



Moving forward

Ohio Department of Transportation

Research Program Newsletter

2015 Volume 1



This Issue

1

FY 2016 RFPs Issued

2—3

OPREP and Student Study
2016 Selections

4

Ohio's Research Initiative for
Locals

5

ROI for District Research
Research Summit 2014

6-8

Highlighted Project:
The Value of Balanced Growth
Plans for Transportation

9

TRB Annual Meeting
TRB State Visit

Research Staff Changes

10

New Final Reports
Calendar of Events

FY 2016 RFPs Issued

ODOT Research is now accepting proposals for the following Strategic Research Projects:

2016-01: Evaluation of Safety Practices for Short Duration Work Zones

2016-02: Assessment of Salt Procurement and Distribution Processes

2016-03: Crack Resistance and Durability of RAS Asphalt Mixtures

2016-04: Effective and Efficient Roadside Ditch Cleaning Using BMP's for Erosion and Sediment Control

2016-05: Evaluation of Roadway Subsurface Drainage on Rural Routes

2016-06: Evaluation of Technology for School Bus Stop Ahead Signs

2016-07: Evaluating the Particle Size Distribution of Ohio's Stormwater Runoff

2016-08: Evaluation of Grade Crossing Hazard Ranking Models

For additional information, please visit the Research Section [RFP website](#). Submissions must be received by **3:00PM (ET)** on **March 6, 2015** in order to be considered. **A new on-line submission process is being used this year**, so please be sure to check out the site early to see the changes and make sure your proposal is submitted correctly.

Projects are expected to begin during state fiscal year 2016 (July 1, 2015 - June 30, 2016). All questions concerning RFPs should be submitted as described in the RFP instructions. Clarifications will be posted to the RFP website as they become available.

Please note that it is now required that non-Ohio agency submissions include an Ohio-based subcontractor or partner.



OPREP 2016 Recipients

A total of 32 OPREP white papers were received and considered for FY2016 funding. From these submissions, seven (7) were selected for development into research projects. Brief descriptions of the OPREP 2016 projects are provided below. For additional information on these pending projects, contact the Research Section.

Title	Description
<p>Determining Optimum Thickness for Long-Life Concrete Pavement in Ohio</p>	<p>Although concrete pavement has shown its evidence for a long last time in service, sometimes it still experiences functional failure and premature failure. ODOT has conducted extensive research focused on improving concrete pavement performance. The rigid pavement design procedure in the 1993 AASHTO Guide for the Design of Pavement Structures, in which a slab thickness can be selected and will result a great improvement in concrete terminal serviceability, is a good example of improving concrete pavement performance. However, other factors also play a major role in concrete pavement performance. The main objective of this study is to provide guidance on the selection of concrete slab thickness required to achieve long term performance considering the effect of slab dimensions, concrete slab support, and climatic conditions on critical stresses. The study will include proposed changes to the design, construction, and material procedures/specifications that, if adopted and implemented, will significantly increase PCC pavement lifetimes and reduce maintenance costs. This is a 28 month project will be conducted by Dr. Shane L. Gilkey of Ohio University in collaboration with Ohio Concrete, Inc.</p>
<p>Effectiveness of Design-Build Project Delivery Method in ODOT's Program</p>	<p>ODOT has increasingly used Design-build (DB) in projects of different characteristics other than highway projects, because of its pronounced advantages, such as improved project timing, reduced costs, clear quality control, and enhanced innovation opportunities. However, ODOT may not be able to gain the desired benefits in all its DB projects with different characteristics. The objective of this study is to provide ODOT with an assessment of the effectiveness of DB PDM use in projects with different characteristics (type, size, and complexity) through evaluation of the projects' measurable performance criteria (time, cost, quality, etc...). The effectiveness assessment will provide ODOT with quantitative measures that could enhance its decision making process in selection of candidate projects for DB project delivery, and thus realize better project performance in its overall transportation system. This is a 15 month project will be conducted by Dr. Ghada M. Gad of Bowling Green State University, and Dr. Douglas Gransberg of Iowa State University.</p>
<p>Reduction of Bridge Deck Cracking through Alternative Material Usage</p>	<p>Current estimates of flood-frequency for gaged streams in Ohio are based on analyses done using data collected through the 2001 water year. Those estimates do not incorporate the most recent 12+ years of peak-flow data or the newly developed methods for computing flood-frequency characteristics. The primary objectives of this projects are to revise the regional skew model for Ohio, to compute updated flood-frequency characteristics for applicable Ohio gage locations, to develop new regional regression equations for estimating flood-frequency characteristics of rural, unregulated streams in Ohio, and to update the Ohio StreamStats application to implement the new regression equations and also update supporting datasets. By using the flood-frequency estimates that are of less than optimum accuracy range from the potential for under design of bridges and culverts or over-design of bridges and culverts. This is a 24 month project conducted by Dr. Greg Koltun of U.S. Geological Survey in collaboration with USGS Office of Surface Water, the USGS National StreamStats Team, and the Ohio Department of Natural Resources (ODNR), Division of Soil and Water Resources.</p>
<p>Update Regional Skew Characteristics of Annual Peak Flows Through StreamStats</p>	<p>Current estimates of flood-frequency for gaged streams in Ohio are based on analyses done using data collected through the 2001 water year. Those estimates do not incorporate the most recent 12+ years of peak-flow data or the newly developed methods for computing flood-frequency characteristics. The primary objectives of this projects are to revise the regional skew model for Ohio, to compute updated flood-frequency characteristics for applicable Ohio gage locations, to develop new regional regression equations for estimating flood-frequency characteristics of rural, unregulated</p>

(Continued on page 3)

OPREP 2016 Recipients (Continued from page 2)

Title	Description
Update Regional Skew Characteristics of Annual Peak Flows Through StreamStats (continued)	streams in Ohio, and to update the Ohio StreamStats application to implement the new regression equations and also update supporting datasets. By using the flood-frequency estimates that are of less than optimum accuracy range from the potential for underdesign of bridges and culverts or over-design of bridges and culverts. This is a 24 month project conducted by Dr. Greg Koltun of U.S. Geological Survey in collaboration with USGS Office of Surface Water, the USGS National StreamStats Team, and the Ohio Department of Natural Resources (ODNR), Division of Soil and Water Resources.
Fundamental Evaluation of the Interaction between RAS/RAP and Virgin Asphalt Binders	The asphalt mixture producers and the ODOT increased the use of the readily available recycled materials such as Reclaimed Asphalt Pavement (RAP) and Recycled Asphalt Shingles (RAS) in flexible pavement mixtures. However, using RAS and higher amounts of RAP in new paving mixtures may cause the resultant mixture to be more prone to load and non-load associated cracking and adhesion/cohesion failures during the service life of the pavement. The main objective of this project is to study the interfacial zone between the RAS/RAP and virgin asphalt binders and evaluate its properties that affect the fatigue cracking and moisture damage resistance of mixtures containing RAP and RAS materials. The results of project will lead to designing and producing durable asphalt mixes containing RAS/RAP, to lowering the life cycle costs of pavements as well as improving their environmental impacts, to the development of sustainable pavement structures in Ohio. This is a 24 month project conducted by Dr. Munir D. Nazzal of Ohio University, Athens, and Dr. Sang-Soo Kim of Ohio University, Athens, in collaboration with Dr. Ala R. Abbas of University of Akron.
Investigate Feasibility of GPR to Measure In-Place Density of New Asphalt Pavement	Extensive research completed in Finland in the late 1990s verified the ability to measure asphalt air void content with Ground Penetrating Radar (GPR). The air void values were obtained from GPR-based dielectric measurements using a small number of cores for calibration. This proposal outlines a field experiment to investigate the applicability of GPR to assess the density of newly placed asphalt mixtures in Ohio. Since GPR provides continuous data, this process can lead to improved paving processes and ultimately longer lasting pavements. In addition, the GPR method shows promise as a standard for quality assurance and acceptance testing of new pavement. This is a 16 month project conducted by Dr. Arudi S. Rajagopal of Infrastructure Management & Engineering Inc. in collaboration with Daniel T Crago, Vally Asphalt Corporation and Cliff Ursich, Flexible Pavements of Ohio partnership.

Student Study 2016 Recipient

A total of 11 Student Study white papers were received and considered for FY2016 funding. From these submissions, one (1) was selected for development into a research project. A brief description of this project is below. For additional information on this pending project, contact the Research Section.

Title	Description
Dedolomitization and Alkali Reactions in Ohio-Sourced Dolostone Aggregates	The goal of this project is to employ state-of-the-art scientific/analytical methods for sample characterization and analysis including using Polarized Light Microscopy (PLM), Scanning Electron Microscopy (SEM) with Energy Dispersive X-ray microanalysis (SEM/EDS), and X-ray Powder Diffraction (XRD) to identify the presence of dedolomitization in Ohio-sourced dolostone aggregates and concretes produced using these aggregates. This project will be overseen by Dr. John R. Farver of Bowling Green State University.

Ohio's Research Initiative for Locals

ORIL Selects FY2016 Research Ideas

Ohio's Research Initiative for Locals (ORIL) issued its second annual Request for Research Ideas to Ohio's local transportation agencies in September 2014. A total of 6 ideas were received by the end of October. The ORIL Board selected three ideas to move forward into the development of Requests for Proposals (RFP). Technical Advisory Committees (TACs) are currently hard at work preparing RFPs for the following projects (titles may be subject to change):



- **Synthesis of Research on Load Capacity of Concrete Slabs with No Plans**
- **Structural Benefit of Concrete Paving of Steel Culvert Inverts**
- **Synthesis Study of Current RUMA Practices Among Local Government Agencies**

The ORIL RFP will be issued to the research community in March 2015 and projects are expected to begin as early as July 2015. Additional information on these specific projects will be available when the RFP posts in March. Research ideas (and RFPs) will not be discussed with prospective researchers. Locals who are interested in learning more about these projects or the ORIL program are encouraged to contact Vicky Fout or Mike Fitch at ORIL@dot.state.oh.us. The next opportunity to submit ideas to ORIL for consideration will occur in September 2015.

Transitions of the Board - Membership Changes

It has been two years since eighteen individuals first got together to design, build and foster a transportation research program focused on addressing challenges specific to Ohio's local agencies. With this passage of time came the conclusion of terms for several ORIL Board representatives. For most associations represented on the board, two of their four positions had terms that expired at the end of 2014. In addition, the terms for the two academic representatives also expired. This prompted the selection of new board members, which was organized by each respective association.

- ◆ The County Engineers Association of Ohio reappointed Warren Schlatter (Defiance County Engineer) and selected Brett Boothe (Gallia County Engineer) to assume the position vacated by Ed Meixner (Ashland County Engineer).
- ◆ The Ohio Municipal League (OML) reappointed Leo Shanayda (Engineer for the City of Springfield) and Paul Schmelzer (Safety Service Director for the City of Findlay). In addition, OML confirmed Terry Lively (formerly the Engineer for the City of Marion now the Deputy Engineer for Belmont County) to continue to represent the organization for the remainder of this term.
- ◆ ODOT selected Brian Olson (Transportation Engineer, District 4 Highway Management) to assume the position vacated by Mitch Blackford (Highway Maintenance Administrator, District 6) and Jennifer Elston (Pavement Engineer, District 8) to assume the position vacated by John MacAdam (Transportation Engineer, Office of Traffic Engineering).
- ◆ An open solicitation for applications for the academic representatives was issued by ODOT's Research Section. The Board reselected Dr. Eric Steinberg (Ohio University) and selected Dr. Rui Liu (Kent State University) to fill the position vacated by Dr. Robert Liang (University of Akron).

December 2014 also brought about the expiration of the appointment of Board Chair. In a unanimous vote, the board reappointed Greg Butcher, Violet Township Engineer, for another term as Board Chair. When asked about his reappointment, Greg responded: "I am looking forward to serving as Chair of the ORIL Board for another year as we continue research efforts benefitting the 2,300 local government agencies within the State of Ohio."

Additional information on the member of the Board is available on the [ORIL Website](#).



ROI for ODOT District Transportation Research

Jill Martindale hosted a popular session on District Transportation Research on Tuesday, October 28, 2014 at OTEC. This is the third year she has led a panel sharing information on this new aspect of ODOT's Research Program.

The excitement this year was in hearing district personnel talk about their research work and learnings that impact their roles. We're proud that the following ODOTers came to present at OTEC:

- ⇒ **Steve McAdam, Summit**
- ⇒ **Brian Hoover, Summit**
- ⇒ **Joseph Hejduk, Lake**
- ⇒ **Chris Starr, Portage**

The three projects our ODOTers discussed were led by Dr. William Schneider, University of Akron, and his team of students.

- Evaluation of Epoke Bulk Spreader for Winter Maintenance
- Evaluation of the Viking-Cives TowPlow for Winter Maintenance (see calendar for 1/16/15 results presentation)
- Investigate Plow Blade Optimization
- Evaluation of GPS/AVL Systems for Snow & Ice Operations Resource Management



Dr. Schneider's [presentation slides](#) are available on the OTEC 2014 web site.

ODOT's Research Summit 2014

By Pieter Wykoff, reprinted from ODOT Transcript, November 2014

American Association of State Highway and Transportation Officials (AASHTO) Frederick "Bud" Wright recently addressed the 2014 ODOT Research Summit in Columbus. The bi-annual event is for all who assist ODOT's research.

As AASHTO executive director, Wright commented that research is critical to the nation's transportation infrastructure.

"We haven't done a great job of portraying this to Congress or the general public," he said. "We need to bring that innovation forward."

Wright expressed concerns that the next federal reauthorization bill sponsored by Congress would not keep pace with the nation's transportation needs.

"They must find a new revenue source for transportation," said Wright. "We'll be asking them to find a way to do it."



Highlighted Project

The Value of Balanced Growth for Transportation

A Cleveland State University research team recently completed an evaluation of the benefit that programs like the Ohio Balanced Growth Program could bring to transportation agencies in Ohio. The team, comprised of faculty, staff and students from the CSU Maxine Goodman Levin College of Urban Affairs and Washkewicz College of Engineering, and CDM Smith Inc, took an interdisciplinary approach to connecting public policy, land use patterns, and transportation outcomes.

Much has been written and observed about the decades-long pattern of out-migration from urban areas into suburban and exurban areas in the United States. Known as “sprawl”, this pattern is widespread, affecting metropolitan areas in both high-growth and low-growth regions of the country. As public transportation budgets become more constricted, many government entities are exploring ways to reduce their costs. For transportation agencies, an obvious question is the role that the pattern of development plays in transportation benefits such as reduced lane miles and associated reduced construction and maintenance costs, increased transit use, reduced vehicle miles traveled, and related social factors such as improved safety, reduced emissions, reduced fuel consumption, reduced costs to private households and business, and improved transportation access.

The literature documents the connection between land use patterns and transportation benefits. In particular, land use patterns that reflect higher densities, and a “nodal” character with mixed development located around “activity cen-

ters” – called “Balanced Growth-Type” patterns in the study - have been shown to provide transportation benefits through reduced, more efficient, more effective, and more cost-effective transportation infrastructure.

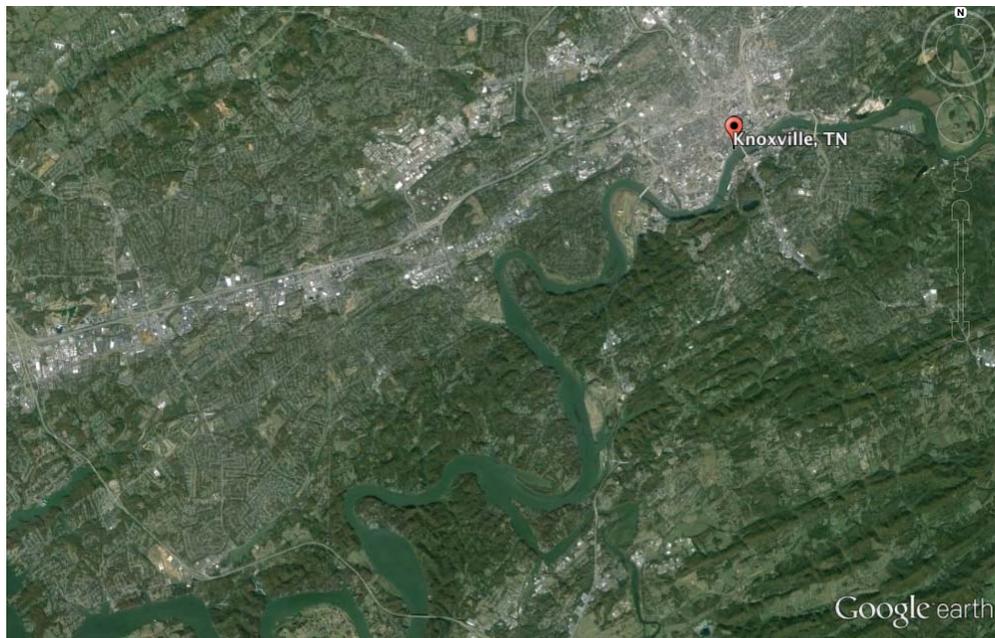
Across the United States, states, regions and municipalities are implementing a wide range of policies and programs intended to encourage compact, nodal development patterns. The Ohio Balanced Growth Program is one such program. Voluntary and locally driven, it involves local collaborative watershed plans that designate priority areas for development and conservation investment. State and local policies and programs are then aligned with those locally-determined priorities through incentives in state programs, grants and loans.

The overall purpose of the research project was ***to assist ODOT with understanding the relationship of transportation decisions to land use policy that supports transportation***

benefits.

After an extensive literature review, including an inventory of Balanced Growth-Type programs nationwide, 26 Metropolitan Statistical Areas (MSAs)(as defined by the US Census Bureau), including 5 in Ohio, were selected as focus areas across the country. Selection criteria were designed to create a group that was both representative of the range of policy and land use characteristics in the US, and relevant to Ohio communities. Quantitative and qualitative data were collected for each MSA. Data ranged from political, geographic, demographic, economic, land use and development characteristics and patterns, to transportation measures.

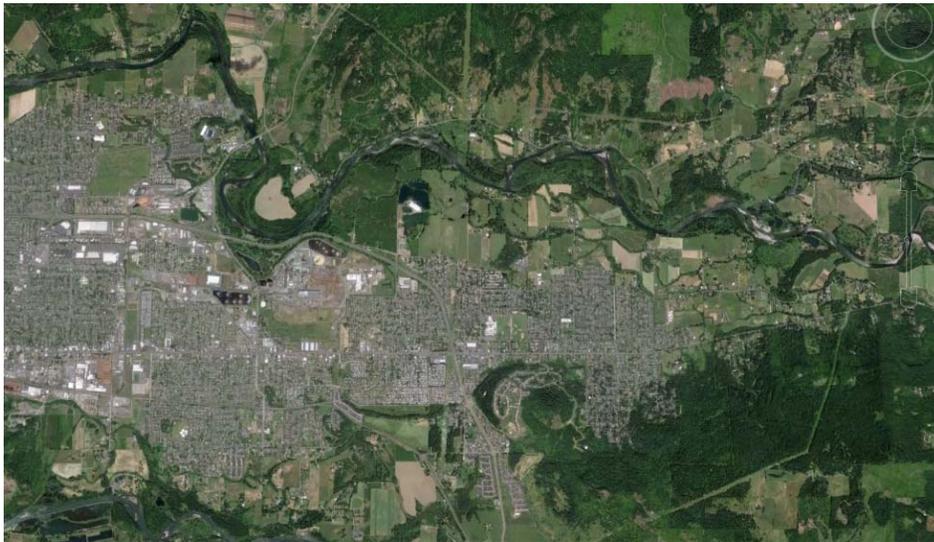
2010 land use measures utilized the Sprawl Index, a composite measure developed by Ewing et al (2014). 2010 transportation measures were obtained through the Texas A&M Transportation Institute Urban Mobility Study. Policy in-



Knoxville, TN – Tier 2 – Sprawl Index Score 68.2. One of the 26 selected MSAs, with the lowest sprawl index of the group evaluated, Knoxville shows a development pattern that is generally concentrated along a linear corridor, and has a diffuse edge with surrounding countryside.

Highlighted Project

By Kirby Date, Cleveland State University



Eugene, Oregon – Tier 3 – Sprawl Index Score 125.6. One of the 26 MSAs evaluated, Eugene has a distinct edge with surrounding agricultural areas, most likely due to the implementation of an urban growth boundary.

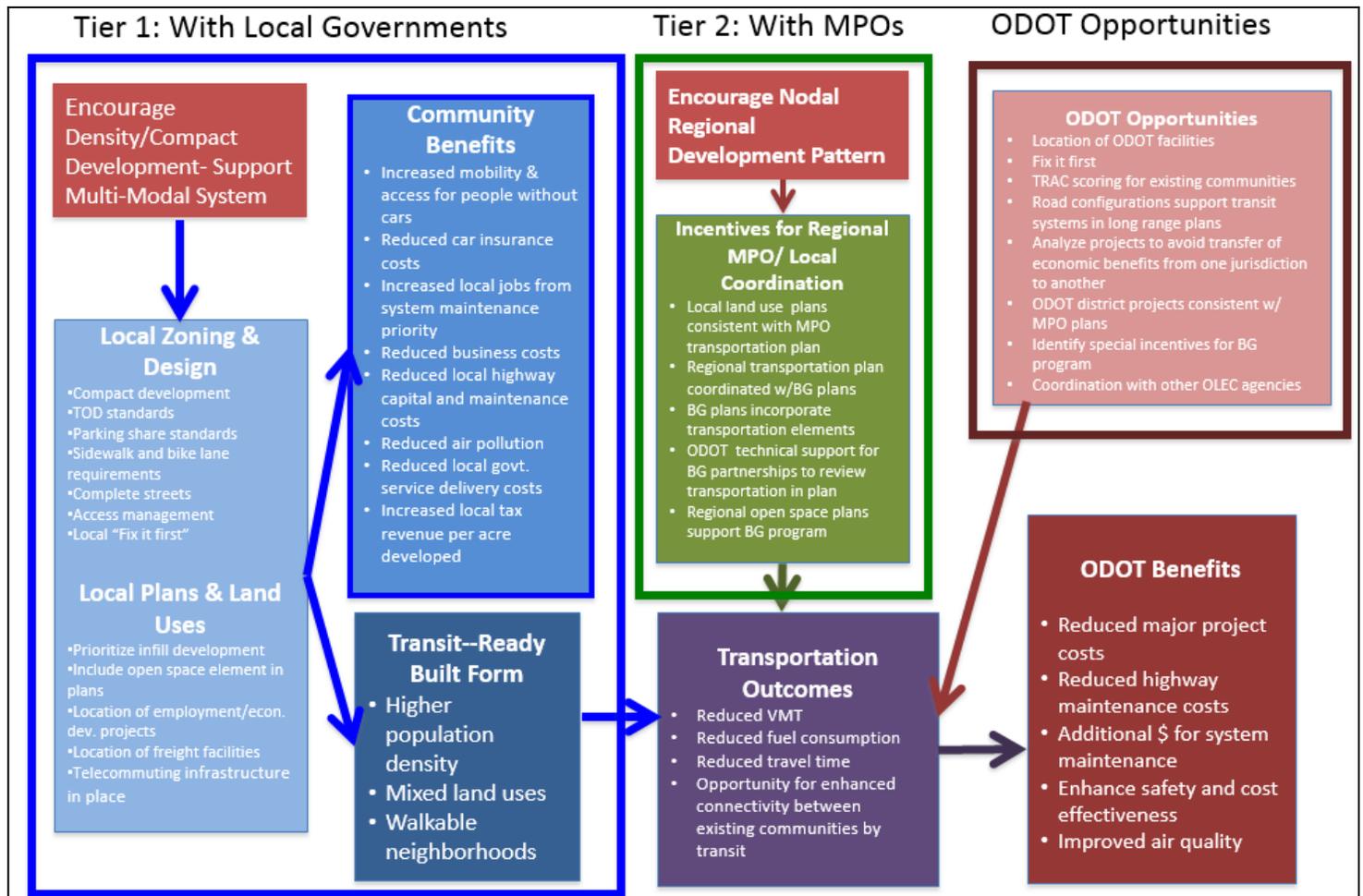
formation for each MSA area was classified into four Policy Tiers, based on the policy that was likely to have had an effect by 2010:

Tier 0 – states/regions with no Balanced Growth-Type policy;

Tier 1 – states/regions with voluntary BG-type policy that encourages both public and private investment decisions to align with Balanced Growth-Type principles, through incentives, technical assistance, education, and resources;

Tier 2 – states/regions with mandatory or rigorous BG-type policy that controls state/regional public investment.

Tier 3 – states/regions with mandatory or rigorous BG-type policy at all levels of gov-



Highlighted Project

Value of Balanced Growth (Continued from Page 7)

ernment, affecting both public and private investment. These policies most often take the form of urban growth boundaries, or rigorous open space dedication programs that effectively create a boundary for development.

The relationship between land use patterns and 14 transportation outcomes was evaluated via linear regression and scatterplot analysis. Visual evaluation of policy patterns was done per MSA using symbols for policy tiers. Conclusions were drawn based on visual analysis of the scatterplots and maps of each MSA, combined with supplemental socio-economic and other data.

The analysis demonstrated significant relationships for many of the measures evaluated. It was noted that while significant relationships are demonstrated,

causality is not demonstrated, due to the likelihood of complex, confounding factors affecting land use and transportation patterns. Some possible factors include market demand, property values, geographic characteristics of the MSA, population and household characteristics, locations of jobs and housing, external travel demand, convenience of transit, and total transportation and transit investment.

Policy patterns were less clear, likely due to confounding factors. Some general trends noted included Tier 3 metros clustering high on the sprawl index (less sprawl), and favorably on the transportation axis for many of the transportation measures. MSAs in the same state tended to cluster along the sprawl index. Geographic, political and land conditions, including urban growth boundaries, significant public open space, water bodies, geographic barriers, and internation-

al boundaries, all of which spatially constrict development, tended to raise the sprawl index and the favorability of transportation outcomes. It was noted that many of the policies in effect at the state level are fairly recent; more time is likely needed to see the effects of policies implemented in the 2000s and later.

The policy review study demonstrated that there are well-documented opportunities for ODOT to accrue transportation benefits through encouragement of compact, nodal development patterns at the local, regional, and state level, and within its own programs and processes.

In conclusion, the study outlines recommendations for future study, including analysis using a model that controls for complex factors; conducting case studies at the project level; and continuing analy-

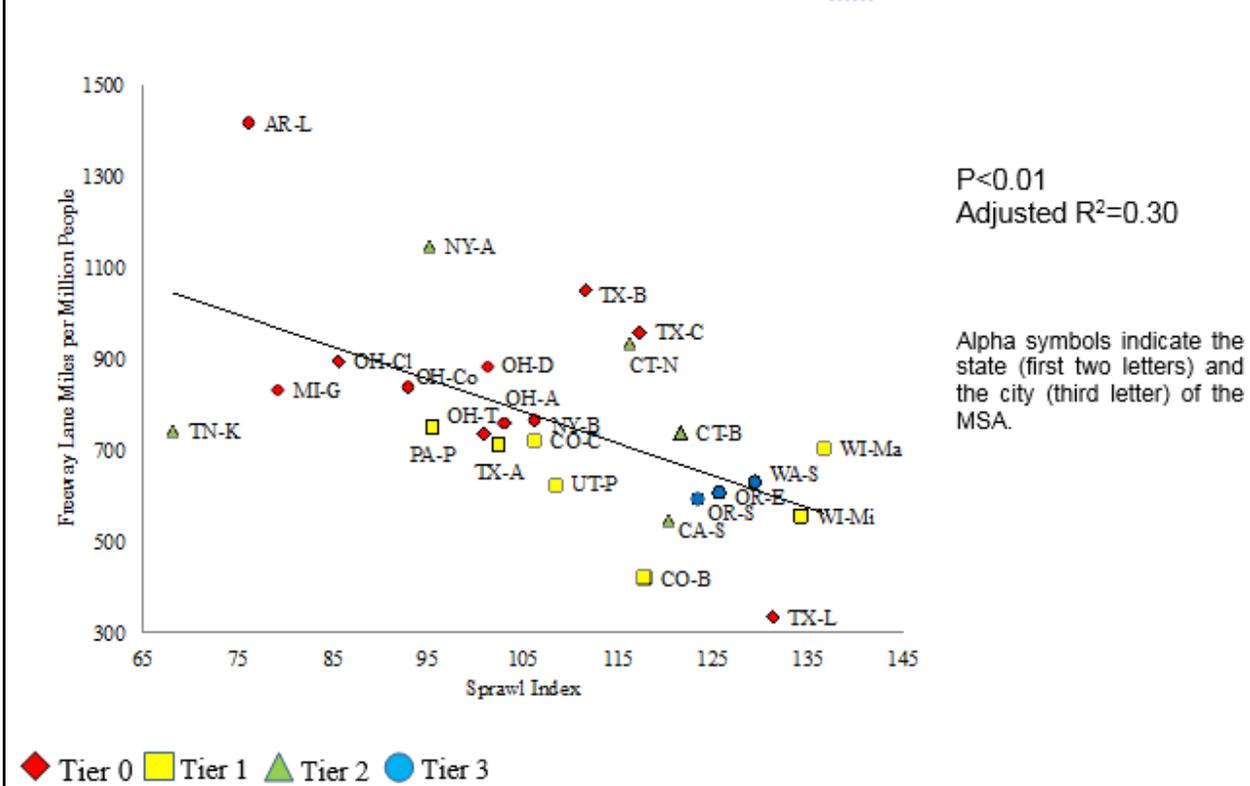
sis over longer periods of time.

References:

Ewing, R., Hamidi, S. (2014) Measuring Sprawl 2014, Smart Growth America, Washington, DC.

For copies of this or any ODOT research project report, please see the Research web site.

EXAMPLE SCATTERPLOT ANALYSIS: Freeway Lane Miles Per Million People



TRB Annual Meeting



Transportation Research Board
94th Annual Meeting

January 11–15, 2015 • Washington, D.C.

The 94rd Annual Meeting of the Transportation Research Board takes place in Washington DC, January 11-15, 2015. The spotlight theme for this years' meeting is **Corridors to the Future: Transportation and Technology**. For additional information on the annual meeting, check out the [TRB website](#).

For the third year we have published a guide containing information on Ohio-based presentations, which is available on the [Research website](#). A total of 63 sessions will highlight speakers and/or research from Ohio.

TRB State Partnership Visit

An important component of the TRB Technical Activities Division is the [Field Visit Program](#). Each year the division sends Program staff to state DOT research programs to meet state personnel, explore upcoming concerns and concepts, and identify trends.

On September 16th and 17th, Ohio DOT hosted both Scott Babcock (Senior Program Officer, Rail and Freight) and Scott Brotemarkle (Senior Program Officer, Marine/Intermodal Freight Specialist).

On the first day we spent time with Scott Phinney, Administrator of Statewide Planning and Research, and

Mark Locker, Freight Specialist. We started at the Port of Toledo with meetings to understand their role, and then a tour of their facilities. There's growth at this multi modal port, with truck, rail, marine modes working together.

Then we traveled to the Airline Junction site and spent time with Bill Harris, Norfolk Southern's Government Relations, as well as Melissa the contracted yard manager. They're undergoing yard expansion at this location and Ohio is a significant part of their business, with 10% of their miles and their employees here.

Marion Intermodal was our final

visit. Ted Graham and Kelly Bonnette led us on tours through their yard.

The annual Ohio Conference on Freight (www.ohiofreight.org) was a two day event that concluded our TRB state partnership visit. The TRB staff were impressed by the content and organization of the conference.

Nominate an Ohio organization, event and/or site for a future TRB State Partnership Visit. It's important that the professionals within TRB see and understand the infrastructure, needs and contribution of Ohio. Contact Cynthia Gerst with suggestions at Cynthia.Gerst@dot.state.oh.us.

Research Staff Changes

Congratulations to **Vicky Fout** on her promotion to Project Manager in the Office of Statewide Planning & Research. After 13 years with the Research Office/Section, Vicky has taken her skill set from the research world to the planning world. Her thorough knowledge, clear writing style, and no-nonsense communication have been critical to the research program as it has evolved over the past decade. She has helped many of the existing ODOT staff and researchers understand the regulations and the spirit of the research program and the value it can (and does) bring to the transportation industry. We wish Vicky all the best in her new position.

Congratulations to **Matt Miller** on his graduation from The Ohio State University with a Bachelors in Civil Engineering. Not only has he accomplished his educational goal, but Matt has also obtained his dream job. In January 2015, Matt will begin working as a full-time Transportation Engineer in District 9's Construction Department through ODOT's Transportation Civil Engineering Program. Matt

was a tremendous asset to the Research Section providing help with everything from inventory to review sessions to project site visits. We wish Matt all the best, not only in his new job, but also on the Miller Family Farm.

Congratulations to **Jill Martindale** on her promotion to District Research Coordinator within the Research Section. This new position solidifies the importance of district involvement in research as a large portion of the duties focuses on developing and managing research projects inspired by district staff. As part of her new position, Jill intends to place extra emphasis on the implementation of research results. "The districts are ODOT's frontline. Getting the people that are in the trenches involved in the research will help us get results that can be used. It will take us from theory to practice quicker."

Welcome to **Shanshan Chi**, a junior in Civil Engineering at The Ohio State University. She has just completed the Transportation Engineering course with Dr. Mark McCord.

RESEARCH PROGRAM WRAP UP

Calendar of Events

January 2015	Strategic Research Project RFP Posting
January 11-15, 2015	TRB Annual Meeting , Washington DC
January 16, 2015	RESULTS: Evaluation of the Viking-Cives TowPlow for Winter Maintenance . 9am via webinar or DOT CO
January 19, 2015	ODOT Closed - Martin Luther King Day
January 27, 2015	RESULTS: Evaluation of Box Culvert Maintenance Methods . 9am via webinar or DOT CO
January 31, 2015	Quarterly Reports due for active projects
February 16, 2015	ODOT Closed - President's Day
February 17, 2015	ORIL Board Meeting - Program Review/RFP Approval
March 2015	ORIL FY 2016 RFP Posting
March 6, 2015	Strategic Research Project RFP Closes 3:00PM(ET)
April 30, 2015	Quarterly Reports due for active projects
May 25, 2015	ODOT Closed - Memorial Day

Recently Published Final

Category	SJN w/ link	Description
Administration	134722	Creation of a Customer Relations Development System , June 2014, by Kelley Klaver Pecheux, AEM Corporation
Environmental	134662	Traffic Data for Integrated Project-Level PM2.5 Conformity Analysis, August 2014, by Heng Wei, University of Cincinnati
Maintenance	134489	Ice Prevention or Removal on the Veteran's Glass City Skyway Cables, August 2014, by Douglas Nims, University of Toledo
Pavements	134659	Incorporating Chemical Stabilization of the Subgrade in Pavement Design and Construction Practices, October 2014, by Shad Sargand, Ohio University
Roadway	134716	Evaluation of Ohio Work Zone Speed Zones Process, July 2014, by Melisa Finley, Texas A&M Transportation Institute
Structures	134695	Bridge Condition Assessment and Load Rating using Dynamic Response, July 2014, AKM Anwarul Islam, Youngstown State University

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"Research is a process of investigation. An examination of a subject from different points of view."
 — [Online Library Learning Center, University System of Georgia](#)