# TRANSPORTATION MODELING REFORM

## CONGRESS FOR THE NEW URBANISM (CNU)

Transportation modeling has a tremendous impact on the transportation infrastructure that is built and how it is built. This, in turn, has an enormous impact on the shape of our communities. Current practices focus too much on automobile mobility, undermining our travel choice, degrading the quality of our built environment, and wasting money and other valuable resources.

Transportation modeling reform is long overdue. While some incremental steps have been made, a complete rework is needed.

## WHAT?

Regional travel demand models are used to develop long-term travel forecasts in all urban areas in the United States. These forecasts are the basis for prioritizing and justifying transportation investments. They include:

- Traffic volumes by roadway
- Transit ridership by route, and
- Number of walk and bike trips

## WHY?

The models relied on today are applied in an outdated "predict and provide" context despite the fact that they cannot accurately predict and there is little need to provide additional roadway capacity. Alarmingly, they also:

1. Fail to properly estimate walk, bike and transit trips in urban areas
2. Overestimate the value of adding roadway capacity in urban areas

## HOW?

Three "Model Makeovers" have been effective in addressing these issues:

1. Scenarios (instead of prediction), making the scenarios as realistic as possible
2. Multimodal modeling based on the 3 Ds – Density, Diversity, and Design
3. Dynamic Traffic Assignment (DTA) to properly model congested roadways, particularly urban freeways

# Model Makeover #1

# REALISTIC SCENARIOS

Regional travel demand models are based on outdated data, and then assumptions drawn from these data are extrapolated into the distant future. The graphic below is for the United States as a whole, but hundreds of regional models similarly overestimate traffic growth.

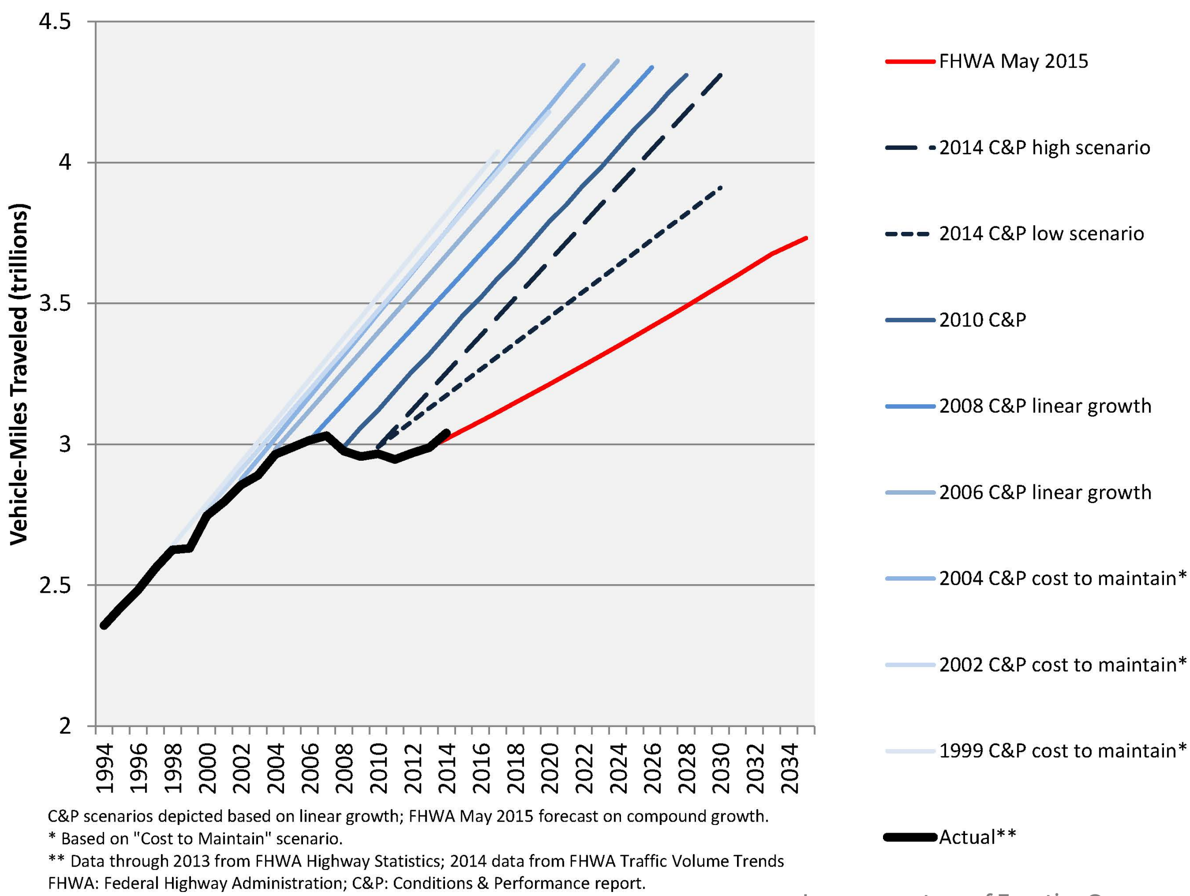



Image courtesy of Frontier Group

Travel demand models have failed to match travel behavior changes over the past decade. It is time to stop suggesting that these models can predict the future accurately, and shift to using the models to evaluate a set of realistic scenarios. The scenarios should include consideration of:

- Shift in housing and work location preferences from the suburbs to urban areas
- Changing travel behavior by young adults
- Climate change policies such as California's Senate Bill 375 that require reduction in gasoline consumption

With realistic scenarios, there will be little need for added roadway capacity in most regions.

## Model Makeover #2

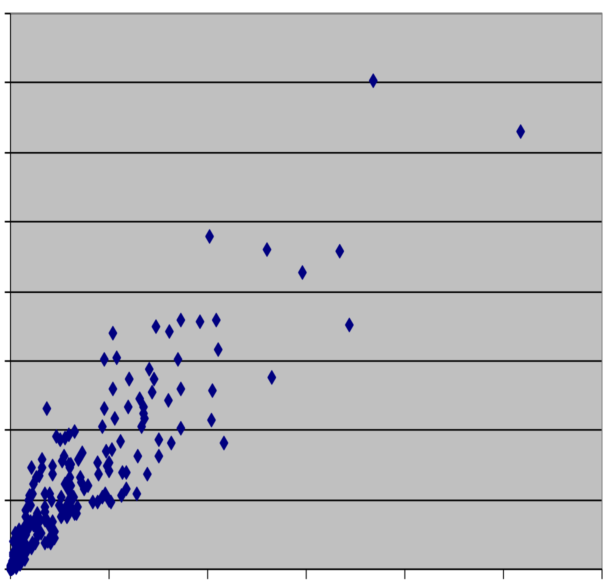
# MULTIMODAL MODELING BASED ON THE DENSITY, DIVERSITY, & DESIGN

Many travel behavior studies have found that walking, biking and transit use is strongly related to a set of “D” variables, including:

- **Density** / both housing and employment density
- **Diversity** / the mix of housing and employment
- **Design** / walkability, approximated by intersection density or average block size

Most regional models only match the number of walk, bike and transit trips in total; they are poor in matching the trips to areas within the region. Travel demand models that include the 3 D variables are much more accurate.

### TRANSIT TRIPS MODEL FIT BY AREA WITHOUT 3 DS



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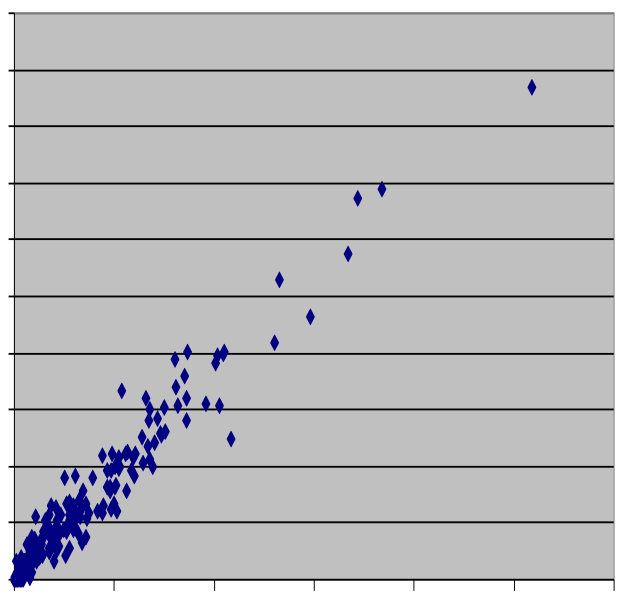


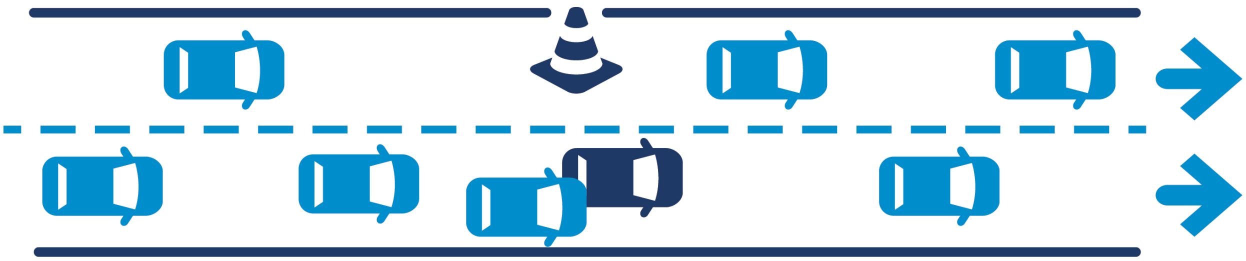
Walk trips are particularly important in urban areas. In order to simplify computations, it was decided 50 years ago that trip destinations would be determined before mode choice would be selected. This sequence remains in most regional models today, including complex Activity-Based Models (ABMs).

These models do a poor job of estimating walk trips in urban areas. In the standard model, a person working downtown and going out for lunch first considers all restaurants in the region, picks one, and then realizes they cannot walk to it and drives. Instead, most people decide whether to walk first. Moving the walk choice step ahead of the destination choice step improves model accuracy.

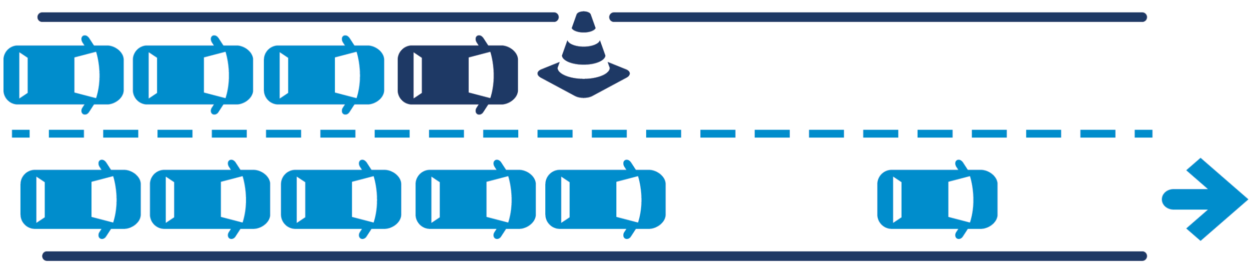
## Model Makeover #3

# DYNAMIC TRAFFIC ASSIGNMENT (DTA)

Current Static Equilibrium Assignment (STA) models were developed 50 years ago when computers were much less powerful. STA models treat each roadway segment as independent rather than as part of a network. Extreme congestion at a bottleneck is modeled as a short delay instead of a physical limit on throughput.



In real world, traffic throughput is constrained. Long queues form upstream behind bottlenecks and delays can be long. Traffic volumes are lower downstream because of "metering" effect.



Dynamic Traffic Assignment (DTA) models the real world much more correctly.[1] In comparison with STA models, DTA models show:

- Lower volumes on congested urban freeways
- Lower speeds on congested urban freeways
- Less congestion benefit from widening urban freeways

## FOR MORE INFORMATION:

cnu.org/our-projects/transportation-modeling

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[1] DTA is being used extensively in research. However, these research models often include very detailed geometric and traffic signal information. This complexity has been a barrier to full adoption. We recommend implementing simpler DTA models than use only the data already in the STA models.