<tr>
<td>Mid Wilshire, Los Angeles (before/after)</td>
<td>42%</td>
<td>8%</td>
</tr>
<tr>
<td>Warner Center, Los Angeles (before/after)</td>
<td>90%</td>
<td>46%</td>
</tr>
<tr>
<td>Century City, Los Angeles (with/without)</td>
<td>92%</td>
<td>75%</td>
</tr>
<tr>
<td>Civic Center, Los Angeles (with/without)</td>
<td>72%</td>
<td>40%</td>
</tr>
<tr>
<td>Downtown Ottawa, Canada (before/after)</td>
<td>35%</td>
<td>28%</td>
</tr>
<tr>
<td>Average of Case Studies</td>
<td>66%</td>
<td>39%</td>
</tr>
</tbody>
</table>

Source: Richard W. Wilson and Donald C. Shoup, "Parking Subsidies and Travel Choices: Assessing the Evidence"

---

# How Employer Parking Subsidies Affect Auto Trips

<table>
<thead>
<tr>
<th>Case Study and Type</th>
<th>Autos Driven per 100 Employees</th>
<th>Decrease in solo drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Employer pays for parking</td>
<td>Driver pays for parking</td>
</tr>
<tr>
<td>Mid Wilshire, Los Angeles (before/after)</td>
<td>48</td>
<td>30</td>
</tr>
<tr>
<td>Warner Center, Los Angeles (before/after)</td>
<td>92</td>
<td>64</td>
</tr>
<tr>
<td>Century City, Los Angeles (with/without)</td>
<td>94</td>
<td>80</td>
</tr>
<tr>
<td>Civic Center, Los Angeles (with/without)</td>
<td>78</td>
<td>50</td>
</tr>
<tr>
<td>Downtown Ottawa, Canada (before/after)</td>
<td>39</td>
<td>32</td>
</tr>
<tr>
<td>Average of Case Studies</td>
<td>70</td>
<td>51</td>
</tr>
</tbody>
</table>

Source: Richard W. Wilson and Donald C. Shoup, "Parking Subsidies and Travel Choices: Assessing the Evidence"
### Parking Price and Mode Share Data for "before/after" Case Studies

<table>
<thead>
<tr>
<th>Location/Organization</th>
<th>Variable</th>
<th>Before (full subsidy)</th>
<th>After (subsidies reduced)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mid Wilshire, Los Angeles (near CBD)</strong></td>
<td>Parking Cost/Mo.</td>
<td>$0</td>
<td>$58</td>
</tr>
<tr>
<td><strong>Mid-sized non-profit</strong></td>
<td>Solo Driver</td>
<td>42%</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>Carpool/ Vanpool</td>
<td>17%</td>
<td>58%</td>
</tr>
<tr>
<td></td>
<td>Transit</td>
<td>38%</td>
<td>28%</td>
</tr>
<tr>
<td><strong>Warner Center (suburban Los Angeles)</strong></td>
<td>Parking Cost/Mo.</td>
<td>$0</td>
<td>$30</td>
</tr>
<tr>
<td><strong>Large Private Firm</strong></td>
<td>Solo Driver</td>
<td>90%</td>
<td>46%</td>
</tr>
<tr>
<td></td>
<td>Carpool/ Vanpool</td>
<td>6%</td>
<td>48%</td>
</tr>
<tr>
<td></td>
<td>Transit</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Central Business District, Ottawa</strong></td>
<td>Parking Cost/Mo.</td>
<td>$0</td>
<td>$23</td>
</tr>
<tr>
<td><strong>Federal government</strong></td>
<td>Solo Driver</td>
<td>35%</td>
<td>28%</td>
</tr>
<tr>
<td></td>
<td>Carpool/ Vanpool</td>
<td>11%</td>
<td>11%</td>
</tr>
<tr>
<td></td>
<td>Transit</td>
<td>42%</td>
<td>49%</td>
</tr>
</tbody>
</table>

Source: Richard W. Wilson and Donald C. Shoup, "Parking Subsidies and Travel Choices: Assessing the Evidence"

### Equivalent Cents Per Mile for Employer-paid Parking

<table>
<thead>
<tr>
<th>Avg. Parking Price</th>
<th>Subsidy Rate</th>
<th>25%</th>
<th>50%</th>
<th>75%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>$25</td>
<td></td>
<td>$0.01</td>
<td>$0.03</td>
<td>$0.04</td>
<td>$0.06</td>
</tr>
<tr>
<td>$50</td>
<td></td>
<td>$0.03</td>
<td>$0.06</td>
<td>$0.09</td>
<td>$0.12</td>
</tr>
<tr>
<td>$75</td>
<td></td>
<td>$0.04</td>
<td>$0.09</td>
<td>$0.13</td>
<td>$0.18</td>
</tr>
<tr>
<td>$100</td>
<td></td>
<td>$0.06</td>
<td>$0.12</td>
<td>$0.18</td>
<td>$0.24</td>
</tr>
</tbody>
</table>
the decision-making process affecting parking user behavior (the demand). This contention appears throughout the available literature and virtually every publication cited in this module could have been included under this aspect of the literature investigation.

2. Parking's use as a governmental control for land use and zoning.

The traditional link between parking policy and zoning ordinances had been forged by the user-driven concept of "more parking". That is, zoning code ordinances required certain parking supply provision minimums so as to insure sufficient quantities of parking to accommodate peak parking user demand at every site - residential, commercial, industrial, medical, educational, etc. Planners assumed that the provision of "sufficient" parking supply to handle peak parking demand would help alleviate traffic congestion. As Shoup and Pickrell explained in "Problems with Parking Requirements in Zoning Ordinances" in 1978, this policy had resulted in an unintended - and opposite - consequence. The oversupply of "free" parking that had been created by zoning minimums had simply encouraged more citizens to commute alone.

The development of parking-related zoning ordinances is a delicate balancing act between planners and developers, parking users, and public officials. Thomas Smith recognized that delicacy in Flexible Parking Requirements (Thomas P. Smith, 1983). Since these zoning policies were such a balancing act, Smith suggested that flexibility in parking requirements could be used to affect parking user behavior. Zoning ordinances that accommodated various land uses, differing temporal (daily, weekly, seasonally) peak demands, transit proximity, and ridesharing programs were necessary to manage the balance problems. The article included examples of innovative (at that time) and flexible ordinances; and its publication enabled the American Planning Association (APA) to spread the word on flexibility.

Steven Smith and Alex Hekimian based "Parking Requirements for Local Zoning Ordinances" (Smith & Hekimian, 1985) on their study of parking policies in Montgomery County, Maryland in the early 1980s. This study covered four land uses with the intent of developing flexible parking regulations that would accommodate various densities, parking patterns, and travel mode shares within each use. Along with the
four land uses (office buildings, retail, hotels, multi-family residential), the authors also addressed the problems of shared parking, downsized cars, and parking maximums. Smith and Hekimian developed four prerequisites in working out shared parking recommendations and they presented a six-point program to accommodate mixes of car sizes through a "universal" parking space size recommendation. They felt that the internal economics within the suppliers' own marketplace (land and parking space construction costs) were the limiting determinants of any parking supply provision quantities that would be over zoning-required minimums. The authors called for the use of localized and flexible requirements, and accurate assessments of actual parking needs.

Melody McCutcheon and Jeffrey Hamm studied the effects of using parking provision regulations based on environmental protection legislation in "Land Use Regulations to Promote Ridesharing: An Evaluation of the Seattle Approach" (McCutcheon & Hamm, 1983). The Clean Air Act was environmental legislation that had profound effects on traffic congestion mitigation programs. However, Seattle's use (in the late 1970s) of the environmental review process to force parking provision quantity changes by developers was perceived by the authors as inappropriate. While requiring preferential parking for high occupancy vehicles (HOV) and restricting total parking quantities for new developments was an effective method for discouraging SOV use, the environmental regulation instruments chosen for implementation simply did not work because the Seattle instrument was weak, unattractive to developers and virtually unenforceable.

The Institute of Transportation Engineers (ITE) developed a supplement to be used with Parking Facilities for Industrial Plants and the parking supply provision reference, Parking Generation, that updated some sections of both publications. Employment Center Parking Facilities (ITE, 1988) summarized the changes in parking requirements due to ridesharing mode use increases since the Oil Crises of the 1970s. This work indicated that local parking space provision zoning ordinances needed to be adjusted to reflect the reality that nearly twenty percent of employees at some work centers used some form of ridesharing. The authors felt that zoning ordinances could allow reductions in parking space requirements where employers actively promoted ridesharing to discourage SOV use.

ITE also observed that there were five criteria on which to base zoning variances regarding parking supply provision in new developments
and an additional five factors that affected parking user demand at particular employment centers. It suggested that the "rule of thumb" used by many zoning boards in developing parking requirements was inadequate to fit a variety of employment center situations.

Wayne Swanson focussed on the need for flexibility and adaptability in parking-related zoning regulations in "Parking: How Much Is Enough?" (Swanson, 1989). He argued that regulations should be based on cooperation, adaptation to specific needs, and situational monitoring. Swanson also suggested that a proactive stance towards flexibility in parking supply requirements when an employer wished to actively promote a ridesharing program was a better method than requiring zoning variance hearings.

The author indicates that states suffering from automobile overdependence (Texas, Florida, California) should be the most innovative in parking policy-making and ordinance implementation. He also provided examples showing the folly of any jurisdiction that simply copies the parking requirements of another. The implications for a particular community, however are not that every jurisdiction needs to develop its own parking supply provision ordinances; on the contrary, it would seem much more reasonable to create a single, flexible, countywide parking policy.

The Seattle Commuter Parking Symposium brought parking thought forward through the many papers included in the Proceedings publication, including Kiran Bhatt's "Local Zoning Codes and Parking Supply" (Bhatt, 1990). Bhatt systematically analyzed the parking policy potential in zoning regulations. He listed seven promising parking supply policy measures and five localized conditional variables that might affect the effectiveness of these measures. Along with nine key issue areas, Bhatt also recommended four policy directions.

Of importance to suburban counties, the author indicated that suburban communities offer some of the best opportunities for parking policy reform measures like reduced minimums. This is because suburban parking is generally oversupplied, suburbs are often sites of new mixed-use developments, and the natural market may take a long time to mature - if ever. On the other hand, he suggests that urban areas may benefit from other strategies, such as employer cashout, increased parking costs through parking taxes or differential pricing, developer "in-lieu of" payments, or reduced parking requirements for
developments in proximity to transit stations.

Richard Willson addressed suburban parking policies through case studies of ten suburban Los Angeles area worksites for Suburban Parking Economics and Policy: Case Studies of Office Worksites in Southern California (Willson, 1992). The study presents six policy options with the warning that convincing the various actors of both the need for and benefits in parking reform can only be accomplished through a concerted education program and consistent public sector parking policy implementation.

His recommendations for local governments include as one option the elimination of minimum parking requirements and then letting the "market" determine supply. However, if parking minimums are seen as a necessity then five factors must be accounted for:

a. actual cost-reflective parking user pricing;
b. specific office-use characteristics;
c. the surrounding land uses;
d. proximity to transit; and
e. employee density.

Willson recommended programs to educate developers on actual parking costs and needs, opportunities for shared parking, ongoing transit programs (including TDMs and TMAs), and public/private cooperative efforts. Additionally, Willson saw a need for public transit operators to expand their efforts to influence parking policy in the city planning and development approval process to encourage reductions in parking supplies, transit-friendly design, and transit support in general.

Zoning ordinances across the country no longer need address the parking issue from the traditional user-driven perspective. Flexibility in parking provision requirements has been put forward as a new paradigm in parking policy. However, inherent in a fragmented metropolitan area are difficulties in implementing policy in one location if there are competing policies in other jurisdictions. When a developer compares parking ordinances across jurisdictions, even if parking policies are similar, confusion (and the potential appearance of conflict) may arise due to different interpretations of ordinance language, categorizations, and vocabulary. A municipal ordinance review may indicate the differences in categorizations and provision requirements from jurisdiction to jurisdiction.
3. **Parking’s purpose in local government revenue generation.**

When parking revenue generation is brought up, first thoughts usually turn to parking meters. However, there are more aspects to this area than curbside meters (and Meter Maids). Among these additional aspects are:

a. increasing pay-for-parking user turnover;
b. raising fees for municipal parking lots to increase revenues;
c. aggressive enforcement of existing on-street metered parking;
d. increasing parking violation fines;
e. installation of more parking meters (both on- and off-street); and
f. other traditional parking revenue generation methods.

However, the so-called “parking tax”, that is, a tax imposed directly on parking users above existing parking charges, has attracted the most attention in recent years (even though parking taxes have existed in some jurisdictions since 1937) as more cities seek to both increase revenues and affect parking user behaviors.

The 1990 Seattle Parking Symposium produced three papers on this subject. In his “Proposal to Levy Parking Charges in the San Francisco Bay Area” (Huerby, 1990), Al Huerby looked at the use of parking charges to facilitate commuter behavior changes aimed towards meeting the requirements of environmental policies. While the City of San Francisco has had a parking tax in place for some time, the use of such a tax in rest of the Bay Area to alleviate air quality problems did not meet with much success. In today’s era of ISTEA, however, prototype air quality improvement programs that use a parking tax as one facet may be able to attract federal funding.

The second paper, “Proposed Parking Tax for Montgomery County, Maryland” (McGarry, 1990), was the story of a failed parking tax initiative. This represents a good example of the need for “political prepositioning”, that is, the necessity to educate the public and the important actors to the importance of a particular problem before any attempt is made to implement a solution, particularly one involving an economic disincentive like a parking tax. This is a critical lesson to be learned about parking policy implementation in general. Unless and until the public sees parking problems and develops these problems...
into a clear parking policy issue, it will not readily accept the need for any form of solution.

The third paper from the Symposium, "Parking Tax Discussion Paper" (Ulberg, 1990), is also pertinent to the possible introduction of a parking tax. In this paper, Cy Ulberg argues that the revenue generation potential of a parking tax is greatest when applied jurisdiction-wide and on all parking and parking users. In order for this to be accomplished in some jurisdictions there would need to be a countywide parking authority to:

a. present the facts outlining the parking problem;
b. educate the public and the important actors to the need for a solution to the parking problem;
c. provide a mix of alternative solutions; and
d. outline "accomplishable goals";
e. lobby the State Legislature for statutory revenue enhancement powers;
f. monitor parking programs and make adjustments;
g. maintain an ongoing public promotion program; and
h. form the basis for countywide cooperative efforts.

The City of Portland, Oregon has had a “parking cap” in place for a number of years but recently decided to increase the overall number of parking places in the city to accommodate more growth. Yet, they were still faced with the risks of debasing ambient air quality by simply allowing “more parking”. The City’s Parking Tax Survey Update (TRI-MET, 1992) done by the regional transit authority (TRI-MET), is an overview of the effects of parking taxes in other jurisdictions. While no decision has been made regarding the implementation of such a tax on Portland’s parking users, the revenue generation potential (actual and estimated) of such a tax is exceptional.

4. Parking’s role and function in economic growth and development attractiveness from both public and private sector perspectives.

One of the hardest aspects of parking policy reform is the necessity of addressing certain parking “myths”, including the role of parking in development attractiveness. Across the world, office developments continue to be built in urban central business districts in both the absence of “sufficient” parking and the presence of “over-priced” parking. Yet within the boundaries of some jurisdictions an innate fear
of the effects of parking policy reform on development has thwarted such reform.

It is possible that there is also a lack of communication between the various actors. Lenders want a return on their investment, while developers want their development to be successful (fully leased) in order to pay off the lenders and then make profits. At the same time, employers want to pay as little as possible for their facilities so that they may maximize their profits and employees want easy access to worksites such that they may spend as little as possible to obtain their earnings. Each of these actors wishes to maximize his or her returns and minimize expenses. The myth of “free” parking has resulted in lenders, developers, employers, and employees all thinking that they have been getting something for nothing. Yet, parking that does not generate revenue slows down the rate of return for lenders, wastes development capital and space, is a hidden cost for employers, and is a subsidy for only certain employees.

The fears that public administrators have regarding parking policy reform must be faced. “Automobile Parking Trends” (Wilbur Smith, 1983), indicates that through communication of community objectives to all of the actors involved, through the use of innovative and flexible parking policy instruments, and by tailoring new or changed parking policies to the individual jurisdiction, these myths may be addressed.

The national survey of the National Association of Industrial and Office Parks’ (NAIOP) “Parking for Industrial and Office Parks” (John A. Casazza, 1986) suggests that there needs to be more such communication between private sector developers and lenders on one hand, and governmental zoning and planning personnel and parking authority administrators on the other. Only by developing an areawide interest in parking policy and encouraging consistent policy administration, can developers, lenders, employers, and public administrators cooperate on reducing wasted space that is given over to underutilized parking.

At the same time, these actors may also be engaged in creating opportunities for increased commuter usage of alternatives to the single-occupant vehicle and for assisting traffic congestion mitigation programs. There are enough presentable economic incentives available to influence lenders and developers into rethinking the mythical effects of parking “rules of thumb”; however, these actors do not have the information available to them that is available to public agencies.
Before parking policy reform can take place, an intensive, jurisdiction-wide educational program must be implemented.

As one example of the tools available to educate the private sector, the Institute of Transportation Engineers, “Guidelines for Parking Facility Location and Design (ITE, 1990) shows how less space may be given over to parking simply by adjusting parking space size to meet the size mix of current commuter fleets.

Beyond simple physical changes in parking space size lies the realm of attitudinal adjustments. The 1993 Seattle Parking Symposium, “Managing Employee Parking in a Changing Market” (Municipality of Metropolitan Seattle, WA, 1993) shows how the education process can be implemented. The public sector sponsors of the symposium were able to gather private sector actors together in order to develop understandings of each others’ real - as opposed to imagined or mythical - needs and issues. The necessity of interaction and mutual education is paramount for policy reform.

5. Parking’s roles in institutional issues such as development financing and joint development.

There are myths in both the private and public sectors regarding parking’s role in development issues. One of the myths, the economic importance of parking to developers and lenders, was succinctly addressed by Peter Valk’s paper, “Leasing Practices and Parking” (Valk, 1990), from the 1990 Seattle Commuter Parking Symposium. Valk clearly shows the circular nature of the argument that parking reform has negative impacts on development. Yet, until developers (and lenders) are presented with parking facts, they will continue to operate at an economic disadvantage to their own goals.

More than any public sector plea to private sector civic responsibility, addressing developers’ own self-interest can be the greatest persuader towards cooperative parking reform efforts. The public sector is armed with information on the real issues and effects of parking policies, and until the private sector is brought into the "information loop", myth will obscure and obstruct parking policy reform.

Although the abstract of the 1993 Seattle Parking Symposium, “Managing Employee Parking in a Changing Market” (Municipality of Metro-
politan Seattle, WA: 1993) covers primarily the statements of the public sector actors, the degree of cooperative effort between the public and private sectors in the Seattle Area comes out in a reading of the entire text. The extent of communication between these sectors in the Seattle area clearly shows that this relationship need not be an adversarial one. There are cooperative efforts existing in the most progressive parking policy jurisdictions.

The case studies in Flynn and Glazer's "Ten Cities' Strategies for Transportation Demand Management" (TRB, 1989) show the divergent results between public/private cooperation (Seattle and Bellevue, Washington; Portland, Oregon) and public sector imposition (Sacramento and Los Angeles, California; Orlando, Florida) of parking management programs. Additionally, the NAIOP survey in John Casazza's "Parking for Industrial and Office Parks" (NAIOP, 1986) shows the potential that communication between public administrators and private sector actors has to create a cooperative relationship in the area of parking policy.

One of the most important goals of parking policy reform is myth destruction. The most important tools to reach this goal are education and communication. In order for a jurisdiction's public and private sector actors to accomplish these tasks they must cooperate. There are myths rampant in both the public and private sectors: regarding the nature (and even the existence) of parking "problems"; regarding parking's role in development issues; determining the institutions and instruments appropriate to address the "problems"; and parking policy-making, administration, and enforcement.

The literature directly addressing joint development issues is less than scant. However, the potential for site-specific parking policy reform measures that is opened up by public/private joint developments at major transit facilities is extensive. Future major transit infrastructure developments (high-speed rail stations and intermodal nodes, in particular) offer opportunities for planners in this area.

6. Parking's place in the ISTEA era of transportation planning, programming, and funding.

The literature available on parking policy makes no direct reference to the impacts of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). However, there would appear to be opportunities to obtain federal funding of parking policy-related pilot programs under
the Congestion Mitigation and Air Quality Improvement Program without designating a metropolitan area as a major non-attainment zone. By placing parking policy reform under the MPO for projects implemented after FY 1996, start-up and pilot projects may be made more attractive to both the public and private sectors.

ISTEA is probably the most important federal legislation aimed at promoting parking policy reform and this area deserves deeper study. According to ISTEAYear Three (Surface Transportation Policy Project, January 1994), ISTEA "...allows local communities and states to select transportation programs that make sense in the context of community goals and plans and it provides the funding flexibility to deliver the alternative selected through that process." There is approximately six billion dollars available through FY 1997 under this section of ISTEA.

From the congestion mitigation/air quality improvement point of view, the use of transportation demand management (TDM) programs may be most applicable to this sector of ISTEA planning and funding provisions. However, directly tying parking policy reform and air pollution can become a "stretch" as indicated by McCutcheon & Hamm (1983) and Huerby (1990). Nevertheless, using air quality as one factor in TDM program justification can create a more cooperative effort, as in Pleasanton, California (Information Report 9C: "Results of the Transportation Systems Management (TSM) Program and 1993 Alameda County Congestion Management Agency Transportation Survey", 1994), Portland, Oregon (TRI-MET Parking Tax Survey, 1992) and Seattle and Bellevue, Washington (Rideshare/Parking Management Program Handbook, 1994).

The relationship between TDM programs (including those that do not address parking policies) and the funding provisions of ISTEA deserves closer investigation.

7. **How parking management strategies could be considered as a real option to alleviate traffic congestion.**

Parking management is not the only answer to traffic congestion mitigation. However, parking management is one of the most significant tools in the traffic congestion mitigation toolbox. Parking management strategies include: peak-period pricing, transportation demand management (TDM) programs, and the parking tax.
Thomas Parody looked at peak-period pricing in “Implementation of a Peak-Period Pricing Strategy for CBD Parking” (Parody, 1984), a study of parking management strategies in Madison, Wisconsin. However, Madison was a unique situation in that all parking supplies that were available to the general public were controlled by the Parking Utility department within the City Transportation Commission (which commission also had responsibility for transit, taxicabs, bicycle and pedestrian facilities, and traffic engineering). Rephrasing the analogy used above, peak-period pricing is one tool in the parking management toolbox.

Carolyn Flynn and Lawrence Glazer gave an overview of TDM programs in “Ten Cities’ Strategies for Transportation Demand Management” (Washington, DC: Transportation Research Board, 1989). This paper presents ten case studies in the implementation of transportation demand management (TDM) programs, some of which addressed parking policies as a strategic tool in the instigation of TDMs.

The City of Pleasanton, California used a transportation systems management (TSM) ordinance to implement a traffic congestion mitigation program. Various parking-related measures were included (with others) in an attempt to reduce traffic-generated impacts. Broad implementation, cooperative public/private programs, articulated goals, and provisions for program enforcement have made Pleasanton one of the commonly cited jurisdictions with successful congestion mitigation programs. Their self-review of this program, “Results of the Transportation Systems Management (TSM) Program and 1993 Alameda County Congestion Management Agency Transportation Survey” (City of Pleasanton, CA: 1994) indicates that they are now looking towards adding employer cashout and parking tax instruments to their toolbox.

Another successful program is presented by the City of Bellevue, Washington in their Rideshare/Parking Management Program Handbook (City of Bellevue, WA: 1994), where an aggressive ridesharing promotion program is included with parking supply management measures.

Cy Ulberg’s “Parking Tax Discussion Paper” (Ulberg, 1990) is included under the “Parking’s purpose in local government revenue generation” (aspect 3. above). Ulberg, however, looked at the parking tax as not only a revenue generator, but also as a TDM strategy - as long as the actual parking users are the ones who are directly affected by
the tax itself.

Of as much importance as individual studies, was the Proceedings of the Commuter Parking Symposium (Municipality of Metropolitan Seattle, 1990). Using grants from the Urban Mass Transportation Administration (UMTA), the Federal Highway Administration (FHWA), and the Association for Commuter Transportation (ACT), the Municipality of Metropolitan Seattle (Metro) assembled, for the first time, a group of recognized experts focusing on the topic of parking policy reform. Many of the papers presented at that conference are mentioned throughout this study. The symposium developed four policy initiatives, twelve challenges, and ten “astounding facts”.
In order to select parking management instruments, measures, and techniques, it is necessary to develop a methodical approach to policy-making. This decision-making process is complicated due to the inter-relatedness of various parking issues on the many actors. Rick Kuner's "Downtown Parking Policy Analysis" from *Transportation Quarterly* (October 1983), is a descriptive primer on policy analysis methodology directed at parking policy in particular. He indicates that parking policy-making is a difficult process due to the diverse and legitimate concerns of the various actors and the perceptions that parking policy issues can be controversial, that alternatives may be overlooked, and that systematic or cost-benefits analysis methods are cumbersome and inexact. Kuner simplifies parking policy issues by recognizing that parking is "...a system in and of itself...", described in terms of supply and demand and he suggests a matrix approach to parking policy analysis.
Summary Review of Abstracted Literature

The primary findings of the literature review are:

1. **Parking policy can have profound effects upon single occupancy vehicle use as a commute mode, and parking pricing policies are the most effective tool in reducing SOV use by commuters.** Negative parking policy (quantity restrictions, price increases, parking taxes, etc.) are not efficient, however, if positive commuter mode choice alternatives are not concurrently offered. Parking policy reform must be offered in a “win-win” situational context.

2. **Parking policy can be a tool towards government control of land use and planning programs; however, it is only one tool in the planning toolbox.** Past mistakes in the use of zoning regulations to affect parking user demand behavior make parking reform a “difficult sell”. An areawide parking policy education program that includes state, county, and municipal officials; developers, lenders and employers; public and private sector employees; and other affected parties has the best chance of producing the best policy.

3. **Parking can be an invaluable revenue generation resource; however, some degree of public sector control of the parking market is an obvious prerequisite to such generation.** Metered on- and off-street public parking, a parking tax, vigorous enforcement of parking statutes and ordinances, and areawide regulatory authority are the best assets to developing such market control.

While political judgements will determine how much control is possible, a clear presentation of the benefits of parking policy reform can make the political decision-making process less controversial. By mandating that parking-generated net (after implementation and enforcement cost) revenue be directed towards transit, the citizen is offered a free market choice: to pay for parking and subsidize transit, or use transit and reap the rewards from others’ parking payments.
4. The role of parking in economic growth and development attractiveness has been one wrapped in myth and a basic lack of both understanding and communication between and among the actors involved.

Modern economic circumstances have presented the public sector with an opportunity to change the private sector's perceptions. Lenders and developers demand more precise estimates of the actual return on their investments and the primary focus of the re-education process must be this one simple fact - there is no such thing as "free" parking.

When employers recognize that the actual cost to them for supplying free parking to their employees can be the same as supplying company-paid health care, employers are much more inclined to assist public sector parking policy reform. Again, public sector education of the private sector is the key to parking policy cooperation.

5. Areawide parking policy reform, the education of private sector actors, and intergovernmental cooperation can be used as a focal point for positive approaches to the institutional issues circulating around development financing and economic growth. Other geographic areas that have been the core instigators of progressive and comprehensive parking management/transpor-tation program development policies have not suffered in the least from parking policy reforms.

On the contrary, positive quality of life and civic responsibility issues have tended to overcome negative first impressions of parking policy reform.

6. Although the available parking policy literature makes no reference to the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), there would appear to be opportunities to obtain federal funding of programs under the Congestion Mitigation and Air Quality Improvement Program. By placing parking policy reform under the MPO and using ISTEA funding, start-up transportation management associations may be made more attractive to both the public and private sectors. The role of ISTEA in parking policy reform and implementation deserves deeper investigation.
7. Parking management is not the solution to traffic congestion. However, it is one of the most important of the many tools available in traffic congestion mitigation. By ignoring parking policy reform, the single occupancy vehicle will continue its dominance in most jurisdictions. Parking policy reform by itself will simply move parking users around the jurisdiction, never actually helping alleviate congestion.

However, the recognition that parking policy reform combined with intelligent overall transportation policy implementation is the only method of addressing the traffic congestion dilemma is paramount. Without including parking policy in the transportation picture any efforts directed at traffic congestion mitigation will potentially be less successful than they could be if parking policy is included.

Overall Review of Parking-Related Literature

Any parking policy has to be based on its effects on parking users. Secondary effects (and unintended consequences) may be noted in policy relationships with secondary actors (developers, owners, lenders, architects, designers, engineers, contractors, operators, etc.). Historically, parking policies have also been used to advance other public policies such as economic development, traffic congestion mitigation, or air pollution abatement, for example. But the direct consequences of public administration decision-making regarding parking policy rest between the two primary actors - the decision-makers and the users.

Until recently, parking policy was "user driven"; that is, the perceived user demand determined the policy, and policy determined that this demand must be met through statutes, ordinances, and regulations which set minimum limits on required supply. Other rules covered parking space sizes, layout of spaces, landscaping, fire protection and security requirements, and other technical items. Such rules and regulations were designed to require, support and sustain parking supplies to meet user demands. While meeting perceived parking user demand was the dominant paradigm governing parking policy decision-making for decades, other issues have since arisen and drawn attention to the effects of parking policy on myriad areas. These include
traffic congestion, air pollution, petroleum dependency, quality of life, urban sprawl and suburban infill, development and redevelopment, governmental economics, and other social complications.

The literature of the 1950s through 1970s addressed accuracy in estimating user demand and the provision of supply to meet that perceived demand. The issues of the 1980s through today created a literature that revolves around adjusting parking supply - or supply costs - to modify parking user demand behavior.

In general this recent literature falls into two categories:

1. **Field experiments designed to test hypotheses.** These fall into six types:
   
   - a. The effectiveness of parking policy decisions in supplying sufficient parking space to meet parking user demand.
   - b. The effectiveness of parking policy decisions in modifying parking user behavior by forcing supply below demand.
   - c. The effectiveness of parking policy decisions in modifying parking user behavior by economic adjustments to parking user costs.
   - d. The effectiveness of parking policy decisions in concert with other transportation policy decisions in modifying parking user behavior.
   - e. The effectiveness of non-parking policy decisions in modifying parking user behavior.
   - f. Future projections of parking user demand.

2. **Gather data category.** These fall into eight areas:
   
   - a. Accurate counts of parking supply and/or use.
   - b. Data analysis of parking user behavior and attitude.
   - c. Economic analysis of the costs of supplying and/or
operating parking spaces.

d. Physical size requirements for parking space design and construction.

e. Technical or aesthetic factors in parking construction and maintenance.

f. Collection and comparisons of parking-related statutes, ordinances, regulations, and rules.

g. Comparative analysis of parking policies across jurisdictions.

h. Investigative methodology development.

Implications

Certain implied elements seem to appear with some consistency throughout the literature available regarding parking policies:

1. Jurisdictional bodies must determine that, even though they may not appear to have a parking problem, they may actually have a "hidden" one, due to lack of communication between parking users, providers and regulators.

On the demand side, when actors expect to be provided with "free" parking (commuters), or cheap and convenient parking (shoppers, visitors, tourists), or lucrative parking (public or private parking managers), then as long as their status quo is maintained there does not appear to be problems. Yet, the maintenance of the status quo continues to waste valuable land areas, contribute to environmental degradation, restrain efficient development, deter mass transit usage and exacerbate traffic congestion. The problems caused by a lack of an overall parking policy do become visible - they are simply not directly connected to one source.

On the supply side, when parking providers conclude - without any specific evidence - that "the market" calls for certain parking quantity standards, and they then supply parking to these perceived "market" standards, the providers' assets (land, capi
tal and interest, maintenance and security costs, etc.) are sometimes squandered on underutilized space. Reliance on the "market" and its rules of thumb are no longer sufficient to supply a less-than-adequately understood demand.

In fragmented jurisdictions, these problems are actually enhanced by a lack of an overarching, cohesive, flexible and cooperative parking policy which is applied with consistency and pragmatism as part of a unified overall transportation program. Fragmented jurisdictional areas - as much or more than central business districts - need a centralized source for information, policy direction, rules and regulations, ordinances and enforcement, and, especially, one communication/education nexus.

2. Certain areas of the country appear to have determined that parking policy needs to be integrated with overall transportation policies. The West Coast is at the forefront of this policy-making and implementation change. Cities in the San Francisco Bay (Pleasanton) and Los Angeles (particularly Irvine), California areas; Portland, Oregon; and in the metropolitan Seattle, Washington area (notably Bellevue) continuously appear in the literature as examples of innovative and cohesive policy development, implementation, administration and enforcement. These areas, for various reasons, have chosen not to maintain the status quo, and instead have attempted to make adjustments or changes in their approaches to parking policies.

The cities which appear to have the best opportunities to create functional and progressive parking policies also appear to have some consistent elements in their makeups:

a. they tend to be "rail" cities, with public rapid mass transportation systems;

b. they have had locally recognized parking problems;

c. they have been experiencing rapid economic growth; and

d. they have areawide mechanisms in place for the development of systematic problem-solving programs
in a range of issues.

In the eastern states, only the area around Washington, DC (Montgomery County, Maryland) is mentioned to any great degree. One would expect that this is due in no small part to the systemic effects of the decades-long economic decline of the major cities of the northeast and a history of experience with rail, subway, or bus commuting in general in those areas - as opposed to the one-man/one-car mindset of the South and West. Cities in the South and West grew concurrently (and often because of) the Automobile Age. It may be argued that this historical context should have offered a better opportunity to develop parking policies. The older cities of the East were more centralized, and the automobile was a retrofit on the dense urban landscape. For the Eastern cities, congestion issues were more dominant than parking issues.

3. Areas which have existing public mass rapid transit systems appear to have recognized that changes in parking policies have limited (but generally positive) effects on transit ridership mode share. They have realized through their experiences that adjusting or modifying parking policies may result in mode shifts in commuter travel methods, but may not significantly affect increases in mass transit shares. However, careful controls placed on parking in and along transit corridors may be able to affect transit shares to a greater degree than areawide parking policy changes.

When many urban public mass transit systems were first implemented, the central business district was the economic hub of the urban area and the transit corridors operated as feeder spokes into and out of that hub. With the changes in the overall economic picture in the United States, and in particular the movement from manufacturing to service industry predominance, a resultant (but delayed) shift in commuter patterns was observed. This shift tended to be away from the hub-and-spoke pattern to one of intrasuburban traffic. That is, rather than a commute from a suburban residential area to an urban manufacturing site, the recent trend is towards a commute from one mixed-use (office/residential) suburb to another mixed-use suburb. This represents a change that has a negative effect on mass transit, which is more effective at serving centralized...
locations.

There would appear, however, to be an opportunity to create mixed-use nodes within the existing mass transit corridors, and parking policy flexibility may become one inducement for developers to assist in that movement. Developers who are given economic incentives within these existing corridors by not having to provide expensive - and often underutilized - parking spaces on valuable land may become the catalyst for expanded transit system share increases.

4. **Spatial consideration is another area of parking policy which parking regulators need to address.** The typical commuter car is no longer the Chevrolet Impala of the 1960s, requiring a standard stall 10 feet wide and 19 feet long. By adjusting parking stall sizes to fit, say, a Honda Accord, the standard parking stall would become 8 1/2 feet wide and 15 feet long, accommodating more vehicles in the same parking lot footprint.

One of the future items which may affect parking policies would be growth in consumer interest in so-called “micros” or “city cars”. These ultra-compact, high-efficiency vehicles create the opportunity to roughly double the total vehicle capacity of existing parking supply. Through the capability of parking three micros in the same square footage now commonly used up by two full-sized vehicles, city cars may increase commuter numbers while having virtually no effect on highway levels of service. However, the reluctance of American commuters to downsize their vehicles would tend to put this revolutionary shift further into the future here, as opposed to Europe or Asia, where micros have been making inroads for some time.

5. **Parking policy measures which appear potentially most successful in modifying parking user behavior seem to be measures (in no particular order) which:**

a. are combined with transportation alternatives, because if alternatives to SOV use are not offered, then parking policy changes may tend to be ineffective at best and counterproductive at worst.
b. take into consideration the effects of parking policy reforms on as many actors as possible.

c. increase the user cost of parking.

d. are based on accurate estimates of parking user demand based on development size, location, and proposed or anticipated land uses.

e. offer preferential spatial or economic treatment to carpool/vanpool participants.

f. carry out restrictions on the minimum and maximum parking supply quantity requirements in transit corridors.

Policy Effects

Parking policies can be used to affect the two primary aspects of the parking market: supply, the quantity of parking spaces available in a given area; and demand, the number of parking users within that area. Parking regulations have traditionally been directed towards ensuring sufficient fixed supply to meet a variable demand - a difficult task at best, and an unattainable goal at worst.

On the supply side, the recent escalation of the costs involved in parking supply provision (land acquisition, development, financing, construction, operation, maintenance, safety, security, and liability) have created a real-market-oriented opportunity for public administrators to affect changes in developer/employer perceptions as to the relative importance of pseudo-market-based rules of thumb relating to parking supply.

On the demand side, parking policies must be designed in conjunction with alternatives to the SOV travel mode. These may include carpool or vanpool programs, preferential treatment of HOV modes, public mass transit, flexible work hours or telecommuting, or similar user incentives. Economic disincentives based on the price (per hour, day, month, year) that parking users are willing to pay to park also have an effect on demand.
Secondarily, parking policies can affect commuter residence location and travel mode selection choices, localized land use, and relations between the various actors affecting or affected by those policies. However, it is important to point out that these secondary effects depend on three aspects: the personalities of the actors, the degree of communication between and among the actors, and the local environment. Parking policies can affect - in limited and variable degrees, depending on the local situations - alternative commuter mode shares by:

a. increasing the number of carpoolers;
b. increasing transit share;
c. decreasing the numbers of SOVs; or
d. increasing the number of telecommuters.

Depending on local conditions, parking policy changes may increase carpool commuter share and decrease transit ridership at the same time. Until changes in parking policies are implemented, however, no empirical evidence can be obtained as to which (if any) of these increases/decreases will actually occur. This requires active, consistent, and comprehensive monitoring of before and after parking supplies, parking user demand data and commuter attitudes.

Parking policies can affect the physical amounts of public and private land space given over to parking. There is a domino effect related to this facet of land use regulation. For example, increases or decreases in the land “footprint” surrendered to parking lot use affects rainwater runoff, which affects storm sewer and catch basin placement, which affects retention area construction and lift station design capacities, which affects municipal capital outlays, etc., etc. Other physical effects involve air quality, light pollution, criminal activity, urban redevelopment, and local construction costs.

Parking policies can have positive or negative effects on the relationships between developers, lenders, and employers on one hand, and public officials and administrators on the other. Additionally, they can have positive or negative effects on the relationships between commuters, visitors, and tourists on one hand, and these same public officials on the other. Changing the parking capacity rule of thumb in local development can have effects on attitudes as much as on traffic or land use. The effects of parking policies in these areas - both primary and secondary - can be presumptively predicted but they cannot be explicitly foretold.
Conclusion

The parking-related literature collectively paints a picture of interconnectedness. That is, no individual parking-related policy or strategy, instrumental measure, regulatory statute, or ordinance stands alone. Just as there is an interconnectedness between parking supply and user demand, so too, there are complicated inter-relationships between the actors involved in the inputs and outcomes of parking policy decisions.

Public officials and administrators must take into account the delicacy of the balancing act that parking policy-making entails. The public policy issue remains unchanged since the introductory pages of this study: How to balance the needs of parking users with publicly mandated goals such as improved access to places of employment or markets, traffic congestion mitigation, and air pollution abatement. Remaining too, is the central public policy question: How much parking is enough to satisfy commuters, visitors, shoppers, developers, and public policy objectives?

The literature does not provide the answers. What it does supply is information so that the public sector decision-makers can make attempts to find a satisfactory balance of the various aspects of this issue.

Accurately predicting the outcomes of policy changes deviating from the status quo is not possible; on the other hand, neither is predicting the outcomes of maintaining the status quo. At best guess, maintaining the present policies may see one of three scenarios develop.

First scenario: nothing changes, that is, individual citizen perceptions as to the impact and importance of “parking problems” or “traffic congestion problems” will stay at the present levels; some parking facilities will go underutilized while others will be overcrowded; the single occupant vehicle will remain the primary travel mode; and transit share will fluctuate but remain low. These are the least benign aspects of doing nothing.

Second scenario: perceptions of “parking problems” and “traffic congestion problems” become acute, with citizen complaints and local media exposure; more parking facilities are underutilized and capacity-stressed facilities become even more overcrowded; the single occupant vehicle becomes the dominant travel mode; transit ridership
remains low; intrasuburban infill will not necessarily be as controlled or transportation-integrated; directed transit policy will be more difficult; and undercurrents of mistrust of official policies develops.

Third scenario: "parking problems" and "traffic congestion problems" reach a critical stage, complaints escalate as organizations become involved and national media coverage focusses on difficulties caused by inaction; costly underutilized parking facilities are abandoned and expensive new ones constructed to address supply/demand imbalances; the single occupant vehicle controls transportation policy decision-making; transit ridership stagnates at uneconomic levels forcing the privatization of the public mass transit system; urban sprawl fills in the few remaining green areas of the county; the citizens lose confidence in elected and appointed public officials and administrators. The worst case scenario may sound like a computer game program gone fatally bad - and it is.

Major metropolitan areas of the nation - Seattle, Washington; Portland, Oregon; San Francisco and Los Angeles, California; Montgomery County, Maryland - have addressed the same overall transportation problems as affect most metropolitan areas. Interestingly, they each have also adopted the concept of areawide parking policies as part of TDM or TRO programs. Additionally, these progressive jurisdictions continuously monitor, adjust, and update their policies.

Parking policy development and implementation seems to have the best chance at succeeding in modifying parking user behavior if:

1. There is a countywide parking authority regulating private off-street and public on- and off-street parking facilities as to supply, physical construction requirements, technical and aesthetic factors, location, and cost to user.

2. The parking authority operates as an operational part of existing countywide institutions, so as to integrate and facilitate parking policies with countywide planning and transportation policies.

3. The parking authority functions in a cooperative manner with planners and developers, developers and lenders, developers and employers, employers and employees, central business district and suburban civic organizations, citizens and elected representatives, tourist and visitor bureaus, the MPO and
transit agency, and the various municipalities within its area.

4. The parking authority develops an areawide public education and promotion program directed at parking users.

5. The policy integrates existing, or helps create or support new alternatives to SOV use as the primary commuter mode choice.

The answer to the basic question asked in the introduction of this study, "How much parking is enough to satisfy commuters, visitors, shoppers, developers, and public policy objectives?", is unavailable, or at best it may be answered with the catch-all reply, "It depends." However, if parking policies are uniform but flexible; if they are implemented countywide yet locally adaptable; if they are perceived as equitable, proactive, progressive, comprehensive, cohesive, and public; if the reasons for the policies are articulated, readily understood and widely publicized; if the effects of the policies are monitored and unintended consequences ameliorated; and if public administrators and elected officials support the policies and the public accepts them; then the potential exists for parking supply to roughly equate with parking user demand under all but the most exaggerated of circumstances. And that is the best scenario of all.
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PUBLIC POLICY

MODULE GOALS

2. Know how to implement a "Cash-Out" program.
3. Ability to relate various tax issues and incentives to employers and employees.
4. Provide a framework for developing trip reduction ordinances.

ASSUMPTIONS

1. Parking incentives and disincentives will affect commuter behavior.
2. The federal government is having a positive influence on TDM through their policies and tax laws.
3. Local governments can develop TDM ordinances if given the proper tools.

Part III. Administrative, Procedural, and Miscellaneous

Qualified Transportation Fringe Benefits Under Section 132 (f)

Notice 94-3

I. PURPOSE

This notice addresses issues relating to the provision for qualified transportation fringes in section 132 (f) of the Internal Revenue Code. As part of the Energy Policy Act of 1992 (the Act), Pub. L. No. 102-486, Congress amended section 132 to incorporate three basic changes in the tax treatment of employer-provided transportation benefits. First, it increased the exclusion for transit passes from $21 to $60 per month and provided that only the value of a transit pass in excess of the statutory limit would be includible in gross income. Second, Congress added an exclusion for van pools. Up to $60 per month may be excluded, but the $60 exclusion applies to the aggregate of van pools and transit passes. Finally, Congress eliminated the working condition fringe benefit for commuter parking and provided that the amount of employer-provided parking excludable from gross income is limited to $155 per month.
II. APPLICATION

Q-1: What is a qualified transportation fringe?

a. In general. A "qualified transportation fringe" is any of the following that is provided by an employer to an employee and meets the requirements described in this notice: (1) transportation in a commuter highway vehicle, (2) transit passes, and (3) qualified parking. Nothing in section 132 (f) of the Code or this notice prohibits an employer from simultaneously providing an employee any combination of these three benefits.

b. Transportation in a commuter highway vehicle. A "commuter highway vehicle" is any highway vehicle that has a seating capacity of at least six adults (excluding the driver) and meets the two requirements for mileage use. At least 80 percent of the vehicle's mileage use must be reasonably expected to be (1) for transporting employees in connection with travel between their residences and their place of employment, and (2) on trips during which the number of employees transported for commuting is, on average, at least one-half of the adult seating capacity of the vehicle (excluding the driver).

c. Transit passes. A "transit pass" is any pass, token, farecard, voucher, or similar item entitling a person to transportation (or transportation at a reduced price) (1) on mass transit facilities (whether or not publicly owned), or (2) provided by any person in the business of transporting persons for compensation or hire in a highway vehicle with a seating capacity of at least six adults (excluding the driver).

d. Qualified parking. "Qualified parking" is access to parking provided to an employee on or near the employer's business premises or at a location from which the employee commutes to work by car pool, commuter highway vehicle, mass transit facilities, transportation provided by any person in the business of transporting persons for compensation or hire, or by any other means. The term does not include parking on or near property used by the employee for residential purposes.

Qualified parking means parking for which an employer pays (directly to a parking lot operator or by reimbursement to the employee), or that an employer provides on premises it owns or leases. See Q-3b for the rules relating to reimbursements.

For purposes of the definition of qualified parking, a car pool means two or more individuals who commute together in a motor vehicle on a regular basis.
Q-2: Is there a limit on the value of qualified transportation fringes that may be excluded from an employee’s gross income?

   a. Transit passes and transportation in a commuter highway vehicle. Up to $60 per month is excludable from the gross income of an employee for transit passes and transportation in a commuter highway vehicle provided by the employer. One $60 limit applies whether these benefits are provided separately or in combination with one another.

   b. Parking. Up to $155 per month is excludable from the gross income of an employee for qualified parking provided by the employer. This exclusion is available whether an employer provides only qualified parking or qualified parking in combination with other benefits described in this notice.

   c. Limitation on employees of a controlled group of corporations. All employees treated as employed by a single employer under section 414(b), (c), (m), or (o) of the Code are treated as employed by a single employer for purposes of section 132(f). See section 1.132-1(c) of the Income Tax Regulations. Thus, an employee of one corporation that is part of a controlled group of corporations may, under certain circumstances, be eligible to receive qualified transportation fringes from another corporation within the controlled group. The statutory dollar limitations with respect to that employee, however, are not increased under this rule.

   d. Result if the value of the otherwise qualified transportation fringe exceeds the statutory limit. Generally, an employee must include in gross income the amount by which the fair market value of the benefit exceeds the sum of the amount, if any, paid by or on behalf of the employee, and any amount excluded from gross income under section 132 or another section of the Code. See section 1.61-21(b)(1) of the regulations. Thus, if an employer provides an employee with a qualified transportation fringe that exceeds the statutory limit, the excess value must be included in the employee’s gross income for income and employment tax purposes.

EXAMPLES

   Example 1. Each month Employer M provides a transit pass valued at $70 to Employee D. D does not reimburse M for any portion of the pass. Because the value of the monthly transit pass exceeds the statutory limit by $10, $10 must be included in D’s wages for income and employment tax purposes.
Example 2. Each month Employer M provides parking valued at $165 to Employee E. Because the fair market value of the parking exceeds the statutory limit by $10, $10 must be included in E's wages for income and employment tax purposes.

e. Payments by employees for qualified transportation fringes. If an employee pays the employer for a qualified transportation fringe, the amount includible in the employee's gross income is the amount by which the fair market value of the benefit exceeds the amount paid by the employee plus any amount excludable under section 132 or another section of the Code.

Example. Employer P provides qualified parking with a fair market value of $200 per month to its employees, but charges the employees $45 per month. Because the amount paid ($45) by the employees plus the amount excludable ($155) for qualified parking equal the fair market value of the benefit, no amount is includible in the employee's gross income.

f. Exclusion applies on a monthly basis. The value of qualified parking, transit passes, and transportation in a commuter highway vehicle must be calculated on a monthly basis to determine whether the value of the benefit has exceeded the limits on qualified transportation fringes. If the value of the benefit does not exceed the statutory limit in any month, the unused portion of the exclusion may not be carried over to subsequent months. Similarly, if the employer provides a benefit having a monthly value greater than the statutory limit, the value in excess of the statutory limit may not be excluded by combining the monthly exclusions. An employer may, however, reimburse an employee for costs incurred for qualified parking, transit passes, and transportation in a commuter highway vehicle in subsequent months, so long as the value of the benefit is calculated on a monthly basis.

Example. Employer Q, at the end of a three-month period, reimburses Employee A for transit passes purchased during the preceding three months. A purchased a $60 transit pass each month, and Q reimburses A $180 in cash at the end of the third month. Because the value of the reimbursed expenses did not exceed the statutory limit in any month, the $180 reimbursement is excludable from A's gross income as a qualified transportation fringe. See Q-3b for the specific rules governing reimbursements.

g. “Month” defined. A “month” is a calendar month or a substantially equivalent period applied consistently.
Q-3: Are cash reimbursements permitted under new section 132(f)?

a. In general. The term "qualified transportation fringe" includes cash reimbursements by an employer to an employee for qualified parking, transit passes, or transportation in a commuter highway vehicle. The term "cash reimbursement" does not include cash advances.

b. Recordkeeping requirements. Employers that make cash reimbursements must establish a bona fide reimbursement arrangement to ensure that their employees have, in fact, incurred expenses for parking, transit passes, or transportation in a commuter highway vehicle. An employee must demonstrate to the employer that an amount equal to the reimbursement was expended for qualified parking, transit passes, or transportation in a commuter highway vehicle. For example, an employee may present a used transit pass to the employer at the end of the month and certify that he or she purchased and used it during the month, or may present a transit pass to the employer at the beginning of the month and certify that he or she purchased it and will use it during the month. What constitutes a bona fide reimbursement arrangement may vary depending on the facts and circumstances, including the method or methods of payment utilized within the mass transit system.

c. Special rules for transit passes. The term "qualified transportation fringe" does not include reimbursements for transit passes if a voucher or similar item that may be exchanged only for a transit pass is readily available for direct distribution by the employer to employees. A voucher or similar item is "readily available" if an employer can obtain it on terms no less favorable than those to an individual employee and without incurring a significant administrative cost.

d. Example. Company C in City X sells vouchers to employers in the metropolitan area of X. Several different bus, rail, van pool, and ferry operators service X, and a number of the operators accept the vouchers either as fare media or in exchange for fare media. Employers can easily obtain vouchers for distribution to their employees. To cover its operating expenses, C imposes on each voucher a charge that is not significant. Employer M disburse vouchers purchased from C to employees who use operators that accept the vouchers. Because M is not making cash reimbursements of its employees' transit expenses with respect to these operators, M need not maintain a bona fide reimbursement arrangement for these transit expenses. The vouchers disbursed to M's employees are qualified transportation fringes.
Q-4: Can employers reduce their employees’ compensation in exchange for providing qualified transportation fringes?

Section 132(f)(4) of the Code prevents employers from reducing their employees’ compensation in exchange for providing qualified transportation fringes. This rule applies even if state or local law requires employers to offer employees the choice of receiving a qualified transportation fringe or a higher salary.

Example 1. Employer X reduces its employees’ compensation by $60 per month and provides $60 per month in transit passes. Each employee is required to include $60 per month in gross income, even though the employee received an otherwise qualified transportation fringe.

Example 2. Employer Y offers its employees a choice between $45 per month in transit passes and $45 per month in additional compensation. Every employee of Y is required to include $45 per month in gross income, whether the employee selected cash or transit passes.

Q-5: To which employers and employees do the qualified transportation fringe rules apply?

a. Employers. Section 1911 of the Act does not exclude government employers from coverage. Accordingly, section 132(f) of the Code applies to both non-government and government employers.

b. Employees. Qualified transportation fringes may be provided only by employers to employees. For this purpose, employees are individuals who are employees within the meaning of section 1.132-1(b)(2)(i) of the regulations. This definition includes common law employees and other statutory employees, such as officers of corporations. Self-employed individuals, who are employees within the meaning of section 401(c)(1) of the Code, are not employees for purposes of section 132(f). Therefore, partners, 2-percent shareholders of S corporations, sole proprietors, and other independent contractors are not employees for purposes of section 132(f). An individual who is both a 2-percent shareholder of an S corporation and an officer of that S corporation is not considered an employee for purposes of section 132(f).

Q-6: Are there any special rules for qualified parking for vehicles provided by law enforcement agencies to their employees?

Section 1911 of the Act does not provide special rules for vehicles provided by law enforcement agencies. Accordingly, section 132(f) of the Code applies to qualified parking provided to
law enforcement officers who travel from home to work in vehicles provided by a law enforcement agency unless the vehicle is a qualified nonpersonal use vehicle as described in section 1.274-5T(k) of the regulations.

Under section 1.132-5(h)(1) of the regulations, 100 percent of the value of the use of a qualified nonpersonal use vehicle (as described in section 1.274-5T(k)) is excludable from gross income as a working condition fringe. This exclusion applies to employer-provided parking for qualified nonpersonal use vehicles as well. Thus, if an employee drives from home to work in a vehicle described in section 1.274-5T(k) of the regulations, the parking provided for that vehicle is excludable from the employee's gross income as a working condition fringe.

As with employer-provided parking for other types of vehicles used solely for business purposes, parking provided for law enforcement vehicles used exclusively for business purposes is a working condition fringe and the rules of section 132(f) do not apply.

Q-7: May partners and 2-percent shareholders of S corporations continue to use the rules that applied to transit passes and parking prior to the Act?

a. Transit passes. The existing de minimis and working condition fringe rules remain available for transit passes provided to partners and 2-percent shareholders of S corporations. For example, the de minimis fringe rule for transit passes continues to apply to partners and 2-percent shareholders of S corporations to the extent it applied prior to the Act. Tokens or farecards provided by a partnership to a partner that enable the partner to commute on a public transit system (not including privately-operated van pools) are excludable from the partner's gross income if the value of the tokens and farecards in any month does not exceed $21. See section 1.132-6(d)(1) of the regulations. If the value of a pass provided in a month exceeds $21, however, the full value of the benefit is includible in gross income.

b. Parking. The Act eliminated the working condition fringe exclusion for commuter parking. However, if a partner performing services for a partnership or a director of a corporation would be able to deduct the cost of parking as a trade or business expense under section 162 of the Code, the value of free or reduced-cost parking is excludable as a working condition fringe. See sections 1.132-5(a)(1) and 1.132-1(b)(2) of the regulations. The de minimis fringe rules remain available for parking provided to partners and 2-percent shareholders of S corporations that qualifies under the general de minimis rules. See section 1.132-6(a) and (b).
Example. G is a partner in partnership P, which maintains offices at various locations in city C. G commutes to and from G’s office every day and parks free of charge in a reserved space in P’s lot. G periodically drives to P’s other offices in C for business reasons and parks in lots leased by P. G must include in income the full monthly value of G’s reserved parking space. Because G would be allowed a deduction under section 162 of the Code for the cost of using the parking spaces at P’s other offices, the value of that parking is excludable from gross income as a working condition fringe.

Q-8: How does section 132(f) affect transit passes and parking provided to independent contractors?

Even though qualified transportation fringes cannot be provided to self-employed individuals (see Q-5b), the existing de minimis fringe rules for transit passes and parking continue to apply to independent contractors to the extent they applied prior to the Act.

a. Transit passes. Tokens or farecards that enable an independent contractor to commute on a public transit system (not including privately-operated van pools) are excludable from the independent contractor’s gross income if the value of those tokens and farecards in any month does not exceed $21. See section 1.132-6(d)(1) of the regulations. If the value of a pass provided in a month exceeds $21, however, the full value of the pass is includible in gross income.

b. Parking. An independent contractor may exclude the value of parking from income as a de minimis fringe if the requirements of section 1.132-6(a) and (b) are satisfied. See also section 1.132-1(b)(2) of the regulations.

Q-9: How do the qualified transportation fringe rules apply to van pools?

a. Van pools operated by or for the employer.

   (i). In general. This category covers two types of arrangements: (1) employers purchase or lease vans to enable employees to commute together, and (2) employers contract with and pay a third party to provide the vans, maintenance, and liability insurance. Up to $60 per month of the value of transportation in the vans may be excluded from the employees’ gross incomes, provided the van qualifies as a “commuter highway vehicle” as defined in Q-1b of this notice and section 132(f)(5)(B) of the Code.
(ii). Valuation. The regulations under section 61 of the Code provide that the fair market value of a fringe benefit is based on all the facts and circumstances. As an alternative, transportation in an employer-provided commuter highway vehicle may be valued under the following special valuation rules, which existed prior to the Act: (1) automobile lease valuation rule, see section 1.61-21(d) of the regulations, (2) vehicle cents-per-mile rule, see section 1.61-21(e), and (3) commuting valuation rule, see section 1.61-21(f).

For general rules applicable to each of the special valuation rules, see section 1.61-21(c) of the regulations.

The Act does not affect the availability of these rules for valuing an employee’s personal use of an employer-provided vehicle that does not qualify as a commuter highway vehicle.

Example. Employer V purchases a van for purposes of transporting its employees from home to work. The van qualifies as a “commuter highway vehicle” within the meaning of Q-1b and section 132 (f) (5) (B) of the Code. V elects to value employee travel in its vans using the commuting valuation rule. In one month, Employee C commutes to and from work in V’s van 20 days. Under the commuting valuation rule, the value of each one-way commute is $1.50 (for a total of $3 per day); therefore, the value of C’s travel for the month is $60. The full value of the benefit is excludable from C’s gross income because it does not exceed the statutory limit. See Q-2d and Q-2e for the rules governing the treatment of amounts in excess of the statutory limit and payments by employees for in-kind qualified transportation fringes.

b. Van pool operated by employees. Cash reimbursements by an employer to employees for transportation in a van pool operated by employees independent of their employer are excludable as qualified transportation fringes, provided the van qualifies as a “commuter highway vehicle” as defined in sections 132 (f) (5) (B) of the Code. The amount that may be excluded from an employee’s income is limited to $60 per month. See Q-3b for the rules governing cash reimbursements.

c. Private or public transit-operated van pools. The qualified transportation fringe exclusion is available for transit passes for travel in van pool owned and operated either by public transit authorities or by any person in the business of transporting persons for compensation or hire. The van must seat at least six adults (excluding the driver). See Q-3c for the special rule for cash reimbursements for transit passes.
Q-10: How is the value of parking determined?

a. In general. The valuation rules of section 1.61-21(b) of the regulations apply both for purposes of determining whether the amount of qualified transportation fringes exceeds the amount (if any) includible in income. Generally, the value of parking provided by an employer to an employee is based on the cost (including taxes or other added fees) that an individual would incur in an arm’s-length transaction to obtain parking at the same site. If that cost is not ascertainable, then the value of parking is based on the cost that an individual would incur in an arm’s-length transaction for a space in the same lot or a comparable lot in the same general location under the same or similar circumstances. An employee’s subjective perception of the value of the parking is not relevant to the determination of its fair market value.

Example. Employer Z operates an industrial plant in a rural area in which no commercial parking is available. Z furnishes ample parking for its employees on the business premises, free of charge. The parking provided by Z has a fair market value of $0 because an individual other than an employee ordinarily would not pay to park there.

b. Rate. Under the general valuation rules of section 1.61-21(b) of the regulations, the monthly rate may be used to determine a monthly value rather than the daily rate multiplied by the number of days in the month. If an annual rate is available, the monthly rate may be determined by dividing the annual rate by twelve. If a space is available for less than a month, the space may be valued according to the daily rate multiplied by the number of days the employee has access to the space. In no case is it necessary, however, for the monthly value to exceed the monthly rate. The rates described above may only be used if they are available to the general public.

c. Parking available primarily to customers. Employer-provided parking that is available primarily to customers of the employer, free of charge, will be deemed to have a fair market value of $0. This rule does not apply, however, if an employer maintains “preferential” reserved spaces for employees. A reserved space if “preferential” if it is more favorably located than the spaces available to the employer’s customers.

Example 1. Employer X’s place of business is situated in a shopping mall. Ample free parking is available to X’s customers and employees alike in the mall parking lot. None of the spaces is reserved for employees. The parking provided to X’s employees is deemed to have a fair market value of $0.
Example 2. Employer Y’s place of business is situated in a shopping mall. Ample free parking is available primarily to customers in the mall parking lot. Spaces reserved for employees are not close to the mall than the spaces available to customers. The spaces reserved for employees have a fair market value of $0 because the spaces are not “preferential” reserved spaces.

Example 3. Employer Z provides ample free parking to its employees and customers. Z maintains a separate lot near the entrance to its business premises for management level employees. Customers are not permitted to park in the employees’ lot, but may park in the customer lot across an access road from Z’s business premises. The parking provided to Z’s employees in the separate lot is preferential reserved parking.

d. Parking valued according to access rather than use. The value of the parking subject to tax under section 61 of the Code is the right of access on any given day to employer-provided parking, and not the actual use of the parking by the employee.

Example 1. Employer V maintains a parking lot for its employees. V requires its employees to apply for parking spaces prior to the month in which the space is to be used. V distributes a monthly parking pass to each employee who applies to park and does not allow anyone without a pass to park in its lot. No value in includible in the gross incomes or employees who do not apply for parking passes because they do not have access to employer-provided parking. The value of parking provided to employees who apply for and receive passes is the full monthly value.

Example 2. Employee D has unlimited access to qualified parking provided by Employer M. During one particular month, D used the parking space 5 days, because D was away on business travel for 1 week and on a personal vacation for 2 weeks. Because D had access to the parking space for the entire month, the amount includible in D’s gross income is the amount by which full monthly fair market value exceeds the statutory limit ($155). See Q-2d. See also Q-2e for the result if M charges D for the parking.

Q-11: How does section 132 (f) interact with other fringe benefit rules?

Under section 132(f) (7) of the Code, a de minimis fringe does not include any qualified transportation fringe. If, however, an employer provides local transportation, other than transit passes or transportation in a commuter highway vehicle, the value of the benefit may be excludable, either totally or partially, under fringe benefit rules other than the qualified transportation fringe rules under section 132(f).
a. Occasional local transportation fare. Section 1.132-6(d)(2)(i) of the regulations provides that local transportation fare (such as taxi fare) provided to an employee is excludable from income as a de minimis fringe if the benefit is reasonable and is provided on an occasional basis because overtime work necessitates an extension of the employee's normal work schedule.

b. Transportation provided under unusual circumstances. Section 1.132-6(d)(2)(iii) of the regulations provides that if an employer provides transportation (such as taxi fare) to an employee for use in commuting to, from, or both to and from work because of unusual circumstance and because, based on the facts and circumstances, it is unsafe for the employee to use other available means of transportation, the excess of the value of each one-way trip over $1.50 per one-way commute is excluded from gross income.

c. Valuation of local transportation provided to "qualified" employees. Section 1.61-21(k) of the regulations provides a special valuation rule for location transportation provided, solely because of unsafe conditions, to "qualified" employees who would ordinarily walk or use public transportation to and from work. If unsafe conditions exist and the employee is valued at $1.50 per one-way commute. Because section 2.61-21(d) is a special valuation rule under section 61, it is not affected by section 132(f)(7). Therefore, employers may continue to provide local transportation to employees meeting the requirements of section 1.61-21(k).

Q-12: When and how do employers withhold and report the value of qualified transportation fringes includible in gross income?

a. Noncash benefits. Taxable fringe benefits are ordinarily treated as wages for federal income tax withholding, Federal Insurance Contributions Act, and Federal Unemployment Tax Act purposes and are reported on an employee's Form W-2, Wage and Tax Statement. Employers may use the guidelines in Announcement 85-113, 1985-31 I.R.B. 31, for reporting and withholding on taxable noncash fringe benefits. Announcement 85-113 provides that employers may elect, for purposes of the FICA, the FUTA, and federal income tax withholding purposes, to treat noncash fringe benefits as paid on a pay period, quarterly, semi-annual, annual, or other basis, provided that the benefits are treated as paid no less frequently than annually.

b. Cash reimbursements. Because employers may not use Announcement 85-113 for cash reimbursements to employees (for example, cash reimbursements for transit passes or qualified parking), cash reimbursements in excess of the statutory limits
under section 132(f) of the Code are treated as paid for employment tax purposes when actually paid. Employers must report and deposit the amounts withheld in addition to reporting and depositing the amounts withheld in addition to reporting and depositing the employer portion of the FICA taxes and the FUTA tax. See Q-3b for the rules governing cash reimbursements.

Q-13: How do employers report income for qualified parking provided to car and van pools?

a. **Prime member.** If an employee obtains a qualified parking space as a result of membership in a car or van pool, the individual to whom the parking space is assigned, the "prime member" must bear the tax consequences attributable to that space. If the space is not assigned to a particular individual, then the employer that provides access to the space must designate one of its employees as the person who will bear the tax consequences. The employer of the prime member is responsible for reporting any taxable income to the employee.

An amount of money (reasonably calculated to cover actual costs, including taxes) received by a prime member from fellow car or van pool members for their share of transporting them to and from work constitutes reimbursement by them for the operation of the vehicle for their mutual convenience. This money is not includible in the gross income of the prime member for federal income tax purposes. Rev. Rul. 55-555, 1955-2 C.B. 20. See also Rev. Rul. 80-99, 1980-1 C.B. 10.

b. **No aggregation of exclusions.** Member of a car or van pool are not permitted to combine their $155 parking exclusions for the pool. For example, employees L, M, and B belong to a car pool and use, at no charge, qualified parking worth $165 a month. M is designated as the "prime member" of the car pool and must bear the tax consequences. M may not use the exclusions attributable to B and L. Accordingly, M must include $10 per month in gross income, the amount by which the fair market value of the parking exceeds the excludable amount.

Q-14: What is the effective date of section 132 (f)?

a. **Effective date.** Section 132(f) of the Code applies to benefits provided after December 31, 1992. The rules in this notice can be applied to comply with section 132(f) of the Code for benefits provided after December 31, 1992, and before April 1, 1994, and must be applied to comply with section 132(f) for benefits provided after March 31, 1994.
b. Transition rule. For qualified transportation fringes provided after December 31, 1992, and before April 1, 1994, employers may use any reasonable good faith method of compliance with section 132(f) of the Code in lieu of the rules contained in this notice. Efforts to comply with section 132(f) of the Code and to determine the fair market value of benefits that differ from the rules contained in this notice will be considered reasonable good faith compliance so long as they are based on a reasonable good faith interpretation of section 132(f).

PARKING CASH-OUT: The President's Parking Subsidy Reform Program

The Problem
- The average home-to-work trip results in about 0.8 tons of carbon per year
- Home to work trips are a primary contributor of urban smog and poor air quality in US cities
- The rush hour means traffic congestion and the need to spend scarce resources on new road construction

Free Parking at Work is an Ubiquitous Fringe Benefit
- 95% of all Americans who drive to work receive free parking from their employers
- Even in the central business districts of the largest US cities, over half of all commuters who drive to work receive free parking from their employers
- Almost no one is offered the choice of a cash allowance or other benefit instead of parking

Who pays for "free" parking?
- US businesses spend $40-$70 billion per year on 'free' parking spaces.
- All of this parking is tax-exempt, a loss to the Treasury of $12-$25 billion per year
- Since free parking is an invitation to drive, it raises the cost of maintaining the highways.
- Driving means pollution, which increases industry's burden in meeting clean air goals.
What is the Tax Exemption for Parking at Work?

- Section 132 of the Internal Revenue Code qualifies employer-provided parking as a 'transportation fringe benefit'.
- Makes offering free parking tax-smart:
  - Tax-Deductible business expense for employers
  - Tax-free income for employees (up to $155 per month)
  - Also untouched by state income, social security, unemployment, and other taxes
- Makes offering other choices tax-stupid:
  - Parking tax break is lost if other options are offered (even if employees choose parking)
  - Transit passes have a tax break, but less than half the size of that for parking.

The President's Cash-Out Proposal

- Keeps the tax advantages of free parking, but makes it tax-smart for employers to offer cash and transit pass options as well.
- Increases commuter choices, but does not add business costs or tax burdens
- Amend Internal Revenu Code Section 132(f) paragraph(5)(C), which defines qualified parking:
  - Qualified Parking - The term 'qualified parking' means parking provided to an employee on or near the business premises of the employer...
- By adding the following cash-out provision:
  - ...if the employer offers the employee the option to receive, in lieu of the parking, the fair market value of the parking, as taxable cash or a qualified transit subsidy.

Cash Out Makes the Tax Code Work for the Environment

- Parking provided by employers to employees is, as before, tax-deductible and tax exempt
- But only if parking is offered with the choice of a commuter allowance equal to the cost of the parking.
  - The commuter allowance may be taken by employees in the form of cash, which would be taxable income to the employee
  - Up to $60 per month of the commuter allowance may be taken in the form of a transit pass, which would be tax-exempt

The Proposal:
Cash Out Employer-Provided Parking Subsidies

- Make the tax code work for the environment: Encourage employers to offer workers who get free parking the option of taking cash or a transit pass instead.
- Keep parking tax free and do not increase costs to busi-
Target urban areas where parking costs more, and employers with greater flexibility to reduce parking costs.

The Benefits: More Choices Mean Less Pollution

- More choices for commuters
- Without significant increased cost to employers
- Cleaner air and reduced greenhouse gas emissions
- Less traffic congestion
- Lower costs for Clean Air Act compliance
- A boost to transit, carpooling, and other commuting alternatives
- A positive step for downtown business

Under Current Law, it is Tax-Smart for Employers to Offer only Free Parking

<table>
<thead>
<tr>
<th>Employer Spends</th>
<th>Parking</th>
<th>Mass Transit Pass</th>
<th>Salary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employer's Taxes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Security</td>
<td>$0.00</td>
<td>$2.48</td>
<td>$6.20</td>
</tr>
<tr>
<td>Medicare</td>
<td>$0.00</td>
<td>$0.58</td>
<td>$1.45</td>
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<tr>
<td>Unemployment Ins.</td>
<td>$0.00</td>
<td>$1.20</td>
<td>$3.00</td>
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<tr>
<td>Unemployment Tax</td>
<td>$0.00</td>
<td>$0.32</td>
<td>$0.80</td>
</tr>
<tr>
<td>Training Tax</td>
<td>$0.00</td>
<td>$0.04</td>
<td>$0.10</td>
</tr>
<tr>
<td>Employee's Taxes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Security Tax</td>
<td>$0.00</td>
<td>$2.48</td>
<td>$6.20</td>
</tr>
<tr>
<td>Federal Income Tax</td>
<td>$0.00</td>
<td>$11.20</td>
<td>$28.00</td>
</tr>
<tr>
<td>State Income Tax</td>
<td>$0.00</td>
<td>$2.00</td>
<td>$5.00</td>
</tr>
<tr>
<td>Medicare</td>
<td>$0.00</td>
<td>$0.58</td>
<td>$1.45</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employee Takes Home</td>
<td>$100.00</td>
<td>$79.12</td>
<td>$47.80</td>
</tr>
</tbody>
</table>

For a typical married worker with total family income of $50,000

California's Cash Out Law

- Requires employers who offer subsidized parking to also offer the choice of a cash allowance in lieu of parking to employees
- Reason
  - Subsidized parking creates a strong incentive for solo commuting, leading to traffic congestion and air pollution
When offered the choice of a cash allowance, many employees choose to take it and find other ways to get to work.

Expected Impacts
- Improved air quality and reduced fuel use
- Reduced traffic congestion
- Increased transit ridership, carpooling and biking to work.
- Passed with bipartisan support

Where it is offered, the Cash Out Option Works
- California Chamber of Commerce, Sacramento
  - The cash option was offered to all 85 employees. 23% gave up their parking spaces for cash in the first year.
- Sierra Research, Sacramento
  - The cash option was offered to all 31 employees of this small firm. 9 employees (29%) chose cash over parking.
- City of West Hollywood, CA
  - Offered cash out to city employees and quickly reduced driving to work by 16%.
- Warner Center, West LA
  - When given the opportunity to save money by giving up a parking space, employees of a large firm reduced solo driving by nearly 1/3, although the building is not well served by transit. Carpool participation shot up from 6% to 31% of employees.

Commuter Cash is good for Downtown Business
- Because downtown parking is more valuable, downtown employers can offer more commuter cash to their employees.
- Vacated parking spaces make downtown more attractive to shoppers and other commerce
- Downtown congestion is reduced
- Reduced demand for parking means less need for new garages, more room for downtown development.

The Cash Out Provision would be applicable to employer-paid parking:
- Provided by firms of 25 or more employees
- Located primarily in urban areas
- Located in a controlled parking lot
- Not owned by the employer
- Not offered to military personnel
- But all employers may participate
TRIP REDUCTION ORDINANCES

City, county or regional enactments setting TDM goals and mandating TDM actions by local developers and/or employers.

Jurisdictional Development
- A locality develops the ordinance with the input from employers and developers

Task Force
- A government body appoints a task force comprised of local officials, employers, and developers

Private Sector
- Major employers and developers draft ordinance with input from local jurisdiction representatives

Motivations for TROs
- 12% - Maintain air quality, conserve fuel...
- 20% - Reduce Traffic Impacts
- 60% - Alleviate Congestion
- 08% - Generate Revenues

TROs by Year

<table>
<thead>
<tr>
<th>YEAR</th>
<th>#</th>
<th>YEAR</th>
<th>#</th>
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<tr>
<td>1980</td>
<td>0</td>
<td>1985</td>
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<td>1981</td>
<td>0</td>
<td>1986</td>
<td>2</td>
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<td>1982</td>
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<td>1983</td>
<td>3</td>
<td>1988</td>
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</tr>
<tr>
<td>1984</td>
<td>1</td>
<td>1989</td>
<td>6</td>
</tr>
</tbody>
</table>

TRO Effectiveness
- TROs are new. There is limited direct evidence on performance.
- Design of the ordinance and characteristics of environment must be considered.
- Effectiveness is determined by the ordinance scope, nature of its mandates and performance assessment.

Common TRO Requirements
- Employee travel surveys
- Annual reporting
- Information dissemination
- Designation of transportation coordinator
- Development of trip reduction plan
TRO Options
- Goals
- Scope and Threshold
- Phasing
- Geographic coverage
- Menu v. mandates
- Penalties

Costs of TROs
- $10.00 to $60.00 per employee per year
- As much as $600 per single occupant vehicle removed per year.

Pleasanton TRO Evaluation Results

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Period Vehicle</td>
<td>26%</td>
<td>36%</td>
<td>36%</td>
<td>43%</td>
<td>41%</td>
</tr>
<tr>
<td>Trip Reduction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employee Modal Split</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drive Alone</td>
<td>81%</td>
<td>84%</td>
<td>86%</td>
<td>84%</td>
<td>85%</td>
</tr>
<tr>
<td>Car/Vanpool</td>
<td>13%</td>
<td>10%</td>
<td>10%</td>
<td>12%</td>
<td>11%</td>
</tr>
<tr>
<td>Transit</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Other</td>
<td>4%</td>
<td>4%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
</tr>
</tbody>
</table>

TRO Evaluation Framework
- SET GOALS: Reduce peak period traffic congestion by X amount in locality A
- IDENTIFY OBJECTIVES: Form Y carpools and Z vanpools at employment center B
- IMPLEMENT PROGRAMS: Offer ridesharing incentives M, N and P at firm C
- MONITOR PERFORMANCE: Collect mode split data at all firms meeting criterion F on a regular basis (with frequency G).
- EVALUATE RESULTS: Compare actual data with desired performance.
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MARKETING TDM

Module Goals

- To examine the importance of customer service.
- To identify the components of a marketing plan.
- To provide guidance in developing a marketing plan for TDM.

Assumptions

- Marketing is an essential component of TDM.
- For many TDM programs, the challenges are similar to operating a small business.
- Marketing plans need to be developed for each TDM program. What works in one area may not work in another.

WHAT IS MARKETING?

"The process of planning and executing conception, pricing, promotion and distribution of ideas, goods and services to create exchanges that satisfy individual and organizational objectives."

- American Marketing Association

The Importance of Customer Service

Many public agencies evaluate the effectiveness of TDM based upon the type of strategies used, the location of the site, and the resources allocated to the program. What is too often overlooked is the role of customer service in program success. The primary purposes of TDM promotional campaigns are to increase awareness, foster interest, and facilitate inquiry. The near term goal is to get the commuter to come in the front door. After that, customer service must drive the organization. In Service America, Karl Albrecht and Ron Zemke advise that: "Three key facts about customer loyalty are that it is circumstantial, it is fragile, and it is fleeting."
A strong customer service orientation will help bring commuters into the TDM program and keep them there. The objectives of quality customer service are: to meet or exceed customer needs and wants; to retain existing customers; and to develop new customers. For TDM, quality customer service focuses on what commuters want and need, helps them select the options best for them, and reinforces their decision.

The implications of poor customer service can be substantial. The Technical Assistance Research Program Institute, a leading research organization in the service field, found:

- customers who have a good experience with a company on a small-ticket item tell an average of ______ other people.
- customers tell an average of ______ other people about a bad service experience.

And an A.C. Nielsen Co. study found that only 1 in 50 dissatisfied consumers take the time to complain to the organization. In other words, communication among potential customers about bad service will do more damage to the TDM program than good service will enhance it.

Even if the customer complains all is not lost. The U.S. Office of Consumer Affairs study, Consumer Complaint Handling in America, found that 70 percent of complainants will patronize the establishment again if the problem cost them $5 or less and if the complaint was resolved in a manner satisfactory to the customer. That figure rises to 95 percent, if customers feel their complaints are resolved quickly. Research also shows that customers are five times more likely to switch vendors because of perceived service problems than for price concerns or product quality issues.

The need to handle customer complaints quickly is not only important for customer retention. It is also critical to the cost effectiveness and efficiency of TDM programs. The cost of obtaining a new customer is five times the cost of keeping a customer. Therefore, money spent on customer service equals customers retained.

So, what's the value of a retained customer? Your local supermarket expects at least $4,400 to $22,000 from each consumer during the five
years that the customer lives in the same neighborhood. In banking, the average customer represents $80 a year or more in profit. A loyal transit rider or vanpool rider who pays an average of $1 per trip could be expected to pay about $500 per year in revenue.

The Marketing Plan: A Roadmap for Success

No single marketing plan is appropriate for every circumstance. Each organization faces different problems, and has a different set of parameters affecting its progress. But successful organizations tend to hold certain planning and management principles in common. These principles focus on the customer and total involvement of every team member in achieving organizational goals and objectives. It is a process whereby companies or organizations continually strive for better ways to serve their customers. The objective is not only to be better internally, but also to be better than the competition.

The primary principles are to focus on the customer, manage with facts, work as a team, show mutual respect, emphasize training and professional development, and follow the “Plan-Do-Check-Act” process. The underlying tenets of the process are to strive for total customer satisfaction, and to never assume that the job is done. Other principles include commitment to the process by top managers and policy makers, total involvement of every team member, and methods of evaluating quality and improving progress.

Simply stated marketing means developing better ways to satisfy commuter needs. All commuters are potential customers of TDM programs. But who is the competition? The primary competition for TDM programs is the alternative that attracts commuters away from TDM - the single occupant vehicle. Envisioning single occupant vehicles as the competition may seem unusual, but if TDM programs fail to convince commuters to use a TDM alternative, then they cannot be claimed as customers. And if they are not customers of TDM, then they have decided that SOV travel is their best solution. They have been lost to the competition.

Attracting commuters as TDM customers requires knowledge of their needs and products or services that target those needs. The process for getting there is can be described as “Plan-Do-Check-Act” (PDCA) cycle. In simple terms, a TDM agency would prepare a Plan for getting customers into alternate modes, Do or carry out the plan, Check to
assure that the plan is working, and Act by standardizing the successful program, then starting the cycle over again with new information. Even if the decision is made to standardize, the key is to never assume that the job is done. Instead, accept that change is inevitable and constantly examine new and better ways to meet customer needs. The following describes how to incorporate the “Plan-Do-Check-Act” cycle into TDM.

SAMPLE STRATEGIC PLAN

PROGRAM STRATEGY

- Program Goals
- Program Description
- Scope. The types of solutions to commute problems offered or to be offered are:
  - Ridematching
    - Batch matching
    - Personalized matching
    - "Ride Wanted" Posters
  - Vanpooling
    - Third-party provider
    - Owner-operator
    - Transit agency
  - Transit
    - Route information
    - Ticket/pass sales
  - Guaranteed Ride Home
    - Taxi
    - Rental Cars
    - Fleet cars
  - Alternate Work Programs
    - Flextime workshops
  - Employee Transportation Coordinator training
  - Parking Information
  - Telecommuting
o Segments

o Differentiation from Competition
  o Our program name does/does not help us to increase ridesharing awareness among our target markets.
  o Our promotional theme does/does not help us to increase awareness.

o Program Objectives:
  o Market Share - “Increase share of non-single occupant vehicle modes by a statistically significant amount from ____% of the TDM, Inc.’s customers by the end of the fiscal year.”
  o Customer growth rate - “Increase the total number of customers receiving assistance by a statistically significant amount more than the _____ customers who received assistance last year.”
  o Average Vehicle Ridership - “Increase the average vehicle ridership by a statistically significant amount from the current 1.20 by the end of 199X.”

As part of the program’s strategic process, the TDM agency will need to identify the markets and services to be offered. The strategic direction will shape the services and tactics to be developed in the marketing plan.

**STRATEGIC DIRECTION GRID**

<table>
<thead>
<tr>
<th></th>
<th>Current Services</th>
<th>New Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Markets</td>
<td>Market Penetration</td>
<td>Service Development</td>
</tr>
<tr>
<td>New Markets</td>
<td>Market Development</td>
<td>Diversification</td>
</tr>
</tbody>
</table>

**FOUR COMPONENTS OF MARKETING**

o

o

o

o
PRODUCT STRATEGY ALTERNATIVES

The following checklist summarizes the type of strategies that could be used for each of the above products and services.

- No Product/Service Change
- Product/Service repositioning
- Product/Service improvement
  - Changes in attributes
  - Changes in packaging
- Eliminate the product/service
- Develop a new product/service
  - Closely related product/service
  - Provide a product or service you previously purchased
  - Unrelated product or service that will expand the scope of the program

APPLY IT!

What ideas presented in this session do you plan to put into action?

1. ____________________________________________
2. ____________________________________________
3. ____________________________________________
4. ____________________________________________

PRICING STRATEGY ALTERNATIVES

The following table was adapted from an article in INC Magazine, “Naming Your Price”, and contains a variety of pricing strategies that could be used for each of the program’s products and services.

APPLY IT!

What ideas presented in this session do you plan to put into action?

1. ____________________________________________
2. ____________________________________________
3. ____________________________________________
4. ____________________________________________
<table>
<thead>
<tr>
<th>PRICING APPROACH</th>
<th>HOW IT WORKS</th>
<th>EXAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>layering or unbundling</td>
<td>Sell products or services together as packages or break them apart and price accordingly.</td>
<td>Allow employers to buy a subscription guaranteed ride home as part of the transit pass subsidy program.</td>
</tr>
<tr>
<td>time-period pricing</td>
<td>Adjust price, up or down, during specific times to spur or acknowledge changes in demand.</td>
<td>Early bird specials at parking lots.</td>
</tr>
<tr>
<td>mail pricing</td>
<td>Make it easy and lower the risk for a customer to try the product or service.</td>
<td>Van subsidies for new starts.</td>
</tr>
<tr>
<td>counting-system pricing</td>
<td>Structure price to make it more suitable within a customers' buying constraints.</td>
<td>Payroll deduction for transit passes.</td>
</tr>
<tr>
<td>value-added price packages</td>
<td>Include free &quot;value-added&quot; services to appeal to bargain shoppers, without lowering prices.</td>
<td>Arrange for discounts at local service stations for vanpool maintenance.</td>
</tr>
<tr>
<td>by-one-price</td>
<td>Unlimited use or unlimited amount of a service or product, for one set fee.</td>
<td>Vanpool driver given unlimited free personal use of vanpool.</td>
</tr>
<tr>
<td>instant promotional pricing</td>
<td>Although a &quot;regular&quot; price exists, no one ever pays it.</td>
<td>Buy one pass - get another for half-price.</td>
</tr>
<tr>
<td>price = performance</td>
<td>Amount customers pay is determined by the performance or value they receive.</td>
<td>Offering a map of downtown parking for $10 and allowing commuters to ask for any amount refunded after use.</td>
</tr>
<tr>
<td>Marble the standard</td>
<td>Rather than adjust the price, adjust the standard to make your price seem different (and better).</td>
<td>Vanpool seats selling for $80 per month for &quot;four weekly payments of $20&quot;.</td>
</tr>
<tr>
<td>shift costs to your customer</td>
<td>Pass an ancillary costs directly to your customer and do not include those in your price.</td>
<td>Provide a &quot;free ride home&quot; but require the commuter to tip the driver.</td>
</tr>
<tr>
<td>variable pricing tied to a creative variable</td>
<td>Set up a &quot;price per&quot; pricing schedule tied to a related variable.</td>
<td>Discount the unit cost employers pay to register all employees for a guaranteed ride home program.</td>
</tr>
<tr>
<td>Different names for different segments.</td>
<td>Sell essentially the same services, under different names, to appeal to different price segments.</td>
<td>Establish TMO membership categories (e.g., Gold, Silver, and Bronze) with different dues requirements.</td>
</tr>
<tr>
<td>Product-line pricing</td>
<td>Establish a range of price points within the product line. Structure the prices to encourage customers to buy your highest profit product or service.</td>
<td>Offer additional services to TMO members depending on membership class (e.g., 4 tickets to the fundraising golf tournament).</td>
</tr>
<tr>
<td>Differential pricing</td>
<td>Charge each customer or each customer segment what each will pay.</td>
<td>Charge each employer for participation in the guaranteed ride home program based on the distribution of employees and availability of transit service.</td>
</tr>
<tr>
<td>Quality discount</td>
<td>Set up a standard pricing practice, which can be done several ways.</td>
<td>Discounts for transit passes bought by employees above a certain level.</td>
</tr>
<tr>
<td>fixed, then variable</td>
<td>Institute a &quot;just-to-get-started&quot; charge, followed by a variable charge.</td>
<td>Taxi fares or congestion pricing schemes based on usage.</td>
</tr>
<tr>
<td>Don't break that price point</td>
<td>Price just below important thresholds for the buyer, to give a perception of lower price.</td>
<td>Charging $59 per month for a parking space.</td>
</tr>
</tbody>
</table>
DISTRIBUTION STRATEGY ALTERNATIVE

The following options help determine how the products and services will be distributed to the market.

- Commute Information
  - Media Outreach
  - Employer Outreach
  - Area-wide agency solicits commuter inquiry
  - Self-standing kiosks
  - Other locations (e.g., malls, libraries)

- Commuter Networking
  - Worksite contacts (e.g., Chamber of Commerce)
  - Home-end contacts (e.g., homeowner associations, civic associations)
  - Board member contacts

- Commute Vehicles
  - TDM program directs delivery to:
    - Driver/operator
    - Employer owner/lessee
  - Third-party lessor delivery to
    - Driver/operator
    - Employer owner/lessee
  - Employer owner/lessee delivery to driver
  - Driver pickup at lessor place of business or vehicle dealership

APPLY IT!

What ideas presented in this session do you plan to put into action?

1. 
2. 
3. 
4. 

8-8
PROMOTIONAL STRATEGY ALTERNATIVES

The following lists the promotional and advertising strategies that can be used for each of the products and services as well as the organization itself.

- **Types**
  - Generic advertising
  - Mode advertising (e.g., vanpooling or transit)
  - Channel (distribution) support (“Trade” promotion to distributors, e.g., employers)

- **Objectives**
  - Increase awareness
    - Organization
    - Competition
    - Products/Services
  - Increase rate of inquiry
  - Increase product trial
  - Reinforce regular use

- **Copy Strategy**
  - Segment for different user groups
  - Differentiate from competition
  - Correct misperceptions

- **Media Strategy**
  - Broad reach
  - Largest market segments
  - Prime prospects

- **Timing Strategy**
  - Steady
  - Pulse (seasonal or periodic)
  - Start-up Pulse

- **Budget Strategy**
  - Percentage of total budget
  - Based on costs of specific tasks
Public Relations
- Create image for:
  - Program or agency
  - Ridesharing generically
  - Selected mode (e.g., carpooling)
  - Communicate sponsor or agency philosophy
  - Correct negative or faulty image

Personal Selling
- Organization:
  - Geographic
  - Market Oriented

Outreach method:
- Program's own personnel
- Employee Transportation Coordinators
- Outsourcing

Personnel Selection
- Experienced
- Educational Background
- Training needs
- Compensation package

APPLY IT!

What ideas presented in this session do you plan to put into action?

1. ____________________________________________
2. ____________________________________________
3. ____________________________________________
4. ____________________________________________
SAMPLE MARKETING PLAN FORMAT

I. EXECUTIVE SUMMARY

II. INTRODUCTION
   A. Purpose: The purpose of this marketing plan is to provide a guide for all marketing activities during 199X. Specifically, this document will:
      1. Review the TDM program's marketing situation.
      2. Define the TDM program's challenges and opportunities.
      3. Outline a marketing program, including goals, objectives, and strategies.

III. SITUATION REVIEW
   A. Market for TDM services
      1. Trends
         a. Population
         b. Workforce
         c. Customer base
   B. The Product Line
      1. Ridematching
         a. Batch matching
         b. Personalized matching
         c. "Ride Wanted" Posters
      2. Vanpooling
         a. Third-party provider
         b. Owner-operator
         c. Transit agency
      3. Transit
         a. Route information
         b. Ticket/pass sales
      4. Guaranteed Ride Home
         a. Taxi
         b. Rental Cars
         c. Fleet cars
      5. Alternate Work Programs
         a. Flextime workshops
         b. How-to guide for employers
      6. Employee Transportation Coordinator training
MAKING TDM WORK IN YOUR COMMUNITY

7. Parking Information
   a. Location Map and Price sheet
   b. Preferential parking - how-to for employers

8. Telecommuting
   a. Workshop
   b. Advisory Committee
   c. Assistance to employers

C. The Competition
   1. TDM program's competition is wide ranging.
   2. Single occupant vehicles hold a share of __%. 
   3. Parking discounts and subsidies
   4. Non-profits & business organizations for dues
   5. Competitive advertising is found in all major media (television, newspapers, radio, magazines, and outdoor).

D. The Prime Prospect
   1. Demographics
   2. Psychographics/Benefits. In selecting a mode, commuters consistently discriminate on the basis of the following characteristics
      a. Convenience
      b. Reliability
      c. Cost
      d. Time
      e. Awareness of options

E. The Buying Process
   1. A proportion of commuters change mode when:
      a. Residential location
      b. Work location
      c. Work schedule
      d. Out-of-pocket prices rise
   2. The most motivating attributes in selecting a non-SOV mode are related to:
      a. (List attributes in rank order of importance among current customers).

F. Results of Prior Programs
   1. Advertising Campaign
   2. Employer Outreach
   3. Guaranteed Ride Home program
IV. CHALLENGES AND OPPORTUNITIES

A. Results of the current campaign are _______. The TDM program has ______ awareness in the absolute and relative to other alternatives.

Strategic Implication: The TDM program’s greatest strength is _______.

V. MARKETING PROGRAM

A. Goals/Objectives/Rationale

1. Awareness
   a. Goal: To increase top-of-mind (unaided) awareness of the TDM program.
   b. Objective: To increase unaided awareness of the TDM program in its marketing area by a statistically significant amount versus the level measure in ______.
   c. Rationale: Before commuters will use the services, they need to know what services are offered, how to access those services, and what are the costs and benefits associated with the services.

2. Image
   a. Goal: To create an image of the TDM program among potential customers that is ______.
   b. Objective: To increase ratings of the TDM program in its marketing area by a statistically significant amount versus the level measure in ______.
   c. Rationale:
      (1) The differences between SOV and
alternative modes are significant to commuters,

(2) The TDM program needs to establish a strong umbrella image to support the various alternatives (carpool, vanpool, bus, etc.) as well as the various vendors (transit system, van leasing company, etc.)

3. Cost Efficiency

a. Goal: To improve the cost efficiency of the TDM program by:
   (1) increasing the number of customers using the services
   (2) increasing the rate of customers altering their mode
   (3) increasing the part-time use of modes

b. Objective: To be determined

c. Rationale: A key objective of a publicly funded program is to increase the effectiveness of the services it delivers. To help accomplish this, the goal of the TDM program marketing should be to increase the number of customers, formation rate, and part-time use of modes.

B. Advertising Strategy

1. Objective: The prospect should initiate or renew an account relationship with the TDM program.
   a. Target Audience:
      (1) Demographics
         o Adults
         o Employed
      (2) Psychographics
         o Seeking an alternative to driving alone
         o Finds commute to be stressful
2. Creative Strategy

a. Image: The prospect should feel that the TDM program is a leader in commuting options within the community.

b. Key Thought: The prospect should know that the TDM program is a provider of commuter information and assistance.

c. Mandatories
   (1) Advertising should build an emotional bond with the TDM program.
   (2) Visual media should include logo.

3. Media Strategies

a. Use _____ as the most efficient medium for generating high reach of the target audience, which is ________.

4. Public Relations Strategy

a. Use public relations at major employment centers as a basis to reinforce the TDM program’s image and increase inquiries.

b. The public relations program will consist of the following:
   (1) Employer outreach
   (2) Transportation Days/National Transportation Week
   (3) Crisis response package

5. Additional Key Strategies

a. Establish an aggressive and enthusiastic staff through training.

b. Use targeted marketing programs to cross-sell existing and former customers:

c. Direct mail

d. Point-of-promotion materials

e. Use targeted marketing programs to build business for vanpooling and non-motorized travel.
Key Terms in Advertising

**Gross Impressions:** The sum of the estimated number of persons who listened to a station for a minimum of five minutes within a quarter hour for all spots in a given schedule.

For example, if one person hears a spot three times and two other persons hear the spot once each then there has been a total of five gross impressions made.

**Reach:** The estimated number of different persons who are listening at least once to a given schedule. (unduplicated audience).

**Frequency:** The number of times a person is exposed to an advertisement.

**Cost per thousand impressions:** The average cost delivering 1,000 gross impressions.
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TDM in the Age of Diversity

MODULE GOALS

- To examine the impact of TDM policies on subsegments of the population.
- To provide guidance for establishing a TDM program responsive to the needs of specific markets.

ASSUMPTIONS

- Participants have a basic understanding that the workforce is becoming increasingly diverse demographically.
- Market segmentation can improve the marketing and delivery of TDM services and products.
- Failure to recognize the implications of TDM on various segments of the population can damage the TDM program’s credibility.

What is the effect of TDM measures on:

- Women?
- Organized Labor?
- Minorities?
- How can TDM programs be designed to better accommodate these groups?

Understanding diversity means recognizing the differences, and in some cases the similarities, of the different groups of people who comprise a program’s target market. Although the demographic gaps between these groups are narrowing, it is important to recognize differences along gender, cultural and racial lines to more efficiently deliver a message, meet peoples' needs, and benefit society as a whole. A program manager must be cautious to avoid stereotyping and generalizing. By assuming that a person
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RECOMMENDATIONS

TDM programs should:

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- Compensate workers for the childcare and eldercare costs of using slower alternative modes
- Provide meaningful security for women using alternative modes at night
- Offer mid-day transportation to grocery stores, dry-cleaning, banks, post office, etc.
- Offer comprehensive, well-advertised guaranteed ride home programs

Just as working mothers, single-parents, and primary care-givers have special needs in today's workplace which demand considerations and changes in the way managers approach TDM, another distinct group is the body of union workers. Union workers have specific regulations which delineate work regulations arrived at under negotiation, and agreed to by union representatives and management. These men and women generally hold the blue-collar jobs with strict work-hour guidelines that would cause them to be considered prime candidates for many ridesharing arrangements. Before the program manager may approach these commuters, however, it is imperative that he/she becomes familiar with the collective bargaining contract under which these people work. Once the contract has been reviewed, if no conflicts are present, the manager may proceed with a TDM program. If there is any doubt about the legality or propriety of typical TDM initiatives, the wisest course of action for the TDM manager is to approach management and union representatives simultaneously to reach consensus and make a determination about the possibilities of a TDM program. If this requires changes to the collective bargaining agreement, the union representative is the best resource for learning the method to change this contract, as well as the vehicle for the change(s).
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An Unfair Labor Practice (UFLP) occurs when:

- an employer dictates terms of employment covered by a collective bargaining agreement without negotiating with the designated union representative.

Examples of TDM measures which can change work rules:

- Cash incentives for employees who opt for alternative modes
- Alternative work hours
- Management-by-results review of employee performance necessary for telecommuting

How to Avoid an UFLP:

- Include a person selected by the union in the design of the TDM program
- Renegotiate the contract to include TDM measures, if necessary

List two advantages of implementing TDM in a unionized workplace:

1. 

2. 

As white collar workers left the city, and moved to the suburbs, blue-collar and unskilled, manual-labor jobs were created in and near the new suburban neighborhoods. The people who moved to these more-expensive neighborhoods continue to work in the central business district to afford their lifestyles. The people who live in the inner-city by choice or for financial reasons make up the unemployed and under-employed population who have no access to the new markets in the suburbs, and may burden the financial infrastructure of their city. If provisions were made to transport the
men and women who cannot afford private transportation, and are not offered public transit, two obstacles will be overcome by this "reverse commute." The people will have jobs, and the open jobs will be filled.

REVERSE COMMUTING

- Population growth in the suburbs
- Job creation in the suburbs
- Whites fled to the suburbs; minorities stayed in the cities
- Lack of alternative mode infrastructure in the suburbs

Catch-22 for urban residents:
- Need a car to get to the job
- Need a job to afford the car

Reverse Commute programs:
provide transportation for urban residents to reach suburban job sites.

Programs can be sponsored by:
- public housing tenants' association (Chicago)
- urban neighborhood community center
- urban non-profit association (Chicago, Detroit)
- municipal transit agency (Detroit)
- regional transit agency (Philadelphia)
- state department of transportation (Milwaukee)
- suburban employers
- suburban business park developers
Program Example:

Hartford, CT
City of Hartford Employment Transportation Service
Reverse Commute Vanpool Program.

- Cooperative effort between public agency and 1-3 employers

- Specific Program guidelines:
  - Income level considerations
  - For under employed and unemployed urban residents
  - Only for commute routes not served by transit
  - Must have minimum of four riders to start program

- To initiate vanpool, company pays half of cost after subsidy, if any

- Employee pays other half of costs
  - Employee's share is comparable to transit costs
    - Door-to-Door $1.50-1.75 each way
    - Central Pickup $0.75-1.25 each way
  - Free van ride to interviews, testing, training... for new job
  - Employee does not contribute fare for two weeks, until first paycheck.
  - After approximately 6 months, company stops subsidy, and employee assumes costs (payroll deduction is an option)

Additional information:

Reverse commute programs can enable people to hold a job who would otherwise be unemployed.

TDM strategies based on financial penalties (i.e. parking fees) will have a disproportionate effect on low-wage earners.

Reverse commute programs are only a short-term solution.

Providing reverse commute transportation services is, at best, a short-term solution. The long-term problem is the job-housing imbalance which creates the need for reverse commuting. Transportation planners must address this problem with long-term solutions which encourage job creation in the urban area and affordable housing in the suburbs.
From the following tables, a trend has been established which demonstrates how the commute patterns of minority communities are becoming more similar to those of the "white" community. Although one study is gained from survey information in one city, the other is from a national survey, and they both indicate similar findings over about a decade. It is important to note that although the trend is toward sameness, the two groups have some differences which the effective manager will understand and use to serve the communities better independently, and, in turn, the combined, larger community, society, better.

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<td></td>
<td>Time</td>
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<td>16.4 min</td>
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<td>Percent</td>
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<td>Time</td>
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References


Bibliography

- Hughes, Mark Alan and Julie Sternberg, The New Metropolitan Reality: Where the Rubber Meets the Road in Anti-Poverty Policy, Public Finance and Housing Center, the Urban Institute, Washington, D.C., December 1992.
- Parker, Mike and Jane Slaughter, Choosing Sides: Unions and the Team Concept, Labor Notes, Detroit, MI, 1988.
- Rosenbloom Sandra and Elizabeth Burns, Do Environmental Measures and Travel Reduction Programs Hurt Working Women?, Drachman Institute for Land and Regional Developmental Studies, University of Arizona, Tuscon, AZ, June 1993.

### RACIAL DIVERSITY AND TDM COMMUTER TRENDS

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<th>Variable</th>
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<td>1990</td>
<td>% Change</td>
<td>1983</td>
<td>1990</td>
<td>% Change</td>
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<td>3.1</td>
<td>3.3</td>
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### CULTURAL DIFFERENCES AMONG LOS ANGELES COMMUTERS

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<th>White</th>
<th>African-American</th>
<th>Asian</th>
<th>Hispanic</th>
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</thead>
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<td>% at worksites with &gt;100 employees</td>
<td>65</td>
<td>50</td>
<td>62</td>
<td>70</td>
</tr>
<tr>
<td>% with Household income&gt;$65,000</td>
<td>36</td>
<td>20</td>
<td>31</td>
<td>9</td>
</tr>
<tr>
<td>Average number of months at worksite</td>
<td>65</td>
<td>54</td>
<td>47</td>
<td>53</td>
</tr>
<tr>
<td>% always have a car available to commute</td>
<td>94</td>
<td>85</td>
<td>90</td>
<td>79</td>
</tr>
<tr>
<td>% Drive alone 3+ days per week</td>
<td>84</td>
<td>73</td>
<td>86</td>
<td>65</td>
</tr>
<tr>
<td>Average number of people per carpool</td>
<td>2.50</td>
<td>2.98</td>
<td>2.56</td>
<td>2.89</td>
</tr>
<tr>
<td>Average number of months in a carpool</td>
<td>29</td>
<td>27</td>
<td>32</td>
<td>24</td>
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<tr>
<td>Most common carpool partner</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Household member</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Co-worker</td>
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<td></td>
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<tr>
<td>Household partner</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Household member</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% would try car-pooling 1-2 days/wk.</td>
<td>16</td>
<td>22</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>% of 20+ mile commuters would try vanpooling</td>
<td>18</td>
<td>11</td>
<td>20</td>
<td>14</td>
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<tr>
<td>% would try riding the bus</td>
<td>6</td>
<td>9</td>
<td>-7</td>
<td>9</td>
</tr>
</tbody>
</table>


What programs or approaches would be best suited for Asians?

African Americans?

Hispanics?

Whites?
TDM in the Age of Diversity

MODULE GOALS

- To examine the impact of TDM policies on subsegments of the population.
- To provide guidance for establishing a TDM program responsive to the needs of specific markets.

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Preston, CEO of Samson Products

will act in a particular manner because of gender or heritage is ludicrous. Conversely, without some sensitivity to the obstacles and needs of single parents in the workplace, an employer risks losing a valuable employee to a competitor who offers more attractive, and necessary benefits.

GENDER DIFFERENCES IN TRAVEL BEHAVIOR

Statistical research shows:

- Working women depend more on the car than men who are in the same economic class and family situation.
- Working women rely on the car to combine work trips with family obligations: childcare, grocery shopping, etc.
- Low-income women travel farther to work than low-income men and high-income workers of either gender.
- Single mothers in the labor force depend more on the car than any other group.

<table>
<thead>
<tr>
<th>List Barriers to Women's Participation in TDM programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problems working women face in switching to alternative modes:</td>
</tr>
<tr>
<td>1)</td>
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<tr>
<td>2)</td>
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<td>3)</td>
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<tr>
<td>4)</td>
</tr>
<tr>
<td>5)</td>
</tr>
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- Free van ride to interviews, testing, training... for new job
- Employee does not contribute fare for two weeks, until first paycheck.
  - After approximately 6 months, company stops subsidy, and employee assumes costs (payroll deduction is an option)

**Additional information:**

Reverse commute programs can enable people to hold a job who would otherwise be unemployed.

TDM strategies based on financial penalties (i.e. parking fees) will have a disproportionate effect on low-wage earners.

Reverse commute programs are only a short-term solution.

Providing reverse commute transportation services is, at best, a short-term solution. The long-term problem is the job-housing imbalance which creates the need for reverse commuting. Transportation planners must address this problem with long-term solutions which encourage job creation in the urban area and affordable housing in the suburbs.
From the following tables, a trend has been established which demonstrates how the commute patterns of minority communities are becoming more similar to those of the "white" community. Although one study is gained from survey information in one city, the other is from a national survey, and they both indicate similar findings over about a decade. It is important to note that although the trend is toward sameness, the two groups have some differences which the effective manager will understand and use to serve the communities better independently, and, in turn, the combined, larger community, society, better.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Commuters</td>
<td>Number</td>
<td>2924</td>
<td>186</td>
<td>7168</td>
</tr>
<tr>
<td>City&gt;City</td>
<td>Number</td>
<td>477</td>
<td>133</td>
<td>890</td>
</tr>
<tr>
<td>Percent</td>
<td>16.3</td>
<td>71.5</td>
<td>12.4</td>
<td>68.8</td>
</tr>
<tr>
<td>Time</td>
<td>15.4 min</td>
<td>16.4 min</td>
<td>15.0 min</td>
<td>15.9 min</td>
</tr>
<tr>
<td>City&gt;Noncity</td>
<td>Number</td>
<td>173</td>
<td>34</td>
<td>534</td>
</tr>
<tr>
<td>Percent</td>
<td>5.9</td>
<td>18.3</td>
<td>7.4</td>
<td>16.5</td>
</tr>
<tr>
<td>Time</td>
<td>20.3 min</td>
<td>26.1 min</td>
<td>19.2 min</td>
<td>23.5 min</td>
</tr>
<tr>
<td>Noncity&gt;City</td>
<td>Number</td>
<td>716</td>
<td>12</td>
<td>1688</td>
</tr>
<tr>
<td>Percent</td>
<td>24.5</td>
<td>6.5</td>
<td>23.5</td>
<td>7.8</td>
</tr>
<tr>
<td>Time</td>
<td>23.5 min</td>
<td>21.7 min</td>
<td>24.7 min</td>
<td>25.4 min</td>
</tr>
<tr>
<td>Noncity&gt;Noncity</td>
<td>Number</td>
<td>1558</td>
<td>7</td>
<td>4056</td>
</tr>
<tr>
<td>Percent</td>
<td>53.3</td>
<td>3.8</td>
<td>56.6</td>
<td>6.9</td>
</tr>
<tr>
<td>Time</td>
<td>14.4 min</td>
<td>21.0 min</td>
<td>14.9 min</td>
<td>18.1 min</td>
</tr>
</tbody>
</table>

References


Bibliography

- Hughes, Mark Alan and Julie Sternberg, The New Metropolitan Reality: Where the Rubber Meets the Road in Anti-Poverty Policy, Public Finance and Housing Center, the Urban Institute, Washington, D.C., December 1992.
- Parker, Mike and Jane Slaughter, Choosing Sides: Unions and the Team Concept, Labor Notes, Detroit, MI, 1988.
- Rosenbloom Sandra and Elizabeth Burns, Do Environmental Measures and Travel Reduction Programs Hurt Working Women?, Drachman Institute for Land and Regional Developmental Studies, University of Arizona, Tuscon, AZ, June 1993.

<table>
<thead>
<tr>
<th>RACIAL DIVERSITY AND TDM COMMUTER TRENDS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variable</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Person Trips</td>
</tr>
<tr>
<td>Person Miles of travel</td>
</tr>
<tr>
<td>Vehicle Trips</td>
</tr>
<tr>
<td>Vehicle Miles of Travel</td>
</tr>
</tbody>
</table>

## CULTURAL DIFFERENCES AMONG LOS ANGELES COMMUTERS

<table>
<thead>
<tr>
<th></th>
<th>White</th>
<th>African-American</th>
<th>Asian</th>
<th>Hispanic</th>
</tr>
</thead>
<tbody>
<tr>
<td>% at worksites with &gt;100 employees</td>
<td>65</td>
<td>50</td>
<td>62</td>
<td>70</td>
</tr>
<tr>
<td>% with Household income&gt;$65,000</td>
<td>36</td>
<td>20</td>
<td>31</td>
<td>9</td>
</tr>
<tr>
<td>Average number of months at worksite</td>
<td>65</td>
<td>54</td>
<td>47</td>
<td>53</td>
</tr>
<tr>
<td>% always have a car available to commute</td>
<td>94</td>
<td>85</td>
<td>90</td>
<td>79</td>
</tr>
<tr>
<td>% Drive alone 3+ days per week</td>
<td>84</td>
<td>73</td>
<td>86</td>
<td>65</td>
</tr>
<tr>
<td>Average number of people per carpool</td>
<td>2.50</td>
<td>2.98</td>
<td>2.56</td>
<td>2.89</td>
</tr>
<tr>
<td>Average number of months in a carpool</td>
<td>29</td>
<td>27</td>
<td>32</td>
<td>24</td>
</tr>
<tr>
<td>Most common carpool partner</td>
<td>Household member</td>
<td>Co-worker</td>
<td>Household member</td>
<td>Household member</td>
</tr>
<tr>
<td>% would try car-pooling 1-2 days/wk.</td>
<td>16</td>
<td>22</td>
<td>.25</td>
<td>20</td>
</tr>
<tr>
<td>% of 20+ mile commuters would try vanpooling</td>
<td>18</td>
<td>11</td>
<td>20</td>
<td>14</td>
</tr>
<tr>
<td>% would try riding the bus</td>
<td>6</td>
<td>9</td>
<td>7</td>
<td>9</td>
</tr>
</tbody>
</table>


### What programs or approaches would be best suited for Asians?

African Americans?

Hispanics?

Whites?