INNOVATIONS IN TRANSPORTATION PLANNING

Presented by:
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- Robert Cramer, Transportation Planner, LSL Planning
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- TRB Access management Committee
- Complete Streets Organization
- And all those who passed along ideas
Outline of Presentation

- Transportation Planner’s Role
- The Process
- Various Scales of Transportation
- Innovations
  - Network Planning and new street typologies
  - Improving traffic flow/safety, Access Management
  - Complete Streets
  - Non-motorized transportation
  - Transit/Transit-Oriented Development
  - Form-Based Codes

Transportation Planning

- Roadway Improvements
- Transportation System Management (TSM)
- Intelligent Transportation Systems (ITS)
- Transit
- Non-motorized
- Planning
- Zoning
- Subdivision regulations
- Street design standards
- Alternative Work Schedules
- Alternative Modes
- Employer Support Programs
A New Paradigm—Innovation

- Link Land Use with Transportation
  - Integrated rather than separate
  - Transportation for all users
  - Fit context, harmonize
  - Land use arrangement to reduce peak hour single occupant auto trips
  - Transportation investments as an economic development catalyst

Role of the Transportation Planner

- "Bridge the gap"
- Advocate for transportation to improve community sustainability
- Explain technical info to officials and public
- Lead the process
Transportation Acronyms and Jargon

Planner as the translator...

- Environmental justice
- Secondary and cumulative impacts
- Friction factor
- 85th percentile

\[ s = \frac{\sigma}{\sqrt{n}} \]

Outcome-based Planning Process

1. The Vision
   - Problem understanding

2. Evaluation
   - Identify alternatives or scenarios
   - Evaluation
   - Select alternative

3. The Plan
   - Long-range plan
   - Transportation improvement program
   - Implementation
Innovations in Transportation Planning
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Vision

□ Establish a Vision
□ Measured by performance outcomes
Examples:
 Accommodate growth with less VMT growth (Ann Arbor 2009 Plan)
 Accommodate growth with a reduction in VMT (Los Angeles County 2008 Plan)

Regional MPO Plan

Future Land Use Plans
• Assumes FLU is valid
• Assumes community will develop per its plan

Employment & Household Projections (by TAZ)

Projected Deficiencies (congestion) and Alternatives Analysis

Recommended Changes—typically to add capacity

Goals and objectives
➢ Mobility and accessibility
➢ Environmental quality
➢ Economic development
➢ Quality of life
➢ Social Equity
Traditional Travel Network Demand Forecasting

- Traffic analysis zones
- Population/employment
- Estimate trips
- Trip distribution – where?
- Mode choice – how?
- Trip assignment
- Calibrate (test)
- Model for future design year
- Identify deficiencies
- Test alternatives
- Air quality modeling

Innovative Modeling

- Movement toward activity based models
- Challenges – data, cost
- Reduce trips out of the TAZ (external trips) through mixed use and connectivity

Land use design (with same density) can impact trip distribution
Community-Wide Transportation Plan

1. Goals/performance outcomes
2. Future demand/scenarios
3. Alternatives (all modes)
4. Evaluation
5. Priorities
6. Funding

Project Specific Study

- Types
  - Widening
  - New Street
  - Interchange
  - Bridge
  - Transit
  - Non-motorized
- Micro-simulation (Synchro, VISSIM)
- NEPA process (if federally funded)
Corridor Simulations

National Environmental Policy Act (NEPA)

- Typical NEPA elements:
  - Purpose and need
  - Public involvement
  - Evaluate adverse environmental effects
  - Alternatives to proposed action
  - The relationship between short-term uses of the environment and the long-term productivity
  - Any irreversible and irretrievable commitments of resources

- Process must be completed before an agency makes a final decision on a proposed action.
NEPA: three basic types

- Environmental Impact Statement (EIS) – projects that will have a significant effect on the environment.
- Environmental Assessment (EA) – projects where significance of environmental impact not clearly established, results in a Finding of No Significant Impact (FONSI) or the need for an EIS.
- Categorical Exclusions for actions that do not have a significant effect on the environment.

NEPA: Impact Evaluation Example

- Environmental
- Endangered species
- Noise
- Historic & cultural
- Parks and schools
- Land use
- Economic/fiscal
- Costs
- Engineering feasibility
- Displacement
- Environmental justice
Any questions so far?

Traditional methods focus on auto travel and likely identify more projects than available funding… and community may not find project acceptable.

"Can we build out of congestion?"

So it’s time to be *innovative* —

How can we meet the needs for a safe, efficient, attractive, and sustainable transportation system?
Sustainable Transportation

To reduce carbon footprint/greenhouse gas emissions:
- Switch some auto trips to transit/biking/walking
- Reduce delays/emissions (ITS)
- “Clean goods movement” – focus of signal coordination
- Replace fleets with green vehicles
- Reduce auto trips with mixed use
- More comprehensive transportation planning

Los Angeles County Transportation Plan notes one VMT = one pound of CO2

Congestion Management

- HOT-High occupancy toll lanes
- HOV-High occupancy vehicle lanes
- Reversible lanes
- TOT- Truck Only Toll
- Congestion pricing
- Ramp metering

Ramp metering (New Zealand)

HOV lanes

Washington, D.C. reversible lanes
Employee Demand Management

- Van pool
- Flex schedule
- Park and ride
- Ride share programs
- Variable parking pricing
- Employer supported program

New Network Typologies

- Traditional Functional Classification based on character of vehicular service
- New (nested) network/typology based on wider scope:
  - Function of street
  - Street width
  - Streetscape
  - Relationship to land use and form
  - Non-motorized transportation/transit
- Quality of travel by street by mode

See upcoming ITE Recommended Practice

From Duany Plater-Zyberk
## Case Study: Design Lansing

### Street Typologies
- Expressway
- Boulevards/Arteries
- Commuter/Workhorse
- Activity/Destination
- Business Corridor
- Prime Connector
- Community Connector
- Neighborhood Connector
- Local Street

### Preliminary Typologies

<table>
<thead>
<tr>
<th>Potential Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right-of-Way Widths</td>
</tr>
<tr>
<td>Roadside Amenities</td>
</tr>
<tr>
<td>Signal Spacing</td>
</tr>
<tr>
<td>Street Length</td>
</tr>
<tr>
<td>Access Management</td>
</tr>
<tr>
<td>Lane Width</td>
</tr>
<tr>
<td>Transit</td>
</tr>
<tr>
<td>Non-Motorized Facilities</td>
</tr>
<tr>
<td>On-Street Parking</td>
</tr>
<tr>
<td>Levels of Service for All Modes</td>
</tr>
</tbody>
</table>

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Super Streets

- For high volume commuter routes
- Indirect left turns (Michigan lefts)
- Very high through capacity
- Significantly fewer crashes
- Requires wide ROW

Corridor Planning

- Assess existing and desired and character (context)
- Traffic Operations (LOS)
- Non-motorized
- Transit
- Land use/form
- Access system
- Road and streetscape design
Street Connectivity Example

- AADT on major streets 23,700
- Driving distance 2.4 miles
- AADT on major streets 18,600
- Driving distance 0.25 mile

Reduces burden on arterials
Improves emergency response
Reduces VMT and emissions
Provides access options

Source: VDOT

Street Connectivity

VDOT Connectivity Standards
- Compact – 1.6
- Suburban – 1.4
- Rural – minimum 1 connection

Network Addition
Access Management

Cost effective traffic management methods to:
- Promote the flow of traffic
- Improve safety of pedestrians & vehicles
- Improve aesthetics of roadway areas
...by managing the location, quantity, type & design of access to a roadway

See TRB’s Access Management Manual

www.accessmanagement.info

Benefit: Safety

- Access management can help reduce injuries and property damage due to crashes
- Doubling of access density from 10-20 access points per mile often results in about a 40% increase in expected crash rates*

*according to the Michigan Department of Transportation
**Access Management Implementation**

**Access Management Plan**
- Identifies driveways to close, consolidate, or redesign
- Guidelines for new development

**Zoning Regulations**
- Typically overlay district
- Apply to change in use/site plan review
- Implement with road projects
- Other incentives

**Roundabouts**
- Not the same as traffic circles!
- Yield entry vs. stop controlled
- Splitter island w/ arrows
- Significant crash reduction
- Can be high capacity
- Alternative to traffic signals & all-way STOP signs
- Typically more expensive (ROW)
- Concerns with pedestrian crossings because of fewer “gaps”
Useful Roundabout Applications

- Safety problems
- Capacity problems
- Closely spaced intersections
- Unusual geometry
- Locations where signal would require bridge widening/lengthening – Interchanges and rail
- Locations where sight triangles are obscured for signals
- Context sensitive applications

Source: DLZ

Design for all Users: “Complete Streets”

- Context Sensitive Solutions
- Harmonize vehicles and other modes/adjacent land uses
- Consider impacts other than only auto traffic operations

Overland Park, KS
Complete Streets—Examples

Vision Metcalf, Overland Park, KS

Charlotte, NC Street Guidelines

Green Street Design

- Variable cross sections match context
- Stormwater/runoff (rain gardens, bioswales)
- Pervious pavement/parking
- Landscape/Streetscape
- Materials (recycled, solar, LED lights/signals)
Street Design Standards

- 24 ft
- 26 ft
- 30 ft
- 32 ft

Traffic Impact Studies

- When to require
  - 100 new peak hour trips
  - Rezonings
  - 15% change in trips
- Trip generation/distribution
- Establish LOS standard
- Identify deficiencies
- Mitigation
  - Improvements
  - Change project
- Funding (proffers, impact fees)

Page from ITE Trip Generation manual
Level of Service

<table>
<thead>
<tr>
<th>LOS</th>
<th>Description</th>
<th>Delay/Vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Operations with very low control delay occurring with favorable progression and short cycle lengths.</td>
<td>≤ 10 sec.</td>
</tr>
<tr>
<td>B</td>
<td>Operations with low control delay occurring with good progression and short cycle lengths.</td>
<td>10 – 20 sec.</td>
</tr>
<tr>
<td>C</td>
<td>Operations with average control delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.</td>
<td>20 – 35 sec.</td>
</tr>
<tr>
<td>D</td>
<td>Operations with longer control delays due to a combination of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop and individual cycle failures are noticeable.</td>
<td>35 – 55 sec.</td>
</tr>
<tr>
<td>E</td>
<td>Operations with high control delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences. This is considered to be the limit of acceptable delay.</td>
<td>55 – 80 sec.</td>
</tr>
<tr>
<td>F</td>
<td>Operation with control delays unacceptable to most drivers occurring due to oversaturation, poor progression, or very long cycle lengths.</td>
<td>80 sec.</td>
</tr>
</tbody>
</table>

Highway Capacity Manual 2000 for Signalized Intersections

Traffic Impact Studies

- Evaluate all modes (autos, biking, walking, transit)
- Set minimum LOS standards for each (e.g. LOS C for pedestrians, LOS E for vehicles)
- Adjust development to mitigate impacts & improve performance
- Incentives for other modes

Non-motorized Planning

- Types:
  - Bike route
  - Bike lane
  - Sidewalk
  - Multi-modal pathway
  - Trail

- Conditions:
  - Pathway width and condition
  - Continuity of pathways
  - Separation from vehicular traffic
  - Crosswalks
  - Street connectivity

Pedestrian Level of Service

<table>
<thead>
<tr>
<th>LOS</th>
<th>Space (ft²/ped)</th>
<th>Flow rate (ped/min/ft)</th>
<th>Speed (ft/s)</th>
<th>V/C Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>&gt;60</td>
<td>&lt;5</td>
<td>&gt;4.25</td>
<td>0.21</td>
</tr>
<tr>
<td>B</td>
<td>40-60</td>
<td>5-7</td>
<td>4.17-4.25</td>
<td>0.21-0.31</td>
</tr>
<tr>
<td>C</td>
<td>24-40</td>
<td>7-10</td>
<td>4.00-4.17</td>
<td>0.31-0.44</td>
</tr>
<tr>
<td>D</td>
<td>15-24</td>
<td>10-15</td>
<td>3.75-4.00</td>
<td>0.44-0.65</td>
</tr>
<tr>
<td>E</td>
<td>8-15</td>
<td>15-23</td>
<td>2.50-3.75</td>
<td>0.65-1.00</td>
</tr>
<tr>
<td>F</td>
<td>&lt;8</td>
<td>variable</td>
<td>&lt;2.5</td>
<td>Variable</td>
</tr>
</tbody>
</table>

Note: Above considers pedestrian density and delay. Several agencies (e.g., Florida DOT) are moving toward a more qualitative ranking using factors like those listed in “conditions” on the previous slide.
Non-Motorized Crossings

- Intersection design
- Mid-block crossings
- “PELICAN” signals
  - Design varies; generally stops traffic when activated
  - High-volume crossings away from other signals
  - Schools, universities, hospitals, other institutions, at main transit stops

Mobility for Seniors and Special Needs

- Note ped hit at 40mph, 85% fatality, 20 mph 5%
- AARP survey, 56% support “complete streets”
- Bigger fonts, brighter signs
- Wide, visible pavement markings
- Timing of ped signals (3.5 ft. per second instead of 4)
- Audible countdown signals
- Tighter intersection curb radii to slow speeds

Source: Reid Ewing Study, NCHRP Report
Traffic Calming

- Residential areas: problem possible if 85th percentile is 5 MPH+ over the desired speed
- Solutions
  1. Document the problem and patterns/causes
  2. Targeted enforcement
  3. Physical traffic calming devices

Traffic Calming Devices

- Chicanes
- Sinusoidal Speed Humps
- Speed Tables
- Chokers
- Medians
- Flares
- Raised / Textured Crosswalks

Results

- Can drop speeds 3-5 MPH
- Costs can vary based on design, materials
- Usually positive reactions

See ITE’s Traffic Calming: State of the Practice by Reid Ewing
Road Diets

- Reducing # of traffic lanes to provide left turn, transit, or bike lane
- Consider:
  - Function & environment
  - Traffic volumes (consider for 8,500 – 24,000 vpd)
  - Peak hour volumes & LOS
  - Crash types, pedestrian, bike, & transit activity
  - Impact on parallel roads

Parking Management

- Modernize number of spaces required
- Shared Parking (see ULI)
  - Parking demand by land use by peak period
  - Reduce where other modes promoted
- Downtown Parking
  - Variable pricing by location
  - Attractive structures integrated with uses

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Parking 85th %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low/mid rise apartment</td>
<td>1.46 v/du</td>
</tr>
<tr>
<td>Office</td>
<td>3.44 v/1000 sq ft</td>
</tr>
<tr>
<td>Medical office</td>
<td>4.30 v/1000 sq ft</td>
</tr>
<tr>
<td>Shopping center</td>
<td></td>
</tr>
<tr>
<td>Non-December</td>
<td>3.56 v/1000 sq ft</td>
</tr>
<tr>
<td>December</td>
<td>5.92 v/1000 sq ft</td>
</tr>
<tr>
<td>Supermarket</td>
<td>6.72 v/1000 sq ft</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>2.59 v/1000 sq ft</td>
</tr>
</tbody>
</table>
Transit Planning

- Commuter rail
- Light rail
- Streetcar
- Bus rapid transit
- Frequent bus
- Demand responsive

Transit Oriented Development (TOD)

**GOAL:** Increased transit ridership and private sector return on transit investment

- Usually higher density, taller buildings
- A mix of uses
- 5 minute walk zones designed for pedestrians
- Buildings oriented to sidewalk
- Reduced parking
- Park and Ride at certain locations
- Norfolk, VA
  - Core zones within 1/8 – 1/4 mile
  - Transition zones 1/4 - 1/2 mile
**TOD [1/4 – 1/2 mile zones]**

- Intermediate Bus
  - 7 DU/acre
- Frequent Bus/Transit
  - 15 DU/acre
  - 75 employees/acre
- Light Rail
  - 9 DU/acre
  - 23 employees/acre

Source: Transportation Research Board

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**Case Study: TOD**

**Catalytic Transportation Projects**

- City of Dallas used transit as economic stimuli
- Shifting planned density to transit corridors
- Both transit and economic tools were reviewed where TOD overlays were used
- Public-Private Partnerships were sought in an innovative fashion

Source: Parsons-Brinckerhoff
Using Transportation as an Economic Catalyst

- Convert one-way to two-way
- Add on-street parking
- Road diet/redesign
- Add a median
- Add transit (BRT/streetcar/light rail)

City of Birmingham, MI
Triangle Plan and Form-Based Code

Form-Based Codes (FBC)

- Regulates physical form, with a lesser focus on use
- Defines the streetscape
- Street related to building form
- Regulates private and public realm

Leesburg, Virginia Form-Based Code
Form-Based Code Example

- Mixed-use/compact
  Buildings closer to street
- Multi-modal streets
- “Green” incentives
- Parking in rear yard
- Incentivize parking structures
- Reduced parking requirements

Revisiting the Triangle

- Roadway Improvements
- Transportation System Management
- Intelligent Transportation Systems
- Transit
- Non-motorized
- Access Management
- Green Streets
- Road Diet
- Traffic Calming

- Planning
- Zoning (audit regs)
- Mixed Use
- Compact Development
- Site Plan Review
- TOD
- Form-based Code

- Alternative Work Schedules
- Alternative Modes
- Employer Support Programs
- Roundabouts
- Complete Streets
- Congestion Management
The world of transportation is changing . . .

- Key organizing themes of U.S. Transportation Policy
  - Economic recovery
  - Safety
  - Alternatives to driving
  - Mobility for increasing senior population
  - Livable and sustainable communities

U.S. Transportation Secretary LaHood, address to Senate Committee, April 28, 2009

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