

# Transportation Economic and Land Use System

LOUIS J. PIGNATARO, JOSEPH WEN, ROBERT BURCHELL, MICHAEL L. LAHR,  
AND ANN STRAUSS-WIEDER

The purpose of the Transportation Economic and Land Use System (TELUS) is to convert the transportation improvement program (TIP) into a management tool. Accordingly, the system provides detailed and easily accessible information on transportation projects in the region, as well as their interrelationships and impacts. By doing so, TELUS enables public-sector agencies to meet organizational, Intermodal Surface Transportation Efficiency Act, state, and other mandates more effectively. The objectives are accomplished by providing the computer-based capability to analyze, sort, combine, and track transportation projects in or under consideration for a TIP; assessing the interrelationships among significant transportation projects; estimating the regional economic and land use effects of transportation projects; and presenting project information in an easily understood format, including geographic information system formats.

Transportation improvements not only serve the mobility needs of an area but also contribute to regional economic development. This occurs during construction (by providing direct employment and through the purchase of construction materials and services) and throughout the useful lives of these improvements (by making their service area a more economically vital place to live, work, and do business). Furthermore, many transportation improvements are interrelated and interdependent in the sense that to achieve the full benefits of one project, one or more other projects in the same or a complementary mode must be undertaken and completed. For example, increasing the airside capacity of an airport will not be beneficial unless the landside transit and/or highway access are also improved. Further, even though development approvals do not necessarily drive transportation improvements, road improvements are often vital to secure tenants for shopping centers and to handle the traffic that these centers will generate.

In 1996, in recognition of the critical relationship between transportation investments and economic development, the North Jersey Transportation Planning Authority (NJTPA) retained the New Jersey Institute of Technology's National Center for Transportation and Industrial Productivity, as designated by the U.S. Congress in the Intermodal Surface Transportation Efficiency Act (ISTEA). and the Center for Urban Policy Research at Rutgers University to develop the Transportation Economic and Land Use System, or TELUS. NJTPA is the fourth largest federally sanctioned metropolitan planning organization (MPO), with a 5-year, \$9 billion transportation improvement program (TIP) serving a 13-county area in northern New Jersey. The area is densely populated, with 5.8 million inhabitants, over 22,000 mi of roads, and 900 mi of rails.

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L. J. Pignataro and J. Wen, New Jersey Institute of Technology, Newark, NJ 07102. R. Burchell and M. L. Lahr, Center for Urban Policy Research, Rutgers University, 33 Livingston Avenue, Suite 400, New Brunswick, NJ 08901-1982. A. Strauss-Wieder, Strauss-Wieder, Inc., 330 S. Chestnut, Westfield, NJ 07090.

## TELUS OBJECTIVES

The purpose of TELUS is to turn the transportation improvement program into a management tool. Accordingly, the system provides detailed and easily accessible information on transportation projects in the region, as well as their interrelationships and impacts. By doing so, TELUS enables public-sector agencies to meet organizational, ISTEA, state, and other mandates more effectively.

These objectives are accomplished by

- Providing the computer-based capability to analyze, sort, combine, and track transportation projects in or under consideration for a TIP;
- Assessing the interrelationships among significant transportation projects;
- Estimating the regional economic and land use effects of transportation projects; and
- \* Presenting project information in an easily understood format, including geographic information system (GIS) formats.

## FURTHERING ISTEA REQUIREMENTS

TELUS and the research conducted as part of this project enable organizations to realize their goals and to implement ISTEA considerations more effectively. ISTEA mandates that metropolitan planning organizations like NJTPA carry out specific planning analyses. For example, the legislation requires that MPOs consider the preservation of existing transportation facilities and, where practical, ways to meet transportation needs by using existing transportation facilities more efficiently. TELUS provides enhanced systemwide knowledge, including improvements planned for the existing system and the interrelationships among transportation projects, as well as more advanced analytical tools to carry out this mandate.

ISTEA also mandates that MPOs consider the likely effect of transportation policy decisions on land use and development; and the consistency of transportation plans and programs with the provisions of all applicable short- and long-term land use and development plans. The requirement is achieved through TELUS's ability to assess the impact of transportation improvements on surrounding land uses based on existing research in the United States. TELUS further provides the tools for analyzing transportation and land use activities on a systemwide basis.

Another ISTEA mandate requires that MPOs take into account the effect of all transportation projects to be undertaken within the metropolitan area, without regard to whether such projects are publicly funded. TELUS enables organizations such as the NJTPA to fulfill this requirement. For example, TELUS consolidates information

on the various transportation projects in the NJTPA area that are being undertaken by the New Jersey Department of Transportation (NJDOT), New Jersey Transit, and public authorities, as well as county transportation improvement data. TRLUS provides an instant view of significant individual projects and combinations of transportation improvements from multiple agencies.

Further, consideration of the overall social, economic, and environmental effects of transportation decisions can be enhanced through TRLUS. This system unlike any currently in use, enables the assessment of the economic and estimates of the land use effects of both individual projects and combinations of transportation improvements.

## THE TELUS COMPUTER SYSTEM

The TELUS computer system has four major components:

1. Project data input and viewing,
2. Sorting and querying capabilities,
3. GIS viewing of projects, and
4. Regional economic impact and land use assessments.

TRLUS builds on the best practices of several similar systems found throughout the country. Specifically, TRLUS uses a highly graphical format, including GIS-based access to project information. In addition, the computer system contains several layers of security permitting varying levels of access to the system, such as clearance to enter or change project information and "view-only" status.

The computer system is Windows 95-based and uses elements of Microsoft Access, Visual Basic, and Sylanmap (a GIS control program). TRLUS will be delivered in executable form, which means that users will not need to own copies of this software to run the system. Similarly, TELUS has been designed to be easy to use; thus, users do not need to be familiar with these software packages to operate the system.

TELUS maximizes the use of existing data files and "pull-down" menus to minimize the need for additional coding and entry of information. For example, TRLUS uses project and program information from NJDGT and New Jersey Transit that have been reviewed for data accuracy by key members of NJTPA staff. GIS information on project locations, county boundaries, bus routes, transportation corridor boundaries, and roadway and rail systems also flow from NJTPA files.

## SYSTEM DESIGN

### security

The system begins with a security screen. This screen allows only authorized users to access TRLUS. Authorized users are divided into three levels of system access:

1. *View only* allows users to view project data, undertake sorts and queries, and run economic impact and land use assessments. However, view-only users are not permitted to enter, change, or delete project information.
2. MPO *staff allows* staff to enter or modify project information.
3. *Data manager* allows the system manager to make additional program modifications to TELUS.

Once users have successfully entered TELUS, their system access level is displayed.

## Selecting Projects

The initial screen that users see after passing security provides three options:

1. Select a project or group of projects to view or review,
2. Conduct an economic impact or land use analysis, and
3. Go directly into TELUS's GIS capabilities.

Users *have several* ways of selecting projects. A *single project* can be selected by scrolling down a list of the projects in the system database (which has been presorted by county). The project descriptions are also shown.

*Multiple projects* can be selected by doing sorts or queries. Sorts and queries can be nested as needed for specificity. Projects can be sorted by geographical parameters (county, municipality, transportation corridor, and legislative district), route, funding source, and/or project type. When multiple projects are selected, a message at the bottom of the subsequent project information screen will tell the user the number of projects resulting from the query or sort.

## Project Information Screen

The project information screen (shown in Figure 1) displays detailed project information, including:

- Project number;
- Project description;
- Project location (county, municipality, transportation corridor, route, section);
- Project type (e.g., highway, transit, bridge);
- Investment type (new capacity, significant system preservation, routine maintenance);
- Project funding; and
- Project phases (including description and details).

The project information screen follows the format adopted by NJTPA for TIP project reporting because this format is familiar to many potential TELUS users. The information on this screen can be viewed, and with the appropriate authorization level, changed or updated, for individual projects.

Buttons at the bottom of the screen allow the user to view information on project status, interrelationships, finances, correspondence, and scoring. Additional buttons allow the user to view the project in GIS form, conduct economic and land use analyses, or print reports.

## GIS

On the GIS screens, the user can view the location of a project in the NJTPA region and zoom in for greater detail at the county or sub-county level. At this level, the user has the option of also displaying roadway, rail line, bus route, and corridor information to see how the project relates to the area's transportation system. An example of a GIS screen is shown in Figure 2.

Individual projects and groups of projects can also be viewed or selected on the GIS screens. When projects are selected in this manner, they can be either viewed on the project information screen or analyzed for their economic impact and land use effects.

**FIGURE 1 Project information screen.**

**FIGURE 2 Geographical information screen.**

## Economic Impact and Land Use Assessments

TELUS enables users to perform a regional economic impact assessment of (a) a single project, (b) multiple projects, and (c) all projects in or under consideration for the TIP, NJDOT, New Jersey Transit, and other projects. After the project(s) are selected and the assessments performed, the results are presented in a series of screens. With a click of the printer icon button, these screens become reports. An example of an economic impact screen is shown in Figure 3.

Economic effects can be viewed for the state of New Jersey, the NJTPA region, the host county, and other individual counties in the NJTPA region. Economic effects are displayed for employment, income, gross regional product, and taxes generated for both direct and total effects. The definitions of each of these economic effects can be called up by holding the cursor on the appropriate label on the screen. Impacts per million dollars invested, share of economic base information, and sector-level impacts can also be viewed and printed out.

The land use effects, shown on a separate screen (Figure 4), are displayed for overall property value, change in property value, and change in property tax for both existing properties and improved properties brought to the area by the transportation improvement. The definitions of these terms can be viewed similarly to the economic impact screens.

## ECONOMIC IMPACT APPROACH

TELUS uses a highly sophisticated multiregional input-output approach to estimate the economic impacts of transportation projects at the county, regional, and state levels. Input-output analysis is

a widely established tool that focuses on the interrelationships among sectors in an economy.

The model that is used for the TELUS project, the Regional Science Research Corporation's (RSRC's) input-output model, has a strong reputation among academics and practitioners. This reputation is based on a number of unique features of the model. Foremost among these features is the way RSRC tailors industry-by-industry data needed for accurate and useful results to the client's geographic specification, particularly data on value added and the proportion of purchases made locally (also known as regional purchase coefficients).

The RSRC model also has the capability of multiregional and hierarchical regional modeling. No other regional input-output modeling system currently has this capability at the substate level. The multi-regional attribute enables the estimation of the regional economic effects that accrue to a region that are not directly affected by the economic change. Thus, for example, one can determine the economic effects in Bergen County of transportation improvements in Essex County. The hierarchical feature of the model allows simultaneous modeling of regions and their components.

The RSRC model was originally developed with funding from the National Cooperative Highway Research Program for estimating the effects of highway development on regional economies. Since then it has been used extensively in joint studies with Peat Marwick and Mercer Management, Inc., to evaluate the economic effects of public investments, including many transportation projects:

- Colorado Springs Multiuse Arena,
- The Economic and Tax Impacts of the Camden Yards Stadium Development,
- Economic Impact Studies of Detroit Metropolitan Wayne County Airport,

FIGURE 3 Economic impact screen.

FIGURE 4 Land use screen.

- Economic Impact Study of Pensacola Regional Airport,
- The MARAD Regional and National Input-Output Models,
- The Economic Impact of the Ports of Los Angeles and Long Beach, and
- The Economic Impact of Commercial Navigation on the Twin Cities.

The outputs generated by the RSRC model and displayed in TELUS include

- Income effects-including changes in wages, salaries, and proprietor's income.
- Federal tax effects-consisting of changes in federal, corporate, and personal income; social security; and excise tax revenues.
- State employment effects-measured in jobs, both full and part-time.
- State tax effects-changes in state personal and corporate tax revenues; state property tax revenues; excise, sales, and other state taxes generated by the level of economic activity in the region.
- Local tax effects-changes in revenues to substate governments that occur mainly through property taxes on worker households and businesses. These effects also include income, sales, and other major local taxes where applicable (e.g., Newark's income tax).
- Gross regional product (also called value added)--measures regional output in the same sense that gross domestic product measures national output.

## LAND USE

The current TELUS land use model is composed of two sections: a property land use model and a tax model. The two models are used

sequentially; that is, the results of the property land use model feed into the tax model. The following sections describe each of the models.

The literature review revealed that most transportation/land use models are driven by changes in travel behavior, which are generated by expectations for regional economic growth. The crux of the more complex branch of this family of models is a transportation network model that is informed with capacities, trip flows, and average travel times by transportation link. Such network models enable the allocation of employment and residential growth into expected transportation-path and link-load changes. TELUS, however, does not currently contain information on the capacities, trip flows, and average travel times associated with links affected by elements of the transportation improvement plan. The future TELUS land use model will have this capacity.

The land use model employs data on transportation investment in conjunction with estimates of the existing aggregate property value equalized tax rates in the municipality where the investment takes place. TELUS distinguishes, in general terms, the manner in which land values will increase by identifying any change in transportation investment in a single municipality or multiple municipalities of the NJTPA 13-county region. This is done by estimating the proportion of the change in municipal aggregate property value that is due to investment in rail and road transportation improvements. The model then breaks these two estimates out by type of use: residential (single and multifamily) versus nonresidential (commercial/industry). It makes such distinctions based on the value of the regression coefficients of roads and rail investment, each as one of several independent variables effecting property value change in the location where investment has taken place.

Applying prevailing effective property tax rates to the results of the property and land use model, TELUS estimates the magnitude of the property tax base expansion and the resultant potential property tax that should derive from the change in value induced by the

transportation improvement. The direct tax savings are further delineated by property type.

### **TELUS STATUS AND NEXT STEPS**

The TELUS project has created a unique management tool that will soon be used in the northern New Jersey area on an ongoing basis. As implementation proceeds, a number of other MPOs and transportation organizations have already asked for information on the system and would like to implement it. TELUS is adaptable to meet the needs of organizations nationwide.

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