

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45

**REDEFINING “TRANSPORTATION IMPACT”: A
COMPARISON OF EMERGING METHODOLOGIES**

Paper submitted for presentation at the
2015 Annual Meeting of the Transportation Research Board
and publication in the Transportation Research Record

Submission Date: July 30th, 2014
Word Count: Words excluding references (2,461) and Figures/Tables (2): = 2,961

by

Tim Black
Researcher
Institute of Transportation Studies
UCLA Luskin School of Public Affairs
3250 Public Affairs Building
Los Angeles, CA 90095-1656
(timothy.c.black@gmail.com)

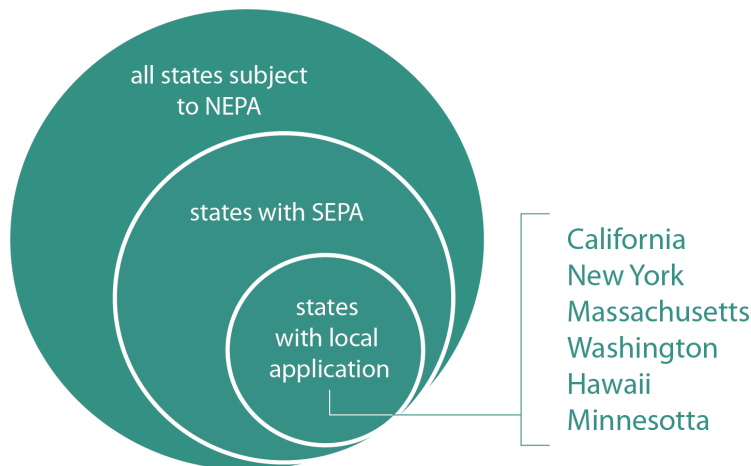
1 **ABSTRACT**

2 Since the enactment of the National Environmental Policy Act (NEPA) in 1970,
3 environmental legislation has played an increasingly important role in the development
4 process. While NEPA regulates only federal actions and federally funded projects,
5 several states have passed their own environmental legislation, extending this oversight to
6 state actors, and, in some cases, to private actors as well. This research focuses on one
7 category of impacts—those related to transportation—and compares emerging
8 alternatives to motor vehicle level of service in defining a transportation impact.
9 Massachusetts and New York City have broadened the traditional level of service concept
10 to include multiple modes of travel, while King County, Washington has added a
11 greenhouse gas component to the environmental checklist. In contrast, California is
12 moving away from level of service, replacing it with vehicle miles traveled. These new
13 methodologies reflect subtle differences in the definition of a transportation impact, with
14 some emphasizing the local impact on the transportation system, while others focus on
15 the impact on global greenhouse gas emissions.

16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46

1 INTRODUCTION

2 Following the passage of the National Environmental Policy Act (NEPA) at the national
 3 level, fifteen states enacted their own State Environmental Policy Acts (SEPA), which
 4 require review of all actions that may have significant environmental impacts (1, 2). In
 5 most of these states, the SEPA process applies only to actions undertaken by a state
 6 agency. However, a few states, including California, New York, Hawaii, Massachusetts,
 7 Minnesota, and Washington, extended the review process to actions at the municipal
 8 level as well. Because land use development often requires approval by the local
 9 government, and because this approval is an “action” subject to review, private
 10 development in these states is therefore also regulated by the environmental review
 11 process (3).
 12



13
 14 FIGURE 1: Levels of Application for Environmental Review Law

15 Environmental reviews often include a transportation impact analysis (TIA),
 16 which is an assessment of the action’s impact on the transportation system. In practice,
 17 most states narrowly define “transportation” to include only the effect on motor vehicle
 18 capacity and level of service (4), where it is not uncommon for the TIA to instead refer to
 19 a “traffic impact analysis” rather than a transportation impact analysis. Viewed through
 20 these metrics, rarely do federal or state agency actions, which often include adding
 21 capacity for motor vehicles, trigger thresholds related to transportation impacts. Although
 22 environmental review documents for such projects serve to compare multiple
 23 alternatives, the TIA is often of less importance compared to other elements in the
 24 review.

25 In contrast, for the six states that extend the review process to the local level
 26 (California, New York, Massachusetts, Washington, Hawaii, and Minnesota), the TIA is
 27 often a lengthy and contentious part of the environmental review. The inclusion of private
 28 development within environmental regulation is particularly important for the evaluation
 29 of transportation impacts, as scholars have long noted the inextricable link between
 30 transportation and the built environment (5). Given this relationship, a change in either
 31 will invariably “impact” the other. It is therefore unsurprising that the scope and
 32 importance of the TIA generally increases when environmental regulation is extended to
 33 the local level, and states with local application of SEPA (California, New York, Hawaii,
 34 Massachusetts, Minnesota, and Washington) generally have the most comprehensive
 35 guidelines with regard to transportation impact analyses. The guidelines in these states

1 are applied far more frequently compared to those in states that do not regulate private
2 development.

3 In these states, and throughout the entire United States, motor vehicle level of
4 service has generally been the dominant transportation impact metric. However, there is a
5 growing perception that motor vehicle level of service alone is either inappropriate or too
6 limited for the measurement of transportation impacts (4, 6). The movement to replace
7 level of service is particularly strong in urban areas, where initiatives to improve
8 bicycling and walking have, perhaps ironically, been stalled during the environmental
9 review process when motor vehicle level of service is degraded (7). In response, a few
10 states have either expanded or supplanted level of service with different metrics. This
11 review examines these alternative metrics.

12 **ALTERNATIVES TO MOTOR VEHICLE LEVEL OF SERVICE**

13 Of the local application states, California, Massachusetts, Washington and New York
14 provide examples of possible alternatives to motor vehicle level of service in
15 transportation impact analysis required by environmental law. The State of Massachusetts
16 is expanding level of service to require multi-modal level of service (MMLOS) principles
17 in all TIAs. In contrast, California is moving away from level of service, replacing it with
18 vehicle miles traveled. At the county level, King County, Washington has added GHG
19 analysis, including GHGs from transportation generated by the project, to the
20 environmental analysis checklist. At the municipal level, New York City requires the
21 traditional motor vehicle level of service to be augmented with additional level of service
22 metrics in the environmental review.

23 The table below summarizes alternative metrics in states that extend SEPA to the
24 local level. Where explicit guidelines were not provided, the table reflects metrics used in
25 environmental review documents.
26

Area	Metric	Threshold for Significance
New York City	Motor Vehicle LOS, bus load, rail line haul capacity, pedestrian movement	Determined locally
King County, Washington	Auto trips generated, level of service, greenhouse gas emissions generated by development	Determined locally
Massachusetts	Motor Vehicle LOS, MMLOS	1) Degraded LOS 2) Inadequate bike/pedestrian access
California	Vehicle Miles Traveled	Determined locally

27 TABLE 1. Alternative Metrics to Motor Vehicle Level of Service

28 **New York City**

29 One notable exception to the traditionally exclusive focus on automobiles includes New
30 York City, which has also historically reviewed impacts on bus service, rail service, and
31 pedestrian movements.
32

1 The New York State Environmental Quality Review Act (SEQRA) mandates the
2 preparation of an environmental analysis for any state or local action that may impact the
3 environment. With regard to transportation, SEQRA mandates the preparation of an EIS
4 when the action may have a “substantial adverse change to ambient air or ground or
5 surface water quality...traffic or noise levels,” leaving it to local jurisdictions to
6 determine the metrics and thresholds of significance (SEQR 617.11(a)(1)). The Act also
7 allows local agencies to adopt “any additional procedures which may be necessary for
8 them to implement” requirements in the law, with the requirement that local review be no
9 less protective of the environment than SEQRA. Under this authority, New York City
10 established the City Environmental Quality Review (CEQR) process in 1977. Projects
11 must include analysis of impacts to vehicular traffic, rail transit, bus transit, pedestrian
12 movement, and parking.

13 *Thresholds for Significance*

14 Autos: The methodology used in the analysis is the motor vehicle LOS. A project is
15 considered to have a significant impact if motor vehicle LOS is degraded.

16
17
18 Rail: A project must not only look at the impact to line haul capacity, but also the impact
19 on stairways, passageways/corridors, turnstiles, and platform conditions.

20
21 Bus: If the projected bus load is above the maximum capacity at any time, the project is
22 determined to have a significant impact.

23
24 Pedestrian Movement: NYCDOT evaluates pedestrian space at corners/crosswalks and
25 pedestrian flow along sidewalks using LOS calculations. The determination of
26 significance depends heavily on the area (CBD or non-CBD). This is because, according
27 to NYCDOT, pedestrian in the CBD have “become acclimated to, and tolerant of,
28 restricted level of service conditions that might not be considered acceptable elsewhere.”

29
30 Parking: If the project generates the need for more parking than the amount that is
31 available nearby, it may be considered a significant impact.

32 *Mitigation*

33
34 The CEQR Technical Manual emphasizes the importance of looking at each travel mode
35 as an element within the comprehensive transportation system. The Manual lists
36 appropriate mitigation measures for impacts to each mode but acknowledges that the
37 relationship between traffic, transit, and pedestrian needs should be carefully considered
38 when mitigation measures are determined. For example, projects should not undertake
39 mitigation measures that would create new significant impacts or aggravate already
40 projected significant impacts elsewhere. One example provided is the tradeoff involved
41 with re-timing signals. Lengthening the green time for motor vehicles—thus increasing
42 capacity—may reduce the time for pedestrians to cross the street.

43 **Massachusetts**

44
45 As with CEQA, Massachusetts Environmental Policy Act (MEPA) Guidelines are
46 currently being amended to incorporate state greenhouse gas reduction goals and

1 implement Complete Streets policies. The Draft Transportation Impact Assessment
2 Guidelines for Transportation Impact Assessments prepared under the MEPA were
3 submitted for public review in November 2013 (8). The updated TIA Guidelines are
4 designed to encourage efficient transportation and support the continued development of
5 a multimodal network. These principles are functionally incorporated into MEPA through
6 the addition of the Multimodal Level of Service (MMLOS) metric in transportation
7 impact analyses. The MMLOS method, adopted by the Highway Capacity Manual in
8 2010, estimates perceived level of comfort for bicyclists and pedestrians along urban
9 streets (9).

10 According to MEPA, a TIA is required if the project generates 3,000 or more
11 average daily automobile trips (ADT) or includes the construction of 1,000 or more new
12 motor vehicle parking spaces at a single location. The TIA should include a level of
13 service analysis of signalized intersections, freeways, and urban streets using the
14 procedures in the most recent Highway Capacity Manual. Multimodal Level of Service
15 analyses using the HCM 2010 method should also be calculated for bicyclists and
16 pedestrians at nearby intersections and streets (8).

17 *Thresholds for Significance*

18 A project is determined to have a significant environmental impact that warrants
19 mitigation if it adds enough vehicle trips to degrade motor vehicle level of service on
20 facilities that already score a level of service of D or worse.

21 A project may also have a significant environmental impact if it attracts trips to a
22 site that does not currently provide adequate pedestrian, bicycle, or public transit access
23 (8). Although the Guidelines support MMLOS principles, the thresholds for significance
24 are not tied to impact of the development on bicycle, pedestrian, and transit level of
25 service. Instead, MMLOS analyses should be used for “informational purposes.” Aware
26 of continued development in the MMLOS methodology, the Massachusetts Department
27 of Transportation acknowledges that “the MMLOS procedures highlighted in this
28 document are relatively new and are expected to improve over time, allowing for more
29 detailed analysis” (8).

30 *Mitigation*

31 The mitigation measures outlined in the updated TIA Guidelines are primarily focused on
32 reducing the number of generated vehicle trips instead of increasing roadway capacity.
33 Suggested mitigation measures include improving bicycle, pedestrian, and transit
34 facilities, reducing the amount of parking provided, and other TDM measures. Roadway
35 widening may be an acceptable mitigation measure if bicycle and pedestrian facilities are
36 not negatively affected as a result of the mitigation measure.

37 **King County, Washington**

38 The Washington SEPA lists “transportation,” as an element of the built environment that
39 is subject to environmental review (WAC 197-11-444). At the beginning of any project,
40 the lead agency must complete a preliminary analysis using the SEPA checklist to
41 determine whether a full Environmental Impact Statement (EIS) is required. The
42 transportation element of this checklist requests information about auto access, nearby
43 public transit routes, parking, and auto trips generated (WAC 197-11-960). However, it
44
45
46

1 does not require an assessment using the multimodal level of service metric. After
2 completing the checklist, the agency must determine whether additional environmental
3 review with an EIS is warranted. SEPA does not specify specific thresholds for
4 determining whether a transportation impact is significant.

5 In addition to calculating auto trips generated (ATG), King County, Washington
6 supplements the SEPA Checklist with a projection of GHG emissions as a result of the
7 action. This comprehensive inventory includes emissions from the construction, energy
8 demands from use of the project after it is completed, and emissions from transportation
9 demands created by the development (10).

11 **California**

12 Rather than augmenting motor vehicle level of service, California is moving to replace it
13 entirely with vehicle miles traveled (VMT). In an effort to better align the California
14 Environmental Quality Act (CEQA) with the state's environmental goal of reducing
15 greenhouse gas emissions, Governor Jerry Brown signed SB 743 on September 27, 2013.
16 The legislation amends CEQA guidelines related to traffic and transportation impacts by
17 removing motor vehicle level of service an appropriate metric for development.

18 Vehicle miles traveled retains the focus on motor vehicle traffic. However,
19 according to proponents, it offers a number of subtle yet important differences, especially
20 with regard to infill development. According to the California Office of Planning and
21 Research, an increase in traffic, by itself, is much more of a behavioral impact than it is
22 an environmental impact, and that the focus of motor vehicle level of service is more
23 aligned with facility performance than the environment (11). By penalizing location-
24 efficient projects, the prioritization of level of service actively contradicts many of the
25 state's efforts to improve air quality and reduce greenhouse gas emissions (11).

26 **CONCLUSION: REDEFINING "TRANSPORTATION IMPACT"**

27 Although there is an emerging consensus in these local application states that motor
28 vehicle level of service alone is inappropriate as a transportation impact metric, there is
29 no similar level of agreement on its replacement. The differences in newer methodologies
30 reveal diverging opinion on the very definition of a "transportation impact."

31 New York and Massachusetts interpret a transportation impact to be an effect of
32 development or government action on the transportation system. In this sense, the issue
33 with motor vehicle level of service is that it is incomplete in the consideration of only one
34 mode of travel, and the natural remedy to this problem is to broaden the level of service
35 concept to include all modes of travel—bicycling, walking, transit, in addition to motor
36 vehicles. In the case of King County, Washington, a transportation impact includes not
37 only the effect on the transportation system, but also the secondary effects that the
38 resulting transportation system will have on the natural environment. Not only does this
39 move beyond the built environment to include impacts on the natural environment, this
40 much more expansive definition adds a global component, greenhouse gas emissions, to a
41 process that is generally focused on local effects. In California, the adoption of VMT is
42 not entirely different from level of service—it is still chiefly concerned with the built
43 environment and retains the focus on motor vehicle traffic. Yet VMT does not ignore the
44 transportation system's effect on the natural environment—it is much more tightly
45 correlated to greenhouse gas emissions compared to motor vehicle level of service (12).

1 The advantages offered by the methodology should therefore be considered by states
 2 looking to streamline the transportation impact process whilst not deviating too far from
 3 level of service.

4 As states, counties, and cities continue to refine the environmental review process,
 5 it is important that they consider the underlying definition of a transportation impact.
 6 Should the environmental process highlight the impacts of development on the
 7 multimodal system? Should the transportation impact be concerned with the nexus
 8 between transportation and effects on climate change? Finally, is the definition more
 9 flexible, where the methodology can indirectly address both concerns?

10

11 REFERENCES

1. American Planning Association. (2002) Growing Smart Legislative Guidebook: Model Statutes for Planning and the Management of Change.
2. Selmi, D., and K. Manaster. *State Environmental Law*. Thompson-Reuters, St. Paul, Minn., 2010.
3. Mandelker, D. R. *NEPA Law and Litigation*, 2nd ed., for the citation about regulation being extended to private development, it is specifically located in Section 12.05[1], 2013.
4. Matute, J., and S. Princetl. Use of Performance Measures that Prioritize Automobiles over Other Modes in Congested Areas. California Center for Sustainable Communities at UCLA, Los Angeles, 2013.
5. Ewing, R., and R. Cervero. Travel and the Built Environment: A Meta-Analysis. *Journal of the American Planning Association*, Vol. 76, no. 3, May 2010, pp. 265-294.
6. Hiatt, R. An Alternative to Auto LOS for Transportation Impact Analysis. in *Transportation Research Board 85th Annual Meeting (No. 06 - 2306)*, 2006.
8. Massachusetts Department of Transportation. Draft Transportation Impact Assessment Guidelines. 2013. <http://www.env.state.ma.us/mepa/mepadocs/2013/112013em/pn/15.pdf>.
7. Henderson, J. Level of service: the politics of reconfiguring urban streets in San Francisco, CA. *Journal of Transport Geography*, Vol. 19, no. 6, December 2011, pp. 1138-1144.
9. Transportation Research Board. Highway Capacity Manual. Washington, DC, 2010.
10. King County Department of Permitting and Environmental Review. King County Climate and Development Regulations. *King County, Washington*, <http://www.kingcounty.gov/property/permits/info/SiteSpecific/ClimateChange.aspx><http://www.kingcounty.gov/property/permits/info/SiteSpecific/ClimateChange.aspx>. Accessed 2014.
11. California Governor's Office of Planning and Research. LOS in CEQA Transportation Analysis. 2014. http://opr.ca.gov/docs/LOS_in_CEQA_slides_for_website_v3.pdf. Accessed April 20, 2014.
12. Miliam, R. Transportation Impact Analysis Gets a Failing Grade When it Comes to Climate Change and Smart Growth. Fehr and Peers., 2009.

13