Measuring Incremental SB 743 Progress

Accounting For Project Contributions Towards Reducing VMT Under California's Senate Bill 743

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Image source: https://commons.wikimedia.org/wiki/File:San_Francisco_Caltrain_Station_as_seen_from_I-280.jpg

On September 27, 2013, California's governor signed Senate Bill (SB) 743 into law, in part mandating the transition from a level-of-service-based (LOS) measure of transportation environmental impacts to a vehicle-miles-traveled-based (VMT) one in compliance with the California Environmental Quality Act (CEQA). Several California jurisdictions, including San Jose, Pasadena, and San Francisco, have moved quickly to comply with SB 743, so it is no surprise that several of these early-adopter cities have been working hard to develop powerful VMT estimation methods and tools using the most recent research available. While early-adopter cities can be expected to be technically ambitious by nature, which leads them to develop comprehensive and often complex VMT measurement techniques, CEQA also sets a high bar for measurement. The Governor's Office of Planning and Research (OPR)—the entity charged with helping California governments implement CEQA and SB 743—has issued CEQA guidelines requiring an evidence-based, "essential nexus" between a project's environmental impacts, the government's "legitimate interest" in those impacts, and the mitigation measures imposed on the project sponsor (e.g., the developer) must be roughly "proportional" to those impacts.[1]

In an effort to establish SB 743 policies and procedures that will best serve their communities while meeting the standards set by SB 743 and the guidance offered by OPR, several early-adopter cities have been working to develop powerful and flexible VMT calculation methods. However, these cities have also encountered significant obstacles to developing these methods. This paper uses the experiences of an early-adopter city, San Jose, to identify and illustrate the challenges faced by California planners trying to meet the legal requirements of SB 743 and the practical needs of their communities in developing the VMT calculation methods.

SAN JOSE AND THE CHALLENGES OF VMT PREDICTION

Prior to the Governor's signing of SB 743, many jurisdictions (including San Jose) had travel models and techniques on hand to calculate VMT. The City of San Jose found several shortcomings in these pre-existing travel models and techniques, leading their team to work towards developing a spreadsheet calculator, the *San Jose VMT Evaluation Tool* (as well as a separate set of associated calculation methods to evaluate the change in VMT from transportation infrastructure projects), to address these shortcomings. In addition, San Jose also saw an opportunity to use the development of their tool as a cornerstone element in reforming and streamlining their development review process. In doing so, the San Jose team has set a very high bar for themselves. Fortunately, they have matched these high expectations with determination, substantial resources, and time for researching and building consensus for their sophisticated VMT CEQA analysis policies and methods. Because of these high ambitions, their methods, while operational as of February 2018, will be periodically refined and improved for the foreseeable future. City staff continues to research and improve their methods, working to establish more effective tools for estimating the effects of land use design mitigation measures, neighborhood-scale transportation infrastructure (for mitigations measurement), and transportation demand management (TDM), on VMT (to name a few)—projects that San Jose has identified as difficult in terms of VMT prediction.

A RECENT PILOT TEST OF SAN JOSE'S VMT CALCULATION METHODS

A recent test of San Jose's VMT calculation method found that while it successfully identified an increase in transit ridership and a decrease in VMT from a planned combined bus lane, complete street, and transit signal priority project, the decrease was small, making it difficult to justify the VMT and GHG reduction benefits of such a project. The San Jose team believes the VMT reductions were low, in part, because, while the project was well-designed and pro-transit, it was placed in a largely auto-oriented, suburban context. Had it been proposed for a more urban and multimodal environment, the transit ridership gains and VMT reductions would have likely been larger.

In some ways this is not surprising—context clearly matters. It makes sense that multimodal projects would be more successful in urban contexts, yielding a larger return on investment, in part through lower VMT. However, over-emphasizing the importance of context may also lead to a premature conclusion that there is little hope in building new multimodal (transit, bicycling, and walking) capacity in auto-oriented environments where origins and destinations are so widely dispersed. Indeed, much has been written in the research literature on the difficulties of encouraging transit ridership in suburban areas with transit and multimodal projects,[2] even large-scale projects like San Jose's own light rail system.[3]

On the other hand, we must start somewhere. If we agree that auto-oriented projects (e.g., adding lanes, widening intersections, and increasing design speeds) lead to increased VMT, which is a central premise of SB 743, then we must also conclude that projects adding multimodal capacity and transit-oriented urban form should lead to decreased VMT. This corollary to the SB 743 premise is essential to our efforts to make good on the promise of this landmark legislation.

Based in part on the San Jose experience thus far, three challenges present themselves. The first is accounting for the wide variety of potential urban and transportation system characteristics (the "context") that might have a measurable impact on VMT. The second one is finding the correct geographical area of impact to measure (the "scale"). And the third one is measuring the potential cumulative impacts of a project over time on its surrounding neighborhood ("time").

ACCOUNTING FOR CONTEXT

By its nature, context is complicated. The sheer number of transportation system and urban form characteristics (collectively, the "context") that researchers have identified and measured thus far can be daunting. Cervero and Kockelman placed an early stake in the sand by identifying three critical characteristics of urban form that play an important role in determining travel behavior: density, diversity and design (or the so-called "3Ds").[4] Since then, a number of capable and well-intentioned researchers have expanded the list to include a number of other "Ds" (not all of them being strictly descriptors of urban form or transportation infrastructure) such as destination accessibility,[5] distance to transit,[6] demand management, and demographics.[7] That makes a total of seven so far, and in casual discussions with colleagues it is not unusual to hear rumors of others in the pipeline.

In other words, context is important but difficult to measure comprehensively since it is also very complicated. Handy criticizes this complex approach, pointing out our over-reliance on the ever-expanding list of "Ds" and the lack of understanding of their interactions and suggests we should return to the basics. In her view, all transportation and urban form interactions may be reduced to accessibility.[8] In essence, she calls for abandoning the "Ds" and using just a few "As" instead.

While Handy's analysis is cogent, insightful, and likely correct, she may be looking at this issue mostly from the perspective of a researcher, and not necessarily as a planning practitioner. While it is undoubtedly true that most transportation and urban form interactions are reducible to accessibility, there are many ways a planner can encourage it. Indeed, a good accessibility measure may provide more explanatory power and theoretical accuracy than the seven (or more) "D" variables, but it will not provide actionable clues to a planning professional about what elements in her plan need tweaking to increase it.

For example, density and diversity (mixed land uses) each play an important role in providing greater accessibility, but not necessarily in isolation. Dysfunctional density[9] (yielding low accessibility) may occur when residential densities are high but there is very little mixed land use. The result is little or no VMT reductions per capita compared to low-density, suburban residential neighborhoods. Therefore, high densities alone may not shorten walking distances to retail and therefore may not reduce VMT, but a mix of high-density/high-diversity neighborhoods can. Importantly, the proportions of each type of neighborhoods can yield vastly different accessibility and travel behavior outcomes; suggesting the importance of the D variables (and other measures of context) to planning practitioners.

San Jose and other cities face similar practical concerns. VMT estimation would be easier (and, as Handy suggests, perhaps more accurate) if San Jose could stick to a small handful of accessibility measures. However, there is a large variety of site and neighborhood characteristics that a transportation planner, urban designer, or architect must consider when designing a new transit line, specific plan, or building. Such characteristics may not appear to have an effect on VMT, but research suggests that they do. Furthermore, the ways in which these design characteristics synergistically work with or against the characteristics of the surrounding neighborhood (the context) to affect VMT may be lost when we reduce our analysis to a theoretically pure and simple set of “A” metrics. On the other hand and as Handy suggests, the more independent variables you include in your model, and the more interactive effects you try to account for, the more you risk double-counting the benefits of each of those variables.

The most recent version of San Jose’s VMT Evaluation Tool has at least 27 urban form, physical and programmatic measures that project sponsors can use to decrease VMT from their proposed developments. Furthermore, the coefficient of change associated with each measure is also modified by a set of five place type classifications to account for the interactions between site-level (project) and neighborhood-level (context) characteristics. Put simply, this approach is in danger of becoming unruly, and if it were not for the practical considerations discussed above, this would seem to be a good reason to do as Handy suggests, that is stick to the “As” and drop the “Ds”.

San Jose’s answer to the “double-counting” problem is to place a cap on the interactive effects of multiple independent context variables – that way they account for the interactive effects but they will never exceed a predetermined amount of VMT reductions. While this approach suppresses the effects of double-counting, it limits the legitimate interactive effects as well. Taken by San Jose from a CAPCOA 2010[10] study, this cap-the-complexity approach may seem to be a blunt instrument since it forces an admittedly imperfect model to give us answers that confirm our theoretical preconceptions. Nevertheless, it represents a realistic compromise between the need to measure the complexity of the real world and the shortcomings of our ability to accurately model it.

Thus, San Jose’s efforts to address context complexity head-on is a logical course of action, but one that has also increased the difficulty of their task. While San Jose’s comprehensive approach to project and context measurement for VMT estimation has the important advantage of providing project sponsors with a variety of levers they can pull to minimize their projects’ VMT, its complexity makes it difficult to know whether the model is accurately accounting for the variety of synergistic and overlapping (collinear) effects of all its intricate parts.

ACCOUNTING FOR SCALE

The size of a proposed project affects the scale of its potential VMT impacts—the more regional-serving the project is, the larger the potential impacts on traveler decisions. Large infrastructure investments such as a new light rail line will have a larger impact area than a local project such as a set of new bicycle lanes. Unfortunately, a project may be large enough to require CEQA review and analysis but too small to register the potential VMT impact of various design choices for that project using our current analysis tools.

Furthermore, the scale of VMT impacts and, by inference, the sensitivity of the analysis to calculate VMT impacts are influenced by the performance measure selected for the analysis. If a project’s jurisdiction elects to use the net change in total roadway VMT as its CEQA performance measure for transportation project impacts (as recommended in OPR’s SB 743 Guidelines), the VMT impacts of a new vehicle overcrossing, for example, may vary dramatically with varying sizes of the analysis area.

While ideally, a project’s geographical analysis area should match its sphere of influence, the area is sometimes too large or too small for the existing analysis models and tools to register them and produce reasonable results. Therefore, one way to address these scale issues is to set the analysis area for small projects to a correspondingly small size, increasing the odds that the impacts are measurable with the existing analysis tools. In their pilot study of a proposed new dedicated bus lane (effectively, a bus rapid transit line), San Jose defined the analysis area by identifying the automobile trips that currently use the travel corridor affected by the proposed project. Using the origin-destination (O-D) pairs from their travel demand model for all automobile trips using the travel corridor, the San Jose team was able to estimate how many of those automobile trips would likely shift to transit. Nevertheless, as the results of the pilot study suggest, this approach left something to be desired and led the San Jose team to look for other enhancements of their methods to address the relevant issues.

Therefore, using an analysis area that is too small will not capture the VMT effects outside the boundary when it should, while on the other hand, using one too large will capture the effects for areas when it should not. CEQA is a law that requires full disclosure of potential project impacts. According to the policies laid out in the CEQA Guidelines, “CEQA does not require technical perfection in an EIR, but rather adequacy, completeness, and a good-faith effort at full disclosure.”[11] Therefore, using an inappropriate analysis area may be seen as an intentional attempt to ignore potentially significant impacts.

Thus, it seems there is an important tension between the need for sensitivity (pushing analysts to define an analysis area based on model/tool capability) and the need for full disclosure (possibly pushing analysts to define an analysis area beyond what the model/tool can handle and to apply off-model analysis methods).

ACCOUNTING FOR CUMULATIVE IMPACTS – CONTEXT AND SCALE COMBINED OVER TIME

So far, we have established that the travel behavior impacts of a transportation or land development project can vary according to its size and the characteristics of the project and its neighborhood (context). But even if the project’s characteristics do not match the surroundings when the project is built (and consequently, there are no desirable synergistic effects between project and context), changes occurring over time may provide a better synergistic match. In fact, the project may play an important role guiding the development patterns and transportation infrastructure improvements in the future, even though there was a mismatch in the near term at the time of project completion.

For example, Ewing and Hamidi found that Portland’s Westside Max light rail transit extension had a direct effect on VMT resulting from travelers switching from car trips to transit trips, and an indirect set of effects that accumulated and increased over time resulting from increases in walking and bicycling activities around stations—activities that are themselves influenced by the increased density and land use diversity in those station areas. For every vehicle-mile reduction achieved from mode shifts to transit (the direct effect), according to Ewing and Hamidi’s estimations, the Westside Max extension achieved an additional 3.04 of reduced VMT over a thirteen-year period from its opening in 1998 to 2011 (the indirect effects).[12] Therefore, while our methods of capturing near-term, direct impacts from large-scale transportation projects have advanced considerably, our ability to capture the long-term, indirect effects of projects on their surrounding neighborhoods remains challenging.

To summarize, time matters as well. A project's impacts on its surrounding context and VMT can be expected to change as both the project and the surroundings mature. Further, scale and time interact. Large-scale projects affect larger geographical areas and hold the possibility of yielding even greater influence on the surrounding neighborhood, changing context and travel behavior over time more than small-scale projects. In a meta-analysis of research comparing bus and rail impacts, Zhang argued that metro (sometimes called "heavy") rail transit can achieve over five times the carrying capacity of light rail and bus rapid transit modes, and, as a result, exert greater effects on surrounding property values and densities.[13] Thus, large-scale, high capacity transportation projects not only have the potential to affect ridership and VMT when they open for operation, but they also have a cumulative effect over the long run as more compact land uses cluster near them and other transportation facilities are built to enhance the attractiveness of transit, walking, and bicycling.

CONCLUSIONS

Measuring and predicting the effects of context, scale, and time are proving to be challenging for San Jose's efforts to develop reliable SB 743 VMT calculation methods. As the discussion above suggests, predicting the effects of context and scale on a project's VMT outcomes is hard enough. However, measuring the effects of these factors over time (the cumulative impacts) is particularly difficult since the relationships between context and scale, among other factors, can be expected to change as the project and its surroundings change.

Nevertheless, hope can be found in San Jose's approach. While ambitious, it seems promising, at the very least, as a useful means for collaboration between the planning researchers and practitioners. Indeed, as San Jose and other California jurisdictions continue to design, test, and build their SB 743 methods, they also identify gaps in our research and understanding of the factors affecting VMT.

ENDNOTES

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