

Lessons Learned from the Implementation of NY Activity-Based Travel Models

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Kuo-Ann Chiao¹, Sangeeta Bhowmick², Ali Mohseni³,

¹Kuo-Ann Chiao, (212) 383-7212, kchiao@dot.state.ny.us

²Sangeeta Bhowmick (212) 383-7212, sbhowmick@dot.state.ny.us

³Ali Mohseni (212) 383-7215, amohseni@dot.state.ny.us

New York Metropolitan Transportation Council, 199 Water Street, 22nd Fl, New York, NY 10038.

Fax: 212-838-2418

Description of NY Best Practice Model

In order to meet the high level demand among regional planners seeking a more accurate way to identify transportation requirements and have ability to forecast demand on the transportation system precisely, New York Best Practice Model (NYBPM) is developed and implemented. NYBPM has been used on a wide range of regional studies to simulate travel patterns including where people travel, their modes of travel(car, subway, bus, ferry, walk & bike or commuter rail); preferred routes (highway vs. local roads) and their trip times.

NY Best Practice Model is an activity-based model which attempts to predict the detailed travel patterns of a diverse population using numerous travel modes. It does this by introducing some innovative approaches to the traditional travel demand models including the concept of Journey or tour as the unit of travel, Micro-simulation approach which is used to simulate the travel pattern of each person in the region and among all other modes of travel, no-motorized modes are also included.

The NYBPM covers 28 counties and is divided into 3,586 transportation analysis zones. The model analyzes travel patterns by four different time period, eight trip purposes on 6 highway and 4 transit modes. The highways of the region are represented in Geographical Information System (GIS) with more than 53,000 segments. All the available transit modes of the New York metropolitan region ranging from commuter rail to ferries are also coded in GIS.

The NYBPM was previewed before a national audience on January 2001 during the TRB Conferences in Washington and immediately was in wide implementation throughout the region on various projects in different sizes including:

- Air Quality Conformity Analysis

- Southern Brooklyn Transportation Investment Study
- The Gowanus Expressway and Kosciuszko Bridge Study
- Tappan Zee Bridge and the I-287 Corridor Study
- Bruckner Sheridan Expressway Study
- Bronx Arterial Needs Study
- Goethals Bridge Modernization DEIS

As one of the first MPOs in the country to develop and implement a new generation of travel demand forecasting models, this paper shares NYMTC's experience throughout different stages of development and implementation of NYBPM. Immediately after release of the models in 1992, NYMTC modeling staff faced with a series of issues and problems which can be categorized as follow:

Identified NYBPM Issues

- **Timeliness and Completeness of Data**

The development of the regional NYBPM, and the data required for its development, largely occurred in the mid and late 90's, Data and networks were developed to generally represent a 1996 base year conditions, six years after the most recent decennial Census in 1990. At the time of completion and implementation in 2002, the model's data was already 10 years old so needed to be updated using the new socio-economic data based on 2000 census. Also adjustments needed to reflect the impact of September 11th disaster on employment and labor force data.

Due to lack of sufficient funding the Regional Travel – Household Interview Survey which was conducted in 1997 and 1998 did not include the survey of establishments as travel generator or attraction points, so the tourist trips were ignored in the survey.

- **Modeling issues**

- o The needs for different level of details of modeling documentation can't be properly addressed.
- o A gap between the availability of proper documentation and the completion of the models.
- o Lack of fully Integration of Transit and Highway networks.
- o Lack of the integration of land use model and the travel demand model in the NYBPM system.
- o Long processing time.

- **Modeling environment**

- o **Diversity of the large region** – BPM is the first regional model with its geographic and functional scope ever implemented successfully in this very large metropolitan region. New York metropolitan area with its complexity in

transportation system and diversity in population and area type as well as its size both in population and area, is unique in the world. This diversity adds to the complexity of travel analysis in such a large and diverse region.

- **Software Issue** - It has been a challenge to address the software compatibility issues of various NYBPM software versions with various versions of TransCAD as NYBPM's platform. TransCAD is used to manage, edit and modify the BPM transportation highway and transit network databases, and for path-building and the development of "skim-tree" matrices of travel times and costs used in the choice models. NYMTC faced some compatibility issues that different member agencies used various versions of TransCAD. Also compatibility between various other software packages used with NYBPM was an important issue.
- **Hardware Issue** - The application of the NYBPM model requires extensive amount of computational resources, as well as careful management of a large number of computer files. Running NYBPM requires a set of special hardware specifications, including dual processors, which could provide an efficient computing application system for the NYBPM.

Users Training

One of the daunting tasks that face NYMTC's modeling staff is to provide training to various stakeholders who are interested in various NYBPM applications. The stakeholders, based on the various levels of technical knowledge and special needs for their applications, require different level of training. To address these needs, NYMTC has developed several set of training programs to meet everybody's need. One-day training is provided to the decision makers. Three to five day training has been developed for individuals who have some modeling background. A hands-on one to one training spanning over several weeks is also being provided to staff of member agencies that need to run the model for specific project analysis.

Staff Resources

Staffing and resource has been a key issue in NYMTC's model implementation process. There are several reasons that attributed to this issue that are identified below.

- **Lack of trained and experienced modeling staff**

There is an inherent shortage of experienced modelers in this country. NYMTC staff, with limited experience at the beginning of the process, needs to work with the stakeholders and the consultants in development and implementation the complex modeling system. At the same time, NYMTC staff needs to learn all the aspects of the model development, including data collection, model methodology, model estimation, calibration and validation, and applications, including project coding, model output analysis, and quality control.

- **High turnover rate**

NYMTC also faces the problem of retaining qualified individuals because of organizational constraints. Since NYMTC is hosted by New York State Department of Transportation (NYSDOT), it is subjected to NYSDOT's rules for promotional opportunities. Promotions in NYSDOT are based on a set of examinations which are not much related to the modeling work. This puts the modelers at a disadvantage of career advancement within the organization.

- **Hiring constraint**

Hiring new staff in NYMTC is an ongoing struggle. NYMTC's modeling group has lost several staff over the years due to retirement or better opportunities. These staff members cannot be replaced at a timely fashion because of the hiring freeze imposed by the hosting agency.

Institutional Coordination

As an MPO, one of NYMTC's role is to provide a regional perspective in all of its work and products. BPM implementation requires taking into consideration two important factors: working with stakeholders and getting consensus.

- **Working with Stakeholders**

From the inception throughout the model development process, NYMTC staff had to work closely with all stakeholders to define the model needs and applications at the beginning of the process. All modeling issues and application support, coordination of data collection efforts, discussion of model calibration and validation results, and issues related to model usage and improvements require close involvement of stakeholders in the complex NYMTC region.

NYMTC staff held ten sessions throughout the NYMTC region with stakeholders to discuss modeling needs that became the guidance for the NYBPM development. NYMTC staff also coordinated stakeholders on the discussion of various modeling issues, including data sharing among different zonal systems, consensus building on socioeconomic and demographic forecasts, design and implementation of regional household travel survey, update of regional highway and transit networks, and building the traffic count data base for the 2,300 screen line locations. In addition to the complexity involved with the large number of stakeholders, data available from stakeholders with inconsistent formats and definitions required the NYBPM project team to spend a lot of resource to reconcile all the assembled data into a common database format for use in NYBPM.

- **Getting Consensus**

NYMTC staff had to work with all stakeholders to reach consensus on all stages of the model development process, including the definition of zonal system, the survey design, the forecasts and calibration results, etc.

One of the required inputs to the BPM was the socioeconomic demographic data and forecasts. While the base year data was collected from various public agencies in New York, New Jersey, and Connecticut, economic models were run to forecast future years by county. The future year forecasts for the four main variables namely population, household, employment, and labor force, were shared with the local and county agencies to ensure consistencies with the individual county forecasts.

This was a long drawn process where suggestions of different members were often divergent resulting in conflicting forecast numbers. After several iterations of review and modifications, numerous meetings and negotiations, the forecasts were finally found acceptable and adopted by the MPO member agencies. Consensus building among the stakeholders is vital in the NYMTC forecasting process. These forecasts are used in all the Major Investment Studies and corridor level studies in the region.

Future Improvements

With more than four years experience, NYMTC has many ideas on sensitivity tests and improvements of model performance, easy of use, and quality control procedures, to name a few. Those ideas are either under contracts with University Transportation Research Center and consultants to implement, or will be implemented step-by-step through various model improvements and updates contracts in the years to come.

One of the problems of NYBPM is its long running times. Previous experiments and new developments suggest massive speedups are possible. NYBPM will also try to relax hardware requirements that more users could use NYBPM, create a full-featured User Interface and a super fast version for production.

To address the data standard issues, NYMTC staff has been working with member agencies through the traffic, transit, and GIS data coordination committees to standardize all data collection in the region. These groups consist of all NYMTC member agencies who are actively working together to collect traffic and transit data in a standardized format so they can be shared among all the agencies. This will avoid duplication and save the region staff time and money. It will also minimize any data reconciliation problems in the variability of data from different sources. A GIS based traffic data editor and viewer developed by NYSDOT has been used as the traffic data clearing house for the NYMTC region.

Other undergoing improvements include:

- Scenario and File Management
- Automated Reporting and Output Manager
- New User Guide with content-sensitive online assistance
- Improve Usability and Applicability
- Move to the Latest Versions of TransCAD
- Exploit Features of New TransCAD Process
- Streamline and Optimize Model Code

- New Graphic User Interfaces
- Adapt to Multiple Hardware Environments
- Multi-threading and Distributed Processing
- Public, Web-Access to Model Outputs

NYMTC has also launched a series of data collections and surveys that will be conducted in the next three years. These efforts will include data to update or enhance existing information (regional household travel survey, external survey, regional speed survey, screen line counts, and regional transit on-board surveys), and new data that will improve existing NYBPM deficiencies (regional establishment survey, airport survey, taxi survey, and regional bridge O/D survey). Several of the data collections will cover 28 counties in the New York-New Jersey-Connecticut tri-state region. The new wave of data collection will provide an up-to-date understanding of travel patterns and behaviors in the region. They will also be used to recalibrate the NYBPM that will address some of the known issues and bring the NYBPM to the next level.

Project Significance

This project is significant for a number of reasons. First, it is the first activity based model that has been used in air quality conformity analysis and many major investment studies in the U.S. The experience of NYBPM proves the concept of activity-based model does work and works very well in the most complex region in the country. Second, throughout the years of experience in various stages of the development and applications, NYMTC staff has worked with all the stakeholders and gained much better understanding of the modeling system and its improvement needs. The lessons learned will provide other MPOs valuable insights of future development of activity-based models.