UTRC

RESEARCH NEWS

Special Edition: Research Reports

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CONTENTS

REPORT ON SMART GROWTH IN THE NEW YORK METROPOLITAN REGION

Harry Schwartz, Urban Planning Consultant

A recently published report, sponsored by the CUNY Institute for Urban Systems and the Revson Foundation, calls for the principles of smart growth to be implemented in the New York metropolitan area. The report, 20/20 Vision: Smart Growth for the New York Metropolitan Region, was prepared by Robert E. Passwell, Director of the Institute and UTRC, together with Harry Schwartz and Linda Davidoff.

Over the last two decades smart growth has emerged as strong national movement and its policies have been widely accepted in planning and government circles. New Jersey has adopted a smart growth management plan and it was a top priority in the Governor's 2003 address to the legislature. In New York State, however, it has been overlooked as a tool for managing growth.

The report emphasizes several elements of smart growth for the metropolitan region: 1. Creating compact, mixed-use developments that provide choices in transportation, minimize pollution and reduce energy consumption. Among the places where this can be achieved are Staten Island, rezoned parts of New York City's waterfront and older commuter suburbs in Westchester and northern New Jersey, 2. Decentralizing economic growth to existing regional centers already served by transportation facilities and other infrastructure, such as downtown Brooklyn and Jamaica in New York City and the center of Newark, 3. Preserving open space and the natural landscape by reducing leapfrogging suburban sprawl and concentrating new residential development around exiting centers, 4. Limiting expenditures for new highways and using public investment, to upgrade existing transit services and build new facilities, as is being done at New Jersey Transit's new rail station in Secaucus.

In addition to describing the principles of smart growth and how they could be employed in specific situations in the region, the report describes legislative, regulatory, and fiscal measures that are being used to implement smart growth. It also offers a wealth of practical information on national, regional and local organizations active in the expanding field and a comprehensive bibliography on various aspects of smart growth.

Transit Technology Skills for the 21st Century

Robert E. Paaswell, Ph.D., Director, UTRC, City College of New York

The Region 2, University Transportation Research Center (UTRC) is conducting a project to address the nature of change for New York City transit workers. The Transit Worker Union of Greater New York asked the UTRC to develop the program. UTRC staff have been working with the Transit Workers Union and a coalition of MTA Unions to address the nature of change in the transit industry. The rapid integration of Information Technology and computers into all aspects of transit operations and management make identification of new skills, potential jobs and processes of working essential for all involved in the public transit industry. UTRC has provided seminars to the coalition on "New Paradigms in Transit" and "Financing and Budgeting". Together with a number of labor unions, UTRC has prepared proposals to the US Department of Labor concerning labor force needs in this changing industry. Computer Based Train Control, Electronic Fare Cards, Automatic Vehicle Location and Computer controlled bus systems are all new technologies rapidly being integrated into transit in this region. New jobs will include managing and working with large scale data bases, working in a central control atmosphere, maintaining a fleet with self diagnosing capabilities, and operating vehicles with new levels of information available. The complexity of these new systems means that workers must be trained (or retrained) with new skills, but further requires workers to gain some management skills.

Calendar

URTC Board of Directors Meeting
November 19, 2003
City College of New York
North Academic Center Private Dinning Room

New Jersey Department of Transportation Research Showcase,
October 24, 2003
Hyatt Regency Hotel
New Brunswick, NJ
Registration: www.ltap.rutgers.edu/njdotshowcase2003

The 4th Annual Tri-State Trasnit Symposium,
October 29, 2003,
The Rudin Center for Transportation Policy & Management
Kimmel Center
New York University
Phone: 212-998-7545

83rd TRB Annual Meeting
January 11-15, 2004,
Marriott Hotel
Washington, D. C.

Consortium Members

City University of New York
Columbia University
Cornell University
Dowling College
New York University
Polytechnic University
Rensselaer Polytechnic University
Rutgers University
State University of NY
Stevens Institute of Technology
University of Puerto Rico

Director's Message

Robert "Buz" Paaswell, Ph.D.
Director & Distinguished Professor

The media has been full of articles on Smart Growth, and the impacts of suburbanization on health. That is the hook that seems newsworthy, although those of us active in the transportation professions have been discussing accessibility, mobility, equity, the environment and transportation for the last 30 years or so. What should be in the news is that many of the agencies and organizations that UTRC and its sister UTCs work with have been in touch with these issues and have been responding in innovative ways.

UTRC, in its work with NYSDOT, NJDOT, the MTA and the PANYNJ has had a unique opportunity to apply innovative thinking to a number of regional studies. These include the I87 and I90 corridor studies for NYSDOT – an examination of transportation needs in a global context, New Jersey in the 21st Century – an examination of substantial transit investment in Northeast NJ and its impact on economic development (written about in the NY Times, 8/13/03), and 20/20 Vision, Smart Growth in the NY Metropolitan Area, a study for the Revson Foundation.

All of these underscore significant changes in how we – in our role as customers of transportation, are changing the methods that we - in our roles as professionals, must use to plan, implement and operate our complex transportation systems. We have shifted from a pure demand-supply mentality to a quality of life mentality. We have come to realize that all decisions involving our infrastructure have significant costs; we have realized that the hard way, as the ability to pay for what we think we need has been greatly reduced. So we must now think of how we would like to live, how we will support our (collective) selves, and how we can now solve our problems of meeting our new infrastructure needs; perhaps the discussions of Smart Growth are a start.

University Transportation Research Center, Region 2
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Director

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Research Summaries

New Jersey's Links to the 21st Century: Maximizing the Impact of Infrastructure Investment Robert E. Paaswell, Ph.D., University Transportation Research Center, City College of New York. New Jersey Department of Transportation, December 2002.

In the last 10 years, New Jersey has invested heavily in its transportation infrastructure, and numerous additional projects are planned or proposed for the next decade. Collectively, these projects have significantly improved accessibility in northern New Jersey. Highway and commuter rail travel times have dropped throughout the region as projects such as Midtown Direct and the completion of Interstate 287 connected networks and provided commuters with new travel choices.

These transportation improvements have done more than change traffic patterns, however; they have spurred residential relocation and enabled economic growth. Shorter commute times have allowed New Jersey residents to move further away from their workplaces, resulting in real estate price spikes in the affected regions. Where commute times have dropped the most, economic output and employment have gone up the most.

As we have seen, New Jersey's investments in transportation infrastructure have collectively improved accessibility throughout the State. In turn, individuals and businesses have taken advantage of the improvements in making relocation decisions, and economic output and employment have increased.

However, infrastructure investment on its own does not spur economic growth. There are a number of factors which determine whether a particular improvement in accessibility will result in increased economic growth, or affect land use decisions. These include Economic conditions, Land availability, Institutional support, Investment, Agglomeration, Labor market barriers, and Network economies.

Furthermore, "accessibility improvements" encompasses more than simple travel time reductions. Cost, convenience, and job availability at the destination are also important. Commuters who moved in response to the Midtown Direct service were more strongly influenced by overall factors such as the single seat ride into Manhattan, than they were by the reduced travel time. This confirms that factors such as convenience, cleanliness, and customer service can have a significant impact on riders' decisions. Working papers on request.

New York in the New World Economy Robert E. Paaswell, Ph.D., University Transportation Research Center, City College of New York and Michael Gallis, Michael Gallis & Associates. New York State Department of Transportation , January 2003.

The New York State Thruway, Route I-87, from New York to Albany and the Northway from Albany to the New York Canadian Border defines a major transportation corridor promoting commerce, tourism, commuting and a range of other activities. The corridor lies in the Eastern part of New York State; it links New York City to Canada and serves as crossroad points to New England, the Midwest and the South.

This report defines this prominent corridor in some detail, highlighting the roles of urbanization and economic activity, the impacts of landform, and the role of transportation. By examining how the corridor responds to activities in three distinct regions, New York City, I84 to the Capital District and the Capital District to the Canadian Border, the report will discuss transportation issues and opportunities. The report is organized to examine the corridor in terms of its connections, globally as well as locally. It then describes the environment the corridor traverses. It then examines economic opportunities and issues, relating these to the three segments of the corridor.

The report discusses issues raised in discussions with a body of professionals regarding moving goods and people in and through the corridor. The report concludes with a discussion of opportunities that can enhance both the population and economic activity within this corridor.

The project was a pivotal project for New York State DOT. The Office of the Commissioner and Executive Staff used this project and related work by UTRC to focus the DOT on the Global Impacts of their work. Shifting some focus from mainly regional concerns within the State to integrating multi modal issues, NYSDOT wanted to address how both State support of transportation investments and the work of DOT can assist the State in developing capabilities for growth in the new Global Economy. The initial work addressed major transportation corridors in New York State, noting the importance of connectivity within State regions, between States, in the NAFTA Corridor and throughout the Globe. The UTRC Team was asked to use some of these themes in addressing significant organizational change, and has presented these to a number of DOT groups addressing organizational change.

Research Summaries

Technology Transfer Project: Bridge Appurtenances Dr. Neville Parker - The City College of New York, Dr. Farhad Ansari - University of Illinois at Chicago, Dr. M. Ghosn and Dr. K. Subramaniam , The City College New York, New Jersey Department of Transportation, September 2003.

This report presents the findings of three technology transfer projects: Energy Absorbing Fender Systems, Pre-Cast or Prefabricated Bridge Deck Systems, and Smart Bridges. This research project was initiated by the New Jersey Department of Transportation and completed by the City University of New York, Institute for Transportation Systems.

Energy Absorbing Fender Systems
The literature search indicates that the current practice for the design of bridge pier protective systems is based on energy considerations. The kinetic energy of the vessel just before impact is transformed into an equal amount of energy that must be absorbed by the protective system through deformation. The existing technology which has been used for bridge fender protective systems by other states or countries was identified and grouped into six main categories: 1) Pile supported; 2) Retractable; 3) Rubber; 4) Gravity; 5) Hydraulic/pneumatic; and 6) Floating systems.

A protection system composed of hardcore composite pile dolphins, composite tubular piles with stay-in-place formwork surrounded by composite ultra high molecular weight faced fender panels was recommended as the state-of-the art system. This recommendation was developed by rating six design alternatives based on their life cycle cost.

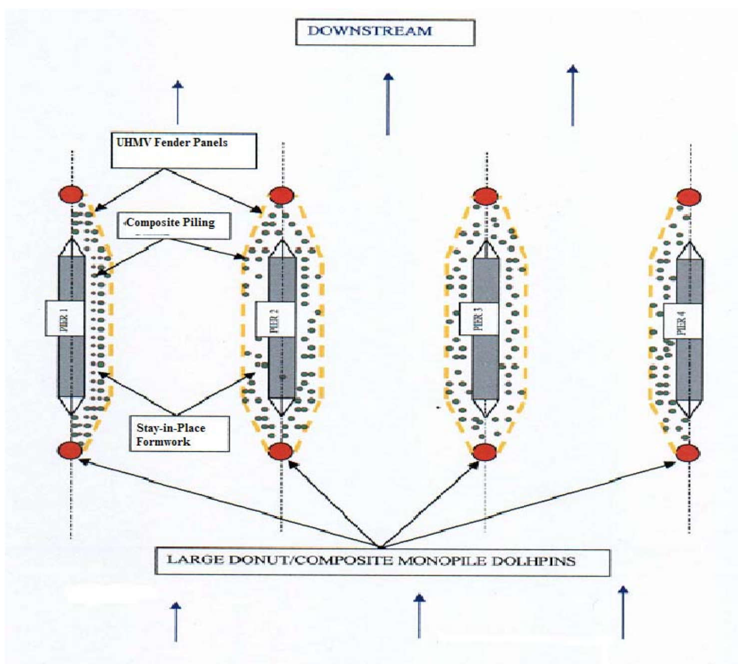
Cast or Prefabricated Bridge Deck Systems
Two categories of pre-cast bridge decks were studied to determine their prevalence, performance, cost efficiency, and construction methods. The first category was the pre-cast superstructures (box beams, tee-beams and pre-cast segmental components). The second category was the pre-cast bridge panel (partial or full depth). It was found that more than 50% of bridges built in the United States are classified as pre-stressed concrete structures.

The study concluded that precast bridge decks have several advantages over those that are cast-in-place including faster construction schedules, longer services lives, and potentially greater cost efficiency. The use of precast bridge decks was recommended in conjunction with new construction materials such as high performance concrete and fiber reinforced composites.

Smart Bridges
Smart bridges utilize various instruments to monitor physical parameters under weather and loading conditions. Listed below are four of the most important parameters of concern to engineers:

- Displacement / Strain.
- Stress / Pressure.
- Cracking.
- Corrosion / Temperature.

A literature was completed to determine the most frequently used nondestructive methods to monitor the above-mentioned parameters, as applied to the reinforced concrete bridges. It was found that nondestructive methods are advantageous when compared to destructive methods because they enable a continuous monitoring of reinforcement condition and allow for measurements to be done at the level of the entire structure. Nondestructive methods have proven to be fast and inexpensive. However, determination of reinforcement steel corrosion with nondestructive methods is complex and may lead to wrong interpretation of results. To avoid misinterpretation it is recommended to combine several nondestructive testing methods before making a determination about reinforcement steel corrosion.



Schematic of Recommended Energy Absorbing Pier Fender System (Plan)

Research Summaries

Analysis of Routes and Ridership of a Franchise Bus Service: Green Bus Claire E. McKnight, City College of New York. New York City Department of Transportation. October 2000

New York City Department of Transportation (NYCDOT) subsidizes several franchise bus operators in Queens and Brooklyn. The Franchise operators, which started operating in the first half of the Twentieth Century, have made few changes to their routes in the past several decades despite the changes in the neighborhoods that their routes serve; for example, new shopping areas developing, neighborhoods that gentrify or degenerate, exodus of industry. To add to these typical changes, Metrocard was implemented in 1997. The free transfers between bus and subway have led to major increases in ridership and probable shifts in origins and destinations to take advantage of the free transfer.

At the same time, the fareboxes installed to handle Metrocard were supposed to provide detailed ridership counts and fare revenue information. However, the computer outputs from the fareboxes have obvious errors, for example, 16,000 passengers on one run. The lack of reliability of the data prevented analysis of the routes through the computer data. NYCDOT contracted to have UTRC take a closer look at franchise routes and ridership; in order to keep the project manageable, they decided to concentrate on one of the franchise operators, Green Bus.

The objectives of the project were to make recommendations for changes to the Green Bus Routes, and to develop a method to verify ridership.

To study the Routes, a GIS map was developed with overlying demographic data on income, auto ownership, density of school age children (Green Bus carries more school children to and from school than any other non-school bus system), and other. Students rode several of the routes, recording where passengers got on and off. This data was used to create load profiles of the routes. Also the route map was studied in detail, noting major traffic attractors and convoluted paths to make recommendations for route changes.

A method was developed to verify ridership by using a counting procedure based on the FTA recommended procedure, and a sampling pattern adapted to verifying the farebox counts. In order to estimate the standard deviation (for determine minimum sample size), on-off counts for New York City Transit routes in the same area of Queens were obtained and analyzed to verify recommendations for route changes.

Evaluation of Graduated Driver Licensing System in New Jersey Raghavan Srinivasan, Dowling College, & Claire E. McKnight, City College of New York. New Jersey Department of Transportation. July 2002.

In 1998, the State of New Jersey passed a Graduated Driver Licensing (GDL) law to take effect on January 1, 2001, enacting a three stage licensing system for beginning drivers. The current project analyzes the traffic safety record of the younger drivers in New Jersey before the implementation of GDL. A second phase will analyze the younger driver's traffic safety record after implementation of GDL and compare it to the pre-implementation record. A review of the national literature on teenage driving indicates that teenagers, in their first year of driving, have the highest rates of fatal accidents, whether measured as accidents per driver or per miles driven.

The data analyzed included all traffic crashes reported in New Jersey from 1998 through 2000 and all traffic violations and license suspensions in 1996 through 2000. The data were provided by New Jersey Department of Transportation and the New Jersey Motor Vehicle Services respectively.

The analysis showed that young drivers in New Jersey have the same tendencies as in the national data, that is, the youngest New Jersey drivers have considerably more crashes than older, more experienced drivers. Additionally, the younger driver's record is distinguished from the middle aged driver's in the following ways:

- Higher percentage of crashes occur after dark
- More crashes occur on local roads
- Lower percent of crashes are fatal
- But higher percent are fatal or injury crashes than for the middle aged driver
- Much higher percent of crashes are single vehicle crashes
- Higher percent of crashes occur while going straight
- For 17 year old specifically, a higher percent of crashes occur while turning left
- Higher percent of crashes are due to inattention
- Higher percent of crashes are due to failure to obey traffic control devices
- Much higher percent of crashes are due to unsafe speed
- The teenage driver has a higher likelihood of being at fault
- Teenage drivers have a much higher rate of violations
- Higher percent of violations are due to careless driving

Research Summaries

Benefits Package Value, Frederick R. Brodzinski, Ph.D., Institute for Transportation Systems. New York State Department of Transportation. August 2002

Recruiting entry level civil engineers and information technology specialists has become more competitive and the New York State Department of Transportation is experiencing difficulty in attracting people to these positions. Compared to the private sector, NYSDOT's entry level salaries are lower but rise more quickly. NYSDOT believes their benefit package is better; however, this has never been quantified. If their benefit package is more valuable than that of NYSDOT's competitors, that would offset lower starting salaries and be an attractive component of a total compensation package. Competitive compensation should enhance their recruitment efforts. This study was conducted to determine if in fact the benefit's package is worth more than NYSDOT's competitors.

Data was collected using a printed survey mailed to six major private engineering firms with interests in transportation projects, eleven State Departments of Transportation, and fourteen information technology firms. Five out of six private firms returned fully completed surveys. All ten state Departments of Transportation returned fully completed forms. Unfortunately despite several mailings and numerous telephone calls and e-mails only one specific IT Organization returned a fully completed survey.

The initial salary offered by NYSDOT to entry level civil engineers is below its competition. The salary after the probation period however, is quite competitive. Fringe benefits in most categories meet or exceed those offered by the competition with exceptions of life insurance and maximum tuition reimbursement per year. It is estimated that the value of NYSDOT's fringe benefit package is $14,352.00. NYSDOT's competition spends a great deal more money on advertising in their recruitment efforts. Other State DOT's far exceeded NYSDOT's travel expenditures for recruitment. NYSDOT spent three times what the others spent on support materials.

An Analysis of Human Factors in Nighttime Work Zones Dr. Jose Holguin-Veras, City College of New York, Robert F. Baker, University Transportation Research Center, New Jersey Department of Transportation August 2001

This report presents the results of a research project aimed at providing insights into the human factors associated with nighttime work zones on the New Jersey Department of Transportation construction and maintenance projects. It examines the impacts that nighttime construction activity has upon the workers and seeks to define work standards to mitigate these factors. These impacts are assessed through field surveys, focus group and interviews that included: highway engineers, construction workers (laborers), field supervisors, and contractors.

Thirty construction workers on four highway construction projects, along with a focus group of union laborers were interviewed for their opinions and comments, to questions on human factors related to work on nighttime work zones in the fall of 2000. The interviews were conducted during construction staging and on the construction site.

Field data from interviews were analyzed for human factors such as sleep deprivation, eating habits, commuting difficulties and social/domestic issues. The research found evidence of long working hours, social and family disruption, long commutes and sleep deprivation. The workers interviewed agreed unanimously that nighttime work has: (a) a negative impact on their body rhythms; and (b) a negative reaction impact on their social and family life. They were almost unanimous in their statements that their families react negatively to them working at night.

A majority of the workers generally preferred daytime work. However, a few liked working at night because they were able to adjust their schedule accordingly and also because working during the nighttime resulted in extra money.

The vehicle speeds of the traffic through the work zone and safety were also a major concern to all the workers. Nighttime construction has many advantages and efforts to address or mitigate its impact on the nighttime worker are very important.

Research Summaries

Development of Bus Maintenance Information Moshen Jafari, Ph.D. Rutgers University. New York City Transit. January 2003

New York City Transit's Department of Buses faced a problem where they found buses frequently breaking down during operation. In order to reduce the number of breakdowns, two approaches are being explored. First, it was felt, using the data present in their database, to develop statistical models to effectively predict the failures of critical components. This would also help in scheduling the buses for maintenance operations. In order to have an impact, using Pareto Analysis, systems that had the most number of failures were identified for the study. These systems consisted of a plethora of components, which were grouped into families. Relevant data was extracted from the central database and the data was validated before the data sets were reduced and prepared for statistical analysis. Various models were studied, but reliability analysis was preferred over the rest. A software application using Visual Basic was developed to automate the process and assist in determining the life various components in a bus.

The second approach to reducing breakdowns is through the use of smart sensor technology. It is evident that a more accurate method of predicting a bus's next failure, such as predictive maintenance, will be useful. One specific application of predictive maintenance is to install sensors on each bus that collect and analyze data in real-time (while the bus is running). This data can be used to predict when the failure of certain components will occur. With the advent of high-speed personal computers and the boom of technological advances in the electronics industry the cost of using computers to collect data from a network of sensors is decreasing rapidly. Such technology is the focus of companies like Clever Devices, developers of the IVN II system. The IVN II system, which stands for Intelligent Vehicle Network, uses automatic vehicle monitoring (AVM), a network of sensors connected to a computer used to collect the types of data that a predictive maintenance system needs. This study identifies what data should be collected from buses to affectivity implement a predictive maintenance program. Several steps are taken to achieve this goal. The first step is to determine which systems, such as the air system, engine, and transmission, are critical to the operation of buses, and which systems cause the most unscheduled maintenance. After the critical systems were identified each system was studied in detail to determine the components critical to the operation of that system. Consequently, a catalogue of sensors that can collect data to predict the failure of components was generated. After the completion of this study further work is expected be done to develop methods of checking for proper operation of buses based on data from the sensors.

"Planning and Management of Regional Transportation Systems"

Research Summaries

Characteristics of Traffic Flow and Safety in 55 and 65 mph Speed Limits: Literature Review and Suggestions for Future Research. Raghavan Srinivasan, Ph.D., Dowling College. New Jersey Department of Transportation. July 2002.

Speed limits have been introduced for many reasons: to reduce gas consumption, to reduce the frequency and severity of crashes, and in some cases, to reduce noise. The overall objective of this research was to conduct a comprehensive literature review to assess the effect of increased speed limits on limited access roads regarding safety, travel speeds, and other unanticipated impacts including the shifts in lane distribution, traffic diversions, and spillover effects (e.g., increase in average speeds and crashes in highway sections that did not increase speed limits). The final report also includes a discussion of issues to be addressed through future research. Following are the conclusions from this research:

- In general, an increase in the speed limit does lead to an increase in average speeds, although the magnitude of this increase is less than the increase in the speed limit. The percentage of drivers exceeding 65 mph seems to have increased following the 1987 speed limit legislation that allowed states to increase the speed limit on rural Interstates 65 mph. Local issues play an important role in how drivers respond to changes in speed limits.
- Speed is directly related to the severity of crash injury. Probability of severe injury increases sharply with the increase in the impact speed of a vehicle. The relationship between speed and frequency of multi-vehicle crashes is more complicated.
- The impact of the increase in speed limit on speed dispersion is not consistent across studies.
- There seems to be a relationship between speed dispersion and safety. The safety effect of speed dispersion appears to be most important for the fastest rather than the slowest drivers.
- Very little is known about the effect of speed limit on spillover or diversion of traffic to high-speed roads. Some of these issues will be addressed in an on-going NCHRP project that is expected to be completed in summer of 2004 (NCHRP project 17-23). There is very little evidence on any direct impact of the change in speed limit on lane distribution of traffic. However, if change in speed limits increase traffic volumes on these roads, this could in-turn affect the lane distribution of traffic.
- Research is needed on the methodologies to be incorporated in the study of impact of speed limits including the selection of appropriate statistical models. More work is needed to study local and system wide impacts of changes in speed limits.

Analytical Tool for Measuring Emission Impact of ACCEL/DECEL Hualiang (Harry) Teng, Ph.D. Polytechnic University. New Jersey Department of Transportation. April 2002.

Air quality has become one of the important factors to be considered in making transportation improvement decisions. Thus, tools are expected to help such decision-makings. On the other hand, MOBILE5 model, which has been widely used in evaluating air quality improvement, become helpless when the transportation improvements are sensitive to factors such as acceleration/deceleration, grade, etc. which are not modeled in MOBILE5 model. For example, improvements can be made to reduce the grade of a ramp, thus reduce high acceleration and deceleration. Intuitively, high acceleration would induce high emissions. MOBILE5 model, however, doesn't model the impact of acceleration/deceleration on emissions, thus cannot help the relevant decision-makings. Therefore, the objective of this study is to develop emission models to incorporate into acceleration/deceleration.

In this study, nonlinear regression models were developed to take into account factors of acceleration or deceleration, which are not considered in MOBILE5 model. To fully capture the dynamics of acceleration/deceleration, not only the acceleration or deceleration of the current time period is included in the independent variables, but also those of previous time periods. In addition, the duration that acceleration or deceleration has been exercised is also included as independent variables. The factor of grade is considered in the models by using the grade to adjust the values of acceleration or deceleration. Besides these independent variables, variables representing tractive power are also introduced into the models because they directly determine the amount of emissions to be produced by a vehicle. With this modeling approach, the validation results show that the emission model developed in this study can produce a close match to the raw emissions data in both microscopic and macroscopic levels.

Research Summaries

Developing Data Resources for the 21st Century: New Uses for Archived Intelligent Transportation Systems (ITS) Transit Data Catherine T. Lawson, Ph. D., Geography & Planning, The University at Albany, August 2003

Transportation is a derived demand for a service to move us from one activity to the next. Our opportunity set of places to go and activities to participate in are dependent on the type of movement patterns available. The first trips were made by foot and were limited by the shear distance people could tolerant walking. Early technological advances in transportation provided urban dwellers with the opportunity to take transit trips to and from a limited set of origins and destinations. With the invention of the automobile and the advent of mass production assembly line efficiencies, people were able to afford individualized transportation services. This freedom allowed them to go virtually where and when they wished – giving those with automobiles many more choices both in time and space to participate in activities.

Transit was not capable of competing with the flexibility available with an auto, both in time and location choices. Transit became popular again with policy makers as a way to cope with mounting air quality and congestion problems associated with increased auto use. Several recent planning efforts to attract "choice" transit riders are based on the notion that attractive pedestrian-friendly landscapes and special transit-oriented features will encourage riders.

This report will look at the opportunity to understand the role of transit in the 21st Century. It includes a case study in the Capital District of Upstate New York – with a spatial example using the City of Troy, New York. The Capital District Transportation Authority (CDTA) provides transit services for the Capital District Counties and has recently incorporated Intelligent Transportation Systems (ITS) into their operations. The ITS data has been archived and provided for this research as a data resource. The archived ITS data has been geocoded at the bus stop level and mapped for analysis using Geographic Information Systems (GIS) technologies available to the Department of Geography and Planning at the University at Albany. The results provide the opportunity for new understandings of transit ridership patterns based on the examination of the data at the bus stop level.

This report is broken into four sections. Section 1 provides a very brief description of transit in early American cities, describes the second generation of transit and the role of government planning and concludes with the third generation of transit, based on the notion of "choice" riders. Section 2 describes the introduction of new technologies for managing bus systems provides a new source of data. Harvesting, archiving, geocoding, and combining these data with Geographic Information Systems (GIS) data offers a new way for planners and researchers to understand transit participation. Section 3 is case study of the Capital District in Upstate New York, with a special illustration using the City of Troy, New York. Section 4 concludes the report with a discussion of the progress being made to better understand the activity patterns of those using transit for daily activities.

Research Summaries

Impact of Congestion on Bus Operations and Costs, Claire E. McKnight, Ph.D., Associate Professor of Civil Engineering, City College of New York, New Jersey Department of Transportation, June 2003

The purpose of this study is to quantify the impact of traffic congestion on bus operations and costs to New Jersey Transit, and to forecast the future impacts of congestion on operations and costs.

The basic approach of this study involved developing a regression model that estimates bus travel time rate (in minutes per mile) as a function of overall travel time rate. The data for calibrating the model were from two local bus routes operating in Northern New Jersey, Routes 59 and 62. The data were collected by study team members riding the buses and following the routes in cars as well as from automatic passenger counter (APC) equipment on eight buses. The APC equipment records exact time and location using the global positioning system as well as passenger activity.

The travel time model was used to estimate the increment in bus vehicle hours due to the increase in traffic travel time over free flow time. This was done by estimating the bus travel time rate using the following values for the explanatory variables: car travel time rate under free flow conditions (2.22 min/mile), the average number of passenger boardings per bus per mile for each route segment, and the average number of bus stops per mile for each segment. The resulting bus travel time rate was compared to the bus travel time rate implied by the route schedule. The results for Route 59 indicated that 12 minutes of the one-way outbound scheduled time of 99 minutes is due to traffic congestion and 10 minutes of the one-way inbound scheduled time of 100 minutes is due to traffic congestion. This analysis was extended to all bus trips on Route 59 in the 6 AM to 6 PM period indicating a total increment of time per weekday due to congestion of 12 hours 53 minutes. When further extended to all non-holiday weekdays for one year, the congestion impact was 3156 vehicle hours for Route 59.

In order to estimate the monetary cost of the travel time impact, a second model of cost as a function of vehicle hours and peak vehicles was developed, using New Jersey Transit FY2002 data on variable operating cost, vehicle hours, miles and peak vehicles for 92 individual routes.

The cost model indicates that every additional vehicle hour needed to provide service costs $43.18. Further, adding an additional bus to maintain the schedule would increase costs by about $125 per day, but, of course, the bus would need to be added for the year, not one day, at an approximate cost of $30,700. Looking at Route 59 again, the 3156 vehicle hours per year due to congestion costs New Jersey Transit about $136,000 per year, which represents 3.4 percent of the total cost attributed to Route 59 in FY2002.

The essence of this process is that the additional bus travel time due to congestion is equal to 0.73 times the increment of general traffic time due to congestion. To determine the increment of general traffic time due to congestion on a broader basis, travel rate indices (TRIs) for the individual counties in New Jersey were used. TRIs are the ratio of actual travel time per mile to free flow travel time per mile. A New Jersey Institute of Technology study estimated TRIs for all New Jersey counties. The increases in bus travel time rate (in minutes per mile) and bus travel time (in hours) due to congestion were calculated from the indices for a sample of 39 bus routes in Northern New Jersey. The results for the 39 routes suggest that 93,600 vehicle hours of the total 1.2 million vehicle hours are due to congestion and the cost for the increase in vehicle hours alone is $4 million. When this is further extrapolated to all New Jersey Transit bus routes in Northern New Jersey, the cost of congestion was estimated to be $15.5 million.

Traffic levels were forecasted to increase by about five percent in the next five years. To calculate the impact on vehicle hours and costs, new TRIs were calculated for a five percent increase in volume to capacity ratios for the New Jersey counties. Using the new TRIs, the increment in vehicle hours and costs were calculated using the same 39 routes as above and extrapolated to the Northern New Jersey bus system.

Research Summaries

Technical Solutions to Park and Ride Facilities for NJDOT, Kyriacos C. Mouskos, PhD, Research Professor, City College of New York, New Jersey Department of Transportation, October 2003.

The Park and Rides program is prominent throughout New Jersey and is one of the most prominent features in the support of transit usage. The NJDOT is actively involved in the provision of new park and ride facilities, expanding the capacity of existing facilities, and providing amenities for park and ride facilities. Their activities are usually coordinated with the New Jersey Transit in the evaluation of future P&R locations and the provision of transit. The local communities are also actively involved as are private bus operators. Under this study the following models have been developed:

1) A parking reservation system. Given a geographical area with a number of parking lots and the associated capacity, the demand for parking per time period of the day (e.g. 5, 10, 15 minutes) for each traveler, and the cost from each parking lot to each travelers final destination (e.g. office, restaurant, other), the model assigns each traveler to a parking lot that minimizes the total cost for all travelers. In this model each traveler specifies his/her expected arrival and departure time period. In addition, a probabilistic model was developed where each traveler specifies the probability of arrival and departure. Both models can be solved using a linear programming software for realistic size problems (e.g. 20 parking lots, 12 time periods, 20,000 travelers in less than a minute.
    - In addition, a web-based parking reservation system was developed in cooperation with the Transportation Information and Decision Engineering Center (TIDE).
    - Furthermore, a cellular based parking information system has been developed. The system sends parking availability information for a number of parking lots to the user through a cellular phone based on the user's request for parking in a geographical area. In addition, the user may request to make a reservation and the system responds with a reserved parking space at a specific parking lot.
2) Planning models. Two intermodal planning models were developed one based on static traffic assignment and one based on dynamic traffic assignment. The analyst could use the intermodal planning models to estimate the impact of a new or existing (deletion, capacity change) P & R facility on traffic conditions and transport mode choice. The dynamic based model could also be used in the future to produce the optimal path for each traveler in real-time as well as for off-line what-if scenarios. Three planning models were developed in this study:
    - A static intermodal planning model was developed and implemented using the TRASCAD transportation modeling capabilities.
    - A dynamic person-based intermodal planning model was developed independently using the Visual Interactive System for Transport Algorithms (VISTA) Dynamic Traffic Assignment Model (VISTA-DTA).
    - A spatial parking equilibrium model was developed and solution algorithms.
3) Parking Technologies: Parking payment and monitoring technologies: E-ZPass based; this technology could be implemented by installing an antenna reader at each entrance/exit of the parking lot.
4) Park and Ride facilities Universal Database. A prototype universal P & R database was developed based on the NJDOT Access based database. A literature review on P & R facilities and a survey of approximately 30 facilities in New Jersey are incorporated into the database. The literature review includes intermodal planning models, parking information and reservations systems, parking monitoring and payment systems.

Innovative Applications of Finite Element Modeling in Highway Structures Federal Highway Administration and Region 2, University Transportation Research Center**,** August 20-21, 2003, New York, NY

The Region 2 University Transportation Research Center and US Department of Transportation, Federal Highway Administration sponsored jointly the workshop: "Innovative Applications of Finite Element Modeling in Highway Structures". The objective of this national workshop which was the first of its kind, was to focus entirely on advancing the use of finite element analysis throughout the highway community. The diverse program was specifically designed to enable transportation department officials, practicing engineers, and researchers to exchange knowledge and experience about finite element modeling and structural mechanics. The two day workshop was held in downtown Manhattan at Alexander Hamilton US Customs House, One Bowling Green, New York. A publication of the workshop presentations will be available in the Fall 2003.

SMART GROWTH - OPPORTUNITIES AND CHALLENGES

By Herbert S. Levinson

Smart Growth integrates land use and transport decisions in a cohesive way to improve livability, amenity, and choice for urban area residents. It is achieved by encouraging more development within urban areas, where growth is desirable and discouraging low-density, automobile development on the urban fringe.

Its goals are to provide more choice for people in terms of type of housing and means of transport, and to reduce costs of public service. It is viewed as alternative to urban sprawl. It focuses on density, diversity, and design. Smart growth emphasizes accessibility rather than mobility. The activities that people use frequently should be located as close together as practical. The basic unit of planning is the local community, neighborhood, or village that contains a mix of uses. A walk able area one-half to one mile in diameter with commuter-used public services should be clustered into a central commercial area.

This unit is similar in many respects to "the neighborhood units" as envisioned by Charles A. Perry in the Regional Survey of New York and its environs in 1929. Perry described the neighborhood unit as a populated area that would support an elementary school with an enrollment of between 5,000 and 6,000 people. This unit would occupy about 160 acres, and would enable any child to walk a distance of one-half mile to school. Through traffic arterials would surround but not penetrate the area.

Typical actions that are conducive to smart growth include: (1) establishing urban designs and density controls, (2) allowing developments only where adequate infrastructure is provided, (3) reducing the amount of commercially zoned land, (4) clustering commercial activities and limiting commercial strips, (5) managing access along major highways, (6) requiring major employers to locate nearer transit stops, (7) preserving green space and historic areas (Ref. 1).

Smart growth usually reflects regional policies and planning. While many individual smart growth measures can and should be implemented at a local level, an effective smart growth program requires coordination among various jurisdictions. This can be a challenging task, given the governmental fragmentation in most metropolitan areas. Incremental development is essential since the existing built-up environment limits the extent and timing of smart growth.

Making smart growth a reality must recognize people's preferences and market forces. Changes will be incremental over time, since existing developments may constrain opportunities.

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1. Online TDM Encyclopedia, Todd Littman, Victoria Transport Policy Institute, June 2003.

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