THE TRANSPORTATION ECONOMIC AND LAND USE SYSTEM (TELUS)

by:

Louis J. Pignataro, Executive Director
Institute for Transportation

and

Joseph Wen, Assistant Professor of Information Systems
School of Management
New Jersey Institute of Technology
Newark, NJ 07102
(973) 596-3363, Fax (973) 596-6454

Robert Burchell, Distinguished Professor

and

Michael L. Lahr, Assistant Research Professor
Center for Urban Policy Research
Rutgers University
33 Livingston Ave, Suite 400
New Brunswick, NJ 08901-1982
(908) 932-3133, Fax (908) 932-2363

Ann Strauss-Wieder
Engineering Consultant
Strauss-Wieder, Inc.
330 S. Chestnut Inc.
Westfield, NJ 07090
(908) 654-8536, Fax (908) 654-5294
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Abstract

The purpose of 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, ISTEA, 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.

• Presenting project information in an easily understood format, including Geographic Information System (GIS) formats.

Keywords: Project Information Systems, Transportation Project Management, Economic Impact, Land Use Impact, Project Interrelationships
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Background

Transportation improvements not only serve the mobility needs of an area - they 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 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 (NJIT) National Center for Transportation and Industrial Productivity (NCTIP), as designated by the U.S. Congress in ISTEA, and the Center for Urban Policy Research (CUPR) at Rutgers University in 1996 to develop the Transportation Economic and Land Use System, or TELUS. NJTPA is the fourth largest federally sanctioned metropolitan planning organization (MPO), with a five-year $9 billion TIP serving a 13-county area in northern New Jersey. The area is densely populated, with 5.8 million inhabitants, over 22,000 miles of roads, and 900 miles of rails.

TELUS Objectives

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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. The Intermodal Surface
Transportation Efficiency Act (ISTEA) mandates that metropolitan planning organizations (MPOs) 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 system-wide knowledge, including improvements planned for the existing system and the inter-relationships 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’ 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 system-wide 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, New Jersey Transit, and public authorities, as well as county transportation improvement data. TELUS 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 TELUS. 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 (Geographical Information System) Viewing of Projects

4. Regional Economic Impact and Land Use Assessments

TELUS builds on the best practices of several similar systems found throughout the country. Specifically, TELUS 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 Sylvanmap (a GIS control program). TELUS 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, TELUS uses project and program information from the New Jersey Department of Transportation 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 TELUS. Authorized users are divided into three levels of system access:

1. View-only - This authorization level 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 - This level allows staff to enter or modify project information.

3. Data Manager - This level 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’ 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: Detailed project information is displayed on this screen (shown in Figure 1) including:
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, financial, 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 the GIS screens 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 either be viewed on the Project Information Screen or analyzed for their economic impact and land use effects.

**Economic Impact and Land Use Assessments:** TELUS enables users to perform a regional economic impact assessment of (1) a single project; (2) multiple projects; and (3) 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. These screens, with a click of the printer icon button, become reports. An example of the economic impact screens 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 in terms of 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, are displayed in terms of 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 outputs generated by the model and displayed in TELUS include:

- Employment effects - measured in jobs, both full and part-time.
- Income effects - including changes in wages, salaries, and proprietors income.
- Federal tax effects - consisting of changes in federal, corporate and personal income, social security, and excise tax revenues.
- 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 NJIT/Rutgers team reviewed the extensive literature written on land use impacts and held numerous discussions with practitioners in the field. Further, the team is analyzing several significant transportation improvements in the State of New Jersey to trace changes in property value associated with these improvements. The improvements include transit projects, the Lindenwold Line, the creation of the Metro Park Rail Station, the expansion of commuter parking in Metuchen, and the Long Branch electrification. Highway projects have impacts on property values that will also be traced. These include development of Routes 1-78, 1-280, 1-195, the expansion of the Garden State Parkway, and intersection improvements along NJ Route 10 in the Parsippany area. Analysis of these "high capital" projects provides the upper bounds of land use impacts.

Using information from the literature, gradations of impacts for smaller projects can be ascertained. Land use analysis must take this long-term perspective due to the length of time necessary for the impacts of transportation investments to be fully realized.

The land use module of TELUS has three components: (1) a model that quantifies relationships between accessibility changes and transportation improvements of certain types; (2) a property value and land use model that relates changes in accessibility to changes in property value; and (3) a property tax model that converts property value increases into property tax benefits. The
models are transportation improvements on the value and tax producing capacities of existing and new properties. The resultant land use impacts are displayed in terms of overall property values, changes in property value, and changes in property taxes for both existing properties and new properties brought to the area by the transportation improvements. The land use screen is shown in Figure 4.

**Telus Status And Next Steps**

The TELUS project for NJTPA is scheduled for implementation by the MPO in August of 1997. A training course is being developed, along with documentation, to ensure smooth implementation.

The TELUS project has created a unique management tool that will soon be used in the northern New Jersey area on an on-going basis. As implementation proceeds, a number of other MPO’s 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.

**ACKNOWLEDGEMENT**

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Figure 1: Project Information Screen
Figure 2: Geographical Information Screen
**Figure 3: Economic Impact Screen**

<table>
<thead>
<tr>
<th>Location</th>
<th>Employment</th>
<th>Income</th>
<th>Gross Reg. Product</th>
<th>State Tax</th>
<th>Local Tax</th>
<th>Federal Tax</th>
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<tr>
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<td>$51,191,000</td>
<td>$70,006,000</td>
<td>$5,227,375</td>
<td>$4,366,500</td>
<td>$13,303,625</td>
</tr>
</tbody>
</table>

**Select Extra Output**
- **Impacts Per Million $**
- **Share of Economic Base**
- **Industry Details**

Share-of-economic-base multipliers show the magnitude of the project’s economic impacts relative to the size of the local economic base.
Figure 4: Land Use Screen
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Figure 1: Project Information Screen

Figure 2: Geographical Information Screen

Figure 3: Economic Impact Screen

Figure 4: Land Use Screen