TRANSPORTATION MODELING FOR GROWTH MANAGEMENT AND COMPREHENSIVE PLANNING IN MONTGOMERY COUNTY, MD

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ABSTRACT

This document contains a short description of the past, present and future direction of modeling in Montgomery County MD. It reaches the following conclusions:

- We are still several years from developing robust, holistic, long-term, least-cost planning systems
- Incremental progress requires greater investment in analysis, monitoring, and management systems for transport, land use, travel demand, and cost/impact evaluation
- Market-based pollution prevention strategies should spur private sector interest in these systems to identify lower cost means of meeting societal and regional goals
- Innovation in these systems will most likely come at the local and regional level as government shifts more to performance-based funding and program evaluation.

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PAST DEVELOPMENT OF TRANSPORTATION AND LAND USE MODELING

- Initial efforts in 1960s: aggregate four-step modeling process and fratar methods -- The future as an enlarged projection of the recent past
- Limited by computational power of early computers, high costs of data manipulation and storage
- Emphasized projection of motor vehicle travel to size freeways, based on recent trends
- Parallel development of traffic operations models for detailed engineering

- Lowry Land use models developed to evaluate future auto-oriented growth patterns

Advances in choice-based modeling techniques, disaggregate analysis, and use of travel panels (1970s/80s)

- Logit and other market-choice models
- Applications for UMTA Alternatives Analysis
- Applications Abroad: Dutch National Travel Model, Stockholm model, national passenger/freight models

Geographic Information Systems for Transportation and the information technology revolution (1980s/90s)

- Reduced costs for computerized data acquisition, manipulation, integration, analysis
- The mainframe to PC transformation
- The transformative impact of fast and cheap graphics
- Overcoming the limits of aggregate travel demand analysis: incorporating factors where the variance within zones exceeds the variance between zones
- GIS-T support for microsimulation of travel demand and transportation system performance

1990S POLICY INITIATIVES AS DRIVERS FOR TRANSPORTATION MODEL REFORM

- Clean Air Act Amendments of 1990: Conformity and State Implementation Plan development
- Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991
    - Congestion Management Systems
    - Major Investment Analysis
    - Consideration of Alternatives in TIPs and Plans
- Ahead of the curve: state and local growth management initiatives in Oregon, Washington, Montgomery County, MD and Maine

Typical Current Modeling Practice Models Vehicles not Person Trips:

- Fails to feed back and treat travel time consistently;
- Fails to account for patterns of development, urban design, proximity relationships, and pedestrian & bicycle friendliness;
- Treats land use as exogenous input without varying pattern in response to alternative scenarios;
- Lacks sensitivity to trip chaining, changes in departure time choice, demographic changes.
- Focuses on VMT-related running emissions, not trip start emissions, accelerations/enrichment episodes

Result:

- Models overestimate emissions reductions from increased highway capacity and flow improvements by ignoring effects of induced demand, degradation of other modes, and community impacts. Better models would lead to different conclusions.
- TCMs related to non-work travel and non-motorized modes, and many alternative land use/transport scenarios cannot be represented in existing model structures for analysis, leading to inappropriate focus on work-related and VMT-reduction oriented TCMs.
- Continued use of these tools will cause many regions to fail in meeting CAA deadlines, leading poor decisions, legal challenges, and federal sanctions.

Short-Term Action Strategy:

- Use short-term quick fixes to current models for next round of TIP/RTP conformity testing, with scenario-testing approach for RTPs;
- Immediately increase investment in data collection, monitoring/ management systems, and new travel forecasting models, with work on parallel tracks;
- Commit to use of best tools available at the moment in a creative and complementary fashion for conformity analysis;
- Acknowledge shortcomings in methods and likely effects on findings which would result from use of best practice methods.

Adopting Best-Practices for Modeling:

- Develop demographically-sensitive person-trip based models for all trip purposes
- Ensure internally consistent treatment of travel times (with feedback to mode choice, trip distribution, and departure time choice models)
- Consider impacts of accessibility changes on land use patterns
- Ensure sensitivity to current transportation pricing and potential future pricing strategies
- Include measures of urban design, job/housing proximity to transit & retail services, pedestrian & bicycle friendliness in model development

Adopting Best-Practices for Modeling:

- Separate intersection capacity/delay from link capacity/delay in network assignment
- Reflect trip chaining in modeling process
- Integrate multi-modal factors into spatial & temporal trip distribution
- Use GIS-based data systems to support smaller or dynamic transportation analysis zone systems
- Ensure that regional job/housing growth is matched with appropriate changes in external trip productions/attractions
- Avoid use of geographic area specific factors in calibration

FUTURE DIRECTIONS FOR TRANSPORTATION AND LAND USE MODELING

- Activity analysis based microsimulation models built on stated preference survey data, household travel surveys
- Panel-survey based microsimulation models forecasting demographic & land use changes simultaneously with activity patterns, derived travel demands, and vehicle/mode choices, considering impacts of information
- Real-time traffic simulation network models to model emissions based on real vehicle operating cycles, not just average speed
- Research and development underway at Los Alamos National Lab on super-computer based TRANSIMS microsimulation model.

Evaluating Transportation Costs and Benefits

- Recent research efforts include:
    - J. McKenzie (World Res. Institute)
    - Miller & Moffet (Natural Resources Defense Council)
    - Conservation Law Foundation (Apogee Research)
    - Charles Komanoff and Brian Ketcham (KEA Associates)
    - Todd Litman
    - Vince Scheuler (Washington State Energy Office)
    - Institute for Local Self Reliance
    - Netherlands Energy Research Foundation (for OECD)
    - Mark Hanson
- Estimates of overt and hidden subsidies and non-internalized costs of motor vehicles vary widely, but are very large -- on the order of $300-730 billion/year for the US.

Least-cost planning for transportation and land use vs. utility least-cost planning:

- Cannot use uniform cost factors or global ranking of investment/policy options for transport, given the complex intermodal character of transportation systems and the high degree of spatial variance in the utility of different options
- Must adopt a scenario-based approach with global multi-criteria evaluation of costs and benefits, including distributional effects

VISIONING AND SCENARIO PLANNING

- Traditional forecasting assumes future will be an extrapolation of the past
- Visioning and scenario planning considers structural evolution of complex emergent systems, including:
    - Transportation investment

- Land use and urban design
- Transportation pricing and demand management policies
- Allocation and management of transportation rights-of-way and operating resources
- Technology changes in vehicles, fuels, and information, communications, and control systems
- Housing choice preferences, demographic factors, and economic structural changes.

DEVELOPMENT OF EXPERT SYSTEMS FOR TRANSPORTATION AND COMMUNITY PLANNING

- Scenario generator can be developed using decision rules to help identify internally-consistent scenario alternatives
- Integrated large-scale transport/land use microsimulation models can support development of improved sketch planning tools for rapid examination of multiple alternatives
- Graphical analysis tools can help non-experts compare and comprehend impacts of alternative scenarios
- Heuristic models can provide opportunity for values-based trade-offs to be made by non-experts

CONCLUSIONS

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