TRANSPORTATION AND ECONOMIC DEVELOPMENT: CHARACTERIZING ECONOMIC DEVELOPMENT IMPACTS FOR CORRIDOR IMPROVEMENTS
## Project Background

**SPR#3912 Economic Development Impact of Corridor Improvements**

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
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<tbody>
<tr>
<td>Research Institution</td>
<td>Joint Transportation Research Program, Purdue University</td>
</tr>
<tr>
<td>Principal Investigators</td>
<td>Dr. Nadia Gkritza &amp; Dr. Jon Fricker</td>
</tr>
<tr>
<td>Project Advisor</td>
<td>Samy Noureldin</td>
</tr>
<tr>
<td></td>
<td>JTRP Program Director, INDOT R&amp;D</td>
</tr>
<tr>
<td>Business Owner</td>
<td>Roy Nunnally</td>
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<td></td>
<td>Director, Asset Planning &amp; Management Division</td>
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<tr>
<td>Research Assistants</td>
<td>Davis Chacon Hurtado &amp; Ruiman Yang</td>
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<tr>
<td></td>
<td>Lyles School of Civil Engineering, Purdue University</td>
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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
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

- Literature Review
- Existing Tools Evaluation
- Tool Development
- Test Beds
- Guidance and materials

C11 and C03 review

Purdue University
TRANSPORTATION AND ECONOMIC DEVELOPMENT

Economic Development Impacts

- Induced impacts
- Dynamic Impacts
- Direct impacts
- Indirect impacts

Wider economic impacts

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

<table>
<thead>
<tr>
<th>Survey and interviews</th>
<th>Benefit/Cost analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corridor inventories</td>
<td></td>
</tr>
<tr>
<td>Expert interviews</td>
<td></td>
</tr>
<tr>
<td>Business surveys</td>
<td>TOPS - BC</td>
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</table>

<table>
<thead>
<tr>
<th>Economic multiplier / I - O tables</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIMS-II</td>
</tr>
<tr>
<td>IMPLAN</td>
</tr>
<tr>
<td>I-O model</td>
</tr>
<tr>
<td>PC Input-Output</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Economic forecasting and simulation models</th>
<th>Market studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>TREDIS</td>
<td>Shopper surveys</td>
</tr>
<tr>
<td>REMI</td>
<td>Windshield surveys</td>
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</table>

<table>
<thead>
<tr>
<th>Integrated traffic and economic simulations models</th>
<th>Statistical analysis tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCIBAS</td>
<td>linear regression/Logistic regression</td>
</tr>
<tr>
<td>HEAT</td>
<td>Hedonic price modeling</td>
</tr>
</tbody>
</table>
**Inputs**

- **Early Stage Planning**
  - “Broad brush”
  - TPICS C03

- **Middle Stage Planning**
  - C11

- **Later Stage Planning**
  - EIA
  - BCA Transp Models

**MODEL**

- Expensive/complex

---

**NEED?**
SHRP2 OVERVIEW

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

Source: SHRP2-Report S2-C03-RR-1
WHAT'S THE STRUCTURE OF T-PICS?

- Case studies database
- T-PICS
  - Case Search (Past Projects)
  - My Project Tool (Predict Impact of future projects)

Source: SHRP2-Report S2-C03-RR-1
## Project Types and Settings

<table>
<thead>
<tr>
<th>Project Type</th>
<th>Economic Market Setting</th>
<th>Economic Distress</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Metro</td>
<td>Rural</td>
</tr>
<tr>
<td>Access Road</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Beltway</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Bridge</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Bypass</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Connector</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Interchange</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Major Highways</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Widening</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Intermodal</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>56</td>
<td>23</td>
</tr>
</tbody>
</table>

Source: SHRP2-Report S2-C03-RR-1
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

Source: SHRP2-Report S2-C03-RR-1
ILLUSTRATION OF CASE SEARCH

T-PICS Website: [http://www.tpics.us/](http://www.tpics.us/)

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Corydon I-64 Interchange</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Corydon, IN</td>
</tr>
<tr>
<td>Project Type</td>
<td>Interchange</td>
</tr>
<tr>
<td>Region</td>
<td>Great Lakes / Plains</td>
</tr>
<tr>
<td>Motivation</td>
<td>Congestion Mitigation / Site Development</td>
</tr>
<tr>
<td>Urban / Class level</td>
<td>Rural</td>
</tr>
<tr>
<td>Economic Distress</td>
<td>All</td>
</tr>
<tr>
<td>Length of the Project</td>
<td>2.3 miles</td>
</tr>
<tr>
<td>Construction Cost</td>
<td>$5 Million</td>
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</tbody>
</table>
RESULTS FROM CASE SEARCH

Source: T-PICS www.tpics.us
**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.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Direct</th>
<th>Indirect</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Jobs</td>
<td>1,103</td>
<td>543</td>
<td>1,646</td>
</tr>
<tr>
<td>Income/Wages (M's)</td>
<td>$59.51</td>
<td>$28.55</td>
<td>$88.06</td>
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<tr>
<td>Output (M's)</td>
<td>$309.85</td>
<td>$140.6</td>
<td>$450.45</td>
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</tbody>
</table>

Source: T-PICS www.t pics.us
ILLUSTRATION OF MY PROJECT TOOLS

T-PICS Website: [http://www.tpics.us/](http://www.tpics.us/)

<table>
<thead>
<tr>
<th>Project Name</th>
<th>East-West Corridor: From I-65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Boone or Johnson County, IN</td>
</tr>
<tr>
<td>Project Type</td>
<td>Connector</td>
</tr>
<tr>
<td>Region</td>
<td>Great Lakes / Plains</td>
</tr>
<tr>
<td>Motivation</td>
<td>Congestion Mitigation</td>
</tr>
<tr>
<td>Urban / Class Level</td>
<td>Rural</td>
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<tr>
<td>Economic Distress</td>
<td>Distressed Only / Non-distressed Only</td>
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<tr>
<td>Length of the Project</td>
<td>12 miles</td>
</tr>
<tr>
<td>Construction Cost</td>
<td>N/A</td>
</tr>
</tbody>
</table>
RESULTS FROM MY PROJECT TOOLS

- Distressed only – Johnson County

Source: T-PICS www.tpics.us
RESULTS FROM MY PROJECT TOOLS

- Non Distressed only – Boone County

Source: T-PICS www.tpics.us
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

Source: SHRP2-Report S2-C03-RR-1
C11-TOOLS

TOOLS FOR ASSESSING WIDER ECONOMIC BENEFITS OF TRANSPORTATION
1. Reduce congestion:
   - RELIABILITY
2. Enhance access to market and jobs
   - MARKET ACCESS
3. Enhance connectivity to intermodal terminals
   - INTERMODAL CONNECTIVITY

Complement each other
(3 main benefits)
**WHAT IS IT?**

- **Trips (in 000's)**
- **95th Percentile**
- **Standard Deviation**

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

**HOW DO WE VALUE IT?**

- **VOT**
- **VOR**
- **VOR/VOT 0.5-1.18**
C11 - TOOLS

**INPUTS**

- Traffic Data
  - AADT
  - Annual traffic growth
- Truck Data
  - Percentage of trucks%
- Capacity Data
  - Peak Capacity
  - Traffic signal ratio/terrain type
- Time Horizon
  - Number of years into the future for which the analysis applies
- Period of analysis
  - Specify the hours of the day for which the analysis will be run

**OUTPUTS**

- Congestion and Reliability Costs

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

### 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

<table>
<thead>
<tr>
<th>Access to Buyer</th>
<th>Access to Labor</th>
</tr>
</thead>
<tbody>
<tr>
<td>– seller Markets</td>
<td>Markets</td>
</tr>
</tbody>
</table>

Source: Report SHRP2-S2-C11-RW-1
<table>
<thead>
<tr>
<th>INPUTS</th>
<th>OUTPUTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subdivision into ZONES</td>
<td>Effective density</td>
</tr>
<tr>
<td>Economic mass</td>
<td></td>
</tr>
<tr>
<td>Impedance</td>
<td></td>
</tr>
</tbody>
</table>

Source: Report SHRP2-S2-C11-RW-1
WHAT DOES IT DO?

- Improvement in frequency
- Reduction of travel time

HOW DO WE VALUE IT?

- Location of the terminal
- Type of service
- Level of activity
- Number of other locations that can be reached

Business locations
Intermodal terminals

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

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
  
  \[ \text{Weighted Connectivity} = \text{connectivity index} \times \text{Savings associated with the highway} \]

Source: Report SHRP2-S2-C11-RW-1
### Project Objective | Mode | Threshold Factor | Analysis Tools
--- | --- | --- | ---
Travel Time Reduction | Car, Bus, Train | Annual reduction in VHT > 80,000 hrs | STB Analysis
| | | Annual reduction in PPT > 80,000 hrs |
Reduce Congestion | Car, Bus, Truck | Level of Service = D | R + STB
| | | Average V/C > 0.85 |
Travel Time Reliability | Car, Bus, Truck | TTI > 1.3 | R + STB
Access between housing & employment | Car, Bus, Truck | Pop > 80,000 & density > 1800 /mi2 | MA + STB
Business Delivery Access | Truck | Trucks > 12% of veh. | MA + STB
Connectivity to Intermodal Terminal | Truck, Bus | Trucks > 12% of veh. | C + STB

Adapted from NCHRP 02-24 Assessing Productivity Impacts of Transportation Investments
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

Source: NCHRP 02-24 Assessing Productivity Impacts of Transportation Investments