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16. Abstract
TxDOT's statewide transportation program has been planned to meet projected transportation needs across the state. However, available financial resources are not sufficient to fully fund the desired program. The 2003 legislature created additional tools and funding. One of the major untapped potential sources is local funding. TxDOT seeks to increase local funding participation in its projects. TxDOT desires to attract local partners — both public and private sector — to participate in its projects by demonstrating economic and other benefits of major transportation projects to local areas.

This project has developed lists and examples of a variety of transportation project partnerships. It has also identified economic and other benefits that result from major transportation projects, estimation methods to quantify the economic and other benefits, and existing and innovative funding sources for local entities. In addition, it produced guidebooks to promote project partnering and to select methods to estimate economic impacts of major transportation projects. Supporting brochures, a presentation, and sample project prospectus components were also produced.

This research report summarizes the background information developed for this project. It is accompanied by other reports, including *Guidelines for Transportation Project Partnering: Promoting Local Participation on Transportation Improvement Projects* (0-5025-P5) and *Guidebook for Economic Benefit Estimation* (0-5025-P1).

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PROMOTING LOCAL PARTICIPATION ON TRANSPORTATION IMPROVEMENT PROJECTS: RESEARCH REPORT

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DISCLAIMER

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of the Federal Highway Administration (FHWA) or the Texas Department of Transportation (TxDOT). This report does not constitute a standard, specification, or regulation. The engineer in charge was Brian S. Bochner, P.E. (Texas, #86721).

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1. INTRODUCTION

This report summarizes the findings from Texas Department of Transportation (TxDOT) Research Management Committee (RMC) project 0-5025, "Promoting Local Participation on Transportation Improvement Projects." This report is one of several reports and products produced as a result of the work performed. Table 1 lists the project outputs.

Table 1. Project 0-5025 Deliverables.

Deliverable Number	Description	Produced By
0-5025-P1	Guidebook — *Guidebook for Economic Benefit Estimation Methods* — methods for identifying and estimating economic benefits; guidelines for assembling a project prospectus.	Center for Transportation Research
0-5025-P2	Local Funding for State Partnerships — funding method summary — tabular summary of existing and potential local transportation funding methods.	Texas Transportation Institute
0-5025-P3	PowerPoint® presentation (produced in draft form for possible future TxDOT use) — "Making Critical Transportation Projects an Early Reality" — 15-minute presentation of benefits of partnering with TxDOT on transportation projects.	Texas Transportation Institute
0-5025-P4	Popular brochure (produced in draft form for possible future TxDOT use) — *Meeting Local Needs Today* — concise summary of advantages of partnering with TxDOT and examples of partnered projects.	Texas Transportation Institute
0-5025-P5	Guidebook — *Guidelines for Transportation Project Partnering: Promoting Local Participation on Transportation Improvement Projects* — guidelines for transportation project partnering and estimation of non-economic benefits and impacts.	Texas Transportation Institute
0-5025-P6	Sample benefit prospectus — *Sample Benefit Prospectus* — sample structure and contents covering economic benefits of transportation projects.	Center for Transportation Research
0-5025-1	Research report — *Promoting Local Participation on Transportation Improvement Projects: Research Report* — summary of research performed and methods, findings, and conclusions; does not repeat most of material in other reports.	Texas Transportation Institute
0-5025-S	Project Summary Report — *Promoting Local Participation on Transportation Improvement Projects* — summary of work performed, findings, and conclusions.	Texas Transportation Institute

This research report has been written to avoid repeating major content components in multiple reports. In some cases content of other products has been summarized; in most cases it is referenced in this report.

BACKGROUND AND NEED FOR PARTNERING

TxDOT and other state departments of transportation (DOTs) face a shortfall in funding their desired transportation improvement programs. This situation has resulted at least in part from increases in both population and vehicle-miles per capita that are growing at a more rapid rate than increases in transportation funding.

Past Growth

Over the past 25 years, Texas' population has increased by 57 percent, and vehicle-miles of travel (VMT) have increased by 95 percent.[1] At the same time, state highway capacity grew only 8 percent as measured in lane-miles. Growth in travel clearly exceeded increases in the system by a large margin.

Past Diversion of Texas-Generated Revenues

During the same 25 years, Texas received $7 billion less in federal gas tax revenues than it contributed. In addition, the state used $10.8 billion in state gas tax and other transportation-related revenues for other uses. Hence, not even all Texas transportation-related tax revenues were available for use for Texas transportation.

Future Growth and Funding Shortfall

Over the next 25 years, Texas' population is projected to increase another 64 percent, and VMT will increase by an additional 214 percent. However, TxDOT will only be able to increase state highway lane-miles by 6 percent during that period. Under the present funding structure, Congress will transfer another $7.5 billion in Texas gas tax revenues to other states, and the Texas legislature will use about $13.5 billion in state transportation-related revenues for other priority uses.

TxDOT has projected over $85 billion more in state transportation system needs than can be funded under current state and federal programs. Even if Congress has to reverse recent transportation funding transfer policies and make Texas a donee state, it has been estimated that it would take 180 percent of Texas fuel tax revenues to meet Texas' projected state transportation needs. That is not an outcome that can be expected.

If the state legislature was to consider increasing the state gas tax to meet the complete state transportation system needs, the state gas tax would have to be increased about six-fold (600 percent) to about $1.40 per gallon. Such an increase is highly unlikely.

Other reasons for the funding shortfall exist. Among these reasons are increasing project costs for right of way, environmental protection, grade separation, and construction in constrained right of way. In addition, as the highway system increases in size and advances in age, maintenance costs are also increasing.

Recent State Gas Tax Revenue Trend

The bulk of state transportation funds are derived from the state fuel tax. Revenue generated from this source is dependent on the fuel tax rate, fuel consumption rates (miles per gallon), and vehicle-miles of travel. VMT has been increasing. Between 1996 and 2003, VMT grew from 185 to 223 billion (20.5 percent), but fuel consumption rates are declining as a result of federal requirements for energy conservation and emissions reduction.[2] The Texas state fuel tax was last increased in 1991, so it has not been growing either. As a result, in the period between 1996 and 2003, Texas VMT increased by 20.5 percent, but state funds from fuel taxes have increased only by 4.3 percent, after adjustments to reflect inflation during the same period.[3]

The end result is a declining ability for TxDOT to meet state highway system needs. However, due to continuing growth in travel, needs and local requests for improvements continue to grow and to exceed available resources.

TxDOT Strategy

TxDOT has a plan for dealing with the gap between needs and current transportation funding.[4] One of the plan's strategies relates to partnering:

> Empower local and regional leaders to solve local and regional transportation problems. This includes both use of new funding tools created by the state legislature (e.g., pass-through financing, use of RMAs, the Texas Metropolitan and Urban Mobility Plans) and partnering with both TxDOT and other local and regional agencies and private organizations.

The 2003 state legislature enacted HB 3588, a wide-ranging measure that provided many new tools to enable TxDOT to obtain funding from non-traditional sources. Many of these tools enhance the ability of local and regional agencies plus private sector organizations to participate with TxDOT. These tools, added to recent federal initiatives, make available both increased funding flexibility and funding available on loan. HB 3588 added about $300 million per year of new funding; other tools enable TxDOT to manage resources more flexibly or borrow funds that have to be repaid from traditional sources. HB 2702, passed by the 2005 legislature, clarified and enhanced some provisions of HB 3588.

TxDOT continues to seek additional ways to fund the state transportation program. For years TxDOT has partnered with local public agencies and private sector entities to make transportation improvements on state highways. This local participation has come in many forms, including provision of right of way, financial contributions, maintenance agreements, and other forms.

In the past, TxDOT has had sufficient resources to build, manage, and maintain the complete state highway system. However, as VMT growth continues to outpace growth in state transportation funding, and more funding is required to keep the growing but aging highway system in good condition, the gap increases between projects desired by local interests and those that can be financed. Hence, if desired projects are to be implemented on a timely basis, TxDOT and others need to find other ways to support these projects.

Partnering is a way that can expedite, enhance, or even add projects to the program. This project addresses how to develop successful partnerships. Cooperative partnering between state and local agencies will be needed to meet future transportation needs. TxDOT will depend on local and regional leaders to provide both leadership and commitment to help carry projects forward.

Partnering is not new for TxDOT or local entities. For years TxDOT has partnered with local public agencies and private sector entities to make transportation improvements on state highways. This local participation has come in many forms, as will be discussed later in this document. Since many improvements and additions to the state highway system meet either local needs and/or yield primarily local benefits, there has been reason for the local entities to participate financially.

In FY 2004, TxDOT expended approximately $4,524,000 on "construction" projects (construction, engineering, right of way, and other costs).[5] The sources of funding were as follows: $2,740,000 federal, $1,534,000 state, $109,000 counties, $111,000 cities, and $30,000 other. Hence, local participation amounted to approximately 5.5 percent of the total.

PROJECT PURPOSE

TxDOT is currently suggesting to local agencies that they consider increasing their participation in TxDOT projects in order to expedite scheduling of locally desired projects. This project has been undertaken to determine the factors that interest local governmental agencies and private entities to participate financially in state transportation projects and to identify and develop tools that can help TxDOT to attract increased local funding into its projects.

The approach used has been to seek examples of local agency and private sector financial participation in state DOT projects, both within Texas and in other states. In addition to identifying such examples, the research has also included the identification of benefits and motivations driving the local participation and, where available, background on how the local participation was increased.

The research also includes compilations of economic and other benefits to local project participants, either realized or anticipated, and methods of providing the local funding. For economic benefits, the research includes descriptions of how the economic benefits are analyzed and projected as well as examples of estimated benefits for specific projects.

2. LEGISLATION

Various federal and state legislation affects local participation in state transportation projects. This chapter summarizes the most relevant legislation.

FEDERAL

Participation of the private sector in transportation infrastructure investment and management has been identified as an important thrust by the federal government. In 1994 President Clinton issued Executive Order number 12893 stating the principles for federal infrastructure investment. This order states that "Agencies shall seek private sector participation in infrastructure investment and management. Innovative public private initiatives can bring about greater private sector participation in the ownership, financing, construction, and operation of infrastructure programs."[6]

More recently the Secretary of Transportation, Norman Mineta, stated that "Expanding and improving innovative financing programs in order to encourage greater private sector investment in the transportation system will be one of the DOT's core principles in working with Congress and other stakeholders."[7]

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy For Users (SAFETEA-LU) and its predecessors, the Transportation Efficiency Act for the 21st Century (TEA-21) and Intermodal Safety and Transportation Efficiency Act (ISTEA), increased funding flexibility for states and permitted and encouraged increased partnering between state DOTs and local public and private entities. Of perhaps most importance was the introduction of the ability to charge tolls on federally funded highways. This provided the opportunity to public and private sector partners to raise additional revenues, which in turn provides the opportunity to expand total resources available to improve the transportation system. However, this legislation also increased the roles that private entities could take in public-private partnerships (PPP).

TEA-21 allowed states to use excess revenue from toll facilities whose construction was paid for out of toll revenues as a credit toward the non-federal matching share for certain transportation projects. Some of the other pertinent federal programs are as follows:[8]

- The Transportation Infrastructure Finance and Innovation Act (TIFIA) of 1998 that was enacted as part of TEA-21 presented a method of acquiring loans and lines of credit for large projects (projects costing at least $100 million or 50 percent of a state's annual apportionment of highway funds, whichever is less).
- Tapered match allows a project sponsor to vary the amount of non-federal match over time. Tapered match can be applied as long as the federal contributions do not exceed the federal limit according to Section 1302 of TEA-21.
- Section 129 Loans allow federal participation in a state loan to a toll or non-toll project with a dedicated revenue stream, such as excise taxes, sales taxes, real property taxes, motor vehicle taxes, incremental property taxes, or other beneficiary taxes.

- Advance Construction Authority allows a state to use non-federal funds to advance a federal-aid project while preserving its eligibility to receive federal-aid reimbursements in the future.
- State Infrastructure Bank (SIB) is a state revolving fund that can offer a range of loans and credit assistance to public and private sponsors of highway projects. Types of assistance include loans, loan guarantees, standby lines of credit, letters of credit, certificates of participation, debt service reserve funds, bond insurance, and other non-grant assistance.
- Grant Anticipation Revenue Vehicle (GARVEE) is a debt financing instrument that has the pledge of future federal aid for debt service and is authorized for federal reimbursement of debt service and related financing costs.
- Non-profit 63-20 Corporations are private, non-stock corporations that may be formed under the non-profit corporation act of a state. The objective of such corporations is for private developers and public agencies to develop major projects.

SAFETEA-LU includes several sections that enhance innovative financing and involvement of the private sector in transportation infrastructure projects. The following are examples of SAFETEA-LU enhancements:[9, 10]

- Private activity bonds: The purpose of these bonds is to encourage additional private participation in surface transportation infrastructure projects. SAFETEA-LU expanded this program by adding highway facilities and surface freight transfer facilities to eligible activities. This expansion allows additional private activity on eligible projects while maintaining the tax-exempt status of the bonds. The national cap for all such bonds was set at $15 billion.
- TIFIA: TIFIA provides secured loans, loan guarantees, and lines of credit for eligible projects; TIFIA loans may constitute up to one-third of total project cost.[11] SAFETEA-LU makes TIFIA financing accessible to more highway, transit, and rail projects by lowering the project cost eligibility threshold to $50 million ($15 million for intelligent transportation system [ITS] projects). These projects can now include intermodal facilities, border crossings, expansion of multi-state trade corridors, and other investments with regional and national benefits.
- Tolling: SAFETEA-LU extended tolling provisions for federal-aid highways that had been initiated under TEA-21 in the Interstate System Rehabilitation and Reconstruction Pilot Program. This program permits states to collect tolls on the interstate system for the purpose of reconstruction and rehabilitation. However, SAFETEA-LU allows states to collect tolls on interstate highway facilities to fund construction of interstate highways. The express lanes demonstration program was instituted for alleviating congestion and reducing emissions by permitting vehicles not meeting high occupancy vehicle (HOV) lane occupancy requirements to use those lanes for a variable toll charge based on current traffic conditions.
- State Infrastructure Bank: SAFETEA-LU expanded the previous SIB loan program to all states. This program permits states to establish revolving loan programs for eligible transportation projects, with the loan programs being

capitalized with federal transportation funds. Loans can be made to public or private entities for eligible projects.[12]

State DOTs have partnered with local agencies and private entities for decades. Recent federal legislation provides more financing options to state-local partnerships as described above, but legislation has not been needed to make such alliances possible. However, federal policy has been to encourage states to seek partnerships with local entities to increase total resources available for transportation projects and to encourage local participation throughout project development.

TEXAS

TxDOT has long used traditional cost sharing methods to partner with local agencies and private entities to make transportation improvements. In recent years, state legislation has created a number of additional tools through which local entities can participate in state transportation projects. These include:[13]

- toll roads,
- regional mobility authorities(RMAs),,
- comprehensive development agreements (CDAs),
- pass-through financing, and
- State Infrastructure Bank (SIB).

HB 3588 and HB 2702

The 2003 state legislature enacted HB 3588, a wide-ranging measure that provided many new tools to enable TxDOT to obtain funding from non-traditional sources. Many of these tools enhance the ability of local and regional agencies plus private sector organizations to participate with TxDOT. HB 3588 also added about $300 million per year of new funding; other tools enable TxDOT to manage resources more flexibly or borrow funds that have to be repaid from traditional sources. HB 2702 passed by the 2005 legislature clarified and enhanced some provisions of HB 3588.

The following is a summary of the key portions of those bills that expand funding capability or partnership tools.[14, 15, 16]

Regional Mobility Authorities (RMAs)

HB 3588 allows the Texas Transportation Commission to authorize the creation of RMAs for the purposes of constructing, maintaining, and operating transportation projects in a region of the state. An RMA may designate a turnpike project or a portion thereof as a controlled-access toll road.

An RMA can establish tolls to pay for the facility. An RMA may also lease part of a transportation facility for subsidiary uses in order to raise funds. In addition, TxDOT may help pay for certain costs of an RMA project.

HB 3588 enables an RMA to enter into agreements with public or private entities, a toll road entity, the U.S. or Mexican federal or Texas or other state government, or another governmental entity to plan, acquire, finance, build, operate, or maintain a transportation project. An RMA may enter into comprehensive development agreements (see below).

Bonds — Texas Mobility Fund

HB 3588 authorized the commission to issue bonds secured by a pledge of and payable from the State Highway Fund. The bonding limit is $4 billion. The Texas Mobility Fund enabled TxDOT to borrow funds to accelerate its program to get more projects completed sooner.

Pass-Through Financing

HB 3588 established pass-through financing, which is a fee per vehicle or per vehicle mile based on highway usage. TxDOT or another agency may use the resulting revenue to finance construction, maintenance, and operation of a tolled or non-tolled state highway or other toll facility. The legislation allows TxDOT to enter into an agreement with a public or private entity to provide pass-through financing to be paid to a public or private entity as reimbursement for the cost of construction, maintenance, or operation by that public or private entity. HB 3588 also allows TxDOT to partner with private entities for pass-through financing.

HB 3588 also authorizes counties to issue bonds to fund the costs of state highways and use revenues from pass-through financing for the payment of the bonds. HB 2702 added that a local entity may also use pass-through financing to reimburse TxDOT for the development and construction of a highway project.

Comprehensive Development Agreements (CDAs)

HB 3588 provides for CDAs, which are agreements with a private entity that, at a minimum, provides for the private entity to design and construct a turnpike project and may also provide for the financing, acquisition, maintenance, or operation of a turnpike project. Projects are eligible if included in the TxDOT Unified Transportation Program or located on a transportation corridor identified in the statewide transportation plan.

HB 2702 authorized CDAs for projects that include both tolled and non-tolled elements, projects in which the private entity has an ownership interest in the project, and projects that are financed wholly or partly with private activity bonds.

The legislation permits a CDA concession term of up to 50 years (up to 70 years for projects not on the Trans-Texas Corridor).

Toll Equity

Monies granted by TxDOT for toll equity were increased by HB 3588 to $2 billion average annual expenditure over a five-year period. This limit excludes all money to be repaid to TxDOT.

Local Governments

HB 2702 authorized local governments to enter into and make payments to other local governments for the design, development, financing, construction, maintenance, and operation of a toll or non-toll facility on the state highway system.

HB 2702 also authorized counties to issue bonds to fund the costs of state highways within the county and extensions into adjacent counties, and to pay the bonds with revenues from any source, including pass-through toll revenues from TxDOT.

Additional Previously Authorized Programs

Texas had previously established a State Infrastructure Bank to operate under the federal SIB revolving loan and credit line program. The Texas SIB program enables local entities to use loans, lines and letters of credit, bond insurance, and capital reserves. The loans could then permit the local entity to implement their projects earlier than would be possible if they had to accumulate funds first.

3. LOCAL PARTICIPATION EXAMPLES

As mentioned previously, local participation in TxDOT projects has been taking place for decades. Most of this participation appears to be occurring for two primary reasons:

1. local sponsor needs and requests highway improvement to be added to TxDOT program (i.e., add a project) and/or
2. local benefits to be derived from a project make it desirable to expedite the project by providing financial incentives to TxDOT for earlier project scheduling (i.e., expedite a project to gain benefits earlier).

Examples of the types of projects for which TxDOT and other state DOTs have had local partnerships are:

- TxDOT
  - Add frontage road
  - Widen existing highway
  - Construct new highway
  - Construct new publicly owned toll road
  - Relocate section of existing highway
  - Construct new bridge
  - Construct new interchange
  - Add HOV lanes
  - Reconstruct existing highway or bridge
  - Access improvements adjacent to new development
  - Install traffic signals
  - Maintain highways
  - Utilize preferred contracting provisions available to either TxDOT or local entity
- Additional types of projects for which other state DOTs have partnered locally
  - Construct privatized toll roads
  - Construct grade separations
  - Construct multimodal (highway, rail) facility
  - Eliminate railroad grade crossings

Table 2 describes a number of examples of such projects both within and outside Texas. This list is not intended to be comprehensive, but is intended to provide examples of the types of projects and partnerships that are or could be available to TxDOT and local public and private partners. Texas examples are listed first. Examples for other states follow in alphabetical order by state.

Table 2. Examples of State DOT Projects Partnered with Local Entities.

No.	Project	Description	Partnering Structure	Partnering Entities	Primary Benefits to Partners	Reference
Examples from Texas						
1	Texas, Austin: SH 130 Toll Road	The 49-mile tollway is part of the Central Texas Turnpike Project. The total project financing is $2.9 billion and includes a federal TIFIA loan, state highway funds, contributions from local governments, and a $2.2 billion bond sale. The financing maximized the use of the federal loan and secured financial commitments from TxDOT and local governments. Amount: $2.9 billion Status: Open between SH 79 and US 290; under construction between US 290 and US 183 and between SH 79 and I-35 (north) and US 183 and I-35 (south).	Cost sharing with design-build agreement	TxDOT, local governments for right of way (ROW) acquisition (City of Austin, Williamson County, and Travis County)	• Time and cost savings • Additional funds for transportation • Advanced project completion	http://www.sh130.com/default.asp http://www.texastollways.com/tta/downloads/Official_Statement_Dated_August_7_2002.pdf TxDOT Turnpike Authority Division (512) 936-0980 Phil Russell, Director
2	Texas, Austin: US 183-A	A new 11.6-mile toll facility being developed through a CDA between Central Texas RMA and a design-build team. Amount: The first phase design and construction costs are estimated at approximately $200 million. Status: Initial segments opened November 2006. Estimated completion in 2007.	CDA: RMA and design-build team	Central Texas Regional Mobility Authority (CTRMA) and design-build contractor	• Advanced project completion (more than four years ahead of schedule)	Austin (CTRMA) — http://www.sh130.com/default.asp http://www.ctrma.org/newsletter/newpage.htm http://www.ctrma.org/documents/CTRMA_Forest_Oaks_presentation_ Final.pdf Turnpike Authority Division (512) 936-0980 Phil Russell, Director

Table 2. Examples of State DOT Projects Partnered with Local Entities (continued).

No.	Project	Description	Partnering Structure	Partnering Entities	Primary Benefits to Partners	Reference
3	Texas, Houston: Sam Houston Toll Road	This road was planned to be built as Beltway 8 (state highway) in two basic phases due to its length and cost. The first was to be frontage roads. Later, when money became available, the freeway main lanes were to be built. Harris County interests wanted a faster completion of the main lanes, especially in congested west and north Houston, with a connection to Bush Intercontinental Airport from the west side. As one of two initial Harris County Toll Road Authority (HCTRA) projects, the Sam Houston Toll Road was built as the main lanes on state ROW, with TxDOT constructing the frontage roads and system interchanges. This saved TxDOT both time and much of the cost of the project. The main lanes were financed with toll revenues. This tollway has been extended in several increments as demand has warranted. Amount: $888 million (all sections) Status: Completed	Toll road: TxDOT provided ROW, frontage roads, and system interchanges; HCTRA provided the rest	TxDOT, Harris County Toll Road Authority	• Accelerated completion • Additional resources for transportation • Reduced congestion in critical corridors • Improved area accessibility	Wesley Friese, HCTRA, Sen. Jon Lindsay http://www.hctra.com/ http://www.hctra.com/hctra/history.html
4	Texas, Garland to Irving: President George Bush Turnpike	This 30-mile, four-lane limited access tollway now extends from State Highway 78 in Garland, Texas, to Belt Line Road in Irving, Texas. The Eastern Extension will extend the toll road from SH 78 to I-30 in Garland. The turnpike is the northern section of the outer highway loop around the Dallas metropolitan area, linking four freeways (I-635, I-35E, US 75, and I-30), the Dallas North Tollway, and numerous thoroughfares, streets, and roads in the rapidly growing seven cities and three counties in the area served. The turnpike was also designed to improve access to the Dallas/Fort Worth International Airport.	Section 129 loan from the Federal Highway Administration (FHWA), flexible match: three counties contributed a total of $40 million in local ROWs as flexible match, and North Texas Turnpike Authority (NTTA) Revenue Bonds	Completed section: North Texas Turnpike Authority, TxDOT, and Counties of Dallas, Collin, and Denton Eastern extension: TxDOT, North Texas Turnpike Authority, Cities of Garland, Rowlett, and Sachse	• Accelerated project by up to 20 years • Lower cost due to inflation savings • ROW donation as flexible match allowed state funds to be used for other projects	Phil Russell of NTTA (TxDOT) http://www.fhwa.dot.gov/innovativefinance/perfreview/sect4.htm#41

Table 2. Examples of State DOT Projects Partnered with Local Entities (continued).

No.	Project	Description	Partnering Structure	Partnering Entities	Primary Benefits to Partners	Reference
		Due to the project's high construction cost, traditional financing proved insufficient. This could have delayed the project by up to 20 years and raised the costs due to inflation. TxDOT's lack of statutory authority to issue bonds at the time placed additional financing constraints on the project. As a result, the project, originally conceived as a freeway, was converted to a tollway, and innovative financing approaches were utilized. Amount: $941 million Status: Irving — SH 78 completed. Eastern extension (SH 78 — I-30) pending cost sharing agreements; anticipated start of construction in 2008-2009				
5	Texas, Dallas: North Tollway at SH 121, Gaylord Parkway	Dallas North Tollway 1.57-mile extension is a joint project between the North Texas Turnpike Authority and TxDOT and involved cooperation from property owners, counties, and cities. The cities along the corridor, Denton County, and Texas Department of Transportation funded improvements to the roadways approaching the bridge. Amount: $35 million Status: Mostly completed	Cost sharing: NTTA, TxDOT, and Denton County. Debt service, operations, and maintenance are funded entirely from user fees (tolls).	NTTA, TxDOT, Denton County	• Lower cost due to inflation savings • More resources for transportation	Plano — Frisco — http://www.ntta.org/pub/pub/pub_proj_1.jsp
6	Texas, Lee County: FM 2116 and FM 112 relocation	The Alcoa Company paid for the relocation of the roadways in order to have access to lignite coal deposits. The new alignment is at least as good, if not better, than the previous alignment. In addition, the new section was built to a higher standard than the previous one. Amount: Not known Status: Completed	Cost sharing: Private company, TxDOT. In this case fully funded by private sector.	Private company, TxDOT	• Economic development • Rebuilt facility to higher standard at no cost to TxDOT	Henry Pearson, Carter & Burgess (512) 314-3100 http://www.c-b.com/information%20center/transportation/ic.asp?tID=23&pID=148

Table 2. Examples of State DOT Projects Partnered with Local Entities (continued).

No.	Project	Description	Partnering Structure	Partnering Entities	Primary Benefits to Partners	Reference
7	Texas, Fort Worth: I-35W Interchange at Dale Earnhardt Way	Ft. Worth Sports Authority (on behalf of Texas Motor Speedway [TMS]) provided portion of ROW, engineering, and some of the construction cost of a new diamond interchange north of SH 114 on I-35W. TMS needed better access to and from the north to its facilities. The one-way frontage roads made it difficult for patrons to both enter and exit from the north. The new interchange solved these problems. This area has been growing in congestion for both the developing Alliance Airport and Texas Motor Speedway. Denton County also contributed to construction cost. Amount: Not known Status: Completed	Cost sharing	Private company, Ft. Worth Sports Authority (city), Denton County, TxDOT	• Improves access to major land use • Reduced congestion • Improved safety • Cost saving to TxDOT	Henry Pearson, Carter & Burgess (512) 314-3100 Barry Heard, TxDOT (940) 387-1414 "Driving for Dollars" http://www.c-b.com/information%20center/transportation/ic.asp?tID=23&pID=148 http://www.bizjournals.com/dallas/stories/2003/08/04/story1.html?page=3
8	Texas, The Woodlands: Lake Woodlands Drive interchange, I-45	The developer desired an interchange of non-standard configuration to serve new arterial street; county created improvement district to fund half of the cost of interchange plus two other major projects. TxDOT funded other half of interchange cost. Amount: Not known Status: Completed	Cost sharing	Montgomery County (improvement district), TxDOT	• Reduced cost to TxDOT • Accelerated completion • More total resources for transportation program	Robert Heineman, Woodlands Operating Company (281) 719-6113
9	Texas, Tarrant County: Alliance Airport access	A private airport developer needed access to I-35 for the airport to accommodate increasing cargo shipments. This area has been growing in congestion for both the developing airport and the Texas Motor Speedway. This project was an opportunity for private developers to participate in the transportation investments for their future. The developer provided funding for the additional interchange to facilitate the airport development, benefiting both the developer and the local region.	Cost sharing	The developer provided funding for the additional interchange to facilitate the airport development, benefiting both the developer and the local region.	• Reduced cost to TxDOT • Accelerated completion • Reduced congestion • Economic development • Improved safety	Henry Pearson, Carter & Burgess (512) 314-3100 http://www.c-b.com/information%20center/transportation/ic.asp?tID=23&pID=148 http://www.bizjournals.com/dallas/stories/2003/08/04/story1.html?page=3

Table 2. Examples of State DOT Projects Partnered with Local Entities (continued).

No.	Project	Description	Partnering Structure	Partnering Entities	Primary Benefits to Partners	Reference
		The project was funded jointly by the Texas Motor Speedway, Alliance Airport, adjacent landowners, local governments, and TxDOT. Amount: Not known Status: Completed				
10	Texas, Houston: I-45/Gulf Freeway reconstruction	This project included expediting the completion of a section of reconstruction of a freeway with an HOV lane in median. TxDOT and Metropolitan Transit Authority of Harris County (METRO) partnered on this project with METRO taking responsibility for construction. This was done in order to take advantage of METRO's ability to offer construction bonuses for early completion (TxDOT at that time could not make such an offer). Amount: Not known Status: Completed	Conventional cost sharing: Houston METRO, TxDOT, with METRO handling all construction	Houston METRO, TxDOT	• Expedited project	John Sedlak, Houston METRO, (713) 739-4600
11	Texas, Brownsville: SH 48 repairs and bus stop pavement reinforcement	The transit authority, Brownsville Urban System (BUS), purchased materials for SH 48 repairs and improvements, and TxDOT personnel completed the construction. Amount: $12 million Status: Estimated to be completed in 2006	Cost sharing	TxDOT, Brownsville Urban System	• Reduced cost to TxDOT • Improved facility to increase lifespan of pavement	http://bus.cob.us/Newsletters/Newsletter%202-2.pdf http://www.Brownsvilleherald.com/ts_comments.php?id=P60689_0_10_0_C
12	Texas, Fort Worth: Rosedale Commercial Corridor	The Rosedale multimodal commercial corridor included improvements for widening four lanes to six lanes and creating improvements for railroad grade separated streets (replaced three existing railroad underpasses). The section under contract is from Main Road to Forest Park Boulevard, a total length of 1.7 miles. The total cost is $12 million (with transit improvements). The city of Fort Worth is contributing $5 million.	Cost sharing	TxDOT, North Central Texas Council of Governments (NCTCOG), Fort Worth Transportation Authority, City of Fort Worth	• Reduced cost to TxDOT • Increased safety for roadway	Joe Fossett, P.E., Albert Durant or Ram Kupta (817) 370-6638 (817) 370-6797 Fax or City of Fort Worth, Contact — Fred Ehia, P.E., Department of Engineering (817) 871-8424

Table 2. Examples of State DOT Projects Partnered with Local Entities (continued).

No.	Project	Description	Partnering Structure	Partnering Entities	Primary Benefits to Partners	Reference
		Amount: $12 million Status: Completed				
13	Texas, San Antonio: Advanced Transportation District (ATD)	The ATD will allocate the proceeds from the additional ¼ cent sales tax to transportation projects based on the following statutory formula: 25 percent to leverage TxDOT Highway Funds, 25 percent for city street construction, maintenance, and operations, and the remaining 50 percent of the funds for transit services and, depending on the level of the sales tax, the development of HOV lanes. Enabling legislation through SB 404.	Additional sales tax collected by district to support projects of three agencies	TxDOT, VIA, Advanced Transportation District, City of San Antonio	• Additional funds to help meet the projected $3.6 billion area road construction funding shortfall between now and 2025	http://www.keepsamoving.com/FAQ%27s.htm#What%20is%20an%20ATD http://www.Advancedtransportationdistrict.org/content/Dilemma.aspx http://www.texastransit.org/archives/001147.html
14	Texas, Houston: Grand Parkway	The Grand Parkway (SH 99) is a proposed 170-mile circumferential scenic highway traversing seven counties and encircling the Greater Houston region. The Grand Parkway Association (GPA) was established to facilitate the efficient development of the Grand Parkway. The association operates on funds received from various sources including TxDOT, METRO, Harris County, Fort Bend County, Chambers County, Galveston County, and Brazoria County. Amount: $4 billion Status: Currently 20 miles of the highway, Segment D, from US 59 near Sugar Land to I-10 near Katy, have been constructed. A second segment is under construction with environmental studies proceeding on several others.	The GPA raised funds for land acquisition (ROW) and pre-construction engineering. Counties and TxDOT subsequently became partners.	Grand Parkway Association, TxDOT, METRO, Harris County, Fort Bend County, Chambers County, Galveston County, Brazoria County	• Additional regional roadway	http://www.grandpky.com/about%20us/default.asp William F. "Billy" Burge — President of the Grand Parkway Association (713) 355-2164 David Gornet Executive Director 4544 Post Oak Place Suite 222 Houston, TX 77027 (713) 965-0871 dgornet@grandpky.com

Table 2. Examples of State DOT Projects Partnered with Local Entities (continued).

No.	Project	Description	Partnering Structure	Partnering Entities	Primary Benefits to Partners	Reference
15	Texas, Hays County: highway improvements	County passed bond referendum to provide $22 million to accelerate four TxDOT projects: US 290, FM 1626, FM 967, and RM 12. Agreement between county and TxDOT has been reached for county participation. Amount: $22 million Status: TxDOT and Hays County have agreed on projects and funding	Cost sharing	Hays County, TxDOT	• Earlier scheduling of projects	Jerry Borcherding, County Engineer (Janice Weber, Assistant), Hays County, (512) 343-7385 Bob Sutton, Turner, Collie & Braden, (512) 457-7750
16	Texas, Port Arthur: FM 365 (US 69 — Spur 93)	The City of Port Arthur wanted to help speed up the process on this roadway and opted to pay for design plans for the project. No construction funds have been committed by the state or the city at this time. The project is being discussed (early stages) for pass-through financing. The earliest possible letting date would be in 2007/2008.	Cost sharing	City of Port Arthur, TxDOT	• Reduced cost to TxDOT • Accelerated project completion	Scott Ayres, TxDOT Port Arthur Area Office (409) 722-8377
17	Texas, Austin: Reconstruct FM 187	Reconstruct FM 187 (Anderson Mill Road) from two lanes to four lanes and add sidewalks between Pond Springs to west of FM 734. The city contributed 74 percent of the cost. Amount: $4.2 million Status: Not known	Cost sharing	TxDOT, City of Austin	• Reduced cost to TxDOT	TxDOT project spreadsheet
18	Texas, Brownsville: East Loop (Segments 1 and 2)	Project is broken into several segments that included construction of a four-lane divided arterial with bridge replacement. The City of Brownsville requested additional improvements be made to this gateway corridor which connects to the downtown, Los Tomates International Bridge, and the university. A pedestrian underpass was paid for (100 percent) by the city which included lighting and pathways that connect to the Resaca De Palma State Park. Amount: $5.6 million Status: Portions of project are completed; Segment 3 in progress	Cost sharing	City of Brownsville, TxDOT	• Reduced cost to TxDOT • Multimodal facility • Improved design	Gus Lopez, TxDOT Cameron City, San Benito Area Office (956) 702-6159

Table 2. Examples of State DOT Projects Partnered with Local Entities (continued).

No.	Project	Description	Partnering Structure	Partnering Entities	Primary Benefits to Partners	Reference
19	Texas, Hudson Oaks: New frontage road	Construction of new frontage road on the north side of I-20. This section is from Centerpoint Road overpass to the Lakeshore Drive overpass. The city contributed 100 percent of the cost. Amount: $2.4 million Status: Not known	Cost sharing	TxDOT, City of Hudson Oaks	• Reduce cost for TxDOT	TxDOT project spreadsheet
20	Texas, Corsicana: Frontage road for I-45 near US 287	Construction of a new frontage road was desired by the City of Corsicana to serve a new retail development at I-45/US 287. TxDOT would not be able to fund and build this project for another four years, and therefore the City of Corsicana funded 100 percent of the project and performed all plan work. TxDOT let the project, reviewed the plans, and inspected the facility upon completion. Amount: $1,789,991 Status: Completed	Local government fully funded project	TxDOT, City of Corsicana	• No capital costs to TxDOT (staff time to review, etc.)	Darwin Myers, TxDOT Area Engineer Navarro County (903) 874-4351
21	Texas, Seagoville: Road widening for US 175 at Malloy Bridge	Project included road widening, traffic signals, turn lanes, and converting frontage roads to one way. The City of Seagoville, Dallas County, and Wal-Mart together funded 50 percent of the project costs. The project would not have been warranted without the Wal-Mart development. Amount: $563,099 Status: Completed	Cost sharing	City, county, developer, TXDOT	• Reduced costs to TxDOT	Trina Brand, TxDOT Dallas Southeast (972) 225-2387
22	Texas, Universal City: SH 218 (Pat Booker Road)	SH 218 between FM 79 and Loop 1604 included improvements for bicycles and pedestrians, as well as landscaping, driveways, and storm drains. TxDOT was directly responsible for the sidewalk, storm drain, and driveways but received 45 percent cost participation on the pedestrian improvements, bicycle improvements, and landscaping by the City of Universal City.	Cost sharing	City of Universal City, TxDOT	• Reduced costs to TxDOT • Improved design for multimodal use	TxDOT Area Office New Braunfels (830) 625-6278 City of Universal City Kim Turner (830) 659-0333

Table 2. Examples of State DOT Projects Partnered with Local Entities (continued).

No.	Project	Description	Partnering Structure	Partnering Entities	Primary Benefits to Partners	Reference
		Amount: $3,148,614 Status: Completed				
23	Texas, Bastrop: FM 1209	A left-turn lane was constructed on FM 1209 to accommodate a new school. TxDOT had completed several other turn lanes for other schools in the past; however, TxDOT could not determine when future funding would be available for this project. The school paid for essentially 100 percent of the project in order to have the project meet its deadlines. The cost to the school district was capped at $300,000, and TxDOT paid for engineering and construction charges. Bastrop County contracted with TxDOT, and the school district funneled the money through the county to TxDOT. Amount: $300,000 Status: Completed	Cost sharing	School District, Bastrop County, TxDOT	• Reduced cost to TxDOT • Increased safety for vehicles turning into school driveway	Danny Smith Area Engineer Bastrop (512) 321-2195
24	Tyler, Texas: Loop 49	First conceived in the 1960s as a bypass around the city, this facility had been publicly supported as a way to support new growth and reduce congestion. The project was championed by the chamber of commerce and local elected officials who led the effort to have the road supported as a toll road. A portion of the road was built and right of way purchased for an additional section with conventional funds. The remainder of the project will be funded through tolling. Amount: $110 million (construction) Status: First 5-mile segment of the two-lane facility open with tolling scheduled to begin in mid-November 2006. The remaining 20 miles of the loop are in various stages of development, with ultimate completion by 2012.	Cost sharing, tolling: City of Tyler and Smith County contributed about 6 percent of construction cost for phase 1.	TxDOT, Smith County, Cities of Tyler and Whitehouse, private foundations	• Congestion relief • Support for new growth • Air quality • Deliver facility years earlier than otherwise possible	Mike Battles, TxDOT District Design Engineer, Tyler (903) 510-9241 Ginger Goodin, Texas Transportation Institute, Austin (512) 467-0946

Table 2. Examples of State DOT Projects Partnered with Local Entities (continued).

No.	Project	Description	Partnering Structure	Partnering Entities	Primary Benefits to Partners	Reference
Examples from Other States						
25	Alabama, Baldwin County: Foley Beach Express	A 13.5-mile limited access bypass was needed to relieve congested SH 59 serving beach traffic to the Alabama Gulf Shores. The City of Foley and a private company each funded and built sections of the project. The Baldwin County Bridge Company built a 6-mile, $36,000 section including a two-lane toll bridge and funded it with private, taxable revenue bonds. The city used FHWA and local funds for the 7.5-mile publicly funded $7500 untolled section.	Build-own-operate for private segment using private taxable revenue bonds. City and FHWA funds for publicly owned segment.	Baldwin County Bridge Company, LLC; City of Foley	• Reduced travel distance and time (15-30 minutes) • Congestion relief • Project completed sooner	http://www.fhwa.dot.gov/ppp/foley_beach.htm Tim James, John McInnis Baldwin County Bridge Company, LLC (334) 264-3474
26	Arizona, Maricopa County: SR Loop 303	Maricopa County is experiencing significant growth and is involved in several partnership projects that involve the state, cities, and private developers. An example of such an initiative is SR Loop 303. A 12-mile section from I-10 to Lake Pleasant Road in Peoria has recently opened. The new segment includes a four-lane, divided roadway and a 10-span, four-lane 1250-foot bridge crossing the Agua Fria River. This section cost approximately $70 million of which the private sector contributed $35 million in the form of ROW, cash, and development fees. Amount: $70 million Status: Completed	Private developers donated cash, ROW, and contributed development fees. Arizona DOT and cities along the corridor were involved in putting the package together.	Arizona DOT, Maricopa County, cities, private developers	• Reduced cost to state, county, and cities • Accommodate growth	Bill Hahn, Maricopa County (602) 506-8600 http://www.rightroads.org/spot.htm
27	California, Los Angeles to Long Beach: Alameda Corridor	This project consolidated the operations of three freight railroad carriers and a highway into one high-speed, high-capacity multimodal corridor. The highway component included a widening to six lanes from SR 91 to the ports. The railroads will pay $15 for each loaded 20-foot equivalent unit container, $4 for each empty container, and $8 for other types of	A combination of government grants, port reserves, and/or revenue bonds were used. Revenues from user fees paid by the railroads will be	Caltrans, Alameda Corridor Transportation Authority (ACTA), Ports of Long Beach and Los Angeles, Southern Pacific Railroad, Union Pacific Railroad, and Burlington Northern Santa Fe Railroad	• Reduced highway traffic delays and congestion • Economic and environmental benefits • Elimination of	http://www.scbbs.com/alameda/alameda.htm http://www.acta.org/projects_completed_alameda_factsheet.htm http://www.aaroads.com/high-priority/

Table 2. Examples of State DOT Projects Partnered with Local Entities (continued).

No.	Project	Description	Partnering Structure	Partnering Entities	Primary Benefits to Partners	Reference
		loaded rail cars such as tankers and coal carriers. Over a 30-year period, fees will increase between 1.5 percent and 3 percent per year, depending on inflation. Amount: $2.4 billion Status: Completed	used to retire debts.		conflicts at nearly 200 at-grade highway crossings • Increased railroad operating speed	corr22.html
28	California, Orange County: Foothill/Eastern Transportation Corridor	The Foothill Transportation Corridor is 28 miles in length. The Foothill/Eastern Transportation Corridor Agency (FETCA) was formed in 1986 as a separate regional single-purpose agency to plan, finance, construct, and operate this Orange County, California, toll road. The board is composed of elected officials of county agencies. It issued tax exempt bonds to build, operate, and maintain the toll road. The contractor guaranteed construction cost and completion date in a design-build contract. FETCA assumed the proposed Caltrans freeway project to accelerate completion. Amount: $1.8 billion Status: Completed	Design-build contract (no equity); state acquired right of way, approved design, bonds	Local toll road agency (FETCA), Caltrans, design-build contractor	• No financial risk to taxpayers or government • Accelerate completion • Funding from outside DOT resources	California — Transportation Corridor Agencies 125 Pacifica, Suite 100 Irvine, CA 92618-3304 (949) 754-3400 (949) 754-3467 Fax http://www.thetollroads.com http://www.fhwa.dot.gov/innovativefinance/appd_04.htm
29	California, Orange County: SR 91 Riverside Freeway	Originally planned to be built as an HOV facility, this project is a four-lane toll facility in the median of a 16 km section of the SR 91 Riverside Freeway. It was franchised by Caltrans to the California Private Transportation Company (CPTC) (a privately owned and operated company) and is the first variably priced toll road in the United States. Orange County Transportation Authority (OCTA) provided a $10 million loan to CPTC for initial engineering. January 3, 2003, OCTA took public ownership of the SR 91 Express Lanes from the private firm, borrowing funds from Metrolink to do so and then refinancing the debt.	Originally design-build-finance-operate maintain-transfer: OCTA provided initial loan to franchisee; franchisee provided all subsequent financing. Purchased by OCTA after that agency wished to change the no-complete provision. OCTA now operates toll lanes	Orange County Transportation Authority, Riverside County Transportation Authority, Caltrans	• Multimodal facility with costs transferred to users rather than DOT • Additional funds for transportation	Greg Hulsizer General Manager California Private Transportation Company SR 91 Express Lanes 180 N. Riverview Drive, Suite 290 Anaheim, CA 92808 (714) 637-9191 x328 (714) 637-9266 Fax ghulsizer@91expresslanes.com Ken Phipps, Director of

Table 2. Examples of State DOT Projects Partnered with Local Entities (continued).

No.	Project	Description	Partnering Structure	Partnering Entities	Primary Benefits to Partners	Reference
		Amount: Short-term projects, $87.55 million Mid- and long-term, $418–$917 million Status: Opened in 1995	within state freeway ROW.			Finance & Administration, OCTA (714) 560-5637 http://www.naiopsocal.org/NAIOP_SR-91_Report.pdf Measure M: http://www.octa.net/octa/measurem/about2.asp OCTA: http://www.octa.net/91express/geninfo.asp
30	California, Orange County: Measure M	Orange County voters authorized in 1990 a ½ percent sales tax for 20 years for transportation improvements. Revenues are projected at $3.1 billion. 43 percent is for freeways; 32 percent is for street and road improvements and maintenance; 25 percent is for transit improvements and bus fares for seniors. 14.6 percent of the total is given to local jurisdictions; the remainder is allocated by the Orange County Transportation Authority to fund Caltrans, county, and city projects as determined appropriate. There is no set cost sharing percentage. Freeway projects were specified in the referendum; other projects are funded on a competitive basis.	Cost sharing	• OCTA with Caltrans, Orange County, and cities as applicable for each project • OCTA with Metrolink (commuter rail) partners	• Advance projects • Reduce congestion • Advance additional projects	http://www.octa.net/octa/measurem/about1.asp Ken Phipps, Director of Finance & Administration, OCTA (714) 560-5637 Monty Ward, Special Projects Manager, OCTA (714) 560-5582
31	California, Orange County: San Joaquin Hills Transportation Corridor	The San Joaquin Hills Transportation Corridor Agencies (SJHTCA) was formed in 1986 to plan, finance, construct, and operate Orange County's 15-mile public toll road system, a six-lane, limited access highway. The median is reserved for future proposed exclusive HOV lanes and possible transit options. The board is composed of elected officials of	Agency formed to accelerate completion; design-build used; state acquired right of way, approved design. Funding sources include tolls, development	Local toll road agency, state DOT	• Accelerated completion • Provide funding outside DOT resources	California — Transportation Corridor Agencies 125 Pacifica, Suite 100 Irvine, CA 92618-3304 (949) 754-3400 (949) 754-3467 Fax http://www.innovativefinance.org/projects/

Table 2. Examples of State DOT Projects Partnered with Local Entities (continued).

No.	Project	Description	Partnering Structure	Partnering Entities	Primary Benefits to Partners	Reference
		county agencies. The board issued tax exempt bonds to build, operate, and maintain the toll road. The contractor guaranteed construction cost and completion date in a design-build contract. Amount: $1.4 billion Status: Completed	impact fees, and interest earnings.			highways/ http://www.thetollroads.com http://www.fhwa.dot.gov/innovativefinance/appd_04.htm
32	California, San Diego: SR 125 Toll Road	New 11-mile highway alignment from SR 905 near the International Border to SR 54 will complete the missing link in San Diego's third north-south freeway corridor. Developer California Transportation Ventures, Inc., (CTV) was awarded franchise to build this planned freeway as a toll road and contributed more than $150 million in private at-risk equity. Six real estate developers and the City of Chula Vista donated $48 million in right of way in return for interchanges located where donors wanted them. Private equity and ROW account for 78 percent of the project costs. California Department of Transportation (Caltrans) handled NEPA process at CTV's cost. The metropolitan planning organization (MPO), San Diego Association of Governments (SANDAG), paid for interchange plus 1 mile of connector ($138 million — 80 percent federal). Chula Vista contributed up to $10 million to cover cost escalation, if needed, due to delays. $141 million TIFIA loan; rest of approximately $400 million debt from banks financing. Amount: $635 million plus donations Status: Ground breaking in 2003; to open in October 2006	Private at-risk equity, dedicated ROW, and TIFIA loan	Caltrans, private entity (MIG)	• Funding from outside DOT resources • Additional funds for transportation • Accelerated completion	Kent Olsen Parsons Brinkerhoff (512) 347-3649 olsenk@pbworld.com Greg Hulsizer, CEO, California Transportation Ventures, Inc. (619) 591-4200 http://www.dot.gov/affairs/fhwa1803.htm Private equity: http://www.fhwa.dot.gov/innovativefinance/stchap3.htm

Table 2. Examples of State DOT Projects Partnered with Local Entities (continued).

No.	Project	Description	Partnering Structure	Partnering Entities	Primary Benefits to Partners	Reference
33	California, Santa Clara: Santa Clara Valley Transportation Authority Corridor (VTA) (Measure B)	Measure B (½ cent sales tax) projects include improvements to I-880 and US 101, and Route 85/87 Interchange. The county established the program, prioritized transportation projects, and acted as the bank funding source and project monitor, and dispersed county sales tax revenues for project construction. VTA took on the role of the contractor, constructing rail and highway projects, and also successfully secured outside funding to augment the program in a declining economy (VTA was instrumental in securing GARVEE bonds to fund construction of the Route 87 HOV lane projects). Amount: $55.2 million: $50.8 million from 1996 Measure B funds and $4.4 million from non-1996 Measure B funds Status: Completed	Cost sharing for Caltrans and Santa Clara County projects: nine-year, ½ cent sales tax to fund improvements to county roads, highways, bicycle and pedestrian pathways, and rail networks	Caltrans, Santa Clara County, VTA	• Accelerated completion • Lower cost due to inflation savings • Additional funds for transportation	http://www.vta.org/news/releases/2004/06_jun/nr06-16_2004.html#0
34	Colorado, Denver: Metro Denver's Transportation Expansion Project (T-REX)	Project consisted of reconstruction of 17 miles of I-25 and I-225 freeways and extension of the city's light-rail system (19 miles). Design-build contractor guaranteed construction cost. Amount: $1.67 billion combined freeway reconstruction and light-rail extension Status: Anticipated to be completed in 2008	Design-build, joint state DOT-transit agency project Cost sharing	Colorado Department of Transportation (CDOT), Denver's Regional Transportation District (RTD)	• Both the highway and transit elements • Accelerated completion • Lower cost due to inflation savings • Improved mobility and accessibility • Economic development	Heather Dugan Colorado DOT http://www.fhwa.dot.gov/innovativefinance/perfreview/sect4.htm#41 http://www.tfhrc.gov/pubrds/septoct01/trex.htm
35	Colorado, Denver: E-470 Highway	E-470 is a 47-mile beltway along the eastern edge of the Denver metro area. It links the metropolitan arterials and Denver International Airport. Four phases are expected to stimulate residential and commercial development and improve mobility in the eastern metro area. Interchange improvements are planned for 2005. There are also longer term plans (20–30 years).	Sources of funding included toll revenues, ROW donations, county vehicle registration fees, highway expansion fees on adjacent properties,	E-470 Public Highway Authority was established as a venture of Adams, Arapahoe, and Douglas Counties and the cities of Aurora, Commerce, Brighton, Thornton, and Parker.	• Economic development • Additional funds for transportation • Accelerated project	Piper Jaffray Vollmer Associates http://www.innovativefinance.org/projects/highways/ http://www.e-470.com/

Table 2. Examples of State DOT Projects Partnered with Local Entities (continued).

No.	Project	Description	Partnering Structure	Partnering Entities	Primary Benefits to Partners	Reference
		Joint funding was arranged with CDOT and local agencies for interchanges and traffic signals. Operations/management is almost fully privatized. Initial segments are completed; now starting widening of initial segment, addition of climbing lanes, access bypass, and other upgrades. Amount: $1.23 billion Status: Sections I–IV completed	lease revenues from cellular towers, and easement permit fees. Loans also obtained from CDOT and local agencies.			uploads/Historical-Fact-File-2004.pdf John McCusky Director of Finance E-470 Public Authority (303) 537-3745
36	Idaho, Boise: Isaac's Canyon Interchange	The Isaac's Canyon Interchange is located on I-84 east of Boise, Idaho. The interchange was constructed primarily to accommodate growth in traffic forecasted to result from the expansion of a local technology firm. The new interchange at Isaac's Canyon provided an alternative to the Gowen Road Interchange and improved traffic flow and safety conditions on I-84. The technology firm offered to contribute $5 million to the project, which provided the local match plus more. Amount: $10.5 million (1998 dollars) Status: Completed in December 1997	Private firm funded local match (above normal requirements)	Idaho Transportation Department (ITD), the technology firm	• Alleviated traffic congestion • Improved safety conditions • Economic development	http://www.fhwa.dot.gov/innovativefinance/perfreview/sect4.htm#41
37	Kansas, Salina: Magnolia Road and I-135 Interchange	The Magnolia Road and I-135 interchange was developed to improve traffic flows in the south Salina area. The interchange improves access to the Central Mall, reduces traffic at a nearby interchange, and reduces traffic volumes and thereby the need to widen local streets in the vicinity of the interchange. The new interchange also is expected to encourage economic development and growth in the area by providing direct access to and from I-135. Amount: $6.7 million Status: Completed in June 1998	Federal-Aid Highway Program funding and local funds from the City of Salina and tapered match by the Kansas Department of Transportation	Kansas DOT, the City of Salina	• Prevented the allocation of funds to other projects • Delayed the borrowing of funds and thereby reduced interest expenses • Avoided delays in project construction	http://www.fhwa.dot.gov/innovativefinance/perfreview/sect4.htm#41 http://www.fhwa.dot.gov/innovativefinance/ifnlv1n3.htm#ifth

Table 2. Examples of State DOT Projects Partnered with Local Entities (continued).

No.	Project	Description	Partnering Structure	Partnering Entities	Primary Benefits to Partners	Reference
38	New Jersey, Atlantic City: Atlantic City/Brigantine Connector	Design-build-finance was used to complete the 2.3-mile Atlantic City/Brigantine Connector. Financing was split equally between the developer, South Jersey Transportation Authority, and New Jersey Department of Transportation (NJDOT). A design-build joint venture constructed the project. Funding included $60 million from the South Jersey Transportation Authority (SJTA), $65 million from Casino Reinvestment Development Authority (CRDA), $95 million from the State of New Jersey Transportation Trust Fund, and $110 million from Mirage Resorts Incorporated (MRI). Amount: $330 million Status: Completed	Cost sharing: SJTA, CRDA, NJDOT, and MRI Design-build contractor	Developer (MRI), South Jersey Transportation Authority, NJDOT	• Funding from outside DOT resources • Additional funds for transportation • Accelerated project completion	New Jersey — http://www.phillyroads.com/roads/ac-brigantine Consultant: Parsons Brinckerhoff and FG, Inc. Richard T. Fischer, P.E. Vice President/Senior Project Manager Parsons Brinckerhoff–FG, Inc. James Crawford, Executive Director South Jersey Transportation Planning Association (609) 965-6060 General Contractor Lawrence W. Kline Vice President Yonkers Contracting Company Inc./Granite Contracting Company (A Joint Venture) 969 Midland Avenue Yonkers, New York 10704 (914) 965-1500 (914) 378-8882 Fax Atlantic City Field Office (609) 572-0505

Table 2. Examples of State DOT Projects Partnered with Local Entities (continued).

No.	Project	Description	Partnering Structure	Partnering Entities	Primary Benefits to Partners	Reference
39	New Mexico, Santa Fe: Corridor 44	This 121-mile highway corridor was developed with special attention to future pavement maintenance costs. Bonds used for funding were secured solely on the pledge of future Federal Highway Funds (GARVEEs) New Mexico State Highway and Transportation Department (NMSHTD) in partnership with Mesa Development Corporation introduced the first-ever, long-term, 20-year highway warranty in the United States. The warranty is secured with private sector Koch Materials, Inc., assets that are pledged to the state. This warranty guarantees the public a road performance level that could not be achieved through traditional means. The estimated cost for a maintenance equivalent is $151 million, warranted for $62 million. The state and the taxpayers will realize a savings of $89 million. Amount: $105 million in the initial phase Status: Completed	Design-build-maintain GARVEE bonds The partners introduced a "20-year highway warranty" secured with Koch Materials, Inc., assets.	NMSHTD, Mesa Development Corporation, Koch Materials	• Joint design and accelerated completion • Performance standards for pavement; reduced maintenance costs for DOT	http://ncppp.org/cases/santafe.html http://www.performanceroads.com/nm44_us550/feedback.htm#Innovative http://www.nmshtd.state.nm.us/depts/commrelat/press/pdf/nm%2044%20%209-25-01.doc Rhonda G. Faught, P.E. Cabinet Secretary, New Mexico Department of Transportation (505) 827-5110 rhonda.faught@nmshtd.state.nm.us Tisha Jones, Mesa PDC, LLC, 4111 E. 37th St. North Wichita, KS 67226 jonest@nm44.com (316) 828-6688
40	Ohio, Butler County: Butler Regional Highway — Michael A. Fox Highway (SR 129)	Butler County formed Butler County Transportation Improvement District (TID) to construct Butler Regional Highway, a 10.7-mile four-lane limited access road located in southwest Ohio that will connect an intersection in Hamilton, Ohio, to I-75 in Liberty Township. Under a lease agreement in 1996, Ohio DOT (ODOT) agreed to pay for the construction costs of the highway, and the TID agreed to maintain the highway for 20 years and	Revenue sources through SIB loans, GARVEE loans, and revenue bond sales ODOT will lease road from TID through 2017.	Transportation Improvement District, ODOT	• Maintenance costs and some road improvements by TID • Economic development • Additional resources for transportation program	http://www.fhwa.dot.gov/innovativefinance/ifq41.htm http://www.bctid.org/brh/history.html Butler County Transportation Improvement District 315 High Street

Table 2. Examples of State DOT Projects Partnered with Local Entities (continued).

No.	Project	Description	Partnering Structure	Partnering Entities	Primary Benefits to Partners	Reference
		complete much-needed improvements to local roads. The improvements included the construction of the Union Centre Interchange, the widening of SR 747, and the extension and widening of Muhlhauser Road. Amount: $158.5 million Status: Completed				Hamilton, Ohio 45011 (513) 785-5800 (513) 785-5756 Fax
41	South Carolina: SC 22 (Veterans Highway, Conway Bypass)	As part of the South Carolina "27 in 7" program compressing 27 years of planned work into seven years, South Carolina completed the Conway Bypass, a 28.5-mile road, utilizing funding from various sources to back SIB loans. Joint funding by South Carolina Department of Transportation (SCDOT) through SIB and Horry County. Project cost $386 million; $95 million from SCDOT using State Highway Bonds and remainder from SIB, hospitality fee (on hotel rooms, greens fees, restaurant meals). Amount: $387 million Status: Completed	Cost sharing: SCDOT highway bonds, SIB loans, county hospitality fee; MPO/COG committed anticipated federal funds against SIB debt	SCDOT, SIB, County, MPO/COG	• Accelerated completion • Funding from outside DOT resources • Reduced project cost • Increased funds available for transportation program	http://www.fhwa.dot.gov/innovativefinance/ifp/cssc.htm "27 in 7 Peak Performance" downloaded from http://www.dot.state.sc.us/inside/financing.shtml Deborah Roundtree, South Carolina DOT (803) 737-1243
42	South Carolina, Hilton Head: Cross Island Parkway	The SCDOT, working with the FHWA Division Office, selected Affiliated Computer Services, Inc., for the private operation of all aspects of toll collection on the 7.5-mile Cross Island Parkway in Hilton Head. It is an example of the use of a private firm to operate and maintain a toll system, while the state retains control over the toll evasion and processing system. SCDOT issued State Highway Bonds rather than toll revenue bonds to obtain a lower interest rate. Amount: $83 million Status: Completed in 1999	State-owned toll road using private firm under contract to operate and maintain toll system; state retains control over toll evasion and processing system	SCDOT, Affiliated Computer Services	• Toll collection handled by private operator • Lower cost • Reduced SCDOT staff responsibilities • Congestion relief	Anna Salvagin South Carolina DOT (803) 737-0459 http://www.innovativefinance.org/projects/highways/

Table 2. Examples of State DOT Projects Partnered with Local Entities (continued).

No.	Project	Description	Partnering Structure	Partnering Entities	Primary Benefits to Partners	Reference
43	South Carolina, Greenville: Southern Connector	Southern Connector is a privately owned toll road licensed by SCDOT. The license is for 50 years by which time revenue bonds are to be retired. A non-profit private entity (Connector 2000 Association) financed, owns, operates, and maintains the road using IRS 63-20 not-for-profit corporation. The 16-mile four-lane road (plus 1-mile connector road) connecting two interstates was funded with about $200 million in toll revenue bonds. SCDOT funded the $17.5 million connector road. Amount: $217.5 million Status: Project completed in 2001	Private entity doing design-build-operate-maintain and transfer after 50 years. SCDOT provided some funds and right of way. State has no liability for bond debt.	SCDOT, private entity under license to SCDOT	• Additional project capacity • Project completion advanced • Reduced project cost • Reduced SCDOT responsibility	Anna Salvagin South Carolina DOT (803) 737-0459
44	South Carolina, Infrastructure Bank Program	The state of South Carolina makes SIB loans and grants to counties that will contribute to transportation projects. SCDOT owns almost all projects, which range from highways to freeways and bridges. Counties offer projects in packages that must exceed $100 million; SIB selects the projects. The county shares vary greatly. SIB funds are generated from truck registration fees plus 1 cent of state fuel tax (total $80 million/year) plus repayments of loans by counties. Some projects have SCDOT participation through loan repayment.	County funds in form of cash or SIB loans; state in form of SIB grants or SCDOT funds	SCDOT, SIB, counties	• Advance project scheduling • Reduce congestion	Deborah Roundtree South Carolina DOT (803) 737-1243
45	Utah, Salt Lake City: I-15 reconstruction	The project involved the reconstruction of 26 km of interstate mainline and the addition of new general-purpose and HOV lanes through the Salt Lake City metropolitan area. Using the design-build contracting technique with bonuses for early completion, the Utah Department of Transportation (UDOT) completed the project under budget and three months ahead of schedule. Traditional con - tracting would have taken four additional years.	Cost sharing, design-build	UDOT, Utah Transit Authority (UTA), Mountainland Association of Governments (MAG), Wasatch Front Regional Council (WFRC). MAG and WFRC are metropolitan planning organizations that work closely with local governments.	• Delivered project under budget and three months ahead of schedule	Roy O. Nelson Recently retired from FHWA Gary Adams, Parsons Corporation (202) 775-3452 http://www.fhwa.dot.gov/pressroom/re031021.htm

Table 2. Examples of State DOT Projects Partnered with Local Entities (continued).

No.	Project	Description	Partnering Structure	Partnering Entities	Primary Benefits to Partners	Reference
		Amount: $1.59 billion Status: Completed				http://www.udot.utah.gov/i15utahcounty/
46	Virginia, Richmond: Pocahontas Parkway (Route 895)	The contractor was responsible for completing the project for a fixed price and delivering a completed project by a specific date. A total of $300 million was financed privately through the issuance of bonds. The project financing plan relied heavily on the selling of bonds and the collection of tolls to repay the bonds. An $18 million loan was obtained from the State Infrastructure Bank. Over 94 percent of the project funding was by private funds. Amount: $318 million Status: Completed	Public-private lump sum design/build contract; with privately placed revenue bonds. The majority of the risk on the private developer of the project.	Virginia DOT (VDOT), the contractor	• Accelerated completion • Additional resources for transportation • Reduced DOT risk	http://www.virginiadot.org/business/ppta-default.asp http://ncppp.org/cases/pocahontas.html
47	Virginia, Fairfax, and Loudoun Counties: Route 28 Corridor Improvements	Six intersections will be replaced with high-capacity interchanges. The contractor performed right of way acquisition, utility relocation, site development, design, and construction services. Funding is largely provided by the special tax district revenues that will support the sale of tax-exempt bonds that are backed by the moral obligation of both Fairfax and Loudoun Counties. Amount: $200 million Status: Portions of project complete, full completion anticipated in 2006	Partnership in which VDOT contributed more than $70 million of the $200 million and provided project support and guidance. Revenue bonds backed by proceeds from the Route 28 Tax District.	VDOT, Fairfax and Loudoun Counties, Route 28 Tax District, contractor	• Accelerated completion • Additional resources for transportation	http://www.virginiadot.org/infoservice/news/NOVA10032002-RT-28.asp http://www.28freeway.com/ Route 28 Corridor Improvements, LLC 22894 Pacific Boulevard, Suite 104 Dulles, Virginia 20166 (703) 668-0288 (703) 668-0289 Fax
48	Virginia, Leesburg and Loudoun County: Dulles Greenway	Dulles Greenway was the first private toll highway in the United States in 170 years and is one of the few 100 percent privately owned toll roads in the country. A 14-mile limited access freeway extension of the Dulles Toll Road, the Greenway was completed in 1995. Amount: $350 million Status: Completed	Design-build-operate-transfer (DBOT). Project revenue financing enabled by 1988 action of Virginia's General Assembly, authorizing private development of toll	Virginia DOT, toll road developer, Toll Road Investors Partnership II (TRIP II)	• DOT not responsible for capital and operation costs • User-based funding • Accelerated completion	Virginia — http://www.innovativefinance.org/projects/highways/dulles.asp http://www.virginiadot.org/business/ppta-default.asp

Table 2. Examples of State DOT Projects Partnered with Local Entities (continued).

No.	Project	Description	Partnering Structure	Partnering Entities	Primary Benefits to Partners	Reference
			roads.		• Additional resources for transportation	Rick Froehlich Toll Road Investors Partnership II, L.P. (TRIP II) 45305 Catalina Court Suite 102 Sterling, VA 20166 (703) 707-8870 rickfroe@dullesgreenway.com www.dullesgreenway.com

4. PARTNERSHIP FORMS

Partnerships can accomplish at least three primary objectives:

- *Advance projects in time* — make it possible for projects to be implemented sooner than would be the case if TxDOT utilized normal methods and resources. For example, by partnering with TxDOT and providing some financial resources or taking on some project responsibilities, the project may be able to be implemented earlier.
- *Enhance projects* — add to projects to increase capacity; lengthen the project; use higher design criteria; bring new technology, construction, or contracting methods; add aesthetic or other enhancements; or otherwise enrich the project to better meet local objectives.
- *Add projects to the TxDOT program* — by providing funds or other cost support, it may be possible to add projects to the current TxDOT funded improvement program.

TYPES OF PARTNERS AND PARTNERSHIPS

Partnerships can be formed with both public and private entities. This can include local agencies, such as municipalities, counties, local authorities or special districts, and other such entities. Partnerships can also be formed with regional agencies such as regional mobility authorities, county toll road agencies, regional transit authorities, or other agencies created under county or state legislation. Partnerships can also involve private entities such as land developers, landowners, corporations, and private associations, or transportation contractors and developers.

Partnerships can take different forms. Partners may assume responsibility for different roles and responsibilities, depending on their resources and capabilities. Some sample responsibilities include:[17]

- financial planning and funding,
- loans or repayments over time,
- right of way,
- engineering,
- design-build,
- environmental analysis,
- environmental mitigation,
- portions of project improvements,
- project management,
- new or proprietary technology,
- operations,
- toll collection,
- maintenance, and
- ownership.

Table 3 includes additional examples. As evidenced in Table 3, there are many forms of state-local partnerships. Table 3 lists the various forms of partnerships found in Table 2 or identified from other sources and interviews. Local participation has been by one or a combination of methods listed in Table 3. The most common methods to date in Texas appear to be through cash contributions and right of way donation, although most methods appear to have been used in Texas.

Table 3. Local Participation Options for State Transportation Projects.

Participation Type	Sources and Methods
• Cash contributions	• Local agencies • Special authorities, districts, etc. • Private developers and property owners • Private companies
• Right of way	• Acquisition and dedication for project • Easements • Long-term lease
• Pass-through financing	• Local agencies • Private companies
• Comprehensive development agreements	• Private companies • Regional mobility authorities • Toll road agencies
• Maintenance	• Repairs • Overlays • Long-term maintenance contract
• Formation of special districts	• Modal transportation district or authority • Transportation improvements district (area or corridor) • Road district • Tax increment finance district (TIFD) or tax increment reinvestment zone (TIRZ) • Management districts • Special improvement districts • Redevelopment districts (development and transportation)
• Toll road (or lanes)	• Regional mobility authority • Private toll road franchise • State toll road authority or division • Regional/county/municipal toll road authority • Comprehensive development agreements
• Assume bonded indebtedness	• GARVEE bonds • Municipal bonds • Private activity bonds
• In-kind contributions	• Engineering • Environmental documentation • Construction • Materials, equipment • Project management • Operations
• State Infrastructure Bank loans	• Local and regional agencies • Private companies authorized to construct, maintain, finance transportation projects
• Other	• Private at-risk equity • Local agency assumption of projects

Sources: Table 2, interviews.

5. LOCAL FUNDING FOR STATE PARTNERSHIPS

Local agencies have their own transportation funding sources. In Texas these include general funds as well as bonds resulting from approved voter referendums.

Because some areas have needed more resources to meet their area transportation needs, some special authorities, such as the transit authorities and multimodal transportation authorities, have been authorized by the state legislature and local voters to impose a sales tax to generate revenues. Another approach has been to use local toll road authorities that can impose tolls on toll roads as can regional mobility authorities. Most agencies can also privatize transportation projects under a variety of arrangements, normally tolling and shadow tolling.

Table 4 shows a number of funding methods that can be used to provide funds for local agencies and private entities to partner with TxDOT. Many of these methods are used in Texas. Others are being or have been used by local agencies to generate funds for transportation. Some may require enabling legislation for use in Texas.

Table 4. Local Funding Options.

Category	Funding Options
City and County Taxes and Fees	• Fuel taxes • Vehicle taxes • Property taxes • Local option sales taxes • Hotel taxes • Concession taxes • Other special taxes (e.g., liquor, cigarette, rental car, tourism, real estate transfer)
Fees	• Impact fees on adjacent development • Local vehicle registration and license fees • Easement permit fees • Other parking fees • Hospitality fees (e.g., hotel greens, rental car)
Leases	• Right of way leases • Cellular tower leases • Parking leases (e.g., under overpasses, surplus right of way) • Branding and advertising • Sponsorships (e.g., rest areas)

Table 4. Local Funding Options (continued).

Category	Funding Option
Tolls	• Toll roads (revenue bonds) • Managed (toll) lanes • Tolls on improved roads • Peak period tolling — major roads or areas • Pass-through financing (local public agency or TxDOT builds; other agency pays cost share over time based on utilization)
Districts	• Special improvement districts (area or corridor) • Transportation improvement districts • Road districts • Tax increment finance districts/tax increment reinvestment zones
Local Authorities	• Regional mobility authority • Local toll road authority • Transit authority • (Multimodal) transportation authority • Special purpose authority (e.g., port, airport)

Debt Financing (Excluding Revenue Bonds)	• State agency bonds
	• Local agency bonds
	• Grant anticipation notes (GAN)
	• GARVEE
	• SIB loans
	• TIFIA loans
	• Section 129 loans
	• Tax-exempted bonds
	  o Municipal
	  o Non-profit corporations
	• Privately placed (junior) bonds

Other Options	• Local public agency
	  o LPA cash contribution to districts/projects
	  o Right of way
	  o Maintenance
	  o Materials
	• Private
	  o Comprehensive development agreements
	    ▪ Design, build, finance, operate, transfer (DBFOT)
	    ▪ Design, build, finance, operate, maintain (DBFOM)
	    ▪ Build, operate, transfer (BOT)
	    ▪ Build, operate, own (BOO)
	  o Pass-through financing
	  o Joint development
	  o Developer contributions (e.g., right of way, cash, in-kind, maintenance)
	  o Locally purchased (private) bonds

Source: Table 1. *Innovative Transportation for Texas' Future*, Texas Transportation Institute for the Texas Department of Transportation, unpublished draft, September 2003; *Public Private Partnerships Defined*, Federal Highway Administration, Washington, D.C., http://www.fhwa.dot.gov/ppp/defined.htm, August 31, 2006, p. 3-4.

6. BENEFITS AND IMPACTS

Investment in transportation is like any other major public or private expenditure — it requires needs and/or benefits to justify it. The partnerships described in Table 2 resulted from local public and private entities being able to realize benefits from financial participation in state transportation projects.

ECONOMIC BENEFITS AND IMPACTS

Table 5 provides the types of economic benefits that have been associated with local participation in transportation projects in Texas and elsewhere. Not all benefits accrue to all types of projects, nor do they always occur for the same types of projects. Specific benefits are realized based on a combination of factors including project characteristics, location, characteristics of the area, the region, and their transportation systems and economies, as well as other factors. These factors will be addressed in subsequent documentation.

Table 5. Types of Economic Benefits Associated with Local Participation in Transportation Projects.

Category	Benefits
Reduce project cost to TxDOT	Reduced cost of project by advancing schedule (reduce cost inflation)
	Reduced travel costs by reducing duration of construction
	Delay or alleviate need to borrow funds, reduce cost of project
	Improve borrowing conditions
	Reduced project cost (to TxDOT)
	Reduce right of way cost
	Reduce engineering, environmental costs
Reduce financial risk	Reduce financial risk to taxpayers
	Reduce financial risk to TxDOT
Increase transportation program size	Increase funding available for transportation improvements
Economic development	Support or enable economic development and/or tax base
	Capture economic development opportunities
	Increase property values
	More construction jobs
Reduce travel or operating costs	Travel time and cost savings
	Reduce railroad operating costs
Reduce or defer maintenance costs	Extend pavement life
	Improve maintenance standards

Source: Table 2, interviews.

Quantification of Economic Benefits and Impacts

A variety of techniques have been used to quantify the local economic benefits of highway projects. A number of other reviews have come up with their own classifications of these techniques. The relatively parsimonious classifications used here distinguished the following categories: before-after comparisons, econometric analyses, input-output analysis, regional economic models, urban land use models, and surveys/interviews. The following section summarizes methods identified in the research that can be used to evaluate (largely) regional economic impacts of major transportation projects. The companion project report, Product 0-5025-P1, titled *Guidebook for Economic Benefit Estimation Methods,* contains more detail.[18]

BACKGROUND

In striving to meet Texas' needs for highways, TxDOT is increasingly turning to partnerships with the local and regional government organizations. Greater transparency in TxDOT's arrangements for programming highway funding has promoted understanding on the part of such organizations that contributing a larger share to the costs of highway projects can move these projects forward by years. It is evident to all that when it comes to the *transportation system benefits* of such projects, sooner is better. In highly congested urban areas, for example, many residents are seeking imminent relief of highway capacity problems.

More difficult to demonstrate, but also important for achieving partnerships, are the *economic benefits* to a community that can result from moving projects forward. This section of the report is aimed at describing a range of analytical tools with which the economic benefits of highway projects to communities or regions can be estimated.

What Are "Economic Benefits"?

Economic benefits of highway projects describe favorable impacts on the community's market economy. Although the transportation system benefits of such projects arguably fall within this definition, they are normally referred to within the context of a separate, narrower set of benefits. For that reason, and because estimation of transportation system benefits entails a whole different toolkit, we stick to the narrower definition. Economic benefits (thus construed) can refer to impacts on various economic indicators, such as employment, property values, incomes, industry output, etc.

Fiscal Impacts

Local governments are often interested in the fiscal ramifications of their contributions to a highway project. Indeed, a popular argument in favor of such contributions is that they are to some extent self-financing: i.e., the improvement in the highway system will raise the local tax base by attracting business to the community and pushing up property values. The complexity of the tax system, including its fragmentation among multiple jurisdictions, considerably complicates the task of estimating these tax revenue impacts, but some studies have estimated tax revenue impacts for particular highway projects. The more realistic estimates come from studies that incorporate detail on the local tax structures, such as the Manning Avenue Corridor study discussed later in this chapter under market opportunity analysis.[19]

Another possible reason why the tax revenue impacts of highway improvements are not more commonly estimated, apart from the difficulty in doing so, is that economic development is fiscally a double-edged sword. The development induced by a highway improvement brings additional revenue, but it also creates additional costs for supporting public infrastructure and services, such as schools and water. Although our literature review uncovered no examples of studies that have estimated both of these types of fiscal impacts on local governments, such a study could certainly be attempted.

How Do the Economic Benefits Arise?

Highway projects can provide a temporary economic stimulus for localities that supply labor or other resources needed for construction. The focus of this report, however, is on the local economic benefits that result from the improvements to the highways that the projects achieve: added capacity, smoother pavements, frontage roads, etc. Such improvements can attract business and population to a community in various ways, and the following chapters provide numerous examples. In some cases, particularly involving frontage roads, a highway project may provide access to a previously inaccessible site, thereby unlocking the site's development potential. But more commonly, a highway improvement reduces travel time between places already served by roads, and these savings in travel time are the most important channel through which highway improvements benefit local economies. This consideration leads to one of the most important guidelines in this report:

> **Estimates of economic impacts should generally be based on, or at least consistent with, credible estimates of time savings.**

This guideline is important because the estimation of the travel time savings from highway projects is often a challenge. Basing an economic impact analysis on highly conjectural estimates of travel time savings creates multiple layers of speculation. Beyond a certain point, estimates can become too speculative to have much value for project evaluation.

Toll road projects in areas where roads have not been tolled previously present particular challenges for travel modeling because the lack of local experience makes it hard to predict how travelers will react to tolls. In the worst case, utilization of the toll road turns out well below forecast, and the total time saved is much smaller than anticipated. Thus, for toll road projects in particular, an economic impact analysis should include some sensitivity analysis with respect to the assumed time savings.

TYPES OF ECONOMIC ANALYSIS

The remainder of this chapter describes several different types of economic analysis that can be used to estimate the community or regional economic impacts of major transportation facilities. The companion project report, *Guidebook for Economic Benefit Estimation Methods,* contains additional information.[20]

Ex-post Analyses: Before-After and Econometric Analyses

"Ex-post" is Latin for "after the fact"; thus, ex-post analyses examine already completed highway projects. Within this category are *econometric* studies, which employ a sophisticated form of statistical analysis, and *before-after* studies, which examine several economic indicators over time. A study of a completed project presents two immediate advantages when determining the possible impacts of proposed roadway additions or improvements:

1. **Comparison** — A completed roadway project may serve as an example or suggest the potential economic impacts of a proposed project to the extent that important contextual factors and the projects themselves are similar. However, because the accuracy of a comparison is so strongly dependent on the strength of those similarities, an ex-post analysis could almost carry the now-ubiquitous disclaimer "individual results may vary."
2. **Generalization** — Although rare, similar results from several ex-post studies may establish a general rule about roadways and economic impacts. This category includes multipliers like Auschaer's econometric claim that, nationally, a 1 percent increase in the stock of core roadway capital raises productivity by 0.37 percent.[21] However, they are as tenuous as they are sought after.

Ex-post analyses — primarily in the form of econometric equations — quietly underlie many of the simulation and prediction models for estimating roadway economic impacts (e.g., REMI Policy Insight, UrbanSim, etc.).

A Call for More Before-After Studies

In 2000, Congress directed the FHWA to launch the Economic Development Highway Initiative. This program sought to shift the focus of roadway development from simply alleviating traffic to using roadways to generate positive economic impacts on depressed communities. Before the U.S. Congress could start allotting money for such roadway projects, Congress needed to know which projects produced positive impacts and under what conditions. The principal official for the Economic Development Highway Initiative, Martin Weiss, cautioned that insufficient data existed to make those determinations. Congress directed his office to begin developing a database of projects and their effects beginning with 12 before-after studies on interstate projects in rural areas. The directive also resulted in an instructive guide for before-after studies, the material from which has been incorporated into this publication. In 2005, Congress again called for an account of the economic impact of roadways, this time from an expert panel to be assembled by the Governmental Accounting Organization (GAO). When the GAO asked if retrospective analyses of the performance of transit and highway investments have value, one expert panel member replied, "Absolutely. Positively yes. No question about it."[22]

Challenges in Ex-post Analysis

The instructive guide to before-after studies produced for the Federal Highway Administration noted that "relatively few studies have been done on a rigorous basis."[23] There are several pragmatic reasons for the lack of rigor in ex-post analyses:

- **Ex-post analyses need time-series data:** To observe changes over time, there must be data — either continuous or for specific years — from before the project start until several years after its completion. Such data are difficult to find and may not exist. For example, traffic counts for roadways are done without any regularity, and not at all for some roadways.
- **Time-series data standards may change over time:** Better data acquisition methods, finer levels of detail, and improvements in definitions mean that the data collected in one year may not be comparable to data from another year even if it is from the same data set. When the New American Industrial Classification System (NAICS) — a protocol for classifying business activity in North America — replaced the Standard Industrial Classification System (SICS) in 1997, many econometric relationships in models had to be re-estimated or use shorter periods of time (i.e., data from only 1997 or later).
- **Disentangling roadway-specific effects is difficult:** Although before-after studies usually employ control areas and econometric studies parse statistical variations from large samples, ex-post analyses of roadway impacts are not laboratory experiments where variables can be changed one at a time. Roadways represent just one of many factors simultaneously influencing local economic development.
- **Ex-post analyses may be politically unpopular:** Politicians and stakeholders often tout roadways as a route to economic development, and studies undertaken for specific roadways usually receive significant pressure to back these claims. Ex-post analyses present a possibility that these claims may be proven exaggerated or even false.
- **Ex-post analyses are not as neat as predictive approaches:** Input/output, regional economic, and land-use models usually present results as changes in employment, gross regional product, revenue, or some other simple and appealing number presented in a single sentence. However, before-after study results are more like stories with references to multiple lines of evidence. And econometric studies address one specific aspect of economic development like productivity, which may not be easily distilled into a single cumulative effect of the roadway.

Despite these challenges, it is possible to produce ex-post analyses rigorously leading to truly useful and insightful findings on the economic impact of roadways. The transparency of these studies, and especially the simple, logical reasoning of before-after studies, make them quite valuable.

Before-After Studies

Approach

Before-after studies examine the changes in regional economic or demographic indicators over the stages of a highway construction project. Preferably, they examine the changes over the entire progression of the project — before, during, and after construction. Of course, many factors other than the project under study will contribute to these changes. In an effort to isolate the effects of the highway project, most before-after studies compare the changes over time in the region of the project — the “study area” — to those in a “control” area. In addition to the use of a control area, a well-done before-after study will also rely on other evidence, often qualitative, to corroborate or explain the results of the statistical comparisons. Such evidence may come from surveys, interviews, or other information sources.

In practice, problems with data may limit the length of the study period, sometimes even limiting the study to a before-during or during-after comparison. For this and other reasons, including variation in the approach to selecting a control area, before-after studies do not follow a standard approach.

Why Use Before-After Case Studies?

Evidence from before-after studies can hold lessons for how a future highway project will affect a region's economy. The best case is where solid evidence can be found for one or more past projects that resemble the future projects in key respects, such as the nature of the highway improvements and the characteristics of the region. The agency responsible for the future project, whether TxDOT or some other agency, should not assert that the project will generate the *same* economic benefits as did the past comparison project(s). The impacts of highway projects entail far too many uncertainties for such generalization to be defensible. The evidence from the comparisons can, however, be presented in a way that enables local stakeholders to evaluate the evidence and draw their own conclusions. The evidence should enable local officials with whom TxDOT is seeking to partner on a project to better appreciate the potential economic benefits to their communities. In addition, the qualitative evidence collected, such as from interviews and surveys, may help the officials identify the actions their communities may need to take to realize the highway's economic potential. Such actions could include, for example, changes to zoning policies, the provision of non-highway infrastructure, economic development programs and policies, etc. Lastly, the evidence may also provide insights that can guide more formal, model-based studies of the economic impacts of highways.

Examples

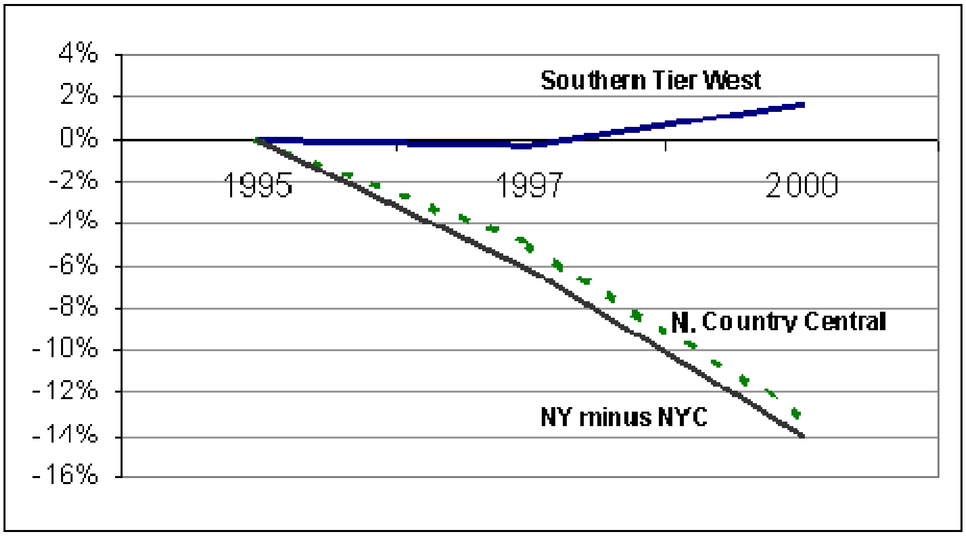
The FHWA employed a before-after study approach to evaluate the economic impacts of I-86 in western New York.[24] The three rural counties that comprise the "Southern Tier West" region — Allegany, Cattaraugus, and Chautauqua — contain three-fourths of I-86's length and have a joint regional planning and development board. The construction of the interstate ran from 1995 to 2000. Data limitations precluded the inclusion of years before 1990, so the "before" period was 1990 to 1995. The "after" period ran from 2000 through 2002, the latest year for which data were available when the study was conducted. For comparison, the agency also analyzed the economic performance of three rural New York counties that comprise the "North Country" region. This region is similar to the Southern Tier West region, except that it lacks an interstate highway.

The study analyzed the trends in economic indicators in the study area relative to the comparison area and also the responses to questionnaires sent to local and county-level officials in both areas. Following are the economic indicators:

- number of business establishments,
- employment,

- average income,
- property values, and
- population.

Results varied by indicator, but overall the study obtained evidence suggesting positive economic impacts from I-86. Figure 1 shows the trend for one indicator.



(Note: data for manufacturing employment not available prior to 1995)

Figure 1. Manufacturing Employment Growth in Southern Tier West (Study Area), North Country Central (Comparison Area), and, for Comparison, New York State Minus New York City.[25]

Further evidence of positive economic impacts came from local officials' responses to the questionnaire, which elicited information about areas within 5 miles of the interstate. The questionnaire asked the officials to identify economic changes — business openings/closings, number of tourists, etc. — since the addition of I-86, including I-86's contribution to these changes. The questionnaire also asked the officials to note any influences of I-86 on community planning. Economic impacts from the interstate were reported for eight of thirteen towns and villages covered by the survey. As an example, FHWA documented the following changes in Mina, a town of just over 1000 people, between 1999 and 2002:

- 57 percent increase in traffic volumes passing through the town,
- a new Harley-Davidson motorcycle dealership,
- 10 percent increase in property values,
- increased tourism,
- updated comprehensive land-use and development plan adopted in 2000, and
- revised zoning laws passed in 2001.

In contrast, the questionnaire sent to officials in the North Country region yielded very few examples of economic development. For this region without interstate highways, the biggest news was bad news: a shoe manufacturing plant, which had employed 600 workers, relocated to a region with better highway and railway access.

Examined together, the economic indicators and questionnaire responses strongly suggest that I-86 has promoted economic development in the Southern Tier West region. As FHWA noted, many of the observed impacts were incipient at the time of study — increased interest by developers, new community development plans, etc. — and the full impacts had yet to be observed.

The Dallas District of TxDOT conducted an assessment of the costs of commuting hassles to employers. The Dallas High Five Interchange Project had the largest budget of any single highway project undertaken by TxDOT's Dallas District. In the study of its business impacts during construction, researchers at The University of Texas Center for Transportation Research (CTR) surveyed tenants of the local office buildings, which house much of the economic activity in the interchange vicinity.[26] The responses indicated that the construction work had inconvenienced some office businesses by disrupting traffic or reducing access to premises, but that most businesses had been either unaffected or only moderately impacted. When asked to indicate their biggest concern about the construction activity, 37 percent of those affected identified the impact on commuting. Weighted by the number of persons each company employs, however, the proportion that identified the impact on commuting rises to 70 percent.

To obtain a general picture of the costs that increased commuting time imposed on employers, the researchers added to their High Five survey some hypothetical questions. The questions asked respondents to imagine that for one month only, each person employed at their business would have to spend a specified amount of extra time (e.g., 25 minutes) commuting each workday. Instead of directly asking respondents to estimate the cost this would impose on their business, the researchers devised questions that indirectly yielded the same information and that respondents could more easily answer. The resulting estimate was that on average, the surveyed businesses attach a value of $22 to each person-hour of commuting delay among their workers. As the researchers noted when the survey was conducted, this estimate was quite high relative to the July 2004 $15.71 average hourly earnings among private sector production workers in the United States. The office tenants surveyed were concentrated in professional and business services that pay relatively high wages, but even allowing for that, the estimate obtained was surprisingly large. Thus, rather than assign a great deal of weight to this particular value, the researchers interpreted their results as simply additional indications that temporary increases in commuting time impose substantial costs on business. Conversely, this finding is also suggestive of the benefits employers would realize from reductions in commuting time, such as could result from a highway improvement.

In other case studies for the Dallas District, CTR researchers interviewed businesses about how traffic problems affect their operations. One of the interviewed businesses was the American Automobile Association (AAA) office in the city of Irving, which houses a call center serving a large region of the United States. The facility manager revealed that at their previous location in Houston, turnover among the call center workers reached 70 to 80 percent per year, and that the hassles of commuting to that location contributed to this problem. The seriousness of this problem can be appreciated given a business journal estimate that to hire and train a new call center employee costs most companies about $6,400.[27] Thus, it is no surprise that ease of commuting was factored significantly into the selection of the Irving location, to which AAA relocated in late 2003. The Irving site, at the junction of SH 161 and SH 114, allows many of the call center workers to make a "reverse commute" (against the direction of the major traffic flow coming from Dallas), and this was thought to be a factor attracting employees. The site manager noted that the labor turnover rate was somewhat lower at the Irving location than it had been in Houston, but that the change in location was not the only underlying factor. Some of the decline was also attributed to a general economic downturn that in mid-2004, when AAA was interviewed, was still elevating the unemployment rate.

Econometrics

The Approach

Econometrics is the branch of statistics that has been developed mainly for analysis of economic data. Although natural sciences (e.g., biology) often conduct experiments that vary one factor at a time, economists must normally make do with non-experimental data in which many factors vary simultaneously. The problem then is to find a technique for disentangling the influence of each factor. As was discussed in Chapter 3, some before-after studies attempt to deal with this problem by finding pairs of observations that are close statistical matches — e.g., essentially the same in all respects except that one area has gained a highway and the other has not — but such matches are hard to find. Instead of attempting to eliminate differences through matched comparisons, the econometric approach attempts to adjust for these differences through statistical modeling. In applications related to this guidebook, such modeling almost invariably takes the form of "regression analysis."

The econometric models discussed in this section are generally single-equation models. In contrast, the regional economic models examined in this report contain numerous equations that represent the many sectors of the economy as separate but interrelated components. Although many of their equations are estimated through econometrics, the much broader reach of these models, as well as their inclusion of some non-econometric structure (in particular, the Input-Output matrices), warrants their placement in a separate class of models from those considered in this section.

Analysts typically divide the economic impacts of highways between those that examine impacts on property values and those that examine impacts on levels of economic activity (employment, output, etc.). Of the analyses that focus on property values, most are about house values, as measured by either sale prices or appraised values, and most use a technique known as *hedonic regression*, which models the price of a good (here, a house) as a function of its characteristics. One such study of 10,000-plus houses near a toll road in Orange County, California, found the following contributions to the price of a home: $79 per square foot of the dwelling, $6290 for each bathroom, and a loss of $24,000 for each mile of distance between the house and the toll road.[28] In econometric terminology, the house price was the study's "dependant variable" (the figure being predicted), and the square footage, number of bedrooms, etc. were the "explanatory variables" (used to make predictions).

In comparison with the analyses of property values, analyses of the impacts of highways on economic activity use samples that are generally smaller, sometimes much smaller. For example, one such analysis, which examined the impacts on employment growth in Missouri, used a sample of 115 observations, the number of counties in the state plus one city. As discussed later in this chapter, larger samples enhance the ability of econometric techniques to produce reliable findings.[29] Moreover, and perhaps more importantly, what drives economic activity in a region is a more complex question and harder to model than the question of why houses differ in their value.

For both these reasons — the typically smaller samples and the greater complexity of the issue under study — the analyses of highway impacts that focus on the level of economic activity are more prone to produce results that fail to conform to reasonable expectations. For example, while investments in highways are known to boost economic productivity in various ways, some econometric studies, including one conducted for Texas, have failed to confirm such a productivity boost. For this reason, it is particularly important that an agency such as TxDOT evaluate the prospects for successful results before undertaking or funding econometric analysis of the impacts of highway projects. The guidelines provided in this chapter are intended in part to help with such assessment.

Why Use Econometrics?

Econometrics are most appropriately used in the following applications:

- To form generalizations about economic impacts. Generalizations about the economic impact of highway improvements, such as the number of jobs created per dollar invested, have been much sought after. Although studies that have attempted to produce such generalizations have produced conflicting results, some of their findings have attracted widespread attention. The Texas Comptroller, for example, referred to a prominent study's generalization that an additional dollar spent on road construction boosts economic productivity by 29 cents. Another example of such generalizations comes from a study by academics Chandra and Thompson, who estimated the economic impacts of interstate highways in non-metropolitan counties. The estimates indicated that the opening of an interstate highway in a county will stimulate growth in that county's labor earnings, and that after 24 years, earnings will typically be 6 to 8 percent higher than if the interstate highway had not been built.[30]

- *To predict economic impacts of individual highway projects.* This use of econometric modeling is relatively uncommon. The modelers themselves often caution that their estimates are only generalizations about the economic impacts of highway investments, that to credibly predict the impacts of any particular investment would require detailed information beyond what the model contains. Even so, such predictions are occasionally derived from econometric models, and this option is worth considering.

- *Econometric equations may be building blocks for a more comprehensive model.* For example, the land-use simulation model, UrbanSim, uses highway accessibility as an explanatory variable in a hedonic price equation for houses. These house prices along with other inputs then predict land development patterns and subsequently economic output in a given area.

Examples

Urban Property Value Example

One study analyzed the effect of toll road access on home prices in Orange County, California.[31] The Foothill Transportation Corridor Backbone (FTCBB) and the San Joaquin Hills Transportation Corridor (SJHTC) are two toll roads in Orange County, California. The access that these roads provide to workplaces and other important destinations adds to the values of nearby homes, but the prices of these homes depend on many other factors as well. Researchers at the University of California at Irvine used hedonic regression analysis — a form of econometric modeling — to separate out the contribution of the toll roads to house prices. The data analyzed were for houses within a few miles of the SJHTC or FTCBB and closer to an on-ramp of these roads than to any other toll road or highway.

Home sale prices between 1988 and 2000 were analyzed in terms of:

- size of the home (square feet);
- number of bedrooms;
- number of bathrooms;
- size of lot (square feet);
- age of the house (years since construction);
- average SAT score of the school district that contains the home, a proxy for school quality;
- crime rate of the home's municipal district, a proxy for neighborhood quality;
- year of sale to control for housing market fluctuations; and
- straight-line distance of house from nearest toll road entrance ramp.

The results clearly confirmed the existence of a price premium for proximity to the studied toll roads. In other words, when comparing two houses equivalent in all the measured physical and neighborhood characteristics, the house closer to the toll road would have a higher price. The estimated premium for proximity amounted to $4600 per mile for the FTCBB and $24,000 per mile for the SJHTC. Importantly, the researchers found that estimated premiums were significantly higher after construction of the toll roads became reasonably certain than during earlier years, when their construction was too uncertain to significantly influence house prices.

To corroborate that the increasing proximity premium actually stemmed from the influence of the toll roads, rather than from extraneous factors, the researchers performed the same hedonic regression analysis for another Orange County roadway, SR 22, which did not change over the study period. Along this corridor as well, houses nearer the roadway commanded a price premium for proximity, but the size of this premium did not change over the study period. Based on this finding, the researcher can more confidently interpret the findings for the new toll roads (the FTCBB and SJFTC) as evidence of their positive influence on nearby house prices.

Rural Development Impact Example

One study used econometrics to predict the economic development that would occur near the exits proposed for the future I-40 in North Carolina. The first step was to develop an econometric model of the amount of business activity — the number of motels, gas stations, and restaurants — at North Carolina exits along the existing I-95. The model indicated that the amount of business activity at a particular exit depended in large part on six observable variables, including distance to the nearest intersecting interchange and the existence of sewer utilities.[32] The next steps were to calculate the values of these variables at the proposed exits along the planned I-40 and then to plug these values into the econometric model. The end result was predictions of the amount of development that would occur at the I-40 exits by business type.

Urban Employment Impact Example

To estimate the economic impact of the proposed Intercounty Connector (ICC) in Maryland, researchers at the University of Maryland (UMD) first analyzed the existing geographic pattern of business activity within the four-county study region.[33] For each zip code area, the researchers measured *business density* — the number of business establishments per square mile — in the year 2000. In modeling the variation in this density, their explanatory variables were measures of each area's highway density — separating the primary highways from the secondary highways and connecting roads — travel time to regional airports, the *transit station density* (number of stations per square mile), and variables not related to transportation. Figure 2 maps the region's transportation network and the variation in business density. For the areas through which the ICC would pass, the UMD researchers calculated the increase in primary highway density that the ICC would result in and then input these values into their econometric model. In this fashion, they derived predictions of the ICC impacts on business density in the affected areas, which through side-calculations were converted to impacts on employment. For one of the proposed ICC alignments, the estimated impacts were gains of 1012 business establishments and 16,855 jobs.

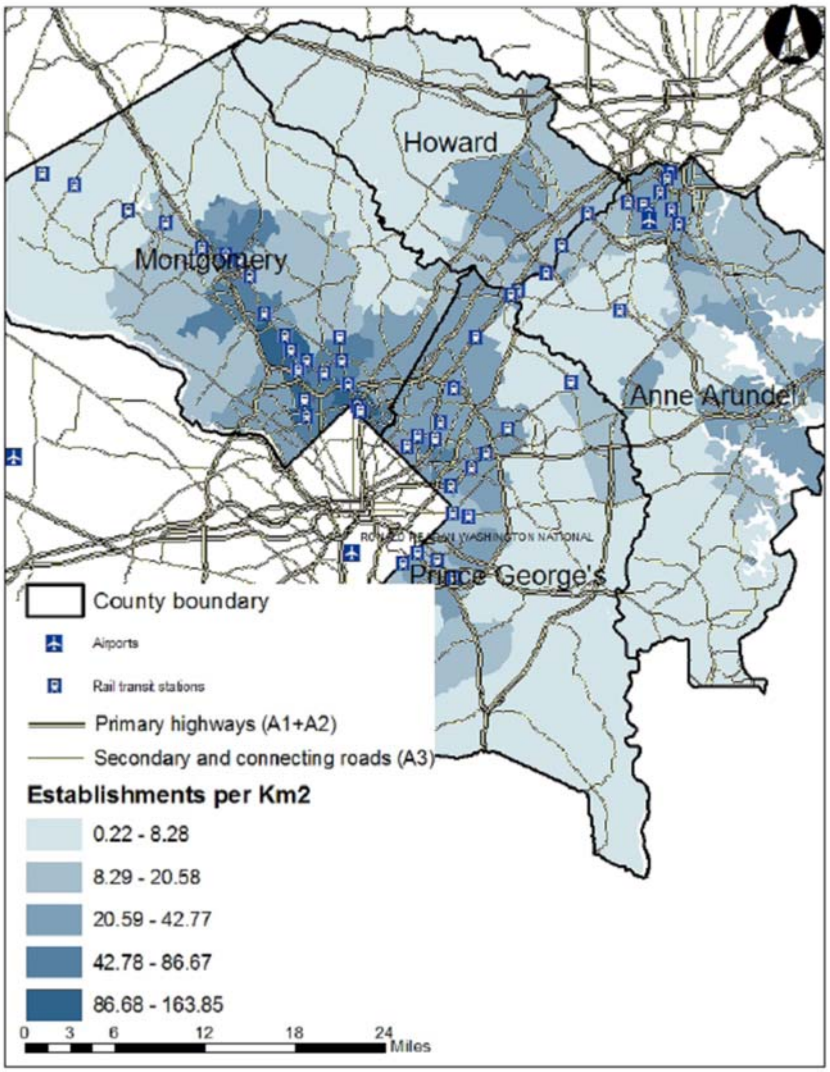


Figure 2. Map of Establishment Density by Zip Code in Year 2000 for the Four Counties Affected by the Proposed ICC.

Predictive Approaches

The Approach

Attention in this report now shifts from ex-post evaluations of the economic impacts of a highway project to tools used more for predicting the economic impacts of planned or proposed highway projects. In making this shift, several issues come to the fore.

Analytical Transparency

As a matter of good governance, it is good practice to have economic impact analyses of highway projects as open to public inspection as possible. Ideally, public access documentation of the analysis and models used should minimize jargon and convey the key points in layman's terms. This is often more difficult to achieve with the predictive approaches, however, than with the before-after or econometric studies discussed in the preceding two chapters. Predictive analyses often rely on highly complicated models, many of which are proprietary and thus, for commercial reasons, not fully open for inspection. Reflecting the state of affairs is the assessment of an FHWA official regarding modeling of the economic impacts of highways: "Computer models can be useful, but they also can be manipulated, and it's difficult to figure out what has been done."

Optimism Bias

Another general issue is whether the predictions suffer from optimism bias, as is all too likely when economic impact analyses are funded by project proponents. One potential source of such bias is the failure to take sufficient account of what a United Kingdom government report termed the "two-way road" effect. This term pertains to highway improvements that provide a community with better access to the outside world. Such access can stimulate the community's economy, for example by extending the market reach of its industries. But at the same time, the improvement in inter-regional access can expose the community to greater competition from outside.

Measurement of Transportation Costs

Several of the predictive approaches require as inputs estimates of a highway project's impacts on transportation costs. Estimates are often obtainable from travel demand modeling and may be broken down by vehicle type. Estimates by commodity transported are harder to obtain but can substantially add to modeling realism. For some regional economic models, special surveys have been conducted on the commodity composition of truck traffic over major highway segments in the region. Another source of information has been the Transportation Satellite Accounts (TSA) developed by the Bureau of Transportation Statistics. Compared to the conventional national economic accounts, these accounts provide a more complete picture of transportation costs in the U.S. economy by more fully including in-house transportation activities (such as a furniture store's operation of its own delivery van). Although TSA has been developed only at a national level, some modelers are making use of them for economic modeling at the regional level, including for economic impact analysis of transportation projects.

Example

The construction of I-664, completed in 1992, provided a new bridge across the James River connecting the port city of Newport News with areas to the south.[34] Newport News officials had seen their city as being at a competitive disadvantage for attracting non-maritime business because of its relative isolation, being surrounded by water on three sides. The addition of I-664 was expected to stimulate the region's economy by mitigating this disadvantage and was seen as key to realization of the city's long-term development plans. According to the study, however, the I-664 favored development on the other side of the bridge from Newport News, as residents sought to take advantage of the cheaper housing on the other side.

Input-Output Models

The Approach

Input-Output (IO) models are the most commonly used modeling tool for estimating the impacts of transportation projects on regional economies.[35] Those persons interested in estimating these impacts need to understand the IO approach for this reason and also because it lays the foundation for more sophisticated models — the regional econometric models and, to some extent, the land-use models discussed later in this chapter.

Although they cannot yield meaningful estimates of these impacts on their own, IO models can serve as useful adjuncts to other analytical frameworks. Typically a *primary analysis* estimates the impacts of a transportation improvement on one or more selected regional industries. The estimates obtained are then fed into an IO model to simulate the flow-on effects for the rest of the regional economy. The flow-on effects arise from the inter-dependencies among the various sectors of an economy. Production of one sector's *outputs* depends on *inputs* from other sectors — hence, the name for this approach. IO models contain a database that quantifies such inter-dependencies.

IO models can be constructed for national, state, or regional economies. Data are usually obtained from federal data collections that go down only to the county level, so the regions distinguished in sub-state models are generally based on county lines — either single counties or aggregations of counties.

Hypothetical Illustration

Suppose that a study has estimated the impacts of a proposed highway improvement on the semi-conductor manufacturing industry in Dallas County. Say that the study has estimated a positive net impact that would boost the industry's employment by 4000 workers. A researcher could then input this estimate into an IO model of the economy of Dallas County to gauge the broader economic impacts.[36] To illustrate the results that would be obtained, we performed such an analysis using IMPLAN, a widely used software for regional IO modeling. Using version 2.0.1025 of this software and the 2001 IMPLAN database for Dallas County, we obtained the following estimates of impacts on the county's level of employment:

- **Direct effect:** 4000. This is the same as what was input into the model, i.e., the number of additional workers that the semi-conductor industry would directly employ.
- **Indirect effect:** 663. To expand output, the semi-conductor industry in Dallas County would need to purchase additional inputs of materials and services, and some of these purchases would be from local suppliers. As a result, the local suppliers would employ more workers. For example, the results indicate purchases of an additional $15 million in services from local wholesale establishments, which, in turn, would need to employ about 84 additional workers to supply these services.

- **Induced effect:** 5167. These additional jobs would result from the increase in local incomes generated by the direct and indirect effects. For employment, the direct and indirect gains equal 4663 (4000 + 663), which would translate to an increase in local labor income. In turn, the increase in labor income would lead to higher consumer spending by local residents, which would further stimulate the demand for labor in Dallas County.

The estimate of total impact on Dallas County employment is thus an increase of 9830 (4000 + 663 + 5167). The ratio of this total to the direct effect, 2.46, is among the "multipliers" that could be derived from the analysis. Each multiplier is the ratio of a broader impact to the direct effect. Some IO models also provide crude estimates of impacts on tax revenues. In our hypothetical example based on IMPLAN, the opening of the semi-conductor plant would generate tax revenues estimated at $179,000 for the federal government and $216,000 for state/local governments. Some analyses using other IO models have estimated tax revenue impacts separately for state versus local government.

As the preceding example shows, the induced effect often accounts for a large share of the local economic gain estimated through IO analysis — in this instance, 52 percent. The modeling of induced effects varies significantly among IO models, and these variations are important to consider when selecting a model to use. The same is true in modeling the import share of local commodity purchases — the proportion of purchases that are from non-local suppliers. Modeling of induced effects is problematic because data on inter-regional trade patterns are scarce. Both these modeling issues — the treatment of induced demand and of import penetration — are discussed further in this chapter.

The Primary Analysis

The primary analysis that provides the estimates of direct effects — the inputs to the IO model — is normally what we have termed a "market opportunity analysis." As Chapter 9 explains, such analyses can range from the simple to the sophisticated. A study of a proposed upgrade to interstate standard of US 50 in Kansas provides an example of a simple approach. The study matched rural communities along this highway with others along existing interstate highways according to population and other factors, and compared the numbers of traffic-oriented businesses: lodging places, restaurants, and convenience stores. Through this means and side calculations, the researchers estimated the upgrade's potential to stimulate traffic-oriented business in communities along the existing highway. These estimates of direct effects were then entered into a regional IO model.

Whatever the approach taken, the estimates of direct effects must have a certain level of credibility to be worth considering as inputs to an IO model. Speculative estimates are acceptable, provided that they are acknowledged as such and that they rest on reasonable evidence and assumptions. But when the estimates of direct effects derive largely from strong assumptions rather than evidence, the credibility test is not met.

The IO Model Database

Regional IO models are data intensive relative to the amount of hard data that are readily available. For this reason, some key components of the database are usually synthesized from conjecture and generalization based on scant data. Among these components are the regional purchasing coefficients (RPC), which determine how much of an increase in local demand for material and service inputs is met by local suppliers. In the IMPLAN database we obtained for Dallas County, the RPC for the industry category "computer systems design services" was 0.80; this means that Dallas County businesses obtain 80 percent of their purchases of these services from local companies. The methods used to derive such coefficients vary among IO models. Occasionally, the creators of the model collect some hard data, but for the most part the data are synthesized using one of several alternative procedures.

Assumptions of IO Models

IO models rely on simple assumptions that may be unrealistic for some applications. The grossest simplification is the assumed absence of resource constraints on the economy's expansion. In actuality, limitations on the supply of labor and other resources can moderate the expansion induced by a transportation improvement or other economic stimulus.

An example is a highway improvement that attracts jobs to a region with limited land available for residential development. By increasing the demand for this limited supply, the increase in the region's employment would drive up the price of residential land and, along with it, the cost of housing. The increase in housing costs, in turn, would pressure employers to compensate with higher wages, but with labor costs higher, some businesses will employ fewer workers than they otherwise would. This displacement of jobs would moderate the overall increase in employment that results from the highway improvement.

Displacement Effects

In causing some activities within a regional economy to expand, highway improvements can also cause others to contract. Failure to account for such displacement is the most common criticism of IO analyses of highway projects. In part, the problem is inherent in IO models: as was just explained, these models do not recognize resource constraints, which can give rise to displacement effects.

The criticism that displacement effects have been ignored may also be directed at the primary analysis that provides inputs to the IO model. Most often mentioned are displacement effects that represent geographic shifts within an industry. A geographic shift may occur when a highway improvement favors business activity at locations well served by the highway at the expense of other locations in the same region. For example, a shopping mall that opens at a location made more accessible by a highway improvement could displace retail activity at other current or potential retail locations. When locations losing business are outside the region being studied, these losses are not pertinent to the estimation of regional economic impacts. But when locations losing business are within the study region, to ignore or understate these losses would be to exaggerate the net impact of the highway improvement on the region's economy.

Displacement can also take the form of one regional industry expanding at the expense of another. A study of US 219 in New York State predicted improved access would draw more visitors to skiing resorts in the southern part of the study region, including visitors from Buffalo, which was also part of the study region. Not addressed was how the Buffalo residents would fund these additional visits. One possibility was cutting back on skiing or other recreational trips to destinations outside the region. Another possibility, however, was curtailing spending on non-skiing recreation within the study region (bowling, movies, etc.); in this case, the induced expansion of the region's skiing resorts would come partly at the expense of the region's other recreational industries.

Why IO Models Are Used

Although their simplicity limits the realism of IO models, it also makes them comparatively easy to construct, use, and understand. For many applications, an off-the-shelf IO model will suffice, and these are available at modest cost. For regional impact analysis, one of the cheaper options is to use the RIMS-II multipliers prepared by the U.S. Bureau of Economic Analysis. A set of IO multipliers for a region's industries is currently available for $725 per region. Although this set of multipliers does not include the underlying IO model and database, the multipliers alone will suffice for many applications. For somewhat more money, there are proprietary IO models and databases such as those provided by IMPLAN. When a customized IO model is needed, the costs will be higher, but as discussed in this chapter's guidelines, an off-the-shelf model will often do the job.

Example

The preceding illustration focused on employment impacts, which usually attract the most attention among the audience for IO analyses. But several other measures of impact can also be used, as in a 1988 study of a proposed upgrade of US 219 in upstate New York.[37] The study first estimated the impacts of the upgrade — to interstate highway standards — on three key sectors in the regional economy: (1) forest products, (2) regional tourism, and (3) advanced ceramics manufacturing. By feeding these estimates into the IO model of the four-county study region, the study then obtained estimates of overall economic impact. Table 6 shows the results from the analysis of the forestry products sector, for which impacts are estimated for 5, 10, and 15 years after the assumed completion year of the highway upgrade.

Table 6. Estimated Impacts of Proposed Upgrade to US 219 in New York: Results from Analysis of Forestry Sector.

	Years after completion of upgrade[a]		
Item	**5 Years**	**10 Years**	**15 Years**
(1) Direct Impacts: Forestry Sector Output	19.7	24.7	31.0
(2) Total Impact on Regional Economy of Expansion in Forestry Sector			
a. Employment (*Job-Years*)	639	1095	1695
b. Regional Gross Product[b]	20.3	33.4	50.6
c. Regional Output[b]	39.1	60.3	88.4

d. Household Income[b]	14.6	28.6	47.3
e. Output Multiplier = Ratio of Item (2c) to Item (1)	2.0	2.4	2.9

[a] The source for these estimates is a 1988 report that assumed completion of the upgrade within the "next five years," which implies completion in 1993.
[b] Units are $ million at 1985 prices.
Source: 1988 report by consultants Peat Marwick Main and Co.

Regional Econometric Models

The Approach

Regional econometric models generally distinguish regions according to county boundaries; the regions analyzed may be single counties, or aggregations of counties that form corridors, metropolitan areas, sub-state regions, or entire states. For analyzing the economic impacts of highway investments in the United States, the most widely used of these models has been REMI Policy Insight, developed by Regional Economic Modeling Incorporated. A model that shares some features with REMI Policy Insight and other regional econometric models is the Random-Utility Based Multiregional Input-Output Model (RUBMRIO) developed by researchers at The University of Texas at Austin. RUBMRIO has been implemented thus far only for Texas, and the model's regions are the 254 Texas counties. Although the model is still in a relatively early stage of development, it has already been used to estimate the economic impacts of the proposed Trans-Texas Corridor.[38]

Regional econometric models expand on the input-output frameworks discussed previously by adding various important features. The most salient of these elaborations are the following:

Resource Constraints

In regional econometric models, the economy's endowments of resources in any year — the amounts of labor, land, and capital of various types — constrains the economy's scale. The models also recognize, however, that these endowments can change over time. A region's endowment of labor changes through natural population growth, migration, education, alterations to labor force participation rates, etc. The growth in a region's fixed capital, which comprises equipment and structures, changes through depreciation and investment.

Any regional econometric model will treat some drivers of resource base growth as *exogenous* (taken as given) and others as *endogenous* (explained by the model). The exogenous treatment is justifiable for those drivers that are relatively insensitive to economic conditions. The mortality rate, for example, is one of many determinants of the growth in the labor force, but in an advanced economy like that of today's United States, the mortality rate is relatively unaffected by economic conditions. Thus, economic models developed for the United States will take the mortality rate as given. This assumption is not the same as assuming that mortality rates will remain constant. One could input into an economic model forecasts of mortality rates obtained from some other source. Exogenous treatment simply means that such forecasts are among the model's inputs, not its outputs.

For a determinant of the resource base that is often treated endogenously, inter-regional migration can serve as an example. In REMI Policy Insight, the net flow of migration into a region depends on relative wage levels and unemployment rates, with migrants being attracted to regions with better job opportunities. Also endogenous in REMI Policy Insight are various other determinants of the resource base of a region's economy.

Land is an important economic resource, and regional econometric models vary in the extent to which they represent natural and man-made constraints on land use. REMI Policy Insight does not represent land as a distinct input to production, thus limiting its value for estimating the impacts of highway investments in certain contexts. In a metropolitan region with scarce undeveloped land and relatively strong land use controls, these constraints will have a significant impact on where additional development occurs. In this context, a model that omits land as an input to production may give misleading predictions of the economic impacts within the region of a new highway project. The problem becomes more significant the smaller the sub-areas for which impacts are estimated.

Economic Dynamics

Migration equations can also illustrate another typical feature of regional econometric models, which is the gradual adjustment of the resource base to changes in economic conditions. Because the time periods in such models are generally annual, the adjustments will often span more than one modeling time period. If, say, a major defense plant unexpectedly wins a large contract, the contract will increase demand for labor in the surrounding region, drawing population from elsewhere; however, the influx of population will take more than a year to be fully realized through adjustments in migration. Likewise, the additional defense contract would induce a general increase in the region's capital base — e.g., local suppliers to the defense plant would add to their plant and equipment — but this expansion, too, would take more than a year to be fully realized, in this case through increased investment.

Because such adjustment processes are gradual, regional econometric models represent the resource base of a region as fixed to some extent in the short term. A common assumption is that each regional industry is limited in a given year to the stocks of capital held at the end of the previous year. In other words, any new investment in these capital stocks will take one year to be put in place. This timing is another reason why the resource base adjusts gradually in these models, in addition to the induced investment being spread over more than one year.

Displacement Effects

Another elaboration of the input-output framework is the inclusion of structure within regional econometric models to quantify the extent to which expansion of some businesses within a region displaces production by similar businesses within the same region. Documentation of the REMI model gives the following example of the displacement effects that the model does capture and that input-output analysis does not:

> If a new grocery store is subsidized to move in, but 95 percent of all groceries are bought in the home region in the baseline case, then most of the sales of the new firm would displace sales in the grocery stores that are currently in the home

region. The net increase in jobs would only be a fraction of the firm's employment. The gain would mainly have to come from the increasing share in other regions, and this gain may be small if the initial shares indicate that the geographic area served by this industry is always very close to its source.[39]

Effects on Costs, Prices, and Demand

Regional econometric models contain more structure than do input-output frameworks for predicting the effects of changes in transportation costs on production costs by industry and output prices by commodity. Consider, for example, a reduction in transportation costs that stimulates the economy of some region, including the demand for labor. At least for a while, the increased labor demand could place upward pressure on regional wage levels, canceling out to some extent the direct reduction in production costs due to cheaper transportation. In contrast to an input-output model, a regional econometric model will have structure to capture some of these secondary effects.

More importantly, regional econometric models quantify how changes in costs and prices affect the demands for various goods and services. In the modeling of many transportation improvements, a key consideration is how the associated reductions in transportation costs affect the distribution of demand among alternative sources of supply. If the cost of transporting food products, for example, from region X to region Y decreases, then region X will be able to win a larger share of the market for food products in region Y. Regional econometric models, unlike pure input-output analysis, have equations to predict the extent of such shifts.

Why Use Regional Econometric Models?

Regional econometric models, when used in combination with other sources of information, can provide key measures of the economic impact of some major highway investments. Such measures, in particular the impact on employment, may generate considerable interest among policy makers and stakeholders. In addition, when the models are dynamic, they have the added appeal that they can demonstrate the economic consequences of delaying a project.

In the following two examples, the modeling framework included:

1. a transportation model to estimate the effects of the proposed highway project on travel times;
2. benefit-cost calculations of the costs of the project and of the dollar value of the savings in travel time;
3. REMI Policy Insight; and
4. REMI Policy Transight, which facilitates modeling of the impacts of transportation investments by converting the results of the benefit-cost calculations into inputs for REMI Policy Insight.

Urban Example

The Texas Transportation Institute (TTI) estimated the economic impacts of the reconstruction of 21 miles of the LBJ Freeway (I-635), a partial orbital road around Dallas.[40] The study estimated the regional economic impacts of the:

- Construction spending
- Improvements to the freeway, including:
  - doubling of vehicle capacity;
  - new, continuous frontage roads;
  - reconstructed bridges and underpasses; and
  - managed HOV/HOT lanes.
- Financing of the construction spending. In the illustrative scenario modeled, the construction spending entails a mixture of:
  - federal funding,
  - private equity (through a comprehensive development agreement),
  - issuance of bonds partly backed by tolls, and
  - local contribution financed by taxes and special assessment fees.

To estimate the full economic impacts of the freeway improvements, TTI first estimated the savings in travel costs that these improvements will produce. For each combination of origin and destination zone, TTI estimated the savings in travel costs by categories that distinguished:

- type of vehicle (trucks, automobiles);
- time of day of travel (morning peak, afternoon peak, or off-peak);
- home-based travel (starting or finishing at home) versus other non-home-based travel; and
- purpose of home-based travel (commuting to work, shopping, other).

The origin and destination zones were those in the travel demand model of the North Central Texas Council of Governments, which covers the eight counties in the Dallas-Fort Worth Metroplex. The model splits the region into more than 4874 zones, a fine level of geographic detail for a travel demand model. After estimating the savings in travel costs at this level, TTI aggregated the estimates to a geographic level broad enough for use with REMI Policy Insight.

Not surprisingly, the results of the modeling indicated that the largest economic impacts will be in Dallas County, where the project corridor is located. The impacts evolve over time, with the temporary economic gain from construction spending followed by long-term gains from the savings in travel costs. The estimated impacts from the burden of financing the project are negative but very slight, in part because much of this burden is assumed to be borne by the federal government or other non-local parties. In the scenario where construction finishes in 2015, the estimated overall impact on employment in Dallas County five years later was approximately 15,000 additional jobs (persons employed). For the final year in the forecast period, 2025, the estimated impact on employment in the county was much larger, at about 35,000 additional jobs. This pattern of mounting annual impact reflects the dynamics of REMI

Policy Insight, in which the economy adjusts gradually to any particular influence, including improvements to the transportation system.

The same dynamic pattern was evident in the estimated impacts of the LBJ Freeway Project on the model's other summary indicators for the Dallas County economy. For 2025, the indicated impact on the county's gross regional product was a gain of more than $20 billion in the county's gross output.

Earlier completion of key segments of the LBJ corridor project, in 2112, was also modeled. Compared with completion of construction in 2015, this acceleration of the project was estimated to have significantly larger impacts on the Dallas County economy. The gains from earlier completion, cumulated from 2003 through 2025, amounted to 110,000 persons employed and an extra $31 billion in county output.

Rural Example

Another application of REMI Policy Insight elucidated the economic effects of a proposed expansion of US 54 in New Mexico.[41] The project would be a substantial upgrade to the New Mexico segments of this major freight corridor, which stretches northeast from El Paso to Chicago. The first 80 miles north of the Texas border currently support four lanes of traffic, as do the 59 miles further north in New Mexico where the highway overlaps I-40. The studied upgrade would improve the remaining 235 miles of the New Mexico segments. In addition to boosting the number of lanes from two to four, the project would broaden the shoulders, improve the road's alignment, and resurface. In combination, these improvements would do much to reduce the currently frequent occurrences of traffic backups behind slower-moving trucks. Primarily because of this effect, the project would increase average travel speed.

The assessment of economic impacts covered a 20-year period starting with the assumed commencement of the project in 2004. Predicted impacts included the project expenditures and the impacts on travel speeds following the project's assumed virtual completion in 2008. The speed impacts were estimated using the state version of the Highway Economic Requirement System (HERS) model and a supplementary analysis. For the improved portions of US 54, the estimated speed impact over the post-construction period was an increase of about 6 mph (from 63.9 to 70.0). The supplementary analysis yielded estimates of the project's impacts on travel speeds elsewhere on the New Mexico highway network, which would arise through traffic diversion and other channels. TranSight converted the speed impacts to changes in transportation costs for freight movements and business travel.[42]

The report on the economic impact assessment provides two measures of economic impact within the five-county region containing the project corridor. The more relevant of these is the change in gross regional product, which measures the region's annual output. Note that this measure is in terms of 1996 prices, the base year for inflation adjustments in the U.S. national accounts. The estimated impacts in terms of current prices were somewhat higher than those reported.

During the construction period (from 2004 to 2008), the project's estimated impact on the gross product of the five-county region averages about $60 million, making for a total impact of almost $300 million. Estimates for the subsequent 15 years, after virtual completion of construction, indicate that the improvements to US 54 would provide an ongoing, albeit smaller, boost to the region's gross annual product. The predicted impact increases over this period, from about $21 million in 2009 to about $36 million in 2023. As the report notes, the five-county region under consideration currently has a small economic base, and the size of the economic base limits the magnitude of a transportation improvement's potential impacts on regional output.

Land Use Models

The Approach

Land-use models predict the allocation of land within a region among alternative development types. Each model splits a region into geographic zones; in the urban land-use models with which this chapter is mainly concerned, these zones are generally well below the county level. For each zone, a land-use model predicts the allocation of land among undeveloped, residential, or business-related uses. The development typology may also differentiate according to the land density of structures (e.g., medium- versus high-density housing) and type of business (e.g., commercial, industrial, or government).

Although people tend to think of land use models as non-economic, many of their predictions actually concern economic outcomes. In particular, land use models predict the distribution of employment and population across a region's zones. In addition, some of the models generate results for area property values, an important capability for applications to Texas, where local governments derive much of their revenues from property taxes.

Land use models vary enormously in how they predict development patterns, but they all take account of the following influences:

- **Accessibility:** The models all recognize that the amount of development in an area depends partly on accessibility. For example, in predicting where employment growth occurs, the models take account of each area's accessibility to neighborhoods from which potential workers commute. Accessibility can be measured in terms of travel time.
- **Land availability:** In addition to natural limitations on supply, the models may also take account of zoning or other regulatory constraints. Land characteristics relevant to development potential, such as the slope or proximity to wetlands, may also be included.
- **Past development patterns:** Buildings and other structures are long lived, and relocation of jobs and residents is often costly. As a result, the pattern of land use is often slow to change, being determined in large part by past development decisions. In one way or another, all the land use models (excluding purely theoretical models) recognize changes in development patterns.

Another common feature of land use models is that their predictions of future development patterns cannot be counted on. A team of distinguished researchers in this field properly concluded:

> Predicting the future of a city is a bit of a fool's game — there really is no hope that a mathematical model can ever accurately predict what will happen 25 years in the future given all the uncertainty in demographics, national economies, technological shifts and social changes. If land use modelers could accurately predict the future form of a city they would all spend their time on real estate speculation, not planning! It is perhaps more important to focus on the influence of various policies on the probabilities that conditions will change in certain ways into the future.[43]

This conclusion leaves open the possibility that land use models can provide useful evidence on the impacts of highway investment policies, including decisions on particular projects.

Applications to Analyses of Highway Investments

When used together with travel demand models, land use models can yield predictions about the impacts of highway improvements. The simple approach involves one-way interaction between models: the travel demand model supplies values for the accessibility measures in the land use model.

The more complicated approach is an integrated application of travel demand and land use models, either within a single overarching model or through an interface between separate models. The advantage of integrated application is that it incorporates feedbacks from land use impacts into the modeled performance of the transportation network. In urban regions with substantial road congestion, a common concern is that these feedback effects work against congestion mitigation efforts. For example, a typical concern is that highway improvements could gradually induce people to live farther from work, which over time erodes the initial benefit of reduced congestion. In turn, the gradual return to higher levels of congestion could erode some of the initial impacts of the highway on the distribution of population and employment. Integrated transportation/land use modeling can represent such sequences of two-way feedbacks between transportation and land use.

Why Use This Approach?

As a tool for estimating local economic impacts of highway projects, land use models have two advantages over the input-output models and regional econometric models discussed previously.

First, the ample geographic detail in some land use models, particularly of urban regions, presents possibilities for estimating impacts on individual cities or communities. In UrbanSim, a model gaining favor in Texas, the default grid cells — what are termed "zones" in the section on input-output modes — are only about 5 acres in area. With impacts estimated at anything remotely close to this level of geographic detail, a study can, in principle, aggregate at the community level. In contrast, the types of simulation models discussed in the preceding two chapters are geared toward impact estimation at the county level or above.

Second, a number of land use models can estimate impacts on property values. In the models, property values can change through land development — e.g., building an office complex on vacant land — or through changes in the prices for land or existing floor space. With estimates of impacts on property values, local governments can better gauge how much of their contribution to a highway project will return to them in property tax revenues. In Portland, Oregon, the MPO used an integrated model of the region's land use and transportation to estimate the impacts of adding lanes to the I-5 bridge, and obtained estimates of positive impacts on property prices.

Although the hedonic price models discussed previously can also provide estimates of highway impacts on property prices, land use models have the superior capability. The estimates from the hedonic models are only of price *differentials* between locations — for example, the price premiums for houses in locations with better highway access relative to other locations. A land use model, on the other hand, has the additional capability of estimating the *absolute* impacts of a highway improvement on prices at each location.[44]

Land Use Modeling in Texas—Urban Land Use Modeling

Land use models are generating considerable interest in metropolitan regions of Texas because of traffic congestion and air pollution. When integrated with a travel demand model, an urban land use model can help design land use and transportation strategies for mitigating these major problems.

The Houston-Galveston Area Council (H-GAC) currently has the most advanced capability in Texas for land use modeling. The council uses a relatively sophisticated model, UrbanSim, for developing small-area forecasts of population and employment. These forecasts are then input to the region's travel demand model; the models themselves remain separate, however, not integrated. In addition, UrbanSim has been implemented separately for each county in the H-GAC region rather than for the region as a whole; this means that the model can predict the distribution of population and employment within each county, but forecasts of the respective totals for each county must be obtained from another source.

The H-GAC has reportedly used its UrbanSim model for build/no-build analyses of Segment C of the Grand Parkway and Houston's light rail transit. Analysts used DRAM-EMPAL, a less sophisticated model, for a build/no-build analysis of toll roads planned for Austin, and presented estimated impacts on population and employment at a detailed geographic level.[45]

Interest in developing urban land use modeling capabilities for metropolitan regions of Texas has led to plans for a TxDOT research project for FY 2007, "Analysis and Guidelines for Establishing Unified Urban Land-Use and Transportation System Planning Framework and Procedures" (Project 0-5667). The problem statement for this project called for a focus on UrbanSim, but a review of various models is planned, and our understanding is that the PECAS model will receive particular attention. Both models — PECAS and UrbanSim — incorporate the influence of property prices on location decisions. In addition, both are transparent: UrbanSim is an open source code model, and PECAS has been described as transparent by its principal developer.

Progress toward implementation of either of these models for regions in Texas, and toward integrating them with travel demand models, will permit further exploration of the potential value of such models for estimating the local economic impacts of Texas highway projects. Thus, we recommend that such exploration be undertaken as a follow-up to TxDOT Project 0-5667, which according to the current proposal, will implement an integrated land use/transportation model for at least two of the five largest metropolitan regions of Texas (Houston-Galveston, Dallas/Fort Worth, Austin, San Antonio, and El Paso).

Statewide Land Use Modeling

RUBMRIO is an integrated transportation and land use model that predicts land use patterns at the county level. A recent study of the planned Trans-Texas Corridors used the model to estimate impacts on population and employment for each of the states' 254 counties. The model is still under development, however, and it is too early to gauge its ultimate potential for shedding light on the economic impacts of highway projects. As part of a future assessment, comparisons will need to be made to regional econometric models (Chapter 7), especially since these models are sometimes built at a county level, the same as RUBMRIO.

Example — Integrated Modeling of Transportation and Land Use in Sacramento, California

To explore the capabilities of land use and transportation interaction models, various teams of researchers applied three such models to several long-range planning scenarios for the Sacramento region:[46] DRAM-EMPAL, TRANUS, and MEPLAN. DRAM-EMPAL was described in 1999 as the land use model most commonly used by metropolitan planning organizations. Compared to the other two models, DRAM-EMPAL is simple to implement for a region because of its modest data requirements. On the other hand, it also provides a more basic representation of economic interactions, as land prices and supplies of floor space are not represented.

For each model, the Sacramento region was divided into five sub-regions as shown in Figure 3. Four scenarios were modeled. The base case, or "trend scenario," consisted of "expected regional population growth, and a financially constrained infrastructure and service plan based on the latest transportation improvement plan." The other three scenarios added transportation improvements or innovations in road pricing to the base case. For each of these "do more" scenarios, impacts relative to the base case were estimated for the year 2015, a number of years after implementation of the assumed initiatives. Figure 4 maps the scenario highway networks.

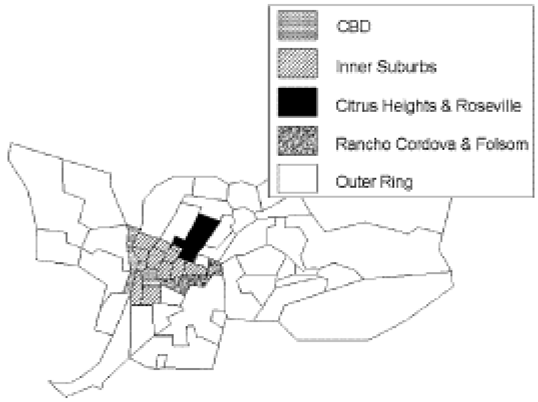


Figure 3. The Five Sub-regions for the Sacramento Land-Use Model Analysis.[47]

Table 7 shows the estimated employment impacts of adding a beltway as well as HOV lanes to existing radial expressways. The first thing to notice is that the impacts on total regional employment are small. This is no surprise because many land use models take regional totals for population and employment as given. The slight divergence from zero in the regional employment impacts estimated with DRAM-EMPAL may be attributable to approximation errors. MEPLAN and TRANUS, on the other hand, have structure that allows prediction of changes in total regional employment. The other thing to notice in Table 7 is that some of the zonal-level results differ substantially among the models. In particular, the outer region emerges as the biggest gainer in the results from TRANUS, with almost a 2 percent increase in its share of regional employment, and as the biggest loser in the results from MEPLAN, with more than a 13 percent decrease in its share of regional employment.

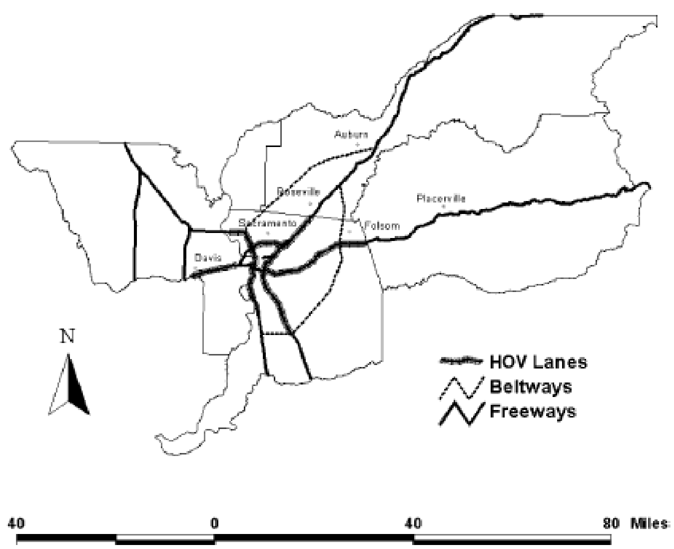


Figure 4. Highway Network Scenarios in the Sacramento Land-Use Model Analysis.[48]

Table 7. Percent Change in Model Outputs as a Result of Policy Scenarios.[49]

	MEPLAN	TRANUS	DRAM/EMPAL
Region Total	0.36	-0.03	0.02
Central Business District (CBD)	3.79	-0.14	-0.96
Inner Suburbs	2.47	-0.52	0.84
Citrus Heights	1.19	0	2.86
Rancho Cordova	14.1	0.72	3.04
Outer Region	-13.07	1.94	-1.86

Market Opportunity Analyses

The Approach

Previous sections of this report examined three types of large-scale models — input-output, regional econometric, and land use models — that can be used for predicting regional economic impacts of future highway investments. In each case, our examination revealed limits on the types of questions that such models can answer meaningfully or at all.

On the geographic dimension, the land use models have the greatest capability for predicting localized impacts, but even they lose their credibility when the areas involved become sufficiently small. For example, they would not be suited to predicting the redevelopment on individual parcels of land adjoining new frontage roads.

On the industry dimension, input-output and regional econometric models may include reasonably fine breakdowns, but the characterizations of industries rely on quantitative generalizations that may be inapplicable in particular circumstances. For example, a company with financial problems not typical of the industry nationally could dominate a major industry in some region, in which case the industry's response to an improvement in transportation could also be atypical.

Moreover, none of these types of models are capable of predicting the emergence of new economic development that represents a sharp break with a region's past. The input-output models lack this capability because they are adjuncts only to other analytical frameworks. The regional econometric and land use models lack this capability because of their tendency to extrapolate from the past. Yet proposals for major transportation projects, especially in economically depressed rural regions, are sometimes accompanied by predictions that the project will galvanize a region's economy, either attracting new industries or breathing new life into old ones. Properly done, an analysis of the region's market opportunities and the role of transportation can help add realism to such predictions. An example given at a recent conference on transportation and economic development was a rural highway that was going to provide better access to the rural birthplace of a famous musician. To analyze the potential of the access improvement to draw more visitors to that attraction, the consultants examined the market across the country for tourism to the birthplaces of cultural celebrities. Obviously, a large-scale economic model intended for more general use would not contain this sort of information.

Inevitably, then, there is much about regional economies and land use that the types of models described in the preceding chapters do not "know." "Market opportunity analysis" is a catchall description of alternative analytical approaches that add some of this missing information to better answer questions about the economic impacts of future highway investments. Because the approaches covered by these terms are so diverse, our coverage of them cannot be exhaustive, and we describe the major ones under separate headings.

Real Estate Market Analysis

These analyses focus on land use impacts at more of a micro level than what the formal land use models can realistically handle. They rely heavily on judgment informed by knowledge of the commercial real estate sector as opposed to formal modeling.

Examples

SH 183 (Airport Freeway) in Dallas District

TxDOT funded a study of the local economic impacts of improvements proposed for an approximately 10-mile stretch of this freeway through Dallas and Irving.[50] The improvements would include reconstruction and widening from the current six to eleven lanes. The consultants who conducted the study examined how the improvements would affect access to and visibility of current and potential future properties on land parcels in the highway corridor. Based on these effects and the consultants' knowledge of local markets for commercial real estate, the study predicted that the improvements would induce development of over 400,000 square feet of office and retail space. The increases in square footage by type of development were then (using conventional industry rules of thumb) translated to numbers of jobs created.

Airport Corridor in Rochester, New York

Another example of a real estate market analysis is the Major Investment Study conducted for the Airport Corridor in Rochester, New York.[51] The study examined the development potential of two existing industrial parks in the airport corridor, which were less fully developed than three other industrial parks in the Rochester area used for comparison. The parks in the corridor, Jetview and Rochester International Commerce Center, had lower annual absorption rates (were growing more slowly in terms of developed square feet) than the comparison parks despite being cheaper. Opinion among the consulted specialists in economic development and industrial real estate specialists was that the "the lack of good highway access has severely hampered industrial development within the study area." Table 8 gives the study's estimates of the effect of mooted road improvements in the airport corridor on annual absorption and on the number of years to full absorption. For one of the two parks, the required years to full absorption would be 156 years at the current annual rate of absorption, but only 15–19 years under the airport improvement scenario (low end of range assumes less extensive road improvements than high end). On the other hand, no significant stimulus to retail development in the corridor was predicted because retailing serves mainly the local community (within the corridor), and the shoppers use local roads (not the major roads being considered for improvement).

Table 8. Development Potential of Industrial Parks in Airport Corridor, Rochester, New York: Major Investment Study Estimates.[52]

Park	Available Acreage	Development capacity in sf (a)	Annual Absorption w/o Road Improvements, in sf (b)	Years to Full Absorption	Annual Absorption with Road Improvements (c)		Years to Full Absorption	
					Low End	High End	Low End	High End
RICC	125	937,500	6,000	156	50,000 sf	100,000 sf	19	9
Jetview	70	525,000	23,500	22	50,000 sf	100,000 sf	11	5

(a) Assumes 7,500 sf of industrial space/acre, based on discussions with developers

(b) Assumes current absorption rate will continue.

(c) Even with the roadway improvements that are recommended, access to these parks will not be as good as access to the competing parks. Therefore, absorption at these parks may be somewhat slower than competing parks. The low-end projection therefore assumes these parks will experience an absorption rate 50 percent that of the competing parks. At the same time, the proximity of the study area to GRIA is an advantage for the study area parks. The competing parks realized absorption rates of approximately 100,000 sf/year. Therefore, the high end absorption rates for the study area parks mirrors the current rates at competing parks, assuming that the proximity to the airport makes up for poorer highway access.

Analyses of this type tend to focus on industries that compete with producers outside the region, particularly industries that export from the region.

North Country, New York

Consultants from Cambridge Systematics, Inc., and Economic Development Research Group estimated the long-term employment impacts of three potential highway alignments at two different operating speeds: freeway and highway.[53] These estimates for North Country, an economically depressed region of New York, originated from the synthesis of three analytical techniques:

- "local interviews and surveys,
- state business attraction and retention trend analysis, and
- a specially designed business attraction model."

The business attraction model — originally produced for and now used by the Indiana Department of Transportation — generated the actual number of jobs associated with each highway alignment. At the heart of this model was yet another: a traffic network model, which determined the accessibility impacts of each highway alignment at freeway and expressway speeds. The impacts were presented as the additional employment or population accessible from several locations within North Country as a result of reduced travel times. For example, assuming that workers will commute up to 1 hour, upgrading Route 11 to freeway conditions would provide access to a 14.3 percent larger labor pool. Table 9 shows the complete set of accessibility measures and their estimates.

Table 9. Estimates of Increases in Market Accessibility and Employment Impacts.[54]

Accessibility Measure	Based on:	Expressway			Freeway		
		Rt. 37	Rt. 11	Rt. 12	Rt. 37	Rt.11	Rt. 12
Labor Market	1hr trip	1.0%	8.8%	1.7%	2.0%	14.3%	2.8%
Customer Market	1hr trip	1.0%	8.8%	1.7%	2.0%	14.3%	2.8%
Business to Business Market	6hr round-trip	8.0%	5.3%	4.4%	9.9%	14.2%	8.8%
Tourism Market	2hr trip	7.3%	8.7%	1.7%	18.8%	18.1%	5.9%
Access to Airports	local survey/ expert knowledge	10.0%	10.0%	7.5%	10.0%	10.0%	7.5%
Access to Riverports	local survey/ expert knowledge	10.0%	5.0%	7.5%	10.0%	5.0%	7.5%
Access to Rail Centers	local survey/ expert knowledge	7.5%	5.0%	7.5%	7.5%	5.0%	7.5%
Pass-By Traffic	assumption	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Direct Business Attraction Employment Impact (jobs)		**824**	**2,505**	**762**	**1,292**	**4,084**	**1,239**

The business attraction model used these changes along with comparative employment data, competitive cost factors (e.g., electricity cost), and figures for transportation usage by industry to develop estimates of direct business attraction employment impacts over five to ten years. These impacts ranged from 762 jobs for one highway alignment at expressway speeds to 4082 jobs along a different one at freeway speeds. However, the exact method of calculating the impacts is unknown, presumably because of proprietary concerns, and the study cautioned that the estimates could vary by roughly 20 percent.

The local interviews and surveys completed for the study as well as the trend analysis served to justify and provide an upper bound for the quantitative estimates of the business attraction model. For example, a survey of the five economic development organizations in the study area listed “transportation access or infrastructure” as one of the top three reasons businesses did not locate in the area. These and other similar findings squarely placed transportation issues as a limiting factor to economic development in North Country. In terms of employment trends, the New York State Department of Labor found that if the region had grown in tourism like the rest of the state between 1992 and 1998, it would have added 400 more jobs and $4500 in wages. Such collaborative evidence lent plausibility to the study findings and provided a ballpark for the quantitative estimates. The strength of combining the three analytical techniques — surveys/interviews, trend analysis, and business attraction modeling — according to the consultants, was “to move from an inherently speculative concept (business attraction impacts) into one that can be reasonably believed and credibly defended.”

Manning Avenue in Fresno County, California

In their economic impact analysis of capacity improvements to the Manning Avenue Corridor in California, Jack Faucett Associates (JFA) began with the 1998 Fresno County

General Plan for the period 2002 to 2020.[55] For the corridor's five cities, JFA estimated the income growth that would result from the employment growth that the plan envisaged. Based on the anticipated addition of 9006 direct and induced jobs multiplied by the average salaries for each employment category, the predicted growth in personal income was $242,100. This figure included downward adjustments related to the outflow of money from in-commuting workers — a number they garnered from their own survey of local employers and their employee commuting patterns. This income was expected to produce $4100 in sales tax revenue for corridor cities using the Bureau of Labor Statistics' Consumer Expenditure Survey — a conservative estimate because it excluded any spending from outside commuters. Lastly, assuming a constant ratio of employees to square feet of land and buildings from 2002, the consultants calculated an additional $3700 in property tax revenue to the corridor cities from business expansions resulting from the increased employment.

JFA also used the growth projections in the General Plan to analyze the ability of Manning Avenue to accommodate the traffic increases that such growth would produce. First, they used a Level of Service Handbook and Highway Capacity Software to calculate the maximum traffic volume acceptable — a level of service "D" — on each of four Manning Avenue segments. Then, they used a questionnaire of businesses to estimate the number and length of trips generated along the corridor by industry category in each of the five cities. This information was converted to a figure for corridor miles traveled per employee (representing work commutes) and square feet of facility (representing business shipments). Excluded from this figure were trips off of the Manning Avenue corridor. Taken together, the calculations suggested that the five cities of the Manning Avenue corridor in its current state could only support 70 percent of the employment growth predicted in the Fresno County General Plan at a traffic level of service "D." From this finding it was clear that employment and transportation realities were on a collision course.

JFA posited the level of service "D" as the maximum amount of traffic tolerable on Manning Avenue before businesses might begin looking elsewhere for location and expansion possibilities. The assumption was based on the implications of traffic deteriorating further to the next and lowest level of service — "F," described as "unacceptable congestion, stop-and-go, forced flow" conditions[56] — and the prominent role that transportation is known to play in business location decisions. As such, 30 percent of the employment growth predicted for the area was declared to be in jeopardy without capacity improvements. This idea represented a novel approach to the issue of roadway improvements and economic growth — one distinctly different than the idea that capacity improvements would *lead* to employment growth. Assuming that this analysis was correct and using the revenue stream calculations from above for 70 percent of predicted employment, a lack of capacity improvements would put "at risk" $58,000 in income, $1000 in sales tax revenue, and $1000 in property tax revenue for the corridor cities and their residents.

OTHER BENEFITS

Anticipated benefits, beyond just economic benefits, also motivate local partners. These benefits range from accommodating or stimulating growth to reducing congestion and crashes to completing projects sooner or faster. Table 10 contains a list of the types of non-economic benefits associated with the types of projects listed in Table 2 or identified during interviews for this research.

Table 10. Types of Non-economic Benefits Associated with Transportation Projects.

Category	Benefits
Accommodate growth	Accommodate desired area growth and development
	Enable new development in desired location or area
	Open new areas to development
	Improve site or area accessibility
Increase transportation system capacity and/or reduce delays	Reduce corridor congestion
	Reduce intersection congestion
	Provide additional roadway capacity
	Increase railroad operating speeds
	Improve transit (HOV, rail)
Increase safety	Eliminate conflicts at highway-railroad grade crossings, intersections, and road segments
	Improve highway safety to reduce number or severity of crashes
Expedite projects	Advance project implementation schedule
	Accelerate project completion (shorter construction period)
	Avoid construction delays
Enhance project	Enhance project improvements
	Expand project
Improve highway condition	Improve maintenance standards
Other	Advance maintenance schedule
	Increase size of state transportation program
	Improve existing transportation facility
	Reduce state DOT responsibility (work load)
	Share risks

Source: Table 2, interviews.

QUANTIFICATION OF EXPECTED NON-ECONOMIC BENEFITS

Some types of benefits listed in Table 10 are easily quantified or estimated in other ways. For example, use of transportation to accommodate growth can usually be measured by the amount of transportation capacity provided to an area or the portion of an area's plan that can be supported by a given transportation improvement. Growth can be measured using acres, population, employment, or other development units. More detailed information on how to estimate non-economic benefits and impacts is available in Appendix 2 of a companion report, Product 0-5025-P5, *Guidelines for Transportation Project Partnering: Promoting Local Participation on Transportation Improvement Projects.*

Other benefits include adding projects to the State Transportation Improvement Program (STIP), or advancing them in time by making local funding available, or through local agencies or private interests donating right of way or services to help implement a project. The local entity can also assume responsibility for a portion or all of a project and advance it on their own schedule, contingent on meeting associated requirements. The extent to which projects can be expedited is dependent on many factors and will vary by project.

A project may be enhanced or expanded using resources provided as additions to state resources. Examples of project enhancement are additional landscaping, improved aesthetics, additional ancillary facilities, upgraded hardware, etc. Project expansions may include improvements to adjacent local streets, inclusion of transit facilities, lengthening a project, additional property access facilities, replacing an intersection or at-grade railroad crossing with a grade separation, etc. Each project has its own enhancement or extension opportunities, and the impact and benefits of each will vary by project.

Addition of funds through local contribution, in addition to potentially expediting a project, may also increase the size of the TxDOT improvement program. By providing resources to implement one project, state funds become available for another project or other use. This freed-up funding may permit another project(s) to be advanced and added to the end of the STIP. Another effect is to provide a planned improvement earlier. The benefits may not increase, but they can be realized earlier.

At least one state DOT has reported that local participation in state projects has resulted in upgraded maintenance standards (e.g., higher type resurfacing). In other instances, local participation may permit more frequent or comprehensive maintenance and improved ride or safety characteristics.

South Carolina reports that local participation and privatization has allowed DOT staff to commit available time to other necessary functions. This change has enabled them to accomplish their program with fewer employees.

7. PARTNERING CHARRETTE

As a part of this project, a charrette was held April 19–20, 2005, to brainstorm experiences and ideas about transportation funding partnerships, how they are composed, and how to promote them. The participants included eight people with extensive experience in transportation partnering of various types, three members of this project's project monitoring committee (PMC), and three TTI researchers. The charrette was held in Irving, Texas, over approximately 1½ days.

PURPOSE

The purpose of the charrette was to brainstorm partnership methods and the promotion of such methods to assist TxDOT in developing its strategy to involve local and private sector entities in their transportation projects. The intent was to capitalize on the experience of the participants and the research completed so far to expand and fill in details and examples of partnership methods and promotion.

PARTICIPANTS

Table 11 lists the participants in the charrette. Participants represented several different backgrounds and experience. Some brought experience with major partnered projects. Others had been involved with a range of partnering activities by their organizations. The participants represented state DOTs, local agencies, special project-related authorities, and private sector partners.

Table 11. Charrette Participants.

Name	Organization	Contact information
External Participants		
Bill Hahn	Maricopa County DOT	billhahn@mail.maricopa.gov, (602) 506-4614
Ginger Murdough	Arizona DOT	gmurdough@azdot.gov, (602) 712-7556
Andres Aragon Viamonte	New Mexico DOT	a.aviamonte@nmshtd.state.nm.us, (505) 827-5258
Jim Crawford	South Jersey Transportation Authority	jcrawford@sjta.com, (609) 344-4426
Kent Olsen	PB Consult	olsenk@pbworld.com, (512) 347-3649
Robert Wunderlich	City of Garland	rwunderlich@ci.garland.tx.us, (972) 205-2432
Dave Kristick	E-470 Public Highway Authority	dkristick@sr125.com, (303) 537-3702
Mike Estes	Virginia DOT	michael.estes@vdot.virginia.gov, (804) 786-2745
TxDOT Project Management Team		
Mark Longenbaugh	TxDOT-El Paso	mlongen@dot.state.tx.us, (915) 790-4200
Marty Boyd	TxDOT-El Paso	mboyd@dot.state.tx.us, (915) 790-4326
Wes McClure	TxDOT-Dallas	wmcclur@dot.state.tx.us, (214) 320-4461

Table 11. Charrette Participants (continued).

Name	Organization	Contact information
TTI Project Researchers		
Brian Bochner	Texas Transportation Institute	b-bochner@ttimail.tamu.edu, (979)-458-3516
Juan Villa	Texas Transportation Institute	j-villa@ttimail.tamu.edu, (979)-862-3382
Joe Zietsman	Texas Transportation Institute	zietsman@tamu.edu, (979)-458-3476

RELEVANT PARTICIPANT EXPERIENCES

The following sections describe the relevant partnering experiences of each of the external experts. Some address individual projects. Others cover partnering done by their organizations. The points are compiled from what each of the participants mentioned during their presentations, content of their presentation slides, other written material provided, and points that they made during the various discussions.

Bill Hahn, Maricopa County DOT (MCDOT)

- Maricopa County is the second fastest growing county in the nation, adding 400 to 600 new residents per day. This growth rate places tremendous pressure on the existing transportation infrastructure. Partnering is used as an important method to facilitate and expedite project development.
- The Maricopa Department of Transportation has approximately 500 people working for it with three staff members working full time on funding and partnerships.
- MCDOT has not used bonding strategy for transportation for the last 25 years except for one specific bridge project. The county has mainly been a pay-as-you-go agency.
- The Arizona statute does make provision for toll roads, but this approach has not yet been accepted by the citizens of Arizona.
- The annual budget of Maricopa County DOT is approximately $100 million, and this amount is then supplemented with an additional $25 million obtained through partnering.
- Care should be taken to avoid possible reversion of donated right of way back to the donor if projects fall behind schedule — in such cases past donations could turn into required purchases.
- Agreements are not always “watertight,” and even if parties have the best possible intentions during signing, future problems can develop. Considerable care should, therefore, be taken with the wording of the agreement.
- Maricopa County chooses not to charge impact fees like many cities do. Instead, the county can charge a development fee that is currently on the order of $4600 per residential unit. The county is still developing a rate of fees for charging different categories for commercial developments.

- Maricopa County was able to partner with several private sector firms so they could help pay for ITS applications such as fiber optics, variable message signs, and computer hardware and software. This partnering has come about because of the AZTech program, which successfully established a Regional Transportation Management Coalition comprised of town, city, county, and state transportation agencies.
- There is a danger that a partnership project can take precedence above a high priority project that is included in the transportation plan only because the public sector entity may place a higher priority on partnered projects.
- It should be remembered that over the long term there are considerable maintenance requirements for highway projects. Roads last a long time, and the cost of the full life cycle of projects should be considered, not only the construction phase.

Ginger Murdough, Arizona DOT (ADOT)

- The Arizona DOT has made the partnering function a separate section in the organization chart. This section has a high status and reports directly to the Division Director of Communication and Community Partnership.
- Partnering in the Arizona DOT has been defined as "a process of collaborative teamwork to achieve measurable results through agreements and productive working relationships."
- The Arizona DOT has developed a Partnering Evaluation Program (PEP). PEP is a web-based interactive application that provides automated graphs and charts. It provides information to teams about progress toward their achievement of mutual goals. It also provides insight into their issues and relationships so that the team members can take action.
- The Arizona DOT has identified and promoted the following forms of partnering:
    - project partnering (with contractors to facilitate project implementation),
    - public partnering (with other agencies for financial or other reasons), and
    - internal partnering (ADOT work units).
- The Arizona DOT's reasons for partnering include:
    - jointly solve problems;
    - increase work efficiency;
    - improve project development and delivery process;
    - maximize program delivery;
    - provide services that exceed customer expectations;
    - develop innovative products;
    - build and strengthen relationships; and
    - enhance work processes, plans, and functions.
- The Arizona DOT operates the Highway and Extension Loan Program (HELP), which is a form of a SIB loan. Under this program ADOT is able to make loans to political subdivisions and tribal governments for eligible highway projects. An example is a loan made to a local agency that then entered into an agreement with a private developer (whose access would be improved) who then made payments to the local agency to repay the loan.

- Since 1997 ADOT has established several financial partnerships with developers to design and construct interchanges on I-10 and I-17 in the greater Phoenix area. An example of such a partnership is the Del Web Corporation partnership with ADOT in 1997 to finance the cost ($12 million) to rebuild a three-lane interchange bridge to a five-lane bridge approximately 25 miles north of Phoenix. Subsequent to this interchange there have been three others developed through partnerships with the private sector, and there are plans for two more partnered interchanges.

Andres Aragon Viamonte, New Mexico DOT (NMDOT)

- New Mexico is becoming more and more focused on partnering. The state developed the Governor Richardson's Investment Partnership (GRIP) program, which is a $1.5 billion program of highway and mobility projects throughout the state.
- New Mexico does not yet have a toll authority.
- The philosophy in New Mexico with regard to partnering is to provide the local community with what it wants but without compromising safety.
- It has been the experience in New Mexico that potential partners may provide up-front money if there is a good likelihood that they will receive long-term paybacks.
- It was found that most of the partnering and innovative financing tools are not available or not conducive for poor communities. Such communities do not have the financial or other resources to leverage funding or to be effective partners.
- An example is a partnership with a developer that provides additional access to I-25. NMDOT is paying for the improvements, and the state will collect 15 percent of the profits from the development.
- Route 44 is a 130-mile highway project. The bonds used for funding were secured solely on the pledge of future federal highway funds (GARVEE bonds). The project has a private sector warranty secured with assets pledged to the state. This warranty guarantees the public a road maintenance performance level that could not be achieved through traditional means.

Jim Crawford, South Jersey Transportation Authority (SJTA)

- The Atlantic City Brigantine Connector resulted from a city request for proposals from private developers for a redevelopment project. In the request for proposals the city stated that it would give land to the developer provided it cleaned up a landfill site at a cost of $30 million as part of the private development project. The city selected a proposal to build one to three casinos. The winning developer's condition was that the state had to build the direct connector from the Atlantic City Expressway to the proposed casino. In addition to cleaning up the landfill, the developer was willing to pay 33 percent of the connector project cost.
- The project was a partnership among the South Jersey Transportation Authority (operator of toll roads and other services), New Jersey Department of Transportation, the city redevelopment authority, and the casino developer.
- The public partners were able to provide:
    - condemnation power,
    - permitting access,

  - tax-exempt financing,
  - multiple revenue sources, and
  - ownership and operations.
- The private partner was able to provide:
  - procurement flexibility,
  - ability to settle quickly with project opponents, and
  - additional funding source for publicly owned infrastructure.
- A combination of funding was arranged through the partnership agreement for this $330,000 project:
  - NJDOT: $95,000 (tax on fuel sales of which 25 percent was estimated to come from out-of-state residents visiting casinos),
  - SJTA: $125,000 ($60M in additional tolls plus $65,000 in a share of casino parking fees), and
  - developer: $110,000 ($55,000 cash plus $55,000 to be recovered through future tax abatements).
- Design-build was used to meet an expedited schedule. The design-build contractor was given a lump sum contract with $28 million set aside for change orders for the contractor. The contractor would get 85 percent of the unused component of these funds at the end of the contract in the form of a performance bonus. This approach significantly reduced the number of change orders for this project.
- Some lessons learned through this project include:
  - In order for this project to be successful, the partners all had to have a need for the project. In this case some of the needs were higher tolls for the transportation authority, transfer of maintenance of 12 miles of highway from the DOT to the transportation authority, cleanup and redevelopment of a site for the redevelopment authority, and direct tollway access for the casino developer.
  - The project had to have a "champion."
  - The partnership required sharing decision authority. In this case, all partners had to agree for a decision to be made.
  - One partner may have to advance another partner's share of the funding to meet the project schedule.
  - Project stakeholders need to meet frequently to address issues and retain commitment.
  - Billboards were found to be good revenue generators.
  - It is important to have good attorneys when using partnering and innovative financing.

Kent Olsen, PB Consult

- The SR 125 corridor near San Diego is a 35-mile freeway corridor comprised of five sections built with five development approaches using six different sources of funding.
- The sources of funding include federal highway funds, state highway funds, countywide ½ cent sales tax, development impact fees, private funds, and donated right of way.

- One segment of the corridor is a toll road developed under a public-private partnership. Funding for the toll road and connection to the existing freeway network included:

• Private debt	$325 million
• TIFIA loan	141 million
• Local sales tax funds (1% sales tax for transportation)	138 million
• Private equity	121 million
• Donated right of way	48 million
• TIFIA capitalized interest	15 million
Total	$788 million

- This approach showed that a project can be split into segments with each having different partners and funding mechanisms.
- The magic formula that made partnerships work for this project was for the developers, city, and state to each want something from the other and to each have something to offer. In this case the state wanted a way to fund the highway, the city wanted to provide transportation facilities to new areas being opened for development, and developers wanted both access to the area and to their properties.
- Partners found that an eligible public agency needs to lead the NEPA process because a private franchisee will appear to the public to have a conflict of interest. In this case, even though the franchise agreement required the private partner to perform the environmental work, the state DOT needed to lead the process; the franchisee was required to pay the cost.
- Aspects that did not work well include public agency review of the design under the design-build agreement (the DOT wanted to perform a review as if the project was design-bid-build). Also fixing the right of way lines prior to the NEPA record of decision required changes after the final design was advanced (right of way lines had to be readjusted).
- When right of way is donated, there are often high expectations from the donor to receive preferential treatment, such as direct access from its property. In this project, developers donated right of way in return for influencing where interchanges would be located and timing of those intersections.

Robert Wunderlich, City of Garland

- The Eastern Extension of the President George Bush Turnpike is a 10-mile section of toll road crossing three cities and spanning 1 mile over a lake. Due to the project's high construction cost, traditional financing proved insufficient. This could have delayed the project by up to 20 years and raised the costs due to inflation.
- The partners for the toll road were: TxDOT, North Texas Tollway Authority (NTTA), three cities, the county, and the regional transportation council. Each

partner had a roll to play. The initial concept was for TxDOT and the NTTA to design and build the project while the cities would provide the right of way. The partnership concept will have the toll road authority build the road and finance a portion, TxDOT building the system interchange and the lake crossing bridge and paying for 90 percent of the right of way costs, and the cities providing 10 percent of the funding for right of way.

- Costs for the project will be approximately $572 million.
- Costs will be shared by the partners as follows (current as of September 2006 draft agreement):

• TxDOT	• Provide 90 percent of right of way cost • Design and build I-30 interchange and lake crossing bridge • Maintain I-30 interchange and lake crossing bridge, and pay for frontage road maintenance by NTTA • Provide toll equity grant to cover right of way and relocation costs in return for revenue sharing
• NTTA	• Design, build, and maintain rest of project including SH 66 bridge over turnpike • Right of way acquisition • Project risk • Share 20 percent of toll revenues on Eastern Extension with Regional Transportation Commission
• Cities of Garland, Rowlett, and Sachse	• Three cities pay 10 percent of cost of right of way within their municipal boundaries

- It was found that partners must all be given an opportunity to contribute to guiding the project. They should not be expected to be silent partners because then they may not want to contribute money or other assets needed for the project.
- Project traffic travels beyond project right of way, and that travel may justify contributions by others (direct or city/county funds) and may obligate local agencies in the future as the project is extended.
- Participants felt that it is better to focus most of the MPO's available money on the bigger projects than to sprinkle it around to small insignificant projects.
- Timing is very important:
  - Needs precede the actual partnerships.
  - Cost of money makes it important to move quickly.
  - Funding availability can change fairly quickly.
  - Partner needs and interests vary over time.

- Respect community and partner values:
  - to gain support and
  - to avoid unnecessary opposition.

Dave Kristick, E-470 Public Highway Authority

- The E-470 is a toll highway system that runs along the eastern perimeter of the Denver metropolitan area. It is 47 miles in length and is mostly four lanes with some sections expanded to six lanes. It has been designed for future widening to eight lanes.
- Colorado enacted the Public Highway Authority Act in 1987. Under this act a public highway authority has the following seven powers without voter approval:
  - to construct, finance, operate, and maintain beltways and other transportation improvements;
  - to take private property by condemnation;
  - to establish and collect tolls on any highway provided by the authority;
  - to establish and collect highway expansion fees from persons developing property within the boundaries of the authority;
  - to issue bonds and to pledge its revenues to the payment of bonds;
  - to succeed to the obligations of other governmental entities; and
  - to establish value capture areas within the boundaries of the authority in order to obtain the incremental growth in revenues in certain local property sales and use tax revenues resulting from the provision of highways by the authority.
- The partners for the E-470 project consisted of three counties and four cities. Each partner had some investment level.
- Funding for E-470 has so far included:
  - voter-approved $10 area vehicle registration fee dedicated to E-470,
  - $1.2 billion in revenue bonds with repayment from tolls and vehicle registration fees,
  - arbitrage earnings from 1986 bonds,
  - local loans — state and local,
  - highway expansion fees on new development within 1.5 miles of E-470,
  - refinancing with non-recourse revenue bonds, and
  - public-private cooperation.
- New additions, primarily interchanges, are being funded as follows:
  - highway expansion fees,
  - multi-use easement fees, and
  - accelerated interchange policy:
    - Future interchanges are identified.
    - There is no planned funding.
    - Interchanges are requested by local jurisdiction.
    - E-470 builds interchange after receiving funding commitment from requesting jurisdiction.
    - E-470 repays jurisdiction without interest or subordination.
  - Widening is paid for from toll revenue.

- The E-470 public highway authority operates as a stand-alone business and has 50 staff members.
- Toll road users are viewed as "customers" with customer quality assurance and marketing seen as important issues. The notion of time saving for the customers is used as the most important incentive from a marketing perspective.
- The project is to be turned over to Colorado DOT no sooner than 2076. The timing is to provide time to pay off the initial bonds and accumulate a reserve to perpetually fund all future maintenance. Any surplus funds will be returned to Colorado DOT. Based on this example, it may be desirable for toll road partnerships to have longer term franchises to not only pay off the principal, but also to accumulate full or partial perpetual maintenance funds.
- The partnership or "project sponsor entity" may need to be able to operate as an independent business so that it does not become bogged down in the multiple bureaucracies of the individual partner organizations.
- Financing can be back-end-loaded (e.g., tolling with increasing rates over time). This may require non-recourse debt (no pre-pay or refinancing) to satisfy bond purchasers.
- Banks/lenders and construction contractors should be involved early in toll road projects since timing is critical and the success of this project can be attributed to the early involvement of the banks, construction companies, cities, and counties.

Mike Estes, Virginia DOT

- Virginia has the third most lane miles in the nation, and VDOT manages 80 percent of all the roads in the state. In addition, VDOT maintains roads in 90 of the 92 counties. VDOT has no extra funding to cover maintenance of local roads.
- VDOT is becoming more proactive in terms of partnering and is promoting more local participation.
- Some new local partnership initiatives include $40 million for local construction administration, a $100 million revenue sharing fund, and a legislative process for counties to assume responsibility for their secondary road construction program.
- Virginia has a transportation improvement fund that makes interest-free loans for a seven-year period for improvement projects undertaken by local agencies. It may also involve a small grant for upfront work. Funds may go to both public and private sector entities.
- Economic diversity of communities provides a challenge when developing partnerships. For example, affluent communities have an unfair advantage over poorer communities by being able to leverage funds more easily — for example, using sales tax revenues.
- Some local authorities want to take over entire projects. Recent legislation makes that possible.
- For Route 28 near the airport, a local tax district was created that administers the project on its own.
- VDOT developed a prototype online tool that will show locals how to participate.

PARTNERSHIPS OPTIONS AND ADVANTAGES

Charrette participants discussed a range of partnership options that had been prepared by the researchers. The objective was to expand the list and identify — from experience — the advantages and disadvantages of each. Table 12 lists the results.

The participants also identified some options for creating additional non-traditional funding resources for transportation projects. Table 13 lists these options although the list is not intended to be a complete list of funding methods.

Table 12. Local Participation Options for State Transportation Projects.

Participation Type	Methods	Advantages	Disadvantages
Assume project	• Take over responsibility for project from state DOT (local agency must have desire and resources to do the project)	• Gets project done • Gets project done sooner • Local agency wants to do it • Additional resources	• Equity issues • Red tape • Local agency boundary limitations for large projects
Cash contributions	• Local agencies • Special authorities, districts, etc. • Private developers and property owners • Private companies	• Expedites or enables project • Shows return on investment • Leverages state/federal money (faster) • Donor has no future responsibilities	• Caution — needs agreements before beginning • Long-term responsibility for maintaining improvement • TxDOT may give up control in some cases • Long-term funding shortages of cash by some partners • More strings, project components
Right of way	• Acquisition and dedication for project • Easements • Long-term lease	• Cost savings • Share costs without requiring cash • Good way to get real estate developer help	• FHWA guidelines for local match credit of contributions; may or may not qualify for match[1] • Public perception that donor is getting improvement for own gain
In-kind contributions	• Engineering • Environmental documentation • Construction • Materials, equipment • Project management • Labor	• Reduces cash cost of project • Share decision making • May increase ability to bring in specialized capability • Good if done as package (e.g., engineering, operations, construct complete interchange)	• Requires sharing decision making • Accounting often difficult (tracking projects/efforts); eliminating target local match percentages could make this easier

[1] Right of way dedication might be made more attractive and facilitated if current FHWA rule is repealed that gives no local matching credit for local agency-owned ROW that is dedicated to state projects.

Table 12. Local Participation Options for State Transportation Projects (continued).

Participation Type	Methods	Advantages	Disadvantages
Maintenance	• Repairs • Overlays • Long-term maintenance contract	• Potential lower maintenance costs (to owner)	• Must have a good contract defining and tracking standards. (level of service or other standards; often overlooked) • Difficulty in actually achieving projected levels of maintenance
Formation of special districts	• Modal transportation district or authority • Transportation improvements district (area or corridor) • Road district • Tax increment finance district(TIFD) or tax increment reinvestment zone(TIRZ) • Management districts • Special improvement districts • Redevelopment districts (development and transportation)	• They work well • Focused on particular types of projects • Generates cash contributions • Quick funding generation	• Local government may forfeit future local projects or tax revenue • Red tape • May require enabling legislation • May require property owner or voter approval
Toll road (or lanes)	• Private toll road franchise • State toll road authority or division • Regional mobility authority • Regional/county/municipal toll road authority • Comprehensive development agreements • Toll road concessions (e.g., restaurants, gas stations, convenience stores)	• Creates additional transportation funding • Single purpose focus (single function agency) • Fast way to get project implemented • Most direct method of user benefit/pay equity	• Perception of dual payment for roads • Area political will • Toll roads may compete with toll-free roads • Financing must be made attractive to bond houses and buyers • Potential bond holder requirements
Pass-through (shadow) tolling	• Loan repayment • Revenue generation	• Payment is based on actual use • User tolls not required	• Uncertain revenue stream • Requires accurate vehicle counts by segment • May not be a good vehicle for repayment of loans or bonds on specific schedule

Table 12. Local Participation Options for State Transportation Projects (continued).

Participation Type	Methods	Advantages	Disadvantages
Assume bonded indebtedness (does not increase total resources available)	• GARVEE bonds • Municipal bonds • Private bonds • Revenue anticipation notes	• Quick way to obtain extra funds • Avoids future inflation costs • Most beneficial in times of significant inflation • Some bond income is non-taxable	• Usually long-term obligations • Must be made attractive to bond houses and buyers • Potential bond holder requirements • Borrows from future • May be limited by agency bonded indebtedness limitations
Loans (does not increase total resources available)	• SIB loans • TIFIA loans • Section 129 loans • Loans from state resources • Corporate loans	• Flexible • Revolving funds • Quick way to obtain extra funds • Avoids future inflation costs • Most beneficial in times of significant inflation • Good way to involve private interests	• Repayment by some agencies may be questionable due to unstable revenues • Potential lender requirements • Borrows from future
Other	• Private at-risk equity or investment capital	• Avoids public funding decisions • May limit public risk • Flexible	• Private interest must be able to profit • Partner requirements

Table 13. Additional Suggestions — Innovative Funding.

Method	Advantages	Disadvantages
Sell existing assets to private company able to use tax advantages of depreciation	• Raises money quickly • May reduce total long-term cost if investor conditions are right	• Requires lease-back of facilities over long term • Long term cost may be higher
Lease right of way for cell towers, utilities, etc.	• Generates revenue from unused ROW • Revenue generated from those who benefit	• May introduce aesthetic concerns • May add constraints for future improvements
Pay parking on right of way	• Generates revenue from unused ROW • Revenue generated from those who benefit	• May introduce aesthetic, safety, or security concerns • Low level of revenue
Highway expansion or transportation facility usage or impact fee	• Generates funds in accordance with (future) usage and impacts • Avoids competition between cities that results from municipal impact fees • Revenue is generated as needs for improvement develop • Based on increase in property value resulting from new highway access	• Potential developer resistance • May require enabling legislation • Requires major development activity in corridor to generate significant revenue
Air, water, mineral rights	• Generates revenue from unused ROW • Revenue generated from those who benefit • May have very long-term revenue stream	• Limited applicability • Limited availability • May require installation of permanent equipment in ROW

ADDITIONAL PARTNERSHIP CONSIDERATIONS AND SUGGESTIONS

Several other partnering suggestions and considerations came out of the conversations. These are described below by category.

- *Bottom up partnership formation*. Partnerships work best if created from the bottom up based on common needs and interests.
- *Operational collaboration*. Partnerships need not be limited to major capital projects; they can also include lesser improvements or the operation of transportation facilities or systems (e.g., ITS, traffic signal system upgrades, ramp improvements). These smaller projects can also involve shared costs among the partners and provide additional technical and financial resources a single agency might not have.
- *Enabling legislation*. Some partnering options may require state enabling legislation. This requirement should not be considered a deterrent for major projects with support among the partners.
- *Transportation as an investment for private capital.* The private sector will be interested in investing in transportation projects if a reasonable financial return and reasonable risk exist.
- *Transportation as an agency investment.* Transportation projects can be viewed as an investment in improving the future, including additional tax revenues or payback from developers based on their profits
- *Financial value engineering.* This approach may be helpful when considering financial aspects of partnerships.

MOST PROMISING PARTNERSHIP APPROACHES

The charrette participants briefly discussed what they think are the most promising methods or approaches to transportation partnerships. Below are their suggestions for forming effective partnerships.

Promising Approaches to Consider

- Use of partnering methods and tools in a way that resonates with the prospective partners. Different methods will work for different partner combinations if used in a ways that appeal to the partners.
- Bottom-up partnerships (see section above).

Attractive Funding Methods for Partnered Projects

- Toll roads which derive their funds from users are therefore easier to sell for new facilities and do not depend on general fund revenues.

- Development contributions in the form of right of way, furnishing of engineering, interchanges or segments, impact or expansion fees, or other contributions which may be viable in new transportation corridors ripe for development.
- Corridor expansion or impact fees, if applicable across a rapid growth corridor, which can be a significant producer of funding.
- An incremental transportation sales tax that can provide a major stream of funds and has been used for transportation in many regions in many states.

However, no single method is a panacea; the funding methods, like the partnership methods, must fit the partners and the project situation.

Least Promising Approaches

There were few approaches that were felt to have little promise, given the right partners and partnership arrangements. One method was felt to have little promise:

- Mandated/top-down partnerships or partnerships with dominant partners that do not share decision making.

Some other experiences also pointed to future caution for partnering agreements:

- Front-end (prepaid) leases. Funds may have to be returned if lessee goes bankrupt.
- Long-term maintenance partnerships. Difficult to specify and obtain a specific level of performance, and sometimes pledged assets will not support guarantee.

PROMOTION OF PARTNERSHIPS

The final major segment of the charrette was discussion about how transportation (funding) partnerships have been or might be promoted. The experiences of the participants were also discussed where relevant.

It was clear that the participants had a wide range of partnership experience and that since the partnerships varied in types and purposes, promotion of those partnerships also varied. Some involved little overt promotion; others required extensive work to pull them together.

The following lists summarize the discussions and suggestions. These lists do not comprise the complete solution but do provide a good starting place for development of strategies for future successful partnerships.

Identifying Proper Partner Candidates

- The best partnership is one in which each partner has both its own needs and something to contribute to the project. This shared interest eases negotiations.
- When considering partnering, do not just go looking for money. The other ingredients need to be present.
- Have a project for which the need is broadly understood and supported; the project should:
  - meet a definite need,
  - be part of a plan that meets an accepted need, and
  - have support of policymakers and stakeholders.
- Partnering is best done using a "systems approach":
  - Identify problems and needs.
  - Identify candidate solutions, projects, and partners.
  - Analyze and evaluate options and alternatives.
  - Select preferred and most beneficial alternative.
- Consider "fit" within existing jurisdictional structures.
- A project can be split into segments with each having different partners and funding mechanisms.
- Invite candidate partners in early to assess/confirm needs and alternatives, and then to assess solutions (projects) that meet the needs and are implementable through a partnership. Invite the candidate partners to participate in the decision process from the beginning. As an example, Dallas County has a standard approach that asks what potential partners want to do and then has them decide what they want and can participate in (with the most appropriate partner leading — often the one that wants to lead).
- Timing is important:
  - needs precede partnerships,
  - cost of money,
  - changes in funding availability, and
  - partner needs and interests that vary over time.
- Since timing is critical, banks/lenders and construction contractors should be involved early in toll road projects.

Marketing Participation in Partnerships

- Partnerships result from effective, mutually beneficial, comfortable relationships that require early involvement to secure.
- Create an environment that encourages partnering (e.g., less red tape, promises of funds, commitment to advance project).
- Have specific projects for candidate partners to consider and support.
- Demonstrate *net* benefit of both project and partnering. One thing that should not happen as a result of local agency partnering is removing funding that was previously programmed in a later year for the partnered project and reassigning it to a different area or district because the partnered project has been accomplished

with partnered funding. That funding should be used for another project in the same area or district.

- Marketing strategy:
  - Listen to partner candidates; don't just tell them the way it will be.
  - Know what you are promoting — the project, funding ideas, proposed partnership.
  - Discuss with decision makers and "lobby" them if necessary.
  - Use one-on-one discussions to surface desires, needs, issues, and concerns.
  - Employ multimedia campaigns if needed to gain public approval.
- Market real benefits to partners, decision makers, and the public.
- Partners must all be given an opportunity to contribute to guiding the project; do not expect partners to be silent, or they may not contribute money or other assets needed for the project.
- Respect community and partner values:
  - to gain support and
  - to avoid unnecessary opposition.
- Build a track record of accomplished projects to build confidence among the candidate partners.

Keeping Partnerships Together

- For an area, convene partner meetings on a regular basis, mainly to promote progress toward project implementation. Project stakeholders need to meet frequently to address issues and retain commitment.
- Follow through from the outset; do not delay once the proposed project and potential partnership have been discussed and generally agreed to.

CONCLUSIONS

Above everything else, the charrette discussions pointed out two things:

1. Partnerships work when there are:
   a. willing partners that have:
      i. needs that can be met by the proposed project and are accepted by the public
      ii. available resources that can be committed to the project
      iii. reasonable, achievable expectations
   b. shared decision making
   c. clear agreements describing each partner's responsibilities
2. No one formula works across all projects and partnering opportunities

Partnerships described earlier in this summary as well as in Table 1 of the literature review demonstrate that creativity is the only limit on possible partnerships. Hence, the Texas approach that has started to make a wide range of partnering and funding methods available provides a sound base upon which partnerships have a chance to be built.

The previous section of this summary, “Promotion of Partnerships,” best summarizes the ingredients for generating successful transportation partnerships.

8. PROMOTING PARTNERSHIPS WITH LOCAL ENTITIES AND ANALYZING BENEFITS AND IMPACTS

This project was initiated to gain insight about how TxDOT partnerships with local public and private entities can help TxDOT and the local entities to leverage available resources together to advance projects and increase the total size of the state transportation improvement program.

The research team developed guidelines to both promote such partnerships and to evaluate the potential resulting benefits and impacts of the partnered projects. The guidelines for promoting partnerships with local entities are contained in a companion report, Product 0-5025-P5, *Guidelines for Transportation Project Partnering: Promoting Local Participation on Transportation Improvement Projects.* Guidelines for selecting estimation methods to evaluate economic impacts are provided in a companion report, Product 0-5025-P1, *Guidebook for Economic Benefit Estimation Methods.* Product 0-5025-P5 also includes an appendix containing estimation methods for evaluating non-economic impacts of major transportation projects. The final chapter of Product 0-5025-P1 contains suggestions on how to assemble a project prospectus for aiding in the promotion of partnering for specific projects. Finally, a companion product, Product 0-5025-P6, *Sample Project Prospectus*, is an example of the types of information that can be assembled to make up a project prospectus.

Additional materials were produced in draft form for possible future use in developing promotional material for use by TxDOT staff in promoting partnerships. The materials consisted of a draft brochure, Product 0-5025-P4, *Meeting Local Needs Today,* and a draft 15-minute PowerPoint presentation, Product 0-5025-P3, "Making Critical Transportation Projects an Early Reality."

9. CONCLUSIONS

TxDOT leadership has placed a high priority on using available methods to leverage its resources to produce as much program for the available resources as possible. This effort has led both TxDOT and the state legislature to adopt many innovative methods to fund, build, operate, maintain, and even own the state transportation system. Much recent emphasis has been on public-private partnerships focused on tolling. However, tremendous potential also exists in TxDOT partnerships with *both* public and private entities, not only in tolling, but also in many other forms of funding and project delivery.

Local participation in state DOT projects has taken many forms and contributed in many ways and resource levels. Examples cited in Table 2 range from taking over complete projects to contributing small percentages of project costs either in cash, other donations, or in-kind services. The benefits to local participants are wide ranging and vary by project, but the most frequent and important benefits (and local entity motivations) appear to:

- expedite projects,
- add projects,
- relieve congestion, and
- support local growth or economic or other development.

Benefits to state DOTs also vary, but the most frequent appear to:

- reduce project cost to state,
- relieve congestion,
- increase state program, and
- expedite projects.

It also appears that in addition to expediting or adding projects, the most important considerations for local partners are economics related. Local participation often depends on some kind of evidence to local decision makers that their contribution is in some way economically advantageous. It is not clear that there needs to be a positive benefit-cost ratio or similar measure. However, local decision makers, both public and private, need to be able to show that there is some kind of economic justification for investing financially in state DOT projects. Product 0-5025-P1, *Guidebook for Economic Benefit Estimation Methods,* describes methods for evaluating economic benefits and impacts of transportation projects. Those methods can produce results that can be used in discussing potential partnerships with local entities.

Many local public and private entities would prefer to have at least a few TxDOT projects implemented earlier than available funding will permit. Local entities also have projects not currently on TxDOT's program to be implemented. While such requests outstrip TxDOT's ability to fund them, the very fact that local entities support those projects presents an opportunity to both TxDOT and the local entities — to partner together to leverage whatever resources can be made available to complete the project earlier than could occur by waiting for TxDOT funding to become available. It is this local desire for projects which can be the heart of promoting partnerships with the local entities. Product 0-5025-P5, *Guidelines for*

Transportation Project Partnering: Promoting Local Participation on Transportation Improvement Projects, provides a straightforward method for promoting TxDOT partnerships with local public and private entities. The other products produced in this project (see Table 1) can also be used in TxDOT efforts to forge local partnerships.

10. IMPLEMENTATION RECOMMENDATIONS

TxDOT already partners in some form with local public and private entities. TxDOT requires local public agency assistance in obtaining right of way for many types of projects. Projects that benefit private development often have to be paid for, at least in part, by the requesting developers. Some local agencies are already providing some of the funding needed for locally beneficial projects. However, most of the local contributions are small, and other than right of way, these partnerships are not the normal way of doing business.

Why not? Few customers will volunteer to pay for something if they think they can get it at no direct cost to them. It is the same with transportation facilities; it has been custom for state DOTs to deliver state highways at little or no cost to the local entity. However, as has been demonstrated by TxDOT's policy changes during the past half decade, TxDOT has a plan to do more, but with increased involvement by other public agencies and private companies.

TxDOT has already embarked on a strong program to increase the role of tolling in funding the Texas transportation system. However, tolling is not viable on most mileage of the state highway system. In order to be able to achieve the goal of meeting the mobility needs of Texas, TxDOT will also need to find other resources for highways that are not toll viable. Innovative partnering, as described in this and companion reports, is a way to increase the total funding available for the state transportation system.

EARLY ACTIONS

The following short-term actions are recommended to help TxDOT develop and market partnerships with local public and private entities that will help to fund and deliver extensions and improvements to the state highway system:

- Obtain more case study examples of project types that should be most appealing to local partners; summarize in a user-friendly handout or other document form that TxDOT staff can easily customize for conversations with candidate local partners.
- Obtain more case study examples of economic and non-economic benefits of major and mid-size transportation projects of the types for which TxDOT would like to seek local partners; summarize in user-friendly handout form.
- Develop and provide training to TxDOT district staff on the full range of partnering and effective methods for promoting partnerships with local entities; include case study examples in the training agenda.
- Refine draft informational materials (brochure and PowerPoint presentation) using latest guidance from TxDOT's Government Business Enterprise (GBE) Division.
- Prepare a sample impact evaluation of a major TxDOT project to assess its economic and non-economic benefits and impacts.
- Promote local partnerships through TxDOT district offices, but with statewide support, as a way to have projects completed earlier than would be otherwise possible.

CONTINUING ACTIONS

A few additional actions would facilitate the future marketing of partnering:

- Conduct economic and non-economic impact/benefit assessments for a limited number of strategically selected TxDOT projects; projects selected would most beneficially resemble future TxDOT project types for which local partners are sought. These assessments may also enable TxDOT to more easily demonstrate the value of its program.
- Track local partnerships and the amount of time project completion is advanced for partnered projects and disseminate summaries to TxDOT district offices and the media.

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