Transportation to What Ends?

Updating the Metric of Transportation Impact under SB 743

Chris Ganson
Senior Advisor for Transportation
Governor’s Office of Planning and Research

January 2019
Old metric:
Transportation impact = \textbf{Level of Service (LOS)}

<table>
<thead>
<tr>
<th>LOS</th>
<th>Signalized Intersection</th>
<th>Unsignalized Intersection</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>\leq 10 \text{ sec}</td>
<td>\leq 10 \text{ sec}</td>
</tr>
<tr>
<td>B</td>
<td>10–20 \text{ sec}</td>
<td>10–15 \text{ sec}</td>
</tr>
<tr>
<td>C</td>
<td>20–35 \text{ sec}</td>
<td>15–25 \text{ sec}</td>
</tr>
<tr>
<td>D</td>
<td>35–55 \text{ sec}</td>
<td>25–35 \text{ sec}</td>
</tr>
<tr>
<td>E</td>
<td>55–80 \text{ sec}</td>
<td>35–50 \text{ sec}</td>
</tr>
<tr>
<td>F</td>
<td>\geq 80 \text{ sec}</td>
<td>\geq 50 \text{ sec}</td>
</tr>
</tbody>
</table>
Level of Service A
Level of Service F

Source: Neighborhoods.org
Which is better?

45 min commute, including 5 min from congestion

Good LOS Grade
Bad Accessibility

20 min commute, including 10 min from congestion

Bad LOS Grade
Good Accessibility
1. Good grade in LOS ≠ Success in Transportation

Denver 1982
- Travel Time Index: 1.09
- Average travel time: 50.6 minutes (46.4 mins + 4.2 mins)

Denver 2007
- Travel Time Index: 1.31
- Average travel time: 49.6 minutes (37.9 mins + 11.7 mins)

Auto Delay-Based Impact Analysis: Fundamental Problems

1. Good grade in LOS ≠ Success in Transportation

A COMPARISON OF CHARLOTTE AND CHICAGO

<table>
<thead>
<tr>
<th>Average Trip</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicago</td>
<td>13.5mi</td>
</tr>
<tr>
<td>Charlotte</td>
<td>19.0mi</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Travel Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charlotte</td>
</tr>
<tr>
<td>9.6min delay</td>
</tr>
<tr>
<td>38.4min un-congested travel time</td>
</tr>
<tr>
<td>48.0min total travel time</td>
</tr>
<tr>
<td>Chicago</td>
</tr>
<tr>
<td>9.8min delay</td>
</tr>
<tr>
<td>22.8min un-congested travel time</td>
</tr>
<tr>
<td>32.6min total travel time</td>
</tr>
</tbody>
</table>

Driven Apart: How sprawl is lengthening our commutes and why misleading mobility measures are making things worse

Executive Summary:
http://www.opr.ca.gov/docs/Driven_Apart-How_Spral_Is_Legthening_Our_Communities.pdf

Technical Report:
1. Good grade in LOS ≠ Success in Transportation
Auto Delay-Based Impact Analysis: Fundamental Problems

1. Good grade in LOS ≠ Success in Transportation

Figure 1 The Relationship Between Proximity To Jobs And Job Accessibility (left) and Local Area Traffic Speeds And Job Accessibility (right)

Mondschein, Osman, Taylor, Thomas – SCAG Area
1. Good grade in LOS ≠ Success in Transportation

With infill development, “…time lost to commuter traffic delays is more than off-set by the greater opportunities to reach destinations over shorter distances to which high development densities gives rise.”

Mondschein, Osman, Taylor, Thomas
1. Good grade in LOS ≠ Success in Transportation

“...myopic focus on the traffic impacts of new developments is misguided and may actually decrease accessibility and economic activity in an effort to protect traffic flows.”

Mondschein, Osman, Taylor, Thomas
Auto Delay-Based Impact Analysis: Fundamental Problems

1. Good grade in LOS ≠ Success in Transportation

Figure 1: The Relationship between Traffic Delay and GDP in American Metros

Dumbaugh et al., Decisions, Values, and Data: Understanding Bias in Transportation Performance Measures (ITE Journal, August 2014)
Amazon Chooses a Little Congestion – and Real Transportation Options

By Andy Clarke, Director of Strategy

There are twenty cities around the United States that must be pretty excited today at making it onto Amazon’s short list for HQ2. Ironically, most of those cities are also awaiting their annual inclusion at the top of the naughty list for congestion – which might seem like a contradiction, especially thinking about a business that is built on the reliability of delivery services and wants to add up to 50,000 jobs to a local economy.

I take two things from this apparent contradiction. First, the Inrix Congestion Index is clearly measuring the wrong things if 8 of their “worst” ten cities are in the running for HQ2 (and the only ones missing are Seattle or HQ1, and San Francisco). Second, Amazon is sticking to its promise of looking for places with a truly multimodal transportation system, as most of the candidates also have mature and well-used transit systems, can boast among the most successful bikesharing systems, and are recognized as leading cities for walkability and bike-friendliness.
The state planning priorities, which are intended to promote equity, strengthen the economy, protect the environment, and promote public health and safety in the state, including in urban, suburban, and rural communities, shall be as follows:

(a) To promote infill development...

(1) Uses land efficiently.
(2) Is built adjacent to other development, pursuant to subdivision (b).
(3) Is located in an area appropriately planned for growth.
(4) Is served by adequate transportation and other essential utilities and services.
(5) Minimizes ongoing costs to taxpayers.

(Amended (as added by Stats. 2002, Ch. 1016) by Stats. 2002, Ch. 1109, Sec. 1. Effective January 1, 2003.)
Analysis of infill development using LOS
Analysis of infill development using LOS

Relatively little vehicle travel loaded onto the network
Analysis of infill development using LOS

Relatively little vehicle travel loaded onto the network

...but numerous LOS impacts
Analysis of greenfield development using LOS
Analysis of greenfield development using LOS

Typically three to four times the vehicle travel loaded onto the network relative to infill development.
Analysis of greenfield development using LOS

Typically three to four times the vehicle travel loaded onto the network relative to infill development

...but relatively few LOS impacts

Traffic generated by the project is disperse enough by the time it reaches congested areas that it doesn’t trigger LOS thresholds, even though it contributes broadly to regional congestion.
Auto Delay-Based Impact Analysis: Fundamental Problems

1. Good grade in LOS ≠ Success in Transportation
2. LOS assessments are expensive, time consuming, and inaccurate

Van Ness BRT analysis (28MB)
Auto Delay-Based Impact Analysis: Fundamental Problems

1. Good grade in LOS ≠ Success in Transportation
2. LOS assessments are expensive, time consuming, and inaccurate
3. “Fixing” LOS simply moves congestion elsewhere

http://www.opr.ca.gov/docs/ITE_Journal_Article_-_Decisions_Values_and_Data.pdf

Braess’s Paradox

https://en.wikipedia.org/wiki/Braess%27s_paradox
1. Punishes last-in, inhibits infill, pushes development outward

http://www.opr.ca.gov/docs/ITE_Journal_Article_-_Decisions_Values_and_Data.pdf
Auto Delay-Based Impact Analysis: Secondary Problems

1. Punishes last-in, inhibits infill, pushes development outward

2. Inhibits transit and active transportation

Auto Delay-Based Impact Analysis: Secondary Problems

1. Punishes last-in, inhibits infill, pushes development outward
2. Inhibits transit and active transportation
3. Forces more road construction than we can afford to maintain

Auto Delay-Based Impact Analysis: Secondary Problems

1. Punishes last-in, inhibits infill, pushes development outward
2. Inhibits transit and active transportation
3. Forces more road construction than we can afford to maintain
4. Generates an array of environmental impacts

Peer-reviewed research on environmental impacts from high VMT projects:

- Emissions
  - GHG
  - Regional pollutants
- Energy use
  - Transportation energy
  - Building energy
- Water
  - Water use
  - Runoff – flooding
  - Runoff – pollution
- Consumption of open space
  - Sensitive habitat
  - Agricultural land

Auto Delay-Based Impact Analysis: Secondary Problems

1. Punishes last-in, inhibits infill, pushes development outward
2. Inhibits transit and active transportation
3. Forces more road construction than we can afford to maintain
4. Generates an array of environmental impacts
5. **Worsens public health and safety**

Updated metric of transportation impact: VMT
Why did OPR choose VMT?

1. Best umbrella metric for transportation environmental impact
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2. Ease of assessment
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4. Achieving long-run GHG goals depend on near-term actions to contain VMT
Why did OPR choose VMT?

1. Best umbrella metric for transportation environmental impact
2. Ease of assessment
3. Already required to be used in CEQA
4. Achieving long-run GHG goals depend on near-term actions to contain VMT
5. Opportunities for streamlining infill
Benefits of VMT as a Measure of Transportation Impact

1. Streamline TOD

January 2019
Benefits of VMT as a Measure of Transportation Impact

1. Streamline TOD
2. Streamline infill
Benefits of VMT as a Measure of Transportation Impact

1. Streamline TOD
2. Streamline infill
3. Streamline transit projects
4. Streamline locally-serving retail
5. Streamline modeling for remaining projects
6. Attack regional congestion more effectively
7. Reduce future pavement maintenance deficits
8. Massive public health improvements
9. Reduction in GHG and other emissions

Diagram:
- 2 people
- 1 person
- 1 person
- 40 people
Benefits of VMT as a Measure of Transportation Impact

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http://www.caleemod.com/
Benefits of VMT as a Measure of Transportation Impact

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Benefits of VMT as a Measure of Transportation Impact

1. Streamline TOD  
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7. Attack regional congestion more effectively  
8. Reduce future pavement maintenance deficits  
9. Large improvements in public health

> 21,000 deaths/y attributable to physical inactivity in California

Achieving CA’s mode share targets:
- 2,095 fewer deaths annually
- $1 billion-$15 billion/y prevented premature death and disability

Benefits of VMT as a Measure of Transportation Impact

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"Automobile-Dependency as a Barrier to Vision Zero: Evidence from the States in the USA"

"The results of our panel models and supplementary analysis of state effects show that two variables — Vehicle Miles Traveled and Vehicles per Capita—have the strongest impact on traffic fatality rates."
Benefits of VMT as a Measure of Transportation Impact

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<table>
<thead>
<tr>
<th>Country</th>
<th>Traffic deaths per 100K pop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweden</td>
<td>2.8</td>
</tr>
<tr>
<td>UK</td>
<td>2.9</td>
</tr>
<tr>
<td>Switzerland</td>
<td>3.3</td>
</tr>
<tr>
<td>Netherlands</td>
<td>3.4</td>
</tr>
<tr>
<td>Denmark</td>
<td>3.5</td>
</tr>
<tr>
<td>Singapore</td>
<td>3.6</td>
</tr>
<tr>
<td>Spain</td>
<td>3.7</td>
</tr>
<tr>
<td>Germany</td>
<td>4.3</td>
</tr>
<tr>
<td>Japan</td>
<td>4.7</td>
</tr>
<tr>
<td>Finland</td>
<td>4.8</td>
</tr>
<tr>
<td>France</td>
<td>5.1</td>
</tr>
<tr>
<td>USA</td>
<td>10.6</td>
</tr>
</tbody>
</table>

World Health Organization
http://apps.who.int/gho/data/node.main.A997
Benefits of VMT as a Measure of Transportation Impact

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10. Reduction in GHG and other emissions
CA GREENHOUSE GAS INVENTORY 2014
BY SECTOR AND ACTIVITY (2016 EDITION)

Transportation-Related Industrial Emissions

- 9.9% Pipelines
- 54.3% Petroleum Refining and Hydrogen Production
- 35.7% Oil and Gas Extraction

- 24% Electricity Generation (In-State)
- 12% Electricity Generation (Imports)
- 8% Transportation
- 8% Industrial
- 6% Commercial
- 5% Residential
- 8% Agriculture and Forestry

http://ca50million.ca.gov/Transportation/transportation.html
Background – State GHG Goals

- Baseline
- Climate Planning Scenario

- 2035:
  - ~50% ZEV Sales
  - 50% RPS
  - 7.5% VMT Reduction

- 2050:
  - 100% ZEV Sales
  - 75% RPS
  - 15% VMT Reduction

WTW GHG Emissions (MMT CO2e)

Years: 2015, 2020, 2025, 2030, 2035, 2040, 2045, 2050
“California is not on track to meet the greenhouse gas reductions expected under SB 375 for 2020, with emissions from statewide passenger vehicle travel per capita increasing and going in the wrong direction.”
“With emissions from the transportation sector continuing to rise despite increases in fuel efficiency and decreases in the carbon content of fuel, California will not achieve the necessary greenhouse gas emissions reductions to meet mandates for 2030 and beyond without significant changes to how communities and transportation systems are planned, funded, and built.”
“CARB’s 2017 Climate Change Scoping Plan Update conducted a comprehensive assessment of greenhouse gas emissions reductions strategies. The plan concludes that **California cannot meet its climate goals without curbing growth in single-occupancy vehicle activity.**

Even if the share of new car sales that are ZEVs grows nearly 10-fold from today, California would still need to reduce VMT per capita 25 percent to achieve the necessary reductions for 2030.”
A sand tornado passes through as thousands of Kurds stream into Dikmetas, Turkey, from Syria in September 2014. Years after rural residents fleeing drought poured into Syria's cities, helping to spark a civil war, the region remains in turmoil.

PHOTOGRAPH BY JOHN STANMEYER, NATIONAL GEOGRAPHIC

Climate Change Helped Spark Syrian War, Study Says

Research provides first deep look at how global warming may already influence armed conflict.

BY CRAIG WELCH, FOR NATIONAL GEOGRAPHIC
743: Three Cases

1. Project streamlined

2. Project mitigates VMT to less than significant

3. Project mitigates VMT as feasible, but VMT remains significant

S.O.C.
If California is serious about climate change, the car can't be king of our roads

The new guidelines allow projects that are specifically designed to reduce vehicle trips, such as the creation of a new bike lane, to be exempted from lengthy transportation studies and shielded from legal challenges under CEQA. Projects such as an apartment complex built within a half-mile of a major transit stop also could escape lengthy study because they are likely to reduce car travel. Cities are expected to develop computer models to estimate how many vehicle trips a project would generate.

California has set an ambitious target of reducing greenhouse gases 40% below their 1990 level by 2030. The state simply cannot reach that goal without a dramatic cut in emissions from cars and trucks, which are the largest source of greenhouse gases in the state. Increasing the number of electric cars on the road will help, but that alone won't suffice. California communities have to be redesigned to make it easier for people to walk, bike or take transit. Changing CEQA is an important step forward.
Benefits of VMT as a Measures of Transportation Impact

Picturing a low-VMT future

Image Credit: Urban Advantage, Roma Design Group, City of Dana Point
Benefits of VMT as a Measures of Transportation Impact

Picturing a low-VMT future

Image Credit: Urban Advantage, Roma Design Group, City of Dana Point
Benefits of VMT as a Measures of Transportation Impact

VMT mitigation helps preserve rural character

LOS mitigation turns rural into exurban
VMT in Case Law

NEPA
Conservation Law Fdn. v. FHA
(2007) 630 F. Supp. 2d 183
Include land use effects of roadway capacity projects

CEQA
Cal.App.4th 173
Include transportation energy in energy impacts

Ukiah Citizens for Safety First v. City of Ukiah (2016) 248
Cal.App.4th 256

Cleveland Nat’l Forest Fdn. v. SANDAG (2017) 17
Cal.App.5th 413
Include a low VMT alternative
With VMT as the metric of transportation impact, how do we do transportation planning?
Project mitigates LOS impacts

Plan roadway capacity using LOS
Impact fee based on s.f. or # of units

Plan roadway capacity using LOS
Impact fee based on VMT

Plan T network using accessibility
Impact fee based on VMT

Also consider cost, livability, walkability, air quality, GHGs, health, etc.
Plan Transportation for the Well-Being of Your City (Not Vice Versa)

Assess transportation infrastructure investments by how much they will improve Access to Destinations
Plan Transportation for the Well-Being of Your City (Not Vice Versa)

Assess transportation infrastructure investments by how much they will improve Access to Destinations

Multi-modal analysis of increased access to jobs via a new bus only lane in Alexandria, VA
Methods: Land use projects
OPR Recommendations on Methodology – Land Use

Take advantage of streamlining

- Use VMT screening maps for residential and office projects
- Presume development near transit LTS*
- Presume locally-serving retail LTS
- More stringent thresholds may be applied at lead agency discretion

*Exceptions:
- FAR < 0.75
- Parking > minimum requirements
- Inconsistent with SCS
Residential project recommendations:
• Assess residential with trip-based approach
• Threshold: 15 percent below regional or city* VMT/capita
  * For above-average VMT cities

Office project recommendations:
• Assess office with trip-based approach
• Threshold: 15 percent below regional VMT/employee
Retail project recommendations:

• Assess retail with “Net VMT” approach
• Retail which increases VMT compared to previous shopping patterns may be considered significant
• Local-serving retail presumed less than significant
Mixed-use development

• Consider uses separately or focus on predominate use
• Compare to relevant threshold
• Take credit for internal capture
Other recommendations:

- **Rural projects** choose thresholds on a case-by-case basis
- **Small projects** screening threshold – 110 vehicle trips per day
CEQA Rule of Reason requires capturing spillover VMT
Methodologies for...
1. Threshold determination
2. Project Assessment
3. Project Mitigation
...should be apples to apples
Background and methods: Transportation projects
Research on Induced Travel

Increasing Highway Capacity Unlikely to Relieve Traffic Congestion

Susan Handy
Department of Environmental Science and Policy
University of California, Davis

Issue

Reducing traffic congestion is often proposed as a solution for improving fuel efficiency and reducing greenhouse gas (GHG) emissions. Traffic congestion has traditionally been addressed by adding additional roadway capacity via constructing entirely new roadways, adding additional lanes to existing roadways, or upgrading existing highways to controlled-access freeways. Numerous studies have examined the effectiveness of this approach and consistently show that adding capacity to roadways fails to alleviate congestion for long because it actually increases vehicle miles traveled (VMT).

An increase in VMT attributable to increases in roadway capacity where congestion is present is called “induced travel.” The basic economic principles of supply and demand explain this phenomenon: adding capacity decreases travel time, in effect

Increased roadway capacity induces additional VMT in the short-run and even more VMT in the long-run. A capacity expansion of 10% is likely to increase VMT by 3% to 6% in the short-run and 6% to 10% in the long-run. Increased capacity can lead to increased VMT in the short-run in several ways: if people shift from other modes to driving, if drivers make longer trips (by choosing longer routes and/or more distant destinations), or if drivers make more frequent trips. Longer-term effects may also occur if households and businesses move to more distant locations or if development patterns become more dispersed in response to the capacity increase. One study concludes that the full impact of capacity expansion on VMT materializes within five years and another concludes that the full effect takes as long as 10 years.
Key findings:

• Adding highway capacity induces VMT
• The quality of evidence on this phenomenon is high
• Each 1% increase in lane miles causes VMT to ultimately rise by 0.6 to 1.0%
• The research controls for other factors such as population and economic growth; the added VMT results from the capacity increase
• The added VMT is truly new, not shifted from elsewhere
• The new VMT tends to increase GHGs
• The new highway capacity does not increase overall employment or economic activity
Roadway Capacity Project Analysis in CEQA

Impact Assessment → Significance Determination
Roadway Capacity Project Analysis in CEQA

Induced Travel Analysis → Impact Assessment → Significance Determination

- Greenhouse Gasses
- Other Air Pollutants
- Noise
- Energy
- Transportation

January 2019
Roadway Capacity Project Analysis in CEQA

1. **Induced Travel Analysis**
   - Land Use Effects

2. **Impact Assessment**
   - Greenhouse Gasses
   - Other Air Pollutants
   - Noise
   - Energy
   - Transportation

3. **Significance Determination**
Roadway Capacity Project Analysis in CEQA

- Induced Travel Analysis
- Impact Assessment
- Significance Determination

- Land Use Effects
- Impact Assessment
- Significance Determination

- Greenhouse Gasses
- Other Air Pollutants
- Noise
- Energy
- Transportation

- Habitat
- Agriculture
- Water Use/Quality/Flood Risk

January 2019
Roadway Capacity Project Analysis in CEQA

- Induced Travel Analysis
- Impact Assessment
- Significance Determination
  - Greenhouse Gasses
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- Impact Assessment
- Significance Determination
  - Habitat
  - Agriculture
  - Water Use/Quality/Flood Risk

January 2019
Adoption of VMT Across California
Resources on OPR Website
Transportation Impacts (SB 743)

CEQA Guidelines Update and Technical Advisory

After over four years of stakeholder-driven development through nearly 300 stakeholder meetings, public comment periods, and other outreach events, OPR has transmitted its proposed CEQA Guideline Implementing Senate Bill 743 to the California Natural Resources Agency. OPR has also prepared a Technical Advisory on Evaluating Transportation Impacts in CEQA, which contains OPR’s technical recommendations regarding assessment of VMT, thresholds of significance, and mitigation measures. OPR may update or supplement this technical advisory in response to new information and advancements in modeling and methods. Both of these documents can be accessed through the following links:

- Proposed CEQA Guideline Implementing SB 743 (Section 15064.5)
- Technical Advisory on Evaluating Transportation Impacts in CEQA (2017)

Notice of future activity on the CEQA Guidelines will be posted on OPR’s website and distributed through the CEQA Guideline List Serve. Please sign up on the List Serve to stay connected. The Natural Resources Agency will also post updated information about the rulemaking process on its website.

OPR developed the proposed updates related to transportation impacts separately from the rest of the CEQA Guidelines update. That proposal has been included in the Proposed Updates to the CEQA Guidelines. For more information on the comprehensive package, please visit Current CEQA Guidelines Updates.

Key Resources on SB 743: Studies, Reports, Briefs, and Tools

This resource page will be updated as new resources become available. Last updated: September 28, 2017

| Transportation Metrics: Disadvantages of LOS and Auto Delay |
| Environmental, Health, Fiscal Benefits of VMT Reduction |
| VMT Reduction Strategies |
| Induced VMT from Highways Capacity |
| Automated Vehicles and VMT |
| Tools to measure VMT and Access to Destinations |
| Housing Affordability and VMT |
| VMT Reduction in Rural Areas |
| Roadway Pricing |
| Traffic Safety |

Address any questions regarding the key resources to chris.ganson@opr.ca.gov.

What is SB 743?

Governor Brown signed Senate Bill 743 (SB 743) (Steinberg, 2016), which creates a process to change the way that transportation impacts are analyzed under CEQA. Specifically, SB 743 requires OPR to amend the CEQA Guidelines to provide an alternative to LOS for evaluating transportation impacts. Particularly within areas carried by transit, these alternative criteria must "promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses" (Public Resources Code Section 21064.6(c)). Measurements of transportation impacts may include "vehicle miles traveled, vehicle miles traveled per capita, automobile trip generation, etc."
Thanks!

chris.ganson@opr.ca.gov

Research and resources:
http://opr.ca.gov/ceqa/updates/sb-743/index.html#KeyResources