Nevada County Transportation Commission meeting – November 8, 2023

Rural Induced Demand Study Status Update
Presentation by Jim Damkowitch of DKS Associates

Mike Woodman:

In 2022, to address the lack of induced demand research in rural settings and context, the California Rural Counties Task Force approved $150,000 to fund a Rural Induced Demand Study and selected the Nevada County Transportation Commission to manage that study process. NCTC selected the consultant team of DKS Associates, GHD Inc., and it also includes academic researcher Anurag Pande from Cal Poly. The theory of induced demand is based on urban research studies of congested highways and it examines the resulting effects of transportation improvement projects. The research studies theorized that if transportation improvements in heavily congested urban corridors and interstate corridors added new capacity to address that congestion, it would generate new trips and result in an increase of vehicle miles traveled and thereby reduce the anticipated congestion relief benefits of the project.

Rural agencies have repeatedly expressed concerns that rural transportation projects and rural highway corridors that are absent significant levels of congestion are being mischaracterized as inducing demand and being unfairly disadvantaged in state funding programs. That was really the impetus to the Rural Counties Task Force funding the study, to get more research on rural context of induced demand. So today we have our team, Jim Damkowitch, the lead for DKS Associates, and Don Hubbard, who's the lead for GHD Inc, to provide a status update and review the preliminary findings of the study.

Jim Damkowitch:

That was a good introduction. My name is Jim Damkowitch, I am project manager for the study. The study includes a number of key steps. One is a literature review which Don Hubbard will be presenting. There was also a sensitivity analysis of the analysis tool that was developed by the state to address the induced demand phenomenon as it relates to project level analysis for transportation projects. And then there was also some need for recommendations.

And that's really the core piece that we want to get to. The state is making recommendations to a number of not only CEQA guidance, but also guidance for state planning and programming, as well as recommendations to UC Davis who did the study of that analysis tool I mentioned. And then of course, to ring the bell to go out and provide this presentation to professional societies and conference proceedings, which we've already done. We did the APA California Conference that was in Fresno just recently. So, with that, I'm going to pass it over to Don Hubbard and he's going to give you a brief overview of our findings from our literature review.

Don Hubbard:

Thanks, Jim. I looked at dozens and dozens of studies. Most of the research on induced demand was done in the 1990s and early two thousands. So, this is stuff that's 20 or 30 years old, that's when it had its heyday. The subject has grown cold since. The main finding that we found on the way the state is approaching this is that they are relying on review studies. Instead of looking directly at what's going on in the research that was done, they're having someone else do a study of studies and then summarize what was done in those studies. And these review studies serve an important function in gathering the data for people that don't have time to read through all the studies like I did and make it digestible for the intended audience. But there is a danger when you do these, if the person making the review study has a bias in one way or another, they can filter out data that they disagree with and present a highly distorted view of what the literature says.

In this schematic, we've got four different studies, A through D. Each of the studies reaches a bunch of conclusions. They might be 20 or 30 pages long, talk about a lot of stuff and end up with an elasticity. And elasticity is a number where they estimate that if you increase road capacity by a certain percentage, that vehicle miles traveled will increase by a certain percentage. So, the creation of road capacity is inducing some additional traffic. When they do this, they are filtering out a whole bunch of information. Almost every study that I looked at went through a whole bunch of different conclusions they presented.

Elasticity is usually as a range, not a number. And they would talk about what situations they think it would be valid for any weaknesses in their data, some cautions about their use and something like that. All that got filtered out in what actually reached the people making the policies for the state. So, as you can see in this diagram, you've got these studies with all sorts of caveats and cautions and stuff. What the people making the decisions get is a table. And then out of that table, which might list 28 elasticities, they're going to have one that's recommended. And so, what we found is there is an enormous amount of information that got filtered out that really ought to be part of the discussion.

So, what got filtered out? Well, the way that the state was measuring induced demand. The thing they're saying is doing it is lane miles, which is a measure of road capacity. But the thing that drives induced demand is a reduction in travel times, not the capacity per se. So, if you've got a crowded congested corridor and you add another lane, well then yeah, there's going to be a bunch of travel times are going to go down and more people are likely to use that road. But if the road is not congested and you add a lane either for safety purposes or for evacuation purposes or something else, it has no effect on travel time, and so, it isn't going to have any effect on induced demand. And you can see why a study that's based on a congested urban area is going to get very misleading results in the rural area because there isn't any congestion, the additional lane isn't going to induce any demand.

We also found that if you look, instead of individual studies, you look at the body of literature, that the numbers were going down over time. And part of that is the studies themselves got better as you went through the nineties and into the two thousands. The first ones were just full of errors, methodological errors and data errors. And as that got cleaned up, people found that induced demand was shrinking, there was less than they thought. And then secondly, induced demand itself seems to be falling over time. So, there was a study that looked at this and said induced demand may have been 44% of total increase in traffic in the 1970s, dropping down to just 10% in the eighties and even less afterwards.

The other thing they found when they spoke to drivers is that only really significant reductions in travel time change behavior. In other words, if there's only minor changes, one or two minutes, then people might change their departure time or something like that. But otherwise, they're still going to be shopping in the same places, working in the same places, living in the same places. That isn't going to make any difference. You have to have a major project that reduces travel time by at least 15 minutes before people are ready to change their habits and live or work or shop in a new place.

Also, the underlying assumption in these studies is that developers are watching what's happening with road projects and they're basing their projects on that. They are assuming that if you say you're going to widen the road, that developers are going to buy up the land and then they're going to build their stuff there based on that. But we're not talking about Petri dishes here. These are people, you could just ask them what they did. And we found almost none of the researchers did this. They were just sitting at their desks looking at their data. The few that actually did talk to developers found that none of that was true. What developers were doing is they were looking for cheap land that had some access to the road system. They didn't care if it was four lanes or six lanes or whatever, as long as you could get to the site and it was marketable, that was fine with them.

And then if it needed more capacity later, the new residents would just apply political pressure to get the road widened, in which case it would be that the development is inducing the road capacity, not road capacity inducing development. What they found is this had no effect on developers' plans. Some of this land was bought 15 or 20 years in advance. From a CEQA a standpoint, this is very important

because under CEQA, you're supposed to compare the project and no project scenario. What this is saying is those are identical, as far as land use is concerned.

One of the things I look for is not just what was in the studies, but what wasn't in them. The way these studies work is they look at how vehicle miles traveled increased, and how lane miles increased. They attempt to control for things they think are important like population growth and income growth and things like that. And whatever isn't explained by those variables they're assuming is done is the result of induced demand. So, in the event that they miss something important, it's going to distort the results. And one of the things that they consistently missed was female labor force participation.

During the seventies and eighties, right at the time when the freeway system was being widened, is also the time when women were entering the out-of-home labor market in large numbers. The blue line shows the female labor force participation rate and the orange line shows the VMT per capita. And you can see these are very closely related. By leaving that out of the analysis, they're attributing something to, they're saying the roads created this as opposed to you had millions of new workers that were now driving to work. And that was what was doing it, not the road construction projects.

The bulk of the literature said induced demand is a real thing, or it certainly was at one time at least, but it only occurs under certain conditions. And so, the short-term induced demand, so you widen the road and a month later the traffic has increased. In order for that to happen, you have to have existing congestion that poses a serious constraint, it's severe enough that it's suppressing existing demand. People would like to shop in a different place, but they're deterred by the fact that congestion is bad. And so, you widen the road. Now they can get there easily, that's short-term induced demand. For a long-term induced demand, somebody widens the road and as a result of that, somebody builds new houses and stuff. That's the development response to capacity improvements. In order for that to happen, you have to have sites that are served by the road where development is not constrained by topography or regulation.

That's why induced demand was a big deal in the seventies when land development was sort of the wild west. But as you moved on into the eighties, nineties and the 2000s, CEQA became a big deal and the land development process became a very highly regulated industry. Developers simply weren't as free to respond to changes as they were earlier. Lastly, the sites have to be marketable. You can widen a road out into the desert and there's plenty of developable land there, but nobody wants to live there. So basically, all three of these things must occur in order for there to be any induced demand. And in rural areas, only one of those three things occur.

Finally, we didn't find any support for the approach that Caltrans has taken with their elasticity-based forecasting tool. I won't go into the tool, but basically, they've got a calculator and it uses elasticities that are measured at the state or county level. What the literature itself, including the literature that Caltrans relies on for its tool says, don't do that. It says that if you measure things on a statewide level, it cannot be used to evaluate a project in an individual quarter. It's simply too coarse. You're not going to get the context right. It isn't going to work. And that's in the literature that Caltrans used to develop. This tool says don't do it. And all that got filtered out from the state guidance. And with that, I'll turn you over to Jim to talk about the tool.

Jim Damkowitch:

Thank you, Don. Part of our work was as the state has this elasticity-based tool. It's very simple. It was developed based on capacity changes in the past, primarily focused on metropolitan areas and the interstate highway system. So just out of the gates, the tool itself really is not that well versed with respect to how these things occur in rural areas and what implications they had in rural areas. I'll just very quickly go over some of the tenets of the calculator. It's based on annual increases in induced VMT as a result of expanding capacity of the higher functional classification. Class One are your interstate highways, Class Two are your other freeways and multi-lane highways.

Class Three are your other principal arterials, which are typically two-lane rural highways and things of that nature. But the higher functional classes, and as I mentioned, the tool itself was primarily calibrated or not calibrated, but it was based on research on the interstate system itself. And it produces both short and long-term induced VMT estimates. UC Davis developed the tool through funding from Caltrans. One important thing to keep in mind is that the tool was never validated. And as a modeler myself and Don is a modeler, that's probably the most important step. And, of course, the NCTC Travel Demand Model is a calibrated and validated model. However, this tool that is now being required to be used in some cases, UC Davis, after looking at these three methods of validation, concluded that either the data was too difficult to get or the validation exercises themselves were flawed. Ultimately, they didn't even attempt to validate their own model.

We decided to do some sensitivities testing ourselves. Just that simple comparison method of past projects. If an NCST tool was around 20 years ago, 15 years ago when roadway improvements were being implemented, how would it have performed in terms of how accurate would it have been if it was used back then and calculated the induced effect. And we chose three horizons. We looked at projects that were open to traffic three years ago, and then 10 years ago, and then 20 years ago. We looked at that much time that elapsed after the project was open to traffic. And so, as part of the study, we reached out to our partners, the regional planning agencies and Caltrans and others to provide some example projects that we could use for this test. We got about 50, and we had to screen them out. Some weren't applicable, some the data was too difficult, but there were 15 that we were able to get good information for.

Five of those improvements were in rural RTPA areas, so no metropolitan areas. This is NCTC, you guys are a rural RTPA area, but we also took in 10 projects that were located in rural areas, but within MPO boundaries. And make no mistake, many MPOs, if not all of them, are very interested in this study as well, so they have a very close eye looking at what we're finding. The 15 projects were all Class Two or Class Three facilities primarily given the rural nature of the selection. We used a regional analysis, not a facility specific analysis that is very appropriate for the NCST tool. As Don said, it does a regional countywide analysis. The data sources that we needed to do this analysis was historical lane mile data from Caltrans, VMT data from the Highway Performance Monitoring System, and Department of Finance population. And that goes back as far as 1990 to 2021 and the elasticity of 0.75, you've heard the elasticity of one MPO, even if you're a rural area in an MPO region, you have to use the elasticity of one.

They apply the elasticity of 0.75 for rural RTPA areas. So, for every 1% increase in capacity, there's a 0.75% increase in induced demand on top of any VMT increase that a Travel Demand Model may estimate. So, just to give you a feel for the areas that for the 15 projects, the top line that is the VMT growth, that's the green line. And then below that, the yellow line, that's population growth. And you can kind of see in those rural MPO areas that VMT per capita or VMT per person, it fluctuated over time. There are some periods where it increased so people were driving further and then there would be dips, namely around recession times. And you can see the big dip that occurred in 2020. That's obviously the pandemic, but you see more fluctuation. The two lines at the bottom, those are the five rural RTP areas where VMT trend and the population trend really there is no trend. It's pretty much a straight line across the board, which should give you an indication that even though there was capacity increasing projects being constructed and open to traffic, you're probably not really going to see a huge effect in terms of induced demand.

These are the results, and this is the three years after the project was opened to traffic. Any bar that's shown in red, that is an over prediction by the NCST tool. So, it's overestimating the amount of VMT that you would anticipate given that capacity increase. If it's in the blue on the other side, that's an under prediction. And as you can see, there's a bar right below State Route 49. Every project that's above that line is a rural RTPA area. All the projects below that are in a rural area but within an MPO region.

As you can see for 14 out of the 15 cases tested, 14 were over predicted by the tool. The one exception was State Route 41 in Fresno County. And when we presented this information, I thought this was very interesting. We had the pleasure of having the CTC chair at our panel discussion and she pointed out that because she is from Fresno, that that was the result most likely of the Lemoore Naval Air Station being awarded a new program. They experienced a huge influx in military personnel into the area. And Dr. Pande, who is our academic side of this, is going to be looking in more depth at the State Route 41 case study as well as a couple of others to get more into the finer granularity of cause and effect. So that's going to be an interesting part.

This is 10 years after the improvement was open to traffic. And as you can see for 12 out of the 15 cases, the tool still over predicts. You see State Route 41, but a couple others pop up as experiencing more VMT than what the NCST tool would estimate. But still in general, the tendency is for the tool to overestimate. And in those rural RTPA areas, it overestimates all of them. And then finally the 20-year estimates, some of the projects drop out because they haven't been around or open to traffic long enough to be in this 20-year analysis. But as you can see, 8 out of the 10 cases, the model over predicts. And again, for the rural RTPA areas, it over predicts all five and State Route 41 continues to show up as the key case study that's not.

So, what are our findings from the sensitivity analysis? You can kind of gauge what those are going to be that the tool consistently over predicts or overestimates induce demand. And whether the project is in a rural RTPA area or in an MPO region. For the non MPO rural projects, it's a hundred percent overestimation for projects in rural areas. And MPO boundaries, it overestimated about 80% of the time. And that overestimation was fairly consistent. It didn't matter whether it was three years out, 10 years out, or 20 years out. And you may be wondering why we did that analysis. Well, that long-term induced effect, the one that modifies choices of where you live and where you work. So, these long-term induced effects, they typically, depending on the literature you read, it's three years, it's 10 years. Some say you have to wait 20 years to really see that play out.

So, we looked at all three, the magnitude of the error decreased over time. That was very consistent with what the literature suggests, that the effective induced demand decreases over time. And we also notice that the tool is extremely sensitive. It is overly sensitive. So, the larger the capacity increase, the larger the error. If you have a very small insignificant capacity increase, the error will not be as great. It's a very sensitive analysis tool. And then last but not least, again, Dr. Pande will be examining the presence of causality factors and before and after assessments for about three of the 15 projects that we looked at. So very brief, what are the recommendations? One of the main importance of this study is that rural areas are getting a raw deal on this. And even though the NCST tool has been advised statewide not to be applied in rural non-MPO areas, it is and it can affect choices or decisions on funding projects in rural areas. And it also, this whole concept of induced demand or induced VMT is a real negative and it can really affect what projects get funded and which ones don't in the political world that we live in in transportation programming today.

As I mentioned before, the main technical guides and guidelines that we're looking to make some recommendations for are the OPR guidance for CEQA, related to SB 743, the Caltrans Traffic Transportation Analysis Framework, which basically is how Caltrans implements SB 743. That is currently being updated. So, the timing of this study is critical. The Caltrans, also their CEQA TAC recommendations, that's currently being updated by Caltrans that we're going to be making comments on. And then the California Regional Transportation Plan, RTP guidelines. And that's currently being updated and we have already submitted comments to them.

Others are the Climate Change Plan for Transportation Infrastructure. That's a very important policy document that's really putting a lot of criteria with respect to funding transportation improvements in the state. And then, last but not least, the California System Investment Strategy is also a very important policy document and has a major role in affecting funding decisions on a statewide basis.

For our MPO partners, we're also going to be submitting comments on the California Air Resources Board evaluation guidelines. This is something that doesn't affect rural RTPAs such as NCTC, but it does affect a lot of rural areas in the state that are within MPO boundaries.

I won't go through this too much, but we're going to make recommendations based on an induced demand checklist. And these directly tie into all the things that Don Hubbard mentioned as part of our review of the literature. Namely, these are very simple yes or no questions. Does the facility that's being improved experience significant recurring congestion for extended periods of the day, yes or no? Does the facility experience off-peak congestion, yes or no? Will travel time increase by more than 15 minutes per motorist, yes or no? Is the project on a state facility or any other access-controlled facility, yes or no? That's getting to the higher functional classes. And then does the project increase access to existing or future developable land, yes or no?

Our recommendation will be that for questions one, three, four and five, all of those must be yes, for latent demand to have any potential and to present or even consider the application of the NCST tool itself. So that's very key.

Back to the main theme, to have induced demand, you have to have latent demand. To have latent demand, you have to have pretty severe congestion. And the improvement must result in a very significant increase in travel time savings to the motorist. If those don't exist, you're probably not going to have a latent demand effect. And that's also true if you're not opening up any existing or future developable land. That's not only the physical characteristics, can you actually build something there, but also zoning, farming restrictions, any kind of local land use control over the land, if that's not allowing land to be developed, then you don't have to worry about that long-term induced effect.

Other considerations are, is the project result of an improved development? There are cases where a specific plan gets approved, it's got traction, it's going to happen. And as part of that specific plan, there's a roadway network that's planned to provide access to the folks who would ultimately live in that new development to access the existing network. In that case, it's the land use decision that's driving the need for new capacity, not the other way around.

Last but not least, does the project result in diverting traffic that reduces VMT? I think in rural areas and other areas, this can happen. So, your higher functional class is congested. It's causing people, they'll check Siri, they'll check their phones. There's a way that you can get around that congestion by going on parallel facilities that may increase their vehicle miles traveled, but it's a quicker travel time. But as soon as you add capacity back to that main facility, and it's providing that premium service again, folks will get off of the local roadways, get back onto the higher functional class of roadway and actually reduce VMT. And then these are recommendations on the tool itself, and provide recommendations for rural areas, RTPAs and rural MPOs, how to use the Travel Demand Model in conjunction with the elasticity tool, and in those cases where you shouldn't be needing it at all. So that's related to the induced demand calculation.

The next steps that we're going to be doing, we're going to finalize these recommendations, the modeling recommendations, the checklist, you name it. And we're going to wrap up our causality assessment, the before and after case studies that Dr. Pande is doing and hopefully have a draft that you can all review by December. And I think we'll probably go final in January or February. So, thanks for hanging in there. Long presentation.

Commissioner:

The work that went into this, are they going to use it and make a real difference?

Mike Woodman:

Yeah, we have Caltrans Headquarters Sustainability as part of the project advisory team as well as the California Transportation Commission. And they've indicated they're very interested in getting the recommendations and applying these into the guidelines.

We worked with Caltrans initially several years ago in the development of the traffic analysis framework and traffic analysis for CEQA to where they acknowledged that the urban based elasticities used in the tool don't apply to rural areas outside of the MPOs. However, they didn't acquiesce on rural areas within the Metropolitan Planning Organizations, which these recommendations will address.

Commissioner:

So, these are going to be strong enough though that that actually says you guys did do your studying right and this is how it works.

Mike Woodman:

I believe so. And one of the things both the OPR guidance said, these urban based elasticities shouldn't be applied in rural areas of the state. They should be analyzed on a case-by-case basis. What does that mean? And then the traffic analysis framework for Caltrans is the same thing. It's like the tool doesn't apply to these areas, but doesn't go into detail on what you should do in these areas. So, this will provide that guidance and direction on how to address it appropriately for the areas outside of the MPO as well as rural areas within the MPO. So hopefully it provides that clarifying information.

Commissioner:

I'm going to use a project from an urbanized area, just to make the point that Caltrans do listen, they did listen. And in support of Jim's conclusion, as a result of this study, for example, when we were working, as part of working on the express lanes on US 101, there was a significant amount of community objections, especially along the segments that involves widening of the freeway. And in support of the analysis, we did the travel modeling because the tool did not really reflect the accuracy of the projections of the vehicle or traffic volumes and the VMT. It just assumed that widening the freeway, adding capacity will increase the vehicle miles traveled.

But the travel model showed that building the express lanes would actually divert traffic from parallel arterials and major collectors. It's not creating new traffic, it's just shifting existing traffic. The express lanes also would encourage the use of the express buses, the transit, shuttle services by the various businesses. So, taking that into account, it actually reduced car traffic, relative high occupancy type vehicles. So, the reasoning of having the travel model to support the tool analysis is very important.

Commissioner:

I just was curious how much they actually take this seriously. I can look at tons of studies we've done in agriculture about grazing all kinds of things off track, but they like their science better than our science. So that's just my question. Is our report going to stand strong for the work that they did?

Jim Damkowitch:

Thank you for the comment. I think this was being focused on the rural and yet you're very urban.

Mike Woodman:

And I might add, just for context, one of the biggest concerns or criticisms of the tool is while it uses countywide vehicle miles traveled data, it doesn't take actual project location or context into

consideration. So, you could have a state highway project in Sacramento, right through the heart of a heavily populated metropolitan area, heavily congested, a five-mile widening project, and you could have a widening project in Sacramento County out in a rural area for a safety reason, five-mile project that's not in a congested area. If you plug it into the tool, it gives you the exact same result of how much VMT it will induce. That's one of the flaws of the tool.

Commissioner:

I look forward to seeing the study in the flesh. There are some interesting questions. It's interesting that we over predicted how much traffic is going to be induced on highway 267 because I work up there, it doesn't seem possible. I'll leave that for Jan to dive into more, but it sure seems like it induced a lot of demand. And one of our 15 studies was from Mono County. And Mono County is so far away from having latent demand compared to our situations that it's an interesting example to compare ourselves to. Insofar as the report is a tool to put us in position to do better work, I look forward to it. It seems like you're probably asking some pretty difficult questions that don't have enough data to really, really get down to business. It's always going to be a functional context. So, I can appreciate what you're getting at insofar as it's the tool, if we're losing the forest for the trees and then it concerns me. I don't know that that's the case and I trust you, but I don't know how much money we can spend on future highway widening in our community. We're just running out of highways to widen. So, I trust you and I trust that you got good work going on and there's some caveats looking on the horizon for me as we go forward.

Mike Woodman:

And just to be clear, I want to state that we're not saying that induced demand can’t occur, especially in heavily congested conditions, even in rural parts of California, if the conditions exist or are present, you can have induced demand and this study will have recommendations on how to do that analysis appropriately and what elasticities to appropriately apply.

Commissioner:

I do recognize that you're saying that opt-in, the average, the tool is off by 10, 15% so that maybe there's some effects there. The tool's not as accurate as it could be and that changing that tool could be helpful for us. And so, I respect that. And so, I don't want to confuse that.

Commissioner:

I'm going to simply reflect what we've just heard from the other commissioners. I'm really looking forward to seeing the study and looking at congestion and sprawl and increases in VMT and emissions and noxious emissions from the perspective of this theory of induced demand. It's a nice, different way to look at it and I look forward to seeing the report.

Commissioner:

I appreciate the update and I'm looking forward to the study more so. I think that'll be a more beneficial tool for me to look at that point. Thank you.

Commissioner:

I'm relatively new to local government, having just been elected in 2022, but this is now the second time where the state has proposed a solution that works in urban areas and does not work hardly at all in rural areas. That's a disturbing trend.

Commissioner:
I hope this is a good tool.

Commissioner:
I appreciate the presentation. I think it clarifies what we've been talking about.

Jim Damkowitch:
It is very technical, so thank you for bearing with us.