

Forecasting for Transportation, Energy, & the Environment

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Overview

- Institutional Context
- Forecasting Activities and Uses
- Institutional Pre-requisites for modeling and forecasting

The Transportation Sector

- Government role in transportation is ubiquitous, but decentralized; s
 - State and local governments play a huge role;
 - some sectors largely public, some largely private.
- Transportation usually require expensive fixed infrastructure, relatively low marginal costs.
- Enduring issues:
 - Infrastructure investment and planning;
 - externalities generated by transportation systems;
 - Safety;
 - Market power;
- Federal Government (esp. DOT) has extensive role in safety regulation;
- Feds have extensive role in financing (but not operating) infrastructure (highways, transit, airports, high speed rail, internal navigation)
- Feds have limited role in economic regulation (FERC, STB)
- Feds have limited role as operator (Air Traffic Control, Amtrak).

The Department of Transportation

- Est. 1966, embodied “planning ethos.”
- Mission: *Serve the United States by ensuring a fast, safe, efficient, accessible and convenient transportation system that meets our vital national interests and enhances the quality of life of the American people, today and into the future.*
- Departmental legal authorities are sweeping and non-specific.
- Incorporated many previously independent agencies, each with its own legal authorities, staff, stakeholders, traditions, and funding sources.
- Most funding is in the form of formula grants to States and local agencies for highways, transit systems, airports, shipbuilding subsidies. Grantees have to fulfill extensive procedural requirements.
- Discretionary grants are a relatively new feature: TIGER, new starts for transit, high speed rail
- Transportation safety regulation is programmatically important: aviation, highways, vehicles, rail, pipelines, hazardous material transport.
- Operational roles: air traffic control, St. Lawrence Seaway.

Agencies and Budgets

- Total Departmental expenditures \$76.3 billion in FY 2011. FY 2012 request \$124 billion in FY 2012. About 55,000 employees, 48,000 at Federal Aviation Administration.
- Agencies (FY 2011 revised)
 - Federal Highway Administration (FHWA): \$42.6 billion
 - Federal Aviation Administration (FAA) \$16 billion
 - Federal Transit Administration (FTA): \$10.7 billion
 - Federal Railroad Administration (FRA) \$4.4 billion
 - National Highway Traffic Safety Administration (NHTSA) \$0.9 Billion
 - Maritime Administration, Research & Innovative Technology Administration, Pipeline & Hazardous Materials Safety Administration, Federal Motor Carrier Safety Administration, St. Lawrence Seaway, Surface Transportation Board, Office of the Secretary, Office of the Inspector General, total about \$1.6 billion.
- Most funds are distributed as formula grants

Forecasting Activities and Uses

- Aviation
 - Twenty year forecast of aviation activities;
 - Forecast of airport utilization by airport.
- Highways/transit
 - Regional transportation model development for transportation planning
 - Projections of future condition of infrastructure, based on alternative funding scenarios (Conditions and Performance)
- Freight projections (Freight analysis framework)
- Regulatory Analysis
- Grant and Project Analysis
 - Project evaluation
 - Cost/benefit analysis
 - Environmental Impact Statements
- Ad-hoc policy analysis

Aviation Forecasting by FAA

- Aerospace Forecast—current 2011-2031
- Short-term forecast covers monthly capacity and demand for scheduled carriers for one year.
- Projects domestic/international passenger and air cargo, aircraft fleet mix and acquisitions for mainline and regional carriers, air freight, general aviation, commercial space launches, ATC ops.
- Extended to cover level of activity at most U.S. airports.
- Primary use is for planning air traffic control system, aviation infrastructure investment.

Regional Transportation Models

- Transportation models are used by State/local Governments and metropolitan planning organizations (MPOs) for transportation planning.
- DOT doesn't generally do modeling itself, but funds technical assistance, model improvements, R&D, peer review.
- Key programmatic activity is FHWA's Transportation Model Improvement Program.
- Environmental impacts of regional transportation planning are generally handled by EPA models, viz MOBILE6, MOVES.

Asset Management

- USDOT/FHWA produces biannual report “Conditions & Performance” which is primarily aimed at described the current state of repair for highway and transit infrastructure.
- As part of this effort, FHWA projects level of capital investment required to keep highway and transit infrastructure from deteriorating over the next 20 years.
- This work is based, in part on output from the Highway Economic Requirements System (HERS) model. This model is made available in a State version.

Freight Projections

- USDOT periodically generates detailed data on magnitude and commodity composition of freight flows between metropolitan areas on all transport modes, based on sample surveys.
- From this data set, DOT/FHWA Office of Operations creates forward projections of future freight flows out to 2040 and beyond, based on projected commodity composition of GDP, and various assumptions about regional distribution of GDP and mode choice.
- Mode choice not modeled.
- Outputs have diverse uses, including for use by MPOs for regional transportation planning

Regulatory Analysis

- USDOT agencies do many regulatory analyses, most for safety regulations, but also fuel economy/tailpipe CO₂.
- Regulatory analyses almost always include an analysis of alternatives, including cost/benefit analysis, in which multiple future states of the world are compared.
- When relevant, energy and environmental impacts are considered, including greenhouse gas emissions.
- There is no standardization of forecasting approaches in regulatory analysis, in part because of the level of detail required for many safety regulations.
- DOT/NHTSA has built complex model to support Corporate Average Fuel Economy (CAFE) regulation.

Project and Grant Analysis

- USDOT agencies are frequently called upon to evaluate major transportation projects.
- In general, the applicant is responsible for preparing required documentation, which may include cost-benefit analysis and Environmental Impact Statements (EIS), which, in turn may require projecting alternative states of the world with and without the proposed project.
- Energy and environmental aspects are generally included in proposals and evaluated as part of review.
- DOT staff must evaluate this material, both in terms of the plausibility of the results and methods used to derive them.
- To the extent that discretionary grant programs become more widely used at DOT, some standardization of reviews of such forecasts may be desirable.

Ad-hoc policy analysis

- Interagency review;
- Proposed legislation;
- Pending policy initiatives.
- Diverse tools and participants. Hard to characterize.
- Typically needs to be done quickly, rely on existing information and tools.

Future Analytical Issues

- Better incorporation of energy and environmental considerations (esp. greenhouse gases) into transportation modeling.
- Land use and transportation investment;
- Compact development, transportation, and energy/emissions.
- Freight mode switching;
- Passenger mode switching and high speed rail;
- Climate change adaptation and transportation infrastructure.

Institutional Issues

- Institutional forecasting requires;
 - Underlying data systems;
 - Development lead time;
 - talented, interdisciplinary staff;
- Enthusiastic customers: forecasts must link directly to real-world decision-making.
- Transportation modeling special issues:
 - The system is very complex;
 - Detailed representation of the network is important;
 - Key issues manifest locally rather than nationally;
 - Hence data requirements, and computational complexity are fierce; interdisciplinary expertise needed.
 - Linkage to national-level decision-making.

Thank-you for your time