The Value of Balanced Growth for Transportation

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TEAM MEMBERS

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Research Objectives

Overarching Goal:
Assist ODOT with understanding the relationship of transportation decisions to land use policy that supports transportation benefits, namely increased transportation efficiency and effectiveness.
Research Objectives

1) 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

2) Data Collection. Collect and develop data that documents the relationship of incentives and policy in Balanced Growth programs to transportation investment, efficiency and effectiveness

3) Data Analysis. Synthesize the new data, for use by state, MPO, and local governments in understanding the potential effects of Balanced Growth land use policy decisions on transportation investment, efficiency and effectiveness

4) Policy Review. Develop recommendations for state, regional MPO, and local government policy related to land use that will improve transportation efficiency and effectiveness
1. Literature Review Overview

• Range of policies in use, classified in tiers
• The Ohio Balanced Growth Program, and Balanced-Growth-Type programs by state
• The Land-Use Transportation Connection: methodologies, land use measures, transportation measures, road infrastructure and transportation cost, commuting times and distances, trip rates and mode choice, vehicle-miles traveled, congestion and travel delay, emissions, vehicle collisions
Transportation Benefits

TRANSPORTATION EFFECTIVENESS
- Reduced lane miles
- Reduced construction costs
- Reduced maintenance/ops costs

TRANSPORTATION EFFICIENCY
- Reduced VMT per capita
- Increased opportunity for optimization of transit/alternative modes
- Reduced peak travel demand
- Reduced congestion/delay/travel times

ECONOMIC/COMMUNITY TRANSPORTATION BENEFITS
- Increased safety
- Increased mobility/access for non-drivers
- Improved transportation choice
- Reduced fuel consumption
- Increased local maintenance jobs
- Reduced transportation costs to citizens, business, government
- Reduced local highway capital and maintenance costs
- Reduced emissions/air pollution
- Increased tax revenue in redeveloped areas

*Blue Text = technical evaluation in this study*
Balanced-Growth-Type Programs

Are programs that attempt to create:

• Increased density/compactness in development areas
• Increased redevelopment/infill of existing areas
• Nodal patterns of development (focus areas)
• Prioritization of development and conservation areas

Community, regional or state planning, by itself, is not a criterion
Tier Classification of Policies

- **TIER 0**: No Balanced-Growth-type policy
- **TIER 1**: Voluntary, incentive-driven; may be supported by education, resources and technical assistance; may address public and/or private investment
- **TIER 2**: Mandatory policy affecting state (and sometimes regional) agency policy, investment and prioritization
- **TIER 3**: Mandatory policy affecting state, regional, and local investment policy; controls both public and private investment
State Programs Findings

TIER 0: 24 States (IN, IL, WV)
TIER 1: 11 (Ohio, PA, WI, MN, KY) - CO
TIER 2: 13 (NY) – (also MD, DE, NJ, FL, TN)
TIER 3: 2 (OR, WA)

• Many recent Tier 2’s
• Some former Tier 3’s and 2’s recently downgraded to 1’s
• Tier 3’s very longstanding, since 1973 (OR) and 1990 (WA)
Range of Policies Utilized in the States

**TIER 1:** Priority Development and Conservation Areas with attached incentives for aligned projects, streamlined approval processes, support and funding for open space and historic resource conservation, technical assistance, public education, research

**TIER 2:** State or regional guide plan with mandatory state/regional agency alignment of policy/investment; elimination of subsidies to non-aligning programs/policies

**TIER 3:** State guide plan; mandatory agency and local government alignment; mandatory urban growth boundaries and service areas
General Findings in the Literature

• Less dense developments require more lane miles per dwelling
• Transit-oriented developments are associated with fewer vehicle trips and greater transit share
• Better jobs-housing balance (nodality) is associated with lower VMT and commute times
• Mixed-use developments provide an opportunity to reduce trips, providing a pedestrian alternative for some trips
• Reduced number and length of trips are associated with reduced emissions and increased safety
2. Data Collection and Analysis

• Focus area Metropolitan Service Area (MSA) selection
• Data collection on MSAs (quantitative and qualitative)
• Data analysis on MSAs via scatterplot and regression analysis
• Visual assessment of tier patterns in scatterplots
• Results
Focus Area MSAs: Selection Criteria

- Data available from both Ewing (2014) Sprawl Index study, and Texas A&M Transportation Institute Urban Mobility study (2012), both using 2010 data
- Exclude very large metro areas (NY, Boston etc) over 7 counties
- Exclude states with unique planning frameworks (HI, VT)
- Choose a range of scores on sprawl index
- Choose a range of positive, neutral and negative growth rates from 1990-2010
- Choose a range of state-level Tier policy types
- Include all Ohio MSAs with available data
Focus Areas: 26 Selected MSAs
14 states; 5 in Ohio

- **OH**: Akron, Cleveland, Columbus, Dayton, Toledo
- **AR**: Little Rock
- **CA**: Stockton
- **CO**: Boulder, Colorado Springs
- **CT**: Bridgeport-Stamford, New Haven
- **MI**: Grand Rapids
- **NY**: Buffalo, Albany
- **OR**: Eugene, Salem
- **PA**: Pittsburgh
- **TN**: Knoxville
- **TX**: Corpus Christi, Laredo, Beaumont, Austin
- **UT**: Provo
- **WA**: Spokane
- **WI**: Madison, Milwaukee
MSA Data Collection

- **Sprawl index values:** land use mix, activity centering, street connectivity, composite
- **Land use data:** area, population and pop density, employment, employment density, countywide job-population balance
- **Travel, network and congestion data:** commuters, freeway daily VMT/lane miles, arterial daily VMT/street lane-miles, public transportation annual passenger miles (million) and unlinked passenger trips, total delay in hours
- **Emissions data:** Nitrogen oxides, sulfur dioxide, volatile organic compounds
- **Collision data:** Fatal collisions, fatalities, injury collisions, property-damage-only collisions
- **Other data:** GDP growth, vehicle ownership, policy tiers, housing growth by decade
Data Analysis Organization

1. TRANSPORTATION EFFECTIVENESS
   • Total lane miles per million people (freeway, arterial)

2. TRANSPORTATION EFFICIENCY
   • Trip rates and mode choice (transit annual passenger miles)
   • Daily vehicle miles traveled (freeway, arterial, total)
   • Congestion and travel delay (annual hours per capita and per commuter)

3. TRANSPORTATION-RELATED COMMUNITY AND ECONOMIC BENEFITS
   • Emissions (nitrogen oxides, sulfur dioxides, VOTs)
   • Safety (fatality, injury and property damage collisions)
Highest Sprawl Index (least sprawl) = 425.2
New York County, NY

Lowest Sprawl Index (most sprawl) = 45.5
Oglethorpe County, GA
Knoxville, TN
Sprawl Index 68.2

Madison, WI
Sprawl Index 136.7
Eugene OR: Sprawl Index 125.6
(urban growth boundaries 1973)
Spokane WA: Sprawl Index 129.4
(urban growth boundaries 1990)
Madison, WI: Sprawl Index 136.7

Milwaukee, WI: Sprawl Index 134.2
Columbus OH: Sprawl Index 93.0

Akron OH: Sprawl Index 103.2
Boulder, CO: Sprawl Index 117.87
Freeway Lane Miles Per Million People

Linear Regression: Significant (p<0.01, Adj. R^2 = 0.30)

Also studied: Arterial Lane Miles per Million People

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Policy Tiers Observations: Lane Miles

- Measure expected to be higher for lower sprawl index (more sprawl)
- Tier results were scattered overall, with general trends
- Tier 3 cluster trends hold for freeway lane miles, not as strong for arterial
- State cluster trend holds throughout all plots
- Possible confounding factors: market conditions, population and household characteristics, jobs-housing locations, MSA size/configuration, external travel demand, overall transportation investment
- Outliers: Little Rock (high); Laredo (low)
Public Transportation Annual Passenger Miles Per Capita

Linear Regression: Not Significant (p=.15, Adj. R² = 0.05)
Policy Tiers Observations: Public Transportation Annual Passenger Miles Per Capita

- Measure expected to be higher for higher sprawl index (less sprawl)
- Tier results were scattered overall, with all tiers having both high and low ratings
- Non-land-use factors highly likely to be at work: transit convenience vs. auto use; jobs-housing locations; weather; overall transit investment; market demand; social desirability; population-household characteristics and locations
- Outliers: Pittsburgh (high); Beaumont, Little Rock, Knoxville (low)
Daily Vehicle Miles Traveled (VMT) Per Capita

Linear Regression: Significant (p<0.01, Adj. R² = 0.38)

Also studied: Freeway Daily VMT Per Capita, Arterial Daily VMT Per Capita
Policy Tiers Observations: Daily VMT Per Capita

- Tier 3 MSAs cluster for Total Daily and Freeway Daily VMT, less for Arterial Daily VMT
- States cluster along sprawl index as usual
- Could be result of mandatory Urban Growth Boundaries; but Wisconsin requires explanation
- Other tiers scattered, with general trend of Tier 1 and Tier 2 within the group – only one outlier (Knoxville)
- Outliers: Little Rock, Beaumont (high); Boulder, Laredo (low)
- Likely confounding factors at work
Results Summary: Land Use Factors and Transportation Outcomes

• Relationships between land use factors and transportation outcomes demonstrated in Ewing’s 2009 sprawl index analysis still hold for 2010 data

• Relationships were significant between sprawl index and freeway lane miles, hours of delay, daily VMT, emissions, and safety

• Models are “weak” with a wide variation from the regression line
Results summary: Policy and Land Use Patterns

• Less clear
• Tier 3 MSAs generally cluster across both sprawl index and specific variables
• States generally cluster along sprawl index
• Modeling to control for complex and external factors is recommended (market demand, property values, size/shape of MSA, external travel demand, socio-demographic factors, etc)
3. Policy Review Overview

• Review ODOT transportation programs and funding mechanisms
• Review ODOT-MPO agency programs, policies, processes and funding
• Review Balanced Growth plans and implementation
• Review academic and agency research on outcomes of transportation policy
• Identify state, regional and local: policies, outcomes and benefits
Policy Lit Review:
ODOT Role and Benefits through Balanced Growth

**Tier 1: With Local Governments**

- **Encourage Density/Compact Development and Support Multi-Modal System**
- **Local Zoning & Design**
  - Compact development
  - TOD standards
  - Parking share standards
  - Sidewalk and bike lane requirements
  - Complete streets
  - Access management
  - Local “Fix it first”
- **Local Plans & Land Uses**
  - Prioritize infill development
  - Include open space element in plans
  - Location of employment/econ. dev. projects
  - Location of freight facilities
  - Telecommuting infrastructure in place
- **Transit--Ready Built Form**
  - Higher population density
  - Mixed land uses
  - Walkable neighborhoods

**Community Benefits**
- Increased mobility & access for people without cars
- Reduced car insurance costs
- Increased local jobs from system maintenance priority
- Reduced business costs
- Reduced local highway capital and maintenance costs
- Reduced air pollution
- Reduced local govt. service delivery costs
- Increased local tax revenue per acre developed

**Encourage Nodal Regional Development Pattern**
- **Incentives for Regional MPO/Local Coordination**
  - Local land use plans consistent with MPO transportation plan
  - Regional transportation plan coordinated w/BG plans
  - BG plans incorporate transportation elements
  - ODOT technical support for BG partnerships to review transportation in plan
  - Regional open space plans support BG program

**ODOT Opportunities**
- Location of ODOT facilities
- Fix it first
- TRAC scoring for existing communities
- Road configurations support transit systems in long range plans
- Analyze projects to avoid transfer of economic benefits from one jurisdiction to another
- ODOT district projects consistent w/MPO plans
- Identify special incentives for BG program
- Coordination with other OLEC agencies

**Transportation Outcomes**
- Reduced VMT
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**ODOT Benefits**
- Reduced major project costs
- Reduced highway maintenance costs
- Additional $ for system maintenance
- Enhance safety and cost effectiveness
- Improved air quality

**Tier 2: With MPOs**

- **Encourage Nodal Regional Development Pattern**
  - **Incentives for Regional MPO/Local Coordination**
  - Local land use plans consistent with MPO transportation plan
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ODOT Role with Local Governments

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ODOT Role and MPO policy

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ODOT Direct Policy and Practices

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Tier 2: With MPOs

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Encourage Density/Compact Development and Support Multi-Modal System
Conclusions and Recommendations

- 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 analysis demonstrates benefits that result from policy approaches.
- More work is needed to control for external and complex confounding factors.
- Time especially is needed to allow policies to demonstrate effect.
Future Study

- Design model, and identify associated data needs, to control for external and complex factors
- 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
Questions?

Thank you!