Synopsis

Innovations in Regional Transportation Plans
What would happen if we could build our way out of congestion? Salt Lake City tried to “virtually” – the induced demand is surprising and lessons learned are critical! Rapid growth, limited funds, increasing costs, climate change - hear how Salt Lake City, Utah has developed practical yet innovative means to help their region define and achieve a sustainable future in a world of harsh realities.
Bio for Michael R. Brown, PE, PTP, AICP

Michael R. Brown is a registered professional engineer and a certified transportation planner. He graduated from Brigham Young University in 1997 with a Masters degree in Civil Engineering. He spent 8-years as a transportation planner and travel demand modeler at the Wasatch Front Regional Council, Metropolitan Planning Organization for Salt Lake City, Utah, where he was involved in 4 successful FTA New Starts bids for passenger rail.

In his career with Wilbur Smith Associates, Mr. Brown has had both modeling and planning roles in California, Nevada, Montana, Idaho, and Utah ranging from nuclear power plant evacuation simulations, to statewide travel models, to MPO plans.
Lessons Learned From “Building Our Way Out of Congestion!”

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Target Audience

– Anyone interested in...
  • improving mobility in large cities,
  • reducing greenhouse gases,
  • reducing dependence on oil.

Note: As a “Red-State Westerner”, I used to believe in a heavy on freeways. Now, I’m convinced that “congestion priced” freeways have a role in the world, but we should accept a maximum size for any freeway, and focus on the content of this show to make freeway travel less necessary. In other words, I “reserved the right to get smarter”, as the Rail~Volution MC noted.
How much CO$_2$ do we create?

- Wasatch Front:
  - 2 Million People
  - 14 Billion VMT/year
  - 8 Million tons/year
  - 200,000 “40-Ton Tanker Equivalents”
Innovative Approach to Determine Need

- MPO needs assessment

- Model “builds its way out of congestion”, by automatically adding lanes.

- Reveals induced demand, otherwise unseen
Key Question

– How much pavement would the public consume if there were no constraints?
Measuring Induced Demand
(pdf version only)

– Model starts with planned lanes, adds lanes if it finds demand exceeds supply, then redistributes trips generally a bit further because travel speeds remain fast.

– The “bit further” is an element of what many professionals term “induced demand”.

– The phenomenon occurs even without dynamic land use, but to a lesser extent than arguably really would occur.
Measuring Induced Demand

Fixed Land Use

Low-Speeds

SLC

High-Speeds

SLC

Dynamic Land Use

High-Speeds

SLC
Left image: Model was run with houses and jobs in identical locations, but in one case improving arterials and transit, and in the other case freeways.

The yellow lines show that over 25 years of investment in transit and lower speed arterials, people will tend to work and play much closer to home, helping to encourage a sense of community.

Center image: Even if locations of houses & jobs were unchanged, with high speed options, they are much more willing to travel long distances, adding to VMT and creating more dependence on the high speed resource than would have occurred otherwise.

Right image: But houses and jobs don’t remain in the same place. High speed access to far-flung, lower cost land encourages leapfrogging, and “1/2 acre lots” that consume the land much more quickly, and increase VMT even more.

This is not intended as an indictment of low density development, which has many positive features. The intent is to simply identify cause and effect relationships so that policy makers can avoid invoking “the law of unintended consequences”.

WilburSmith ASSOCIATES
How much freeway would we consume if we could?

Top = Planned 2030
Bot = Consumed 2030

4 A = 4-lane arterial
8 F = 8-lane Freeway

Target: LOS E

Existing Freeways
How much freeway would we consume if we could?

Top = Planned 2030
Bot = Consumed 2030

4 A = 4-ln arterial
8 F = 8-ln Freeway

Target: LOS E
Comment on Previous 2 Slides
(For pdf version only)

– In SL County, I-15 reaches 18 lanes - potentially not buildable. This is in spite of incredible utilization of numerous other freeways.
– In Utah County, unconstrained demand generally matches plans. However this county would actually grow more if SL is unconstrained.
– Note that freeways in the Eagle Mountain area are under utilized. This is because the manually allocated 2030 population is small.
– If such incredible access really existed, more people would move there. This would:
  • Relieve roadways where residents were otherwise located,
  • Increase freeway use in these spaces.
– This is a phenomenon dynamic land use models are designed to detect, but were not used for this analysis
– Certainly with a 2050 population Utah Co. freeways would be fully utilized.
Optimizing Arterials (2010 Freeways)

“Normal” view of 2030

“Building your way out”

Looks much nicer!
2030 Planned Lanes

Optimized Lanes

Looks much nicer?

Black = 2 each dir., Blue = 3, Green = 4, Red = 5, Brown = 6+, Freeways at 2010 levels
## Return on Investment

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>RTP</th>
<th>Freeway Emphasis</th>
<th>Non-Fwy Emphasis</th>
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<tbody>
<tr>
<td><strong>Billions</strong></td>
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<td></td>
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<tr>
<td>Total Cost</td>
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<td>$13</td>
<td>$16</td>
<td>$14</td>
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<tr>
<td><strong>Annual Delay Per Capita</strong></td>
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<tr>
<td>Total Cost</td>
<td>17</td>
<td>29</td>
<td>27</td>
<td>16</td>
</tr>
</tbody>
</table>

*Note: *The value for Total Cost is marked with an asterisk (*) indicating a specific note or condition.
Explanation of Previous Table (pdf version only)

- Freeway scenario is very expensive. It also facilitates much longer distance trips and does not relieve local congestion, hence has very little effect on reducing overall delay over the financially constrained RTP.
- Improving the arterials and transit gives the most bang for the buck. Congestion still occurs on freeways, but it is “manageable” because parallel arterials can handle freeway spill over.
- A full “balance” can still allow modest freeway expansion without suffering excessive delay or significantly increasing VMT.

- 2006 is replacement cost, others are rough estimates of new capacity in 2006 dollars
- costs are different than other UDOT/WFRC estimates in part because generalized variables like “lane miles” are used in estimate.
How Large is Induced Demand?

– Regional trip lengths and VMT are…
  • +11% freeway scenario
    25% just on freeways
  • +2% arterial scenario
  • -4% arterials & transit
  • +4% arterial, transit, freeway mix

Even higher if land uses had spread in reaction to faster access
What does it mean for you?

Vehicle Miles Per Household Per Day Spent on All Roadways

- Existing: 62
- 2030 Constrained RTP: 72
- Optimized Freeways: 80
- Opt. Arterials + Transit: 69
- Freeway, Arterial, Transit: 74
What to do?
Good Mobility, Less Pavement

High-Density Mixed Uses

One-Way Streets
Good Mobility, Less Pavement

Light Rail, BRT, etc.

Telecommuting, demand reduction strategies
Unconventional Intersections: More Capacity, Less Pavement

Arterial Interchanges

Continuous Flow Intersections
Unconventional Intersections: More Capacity, Less Pavement

Town Center Intersections

Intersecting "Triplets"

Ideal for Mixed Use Centers

Middle alignment used for pedestrians, transit, short-term parking, amenities

Couplet & Triplet Intersections have up to 70% more capacity than the single intersections they replace.

Premium Stops

Regional Transit
Parking Shuttles

Town Center Intersection
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Freeways:
Can’t build them big enough, but does that mean they’re doomed to fail?
What is lost when freeways fail?

– They lose up to 30% of their throughput.
  • 6 lanes at 60 mph = 13,000 cars per hour
  • 6 lanes at 20 mph = 9,000 cars per hour
– It is as if we paid for a 6-lane freeway, and…
  • we got a 4-lane 4th of July parade

If demand exceeds supply, you will get an expensive parade everyday!
Support of Previous Slide
(For pdf version only)

A: 2200 v/h/l typical max flow
B: 1500 v/h/l at forced flow, ~30% loss

Flow (v/1/h) vs. Occupancy (%), 10/3/2000

Free Flow, 100% Efficiency
Congestion, Inefficient Operation

Lane 1

Maximum Flow

5:30 am

9:00 am

Speed = 60 mph

6:45 am

Depth of Congestion

Causes and Cures of Highway Congestion

Chao Chen, Zhanfeng Jia and Pravin Varaiya

University of California, Berkeley

August 18, 2001
How do we get our 30% back?

– Increase supply of free freeways
  • Expensive or impractical; induces demand
– Reduce freeway demand
  • Reduce freeway dependency: arterials, transit, mixed land uses
  • Protect the resource: congestion pricing, aggressive ramp metering
Can’t build enough supply to match demand

Can cause demand to match supply!!!
Smart Growth
Supportive
Freeway Management

Congestion Pricing
Aggressive Ramp Metering

Stop & Go because meters set too fast

Blockages

Ramp "storage" is one way to avoid this

HOV, HOT bypass
Effects ofCongestionPricing

- Balance demand to supply using *revenues*!
- Higher use of alternatives
- 30% higher efficiency
- Over time, millions will shorten their “live, work, play” decisions.
Lessons Learned

– Truly cannot “build our way out”
– A dollar on arterials, transit, etc. goes further
– 25%+ of freeway capacity lost to induced demand
– 30% of freeway is lost during stop-and-go
– Alternatives often cost less and are more effective
Caution

– Travel demand models are imperfect tools.

– Other research may vary in magnitude or even counter some findings of this effort.
Solving Future Mobility Problems Requires "Outside the Box" "Triangular" Thinking !!!!!

"Today's problems cannot be solved by the level of thinking that created them."
– Albert Einstein
The End