



**TRANSPORTATION AND
ECONOMIC DEVELOPMENT:
CHARACTERIZING ECONOMIC DEVELOPMENT
IMPACTS FOR CORRIDOR IMPROVEMENTS**

101ST PURDUE ROAD SCHOOL
LYLES SCHOOL OF CIVIL ENGINEERING
Joint Transportation Research Program



By:
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Ruiman Yang

PROJECT BACKGROUND

SPR#3912 ECONOMIC DEVELOPMENT IMPACT OF CORRIDOR IMPROVEMENTS

Research Institution: Joint Transportation Research Program, Purdue University

Principal Investigators: Dr. Nadia Gkritza & Dr. Jon Fricker
Lyles School of Civil Engineering, Purdue University

Project Advisor: Samy Noureldin
JTRP Program Director, INDOT R&D

Business Owner: Roy Nunnally
Director, Asset Planning & Management Division

Research Assistants: Davis Chacon Hurtado & Ruiman Yang
Lyles School of Civil Engineering, Purdue University

OUTLINE

- Research objectives
- Economic development
- Project planning stages
- Measuring economic impacts
- Project timeline
- SHRP2 overview
- Transportation Project Impact Case Studies (T-PICS)
- Tools for Assessing Wider Economic Benefits of Transportation (C11)
- Questions

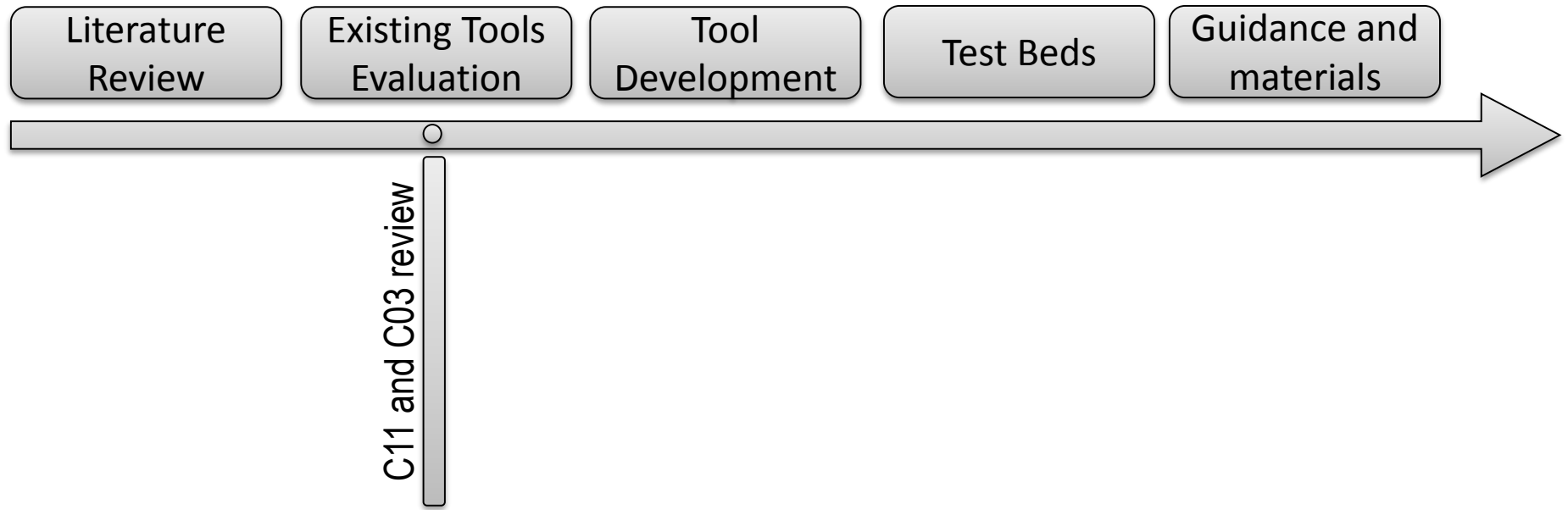
RESEARCH OBJECTIVES

SPR#3912 Economic Development Impact of Corridor Improvements

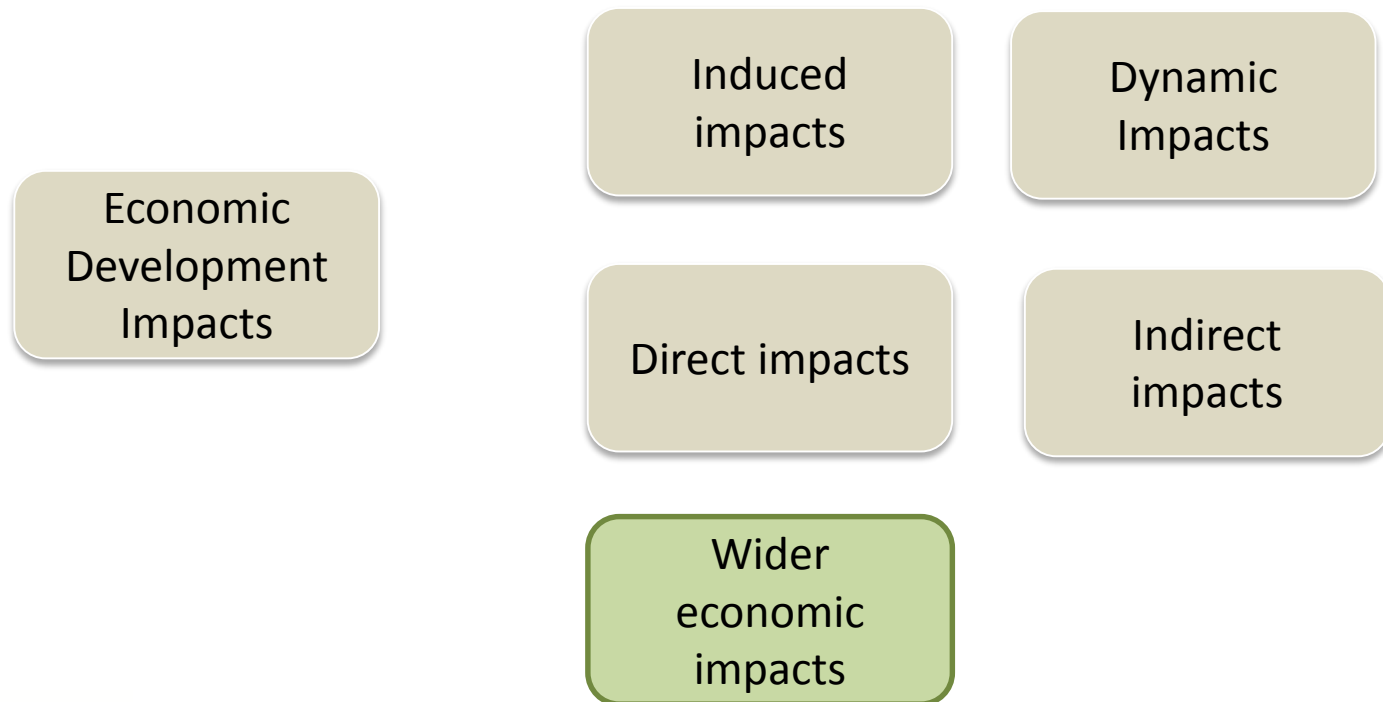
Investigate the synergies among travel demand, traffic, and economic impact models in evaluating alternative corridor-level projects

Investigate ways to adapt the ISTDM, and/or MCIBAS, or develop a post-processing method to meet the needs of INDOT's Division of Asset Planning and Management.

PROJECT TIMELINE



TRANSPORTATION AND ECONOMIC DEVELOPMENT



TRANSPORTATION DEVELOPMENT PROCESS

- *Early Stage Planning*

"Broad brush"
TPICS C03



- *Middle Stage Planning*

C11



- *Later Stage Planning*

EIA
BCA Transp Models



Source: Report SHRP2-S2-C11-RW-1

Decision
making

MEASURING ECONOMIC IMPACTS

Wide range of tools

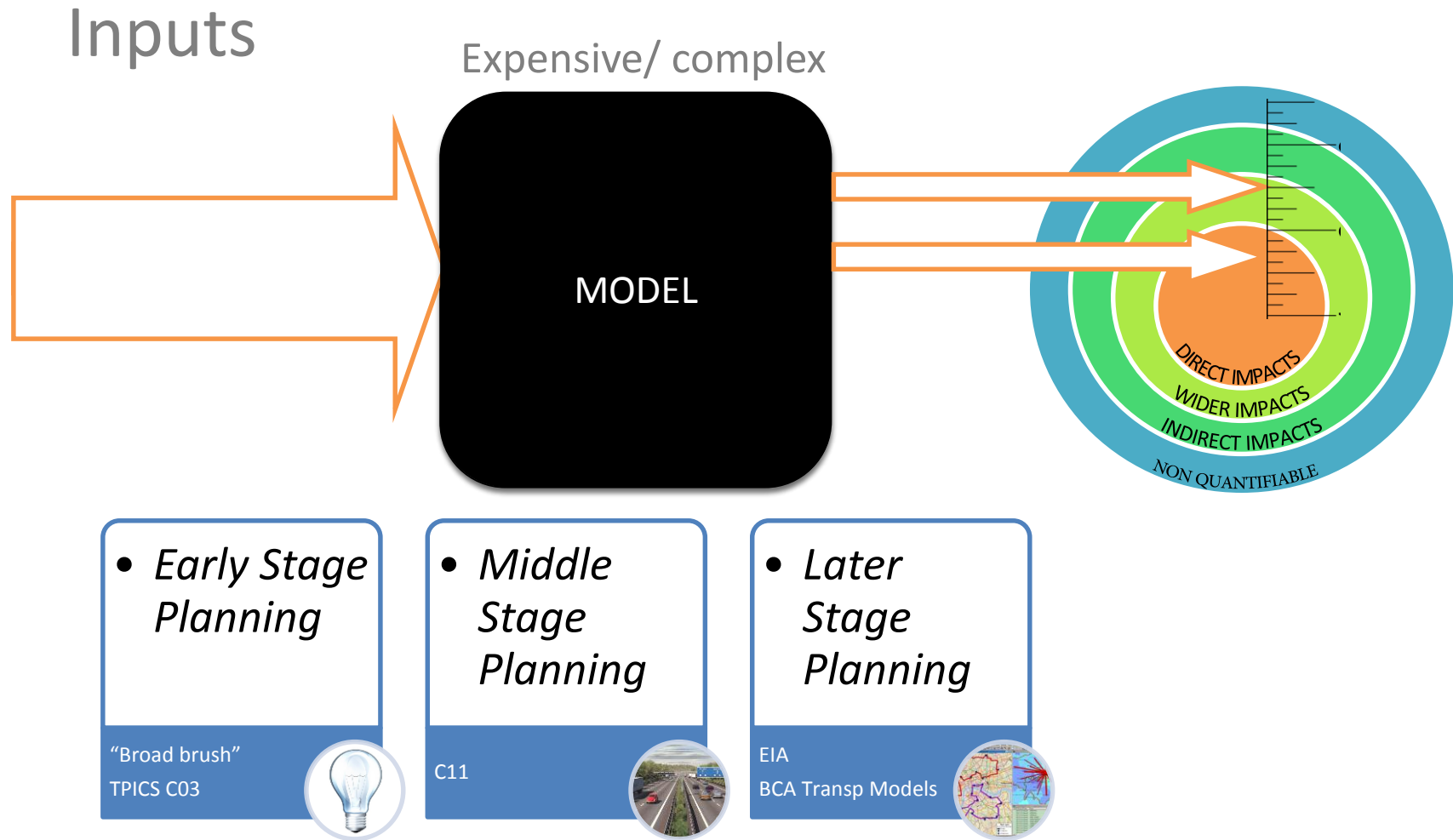
Survey and interviews			Benefit/Cost analysis
Corridor inventories	Expert interviews	Business surveys	TOPS - BC

Economic multiplier / I - O tables			
RIMS-II	IMPLAN	I-O model	PC Input-Output

Economic forecasting and simulation models		Market studies	
TREDIS	REMI	Shopper surveys	Windshield surveys

Integrated traffic and economic simulations models		Statistical analysis tools	
MCIBAS	HEAT	linear regression /Logistic regression	Hedonic price modeling

NEED?



SHRP2 OVERVIEW



Source: <http://www.trb.org/StrategicHighwayResearchProgram2SHRP2/SHRP2ProjectBriefs.aspx>

SHRP2 C03

**TRANSPORTATION PROJECT IMPACT CASE STUDIES
(T-PICS)**

WHAT IS T-PICS?

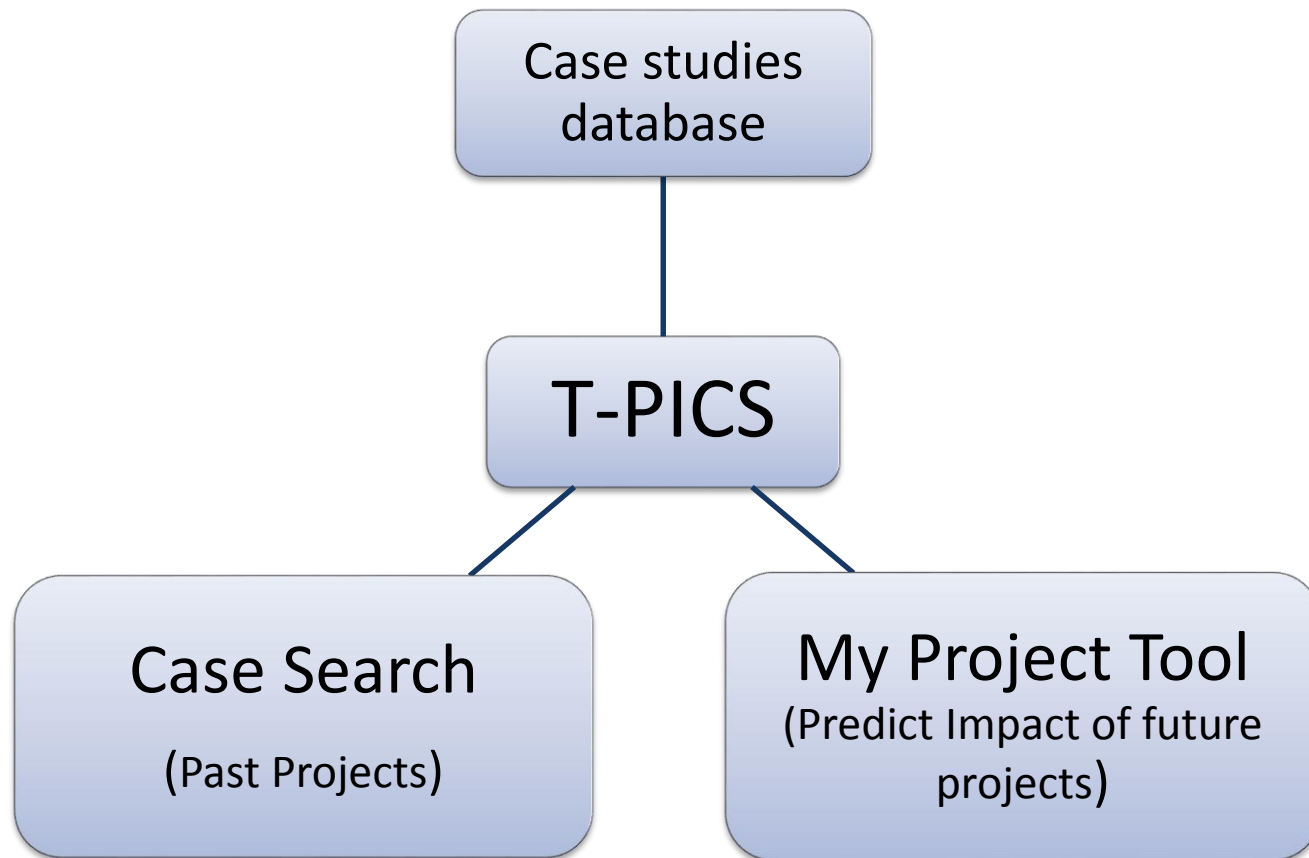
SHRP 2 program to explore the interactions between Transportation Capacity, Economic Systems, and Landuse

T-PICS
A web tool of national database at sketch planning stage



100 before & after case studies on economic and land development highway / intermodal project

WHAT'S THE STRUCTURE OF T-PICS ?



Project Types and Settings

Project Type	Economic Market Setting			Economic Distress		
	Metro	Rural	Mixed	High	Even	Low
Access Road	2	5	0	2	2	3
Beltway	8	0	0	2	3	3
Bridge	4	3	3	0	8	2
Bypass	4	8	1	6	2	4
Connector	4	2	2	3	0	5
Interchange	10	0	2	6	2	4
Major Highways	5	0	9	3	5	6
Widening	4	2	3	1	3	5
Intermodal	15	15	15	5	11	3
Total	56	23	21	28	36	35

Economic Impact Measures

Number of jobs

- Direct
- Total job impacts

Income / wages

- Per capita or per worker
- Direct and total wages impacts

Output

- Business sales
- Direct and total output impacts

ILLUSTRATION OF CASE SEARCH

T-PICS Website: <http://www.tpics.us/>

Project Name	Corydon I-64 Interchange
Location	Corydon, IN
Project Type	Interchange
Region	Great Lakes / Plains
Motivation	Congestion Mitigation / Site Development
Urban / Class level	Rural
Economic Distress	All
Length of the Project	2.3 miles
Construction Cost	\$5 Million

RESULTS FROM CASE SEARCH



Transportation Project Impact Case Studies

Home

Case Search

My Project Tools

About TPICs

Instructions

- (1) On right side, select characteristics of case study projects that you wish to view.
- (2) Press "View Results" button below to see case study names that fit those characteristics.
- (3) Click on individual case study names (titles) to see details.
- (4) Click on each tab to see further information. Apply that information as desired to help judge the possible range of impacts applicable for your situation.

Potential Matches: 1

View Results



[Compare Projects](#)

Basic Criteria

Other Criteria

Project Type:

[Select All](#) / [De-Select All](#)

- Bypass
 Limited Access Road
 Beltway
 Interchange
 Intermodal Passenger
 Bridges
 Access Road
 Widening
 Connector
 Intermodal Freight

Region:

[Select All](#) / [De-Select All](#)

- New England/Mid-Atlantic
 Southwest
 Southeast
 Rocky Mountain/Far West
 Great Lakes/Plains
 International

Motivation:

[Select All](#) / [De-Select All](#)

- Air Access
 Labor Market
 Int'l Border Access
 Site Development
 Tourism
 Rail Access
 Delivery Market
 Marine Port Access
 Congestion Mitigation

Urban/Class Level:

- Rural
 Mixed
 Metro

Economic Distress:

- All
 Distressed Only
 Non Distressed Only

Keywords:

Clear

Results

Compare	Title	Description	Project Type	State	BEA Region	Project Cost (current \$'s)	End Date
<input type="checkbox"/>	I-94 / Opportunity Drive Interchange	The I-94 Opportunity Drive (CASH 75) interchange in St. Cloud, MN added a new highway access ramp that connected I-94 to an industrial park off of the interchange in 2004.	Interchange	MN	Great Lakes/Plains	\$9,813,580	2004

I-94 / OPPORTUNITY DRIVE INTERCHANGE



I-94 / Opportunity Drive Interchange

The I-94 Opportunity Drive (CASH 75) interchange in St. Cloud, MN added a new highway access ramp that connected I-94 to an industrial park off of the interchange in 2004.

Characteristics	Setting	Pre/Post Conditions	Narrative	Impacts	Images
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Measure	Direct	Indirect	Total
Number of Jobs	1,103	543	1,646
Income/Wages (\$M's)	\$59.51	\$28.55	\$88.06
Output (\$M's)	\$309.85	\$140.6	\$450.45

ILLUSTRATION OF MY PROJECT TOOLS

T-PICS Website: <http://www.tpics.us/>

Project Name	East-West Corridor: From I-65
Location	Boone or Johnson County, IN
Project Type	Connector
Region	Great Lakes / Plains
Motivation	Congestion Mitigation
Urban / Class Level	Rural
Economic Distress	Distressed Only / Non-distressed Only
Length of the Project	12 miles
Construction Cost	N/A

RESULTS FROM MY PROJECT TOOLS

➤ Distressed only – Johnson County



Instructions

- (1) On right side, select characteristics of your own project.
- (2) Press "View Results" button below to see the applicable range of economic impacts and project costs, based on similar types of projects in the case study database.
- (3) Move the sliders to adjust for higher or lower levels of project cost, traffic and community factors applicable in your case. You will then see shifts in the likely range of economic impacts.

[View Results](#)

Project Type:

- Bypass
 Limited Access Road
 Beltway
 Interchange
 Bridges
 Access Road
 Widening
 Connector

Region:

- New England/Mid-Atlantic
 Southwest
 Southeast
 Rocky Mountain/Far West
 Great Lakes/Plains
 International

Urban/Class Level:

- Rural
 Mixed
 Metro

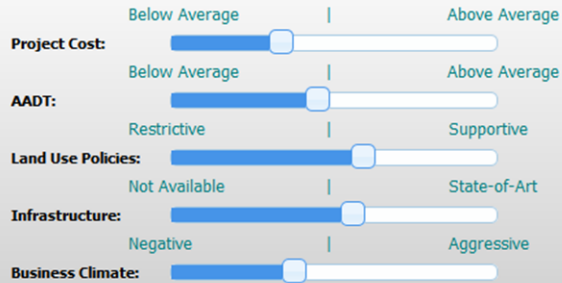
Economic Distress:

- Distressed Only
 Non Distressed Only

Length of Project:

Miles

Results



Estimated Project Cost (\$): \$232.7 million

Estimated AADT: 7,102.2

	Jobs	Wages (mil.)	Output (mil.)
Direct Impacts	3,213 - 5,355	\$150.5 - \$250.9	\$478.4 - \$797.4
Supplier and Wage Impacts	1,845 - 3,075	\$87.3 - \$145.4	\$271.6 - \$452.7
Total Impacts	5,058 - 8,430	\$237.8 - \$396.3	\$750 - \$1,250.1

RESULTS FROM MY PROJECT TOOLS

➤ Non Distressed only – Boone County



Instructions

- (1) On right side, select characteristics of your own project.
- (2) Press "View Results" button below to see the applicable range of economic impacts and project costs, based on similar types of projects in the case study database.
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View Results

Project Type:

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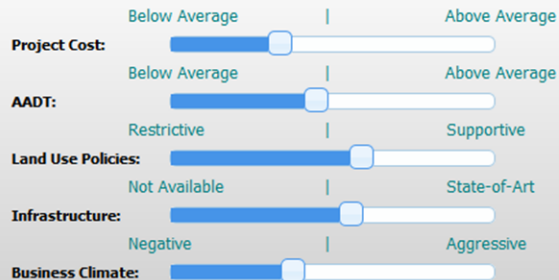
Economic Distress:

- Distressed Only
 Non Distressed Only

Length of Project:

12 Miles

Results



Estimated Project Cost (\$): \$347.8 million

Estimated AADT: 7,102.2

	Jobs	Wages (mil.)	Output (mil.)
Direct Impacts	5,426 - 9,043	\$254.2 - \$423.6	\$807.9 - \$1,346.4
Supplier and Wage Impacts	3,116 - 5,193	\$147.4 - \$245.6	\$458.7 - \$764.4
Total Impacts	8,541 - 14,235	\$401.5 - \$669.2	\$1,266.5 - \$2,110.9

WHAT ARE LIMITATIONS OF T-PICS?

Only for Highway Capacity Expansion Projects

Safety improvement or facility reconstruction, rehabilitation, and preservation cannot be evaluated through T-PICS

Transportation Conditions Were Not Included

The case study database cannot relate observed economic impacts to the magnitude of before and after changes *in transportation conditions*

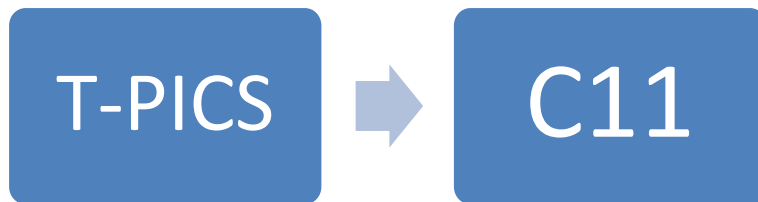
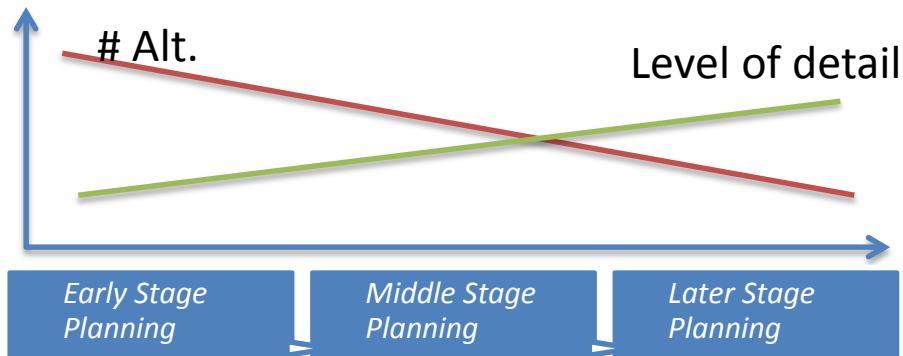
It Isn't a Economic Impact Prediction Model

Case study database and T-PICS tool cannot serve as a substitute for predictive economic impact models

C11-TOOLS

**TOOLS FOR ASSESSING WIDER ECONOMIC
BENEFITS OF TRANSPORTATION**

C11-TOOLS



1. Reduce congestion:
 - RELIABILITY
2. Enhance access to market and jobs
 - MARKET ACCESS
3. Enhance connectivity to intermodal terminals
 - INTERMODAL CONNECTIVITY

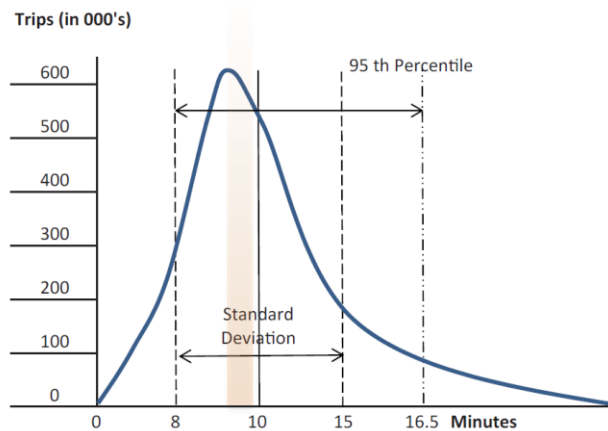
C11-TOOLS

RELIABILITY

MARKET ACCESS

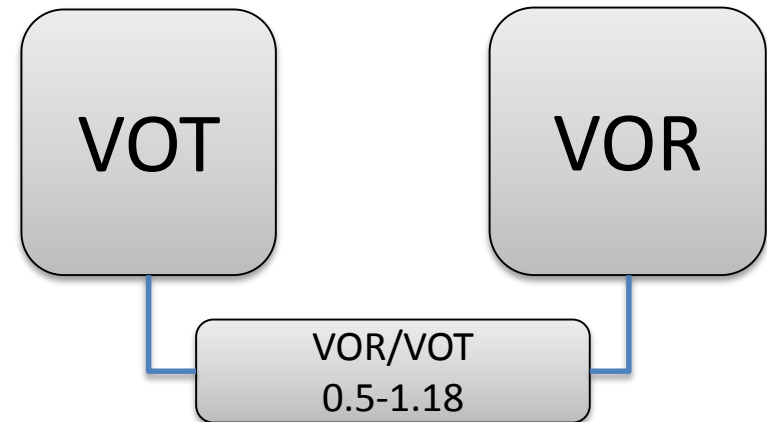
CONNECTIVITY

WHAT IS IT?



Source: Report SHRP2-S2-C11-RW-1

HOW DO WE VALUE IT?



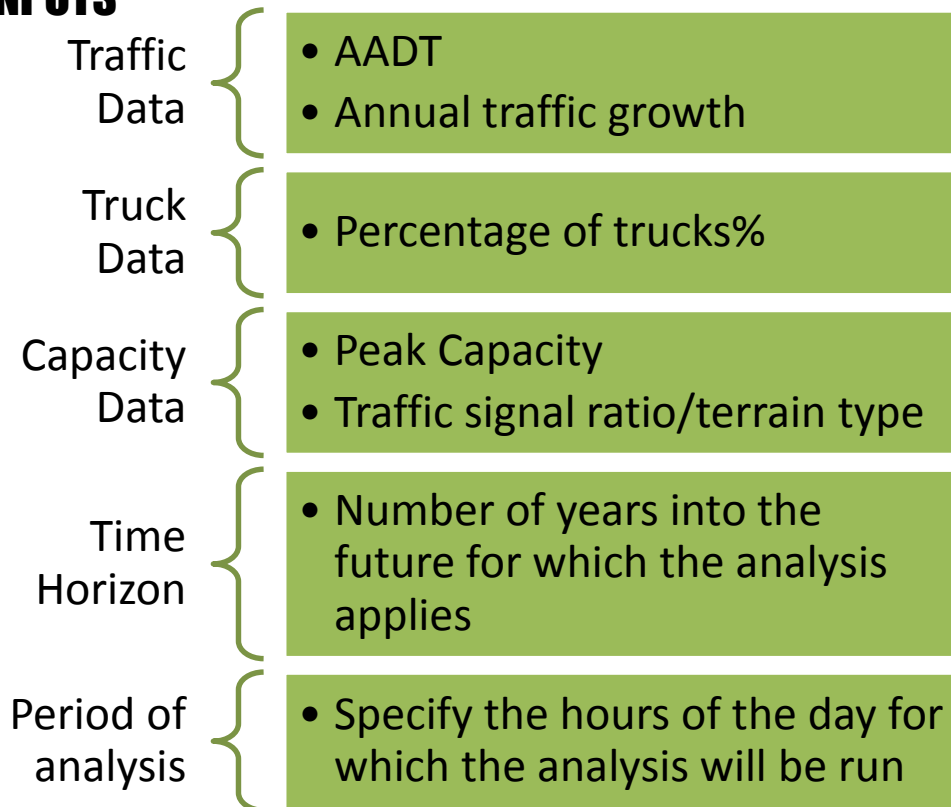
C11-TOOLS

RELIABILITY

MARKET ACCESS

CONNECTIVITY

INPUTS



OUTPUTS

Congestion and Reliability Costs

Source: Report SHRP2-S2-C11-RW-1

C11-TOOLS

RELIABILITY

MARKET ACCESS

CONNECTIVITY

WHAT DOES IT DO?

Expansion the breadth of destinations for freight transportation (same day deliveries)
Expansion of the area which a business can attract customers and businesses

HOW DO WE MEASURE IT?

- Enhanced urban agglomeration



Access to Buyer
– seller Markets

Access to Labor
Markets

Source: Report SHRP2-S2-C11-RW-1

C11-TOOLS

RELIABILITY

MARKET ACCESS

CONNECTIVITY

INPUTS

Subdivision into ZONES

Economic mass

Impedance

OUTPUTS

Effective density

Source: Report SHRP2-S2-C11-RW-1

C11-TOOLS

RELIABILITY

MARKET ACCESS

CONNECTIVITY

WHAT DOES IT DO?

- Improvement in frequency
- Reduction of travel time

Business locations



Intermodal terminals



Faster mov. between existing O-D
Enabling new O-D

HOW DO WE VALUE IT?



Location of
the terminal

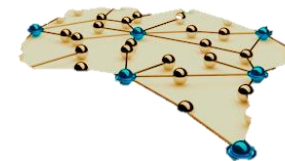


Type of service



Level of activity

Number of other locations
that can be reached



Source: Report SHRP2-S2-C11-RW-1

C11-TOOLS

RELIABILITY

MARKET ACCESS

CONNECTIVITY

INPUTS

Distance of the improvement from the facility

Number of trucks or passenger vehicles on the segment improved

Hours saved per truck or passenger vehicle

Value per vehicle hour saved

Fraction of vehicles on the segment associated with the intermodal terminal being evaluated

OUTPUTS

Freight connectivity index

Passenger connectivity index

Weighted Connectivity

=connectivity index * Savings associated with the highway


















Source: Report SHRP2-S2-C11-RW-1

C11-TOOLS

RELIABILITY

MARKET ACCESS

CONNECTIVITY

Project Objective	Mode	Threshold Factor	Analysis Tools
Travel Time Reduction	 	Annual reduction in VHT > 80,000 hrs	STB Analysis
	 	Annual reduction in PPT > 80,000 hrs	
Reduce Congestion	 	Level of Service = D	R + STB
	 	Average V/C > 0.85	
Travel Time Reliability	  	TTI > 1.3	R + STB
Access between housing & employment	  	Pop > 80,000 & density > 1800 /mi ²	MA + STB
Business Delivery Access		Trucks > 12% of veh.	MA + STB
Connectivity to Intermodal Terminal		Trucks > 12% of veh.	C + STB
		none	

C11-TOOLS

RELIABILITY

MARKET ACCESS

CONNECTIVITY

- Since Market access and reliability are wide concepts, their applicability is limited to urban ground transportation
 - The economic valuation is based on coefficients and elasticities derived for those types of modes
 - Not include
 - Air, marine modes
 - Recreation trips
 - Long distance trips

QUESTIONS?

