12-2014

The Value of Balanced Growth for Transportation: Executive Summary

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The Value of Balanced Growth for Transportation

FHWA Report Number:	FHWA/OH-2014/17
Report Publication Date:	December 2014
ODOT State Job Number:	134819
Project Duration:	16 months
Start Date:	August 20, 2013
Completion Date:	December 20, 2014
Total Project Funding:	$244,701.00
Research Agency:	Cleveland State University, Maxine Goodman Levin College of Urban Affairs, Washkewicz College of Engineering; CDM Smith
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Project Background

This project evaluates the benefit that programs like the Ohio Balanced Growth Program could bring to transportation agencies in Ohio.

Much has been written and observed about the decades-long pattern of outmigration 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. With the national economic challenges since 2008, municipal, regional and state transportation budgets are constricted, and many government entities are exploring ways to reduce their costs for both capital improvements and maintenance. For transportation agencies, an obvious question is the role that the pattern of development plays in transportation benefits involving cost, efficiency, effectiveness, and safety, as well as related social factors such as emissions and transportation access.

There is much research that 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 centers”, have been shown to provide transportation benefits through reduced, more efficient, more effective, and more cost-effective transportation infrastructure. Compact (higher density) development and focused (nodal) development areas are strong candidates for the wider use of alternative modes of transportation, including bicycling, public transit and walking.

Transportation benefits that result include:

- Transportation Effectiveness: reduced construction, maintenance and operations costs
- Transportation Efficiency: increased transportation mode choice (public transit, bicycle and pedestrian, as well as auto); reduced travel times, delay and congestion; reduced peak travel demand and vehicle miles traveled per capita.

- Transportation-Related Social and Community Benefits: improved access to transportation for all, especially those who don't drive; increased safety; reduced air pollution; reduced transportation costs for citizens, businesses and governments; reduced fuel consumption; and increased property values, and economic development, in redevelopment areas.

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 goal is to encourage more infill and development in designated Priority Development Areas; and more conservation in designated Priority Conservation and Priority Agricultural areas.

Study Objectives
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, namely increased transportation efficiency and effectiveness.*

Specific Project Objectives included:

- *Literature Review. Understand the full range of Balanced Growth programs in the nation, and existing research, modeling methods, and policy recommendations related to their effect on transportation planning, efficiency and effectiveness.*
- *Data Collection. Collect and develop data that documents the relationship of incentives and policy in Balanced Growth programs to transportation investment, efficiency and effectiveness.*
- *Data Analysis. Synthesize the new data, for use by state, regional MPO, and local governments in understanding the potential effects of Balanced Growth land use policy decisions on transportation investment, efficiency and effectiveness.*
- *Policy Review. Develop recommendations for state, regional MPO, and local government policy related to land use that will improve transportation efficiency and effectiveness.*

Description of Work
Aligning with the project objectives above, the following steps were followed:

1. Literature Review. A literature review was completed which included a scan of policies and programs in use across the United States and an inventory of state-level programs in all 50 states; and research documenting the connection between land use patterns and transportation outcomes. Information on modeling methods, ODOT policy and programs, and the Ohio Balanced Growth Program was also investigated.

2. Data Collection. 26 metropolitan areas (including 5 in Ohio) were selected as focus areas across the country, using selection criteria 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 was then collected for each metropolitan area at the Metropolitan Statistical Area (MSA) level, as defined by the US Census Bureau. Data ranged from political, demographic, and economic, to land use and development characteristics and patterns, to transportation measures. After evaluation of several alternatives, consolidated land use measures were used as classified by the Sprawl Index, a composite measure developed by Ewing et al in 2002 and expanded in 2014 (1). Transportation measures were obtained through the Texas A&M Transportation Institute Urban Mobility Study. All quantitative data used were from 2010. Policy information for each MSA area was also collected, and classified into four Policy Tiers, based on the policy that was likely to have had an effect by 2010, which most often was policy enacted before 2004:

Tier 0 – states/regions with no policy related to Balanced-Growth-type development patterns;

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 affects state/regional (as applicable) public investment. This most often takes the form of a state policy plan that drives state and regional public commitments and investment.
Tier 3 – states/regions with *mandatory or rigorous* BG-type policy that requires all levels of government align with compact, nodal development patterns, affecting both public and private investment. These policies most often take the form of urban growth boundaries, or rigorous open space dedication and acquisition policies that effectively create a boundary for development.

3. Data Analysis. Using the sprawl index as the land use composite measure, 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 designation of each MSA's effective policy. Conclusions were drawn based on visual analysis of the scatterplots and maps of each MSA, combined with supplemental socio-economic and other data.

The Sprawl Index composite used in the analysis is a scale measure with a median of 100, and a range of approximately 45 to 425 in the MSAs used to define the index. The Index combines 22 land use measures into four factors: density, land use mix, activity centering (nodality), and street accessibility, which are then combined into a composite. A high rating indicates less sprawl; a low rating indicates more sprawl. (1)

Transportation outcomes evaluated included the following:
Transportation Effectiveness:
Lane Miles. Freeway Lane Miles Per Million People, and Arterial Lane Miles Per Million People. It was felt that total lane miles would be an effective surrogate for cost in both construction and maintenance/operations.
Transportation Efficiency:
Mode Choice. Public Transportation Annual Passenger Miles Per Capita.
Vehicle Miles Traveled (VMT). Daily Vehicle Miles Traveled Per Capita, Freeway Vehicle Miles Traveled Per Capita, and Arterial Daily Vehicle Miles Traveled Per Capita.
Travel Delay. Annual Hours of Delay Per Capita, Annual Hours of Delay Per Commuter.
Transportation-Related Community and Economic Benefits.
Emissions. Sulfur Dioxides per Million People, Nitrogen Oxides per Million People, and Volatile Organic Compounds per Million People.
Safety. Annual Fatal Collisions per Million People, Annual Injury Collisions per Million People, and Annual Property-Damage-Only Collisions per Million People.

4. Policy Review. A final step in the method was to understand the potential implications in Ohio of existing and potential policy elements that characterize Balanced-Growth-Type programs. As the transportation benefits of land use policy are identified in the literature and going forward, it will be important for ODOT to have a "road map" for approaches to supporting these policies through their existing programs and processes, and through future research and collaboration. Initial concepts about this "road map" were outlined in terms of local, regional and state-level policy; potential outcomes; and potential benefits.

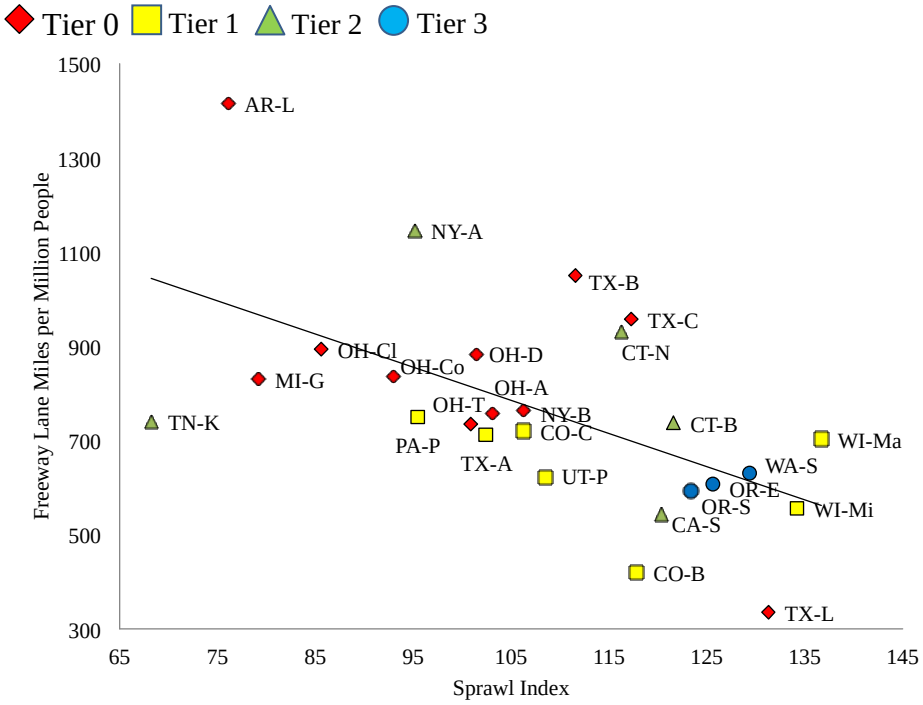
Research Findings & Conclusions
Significant relationships were demonstrated in the scatterplot analysis for many of the measures listed above. It was noted that while significant relationships are demonstrated, causality is not demonstrated, due to the likelihood of complex, confounding factors affecting 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 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 international 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.

EXAMPLE SCATTERPLOT ANALYSIS: Freeway Lane Miles Per Million People



P<0.01
Adjusted R^2=0.30

Alpha symbols indicate the state (first two letters) and the city (third letter) of the MSA.

In summary, general conclusions are:

- Transportation benefits of compact, nodal development are demonstrated in the literature
- This study's technical analysis demonstrates a relationship between land use patterns and transportation benefits, but causality is unknown
- Policy review demonstrates benefits to local, regional and state governments that result from policy approaches fostering density and nodal development patterns
- More work is needed to control for external and complex confounding factors
- Time especially is needed to allow policies to demonstrate effect

Recommendations for Implementation of Research Findings

Three general recommendations for future study are outlined:

- Design a model, and identify associated data needs, to control for external and complex factors as noted above
- Develop case studies to evaluate change and transportation benefits of site-level projects
- Conduct long-term research to evaluate Tier policy effects over longer periods of time

References:(1) Ewing, R., Hamidi, S. (2014) Measuring Sprawl 2014, Smart Growth America, Washington, DC.