Final Report

Emissions Modeling in Transportation Planning: Institutional and Policy Processes

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16. Abstract

This final report describes a pilot study concerning the political context in which changes to the technical tools of transportation planning are made. The impetus was the deployment of a new motor vehicle emission factor model that bears significantly on the responsibility of each metropolitan planning organization in an air quality nonattainment area to demonstrate conformity with the air quality plan. The difficulty of presenting such technical matters to the policy boards that direct agencies such as MPOs can sometimes lead to problems satisfying regulatory requirements such as transportation conformity and thereby jeopardize the flow of federal funding. Thus, this study endeavored to identify key issues about the introduction of new models and how such changes are handled politically.

The finding suggest that carefully planned and targeted briefings to non-technical agency directors can improve the situation and help avoid bumps in the road but this is fundamentally complex.

Further research is not recommended although agencies, such as FHWA, that operate capacity building programs, are encouraged to apply resources to this area.

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Objective

The purpose of this pilot project, generally, was to examine the dynamic in transportation planning between the evolution of technical planning tools and the political process in which transportation plans are developed, adopted, and implemented. Specifically, the project concept emerged in anticipation of the release of a new emission factor model by the U.S. Environmental Protection Agency. This model is used in the calculation of air pollution from motor vehicles; it is central to several regulatory requirements on which federal approval and funding depends.

When changes are made to the technical aspects of the planning process, such as the introduction of a new model or the updating of important data inputs, such as demographic projections, it can alter the planning outcomes. The elected officials and other non-technical decision makers may or may not be sensitive to these factors but they are extremely responsive to changes in the outcomes, especially if it is not in their favor. Friction between these factions can produce upsets in the planning process, disrupt the development or deployment of projects and cause strain on inter- or even intra-agency relations.

The introduction of the new EPA model, MOBILE 6, appeared to offer an opportunity to observe this dynamic and derive some lessons that would be useful for similar situations in the future.

Method

As a pilot project, the funding did not allow for a detailed investigation of case studies but through participation in relevant conferences, events, and panels, as well as a literature review, it was possible to derive some lessons.

Findings

In areas that do not meet federal air quality standards, transportation plans must satisfy the transportation conformity rule, which is a regulation designed to link transportation and air quality plans. To satisfy this regulation, a metropolitan planning organization must take the travel demand projected with the planned investments and apply emission factors to the projection of vehicle miles traveled. If the resulting quantity of emissions exceeds the emission budget provided by the state's environmental agency (which is also based on the mpo's travel model and the same emission factor model), federal funding and approval can be withheld until the situation is corrected.

MOBILE is the name of the emission factor model that EPA has developed for calculating transportation emissions. Based on a variety of variables, it assigns emission rates (in grams per mile) to every road segment in the travel network model. The model

calculates aggregate emissions by applying those rates to the VMT output of the travel model.

Over the years, EPA has issued revisions of the MOBILE model and in January 2002, after extensive pilot testing and significant delays, it released version 6.0. According to environmental regulations, the areas required to use an emission factor model had to adopt the new version (M6) within two years. Some areas had committed to adopt the model within one year in exchange for emission credits.

The model's introduction triggered several patterns. In some cases, MPOs had to conduct their emissions analysis sooner than the planning cycle normally would have required. This fact prompted a great deal of resentment from agency managers as well as their staffs. In other cases, the MPO would have to conduct its emission analysis with the new model before the state air agency had used the new model to produce a new set of emission budgets. This apples-and-oranges comparison frequently endangered the MPO because M6 tends to project higher emissions than its predecessor.

Overall, however, the most significant impact was that M6 was much more data intensive that previous versions. For example, it calculated emissions on entrance and exit ramps separately from regular highway driving, forcing travel models to be adjusted or for an off-model calculation to be performed. Other disaggregations were required, each one imposing significant resource impositions on the agency obliged to address it.

To ease this data burden, EPA provided default data with the model that it had produced by making national assumptions. But clearly the circumstances of any one city differ from those of another and the national defaults could be flawed by any amount and in either direction, causing concern for some parties about overestimation and others about underestimation of emissions.

Tremendous efforts went into sensitivity analyses of the data to determine the data elements to which the model was most responsive and where, consequently, agencies should put their efforts. Several such efforts produced strikingly similar results, a fact that significantly ameliorated the concerns of agencies and staff members responsible for the transition. Factors such as frequency of cold engine starts, humidity and the abundance of highway ramps ranked high in each of the analyses.

Ultimately, an MPO's bottom line was its ability to pass the conformity test with the new model. While some managers and staff members were frustrated by the workload created by transitioning to the model, everybody, especially the elected officials sitting on an MPO's board or awaiting project funding, was extremely concerned about the failure scenario.

To the advantage of agency staff responsible for briefing the board of managers or their own executives, the issues were sufficiently arcane to discourage most political meddling. Such is a mixed blessing, however, because in those instances where an MPO

had trouble demonstrating conformity with the new model, it was very difficult to explain the technical issues in a way that resolved anger or frustration with the staff.

One additional issue that colored the transition was the use of the model as a basis for policy changes. A prime example has to do with the so-called "speed curves" built into the model. These curves represent how the model assigns emission rates to different vehicle operating speeds. Based on current scientific understanding, the model essentially found that emissions began increasing at lower speeds than MOBILE 5 had suggested. Especially in heavy duty trucks, such as tractor trailers, the emission rate took a very steep jump when speed reached a certain point. This affected policy because in some places it became attractive to impose a lower speed limit (from 70 to 55, for example) to reduce emissions. While technically sound, such initiative earned the policy's advocates extraordinary scorn from politicians as well as, unsurprisingly, the operators of heavy duty truck fleets.

Conclusion

This preliminary research underscores that tension between the technical and political processes are inherent in the planning practice. The challenge before members of the technical staff to appropriate engage their agency's executives and policy boards is a perennial one that seems to be managed by the skills and abilities of individual staff members. It is an area often over looked by training programs and could merit further attention in capacity building programs, such as Federal Highway's.

But while the difficulty of explaining the consequences of the model change to non-technical planning officials was one challenge in the transfer to M6, the greatest controversy and difficulty derived from the polices driving and being driven by the details of the model's revision. Even the smallest suspicion that M6 was specifically designed to favor certain policy strategies or to discourage others has caused significant divisiveness in certain areas.

Recommendation for Further Work

Finally, it appears that while this made for a provocative pilot research project, there is no reason for further study. Progress in this area depends on the training of technical staff to perceive the political contexts in which they work. It also depends on the education of non-technical planning officials, a consistently-overlooked area of investment in human capital. Preparation of relevant elected officials and non-technical agency management for episodes such as the transition to M6 could avoid confusion-induced opposition that can disrupt the planning process, generally at cost to the transportation agencies.