Advancing decision making in complex urban watersheds

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LEAM Lab, LEAMgroup®
and
Urban and Regional Planning
University of Illinois at Urbana-Champaign
Informed Decision-Making

- Modeling (LEAM)
  - Systems based
  - Spatio-temporal
  - Multi-model platform
- Impact assessment
  - Water quality and quantity
  - Fiscal impacts, etc.
  - Tradeoffs
- Information management
  - Planning portal
  - Content management
- Policy analysis
  - Interlinked models and frameworks
  - Decisionmaking
- Referenced projects:
  - Iowa-Cedar Rivers Basin Interagency Watershed Plan
  - Chesapeake Bay Megaregions Projects
Land use modeling (LEAM) and application
Modeling outcomes: Megaregion Project
Impact Assessment
Aggregate Growth by ...

Legend
- 100-300 acres New Development
- 300-500 acres New Development
- 500-700 acres New Development
- 700+ acres New Development
Estimating Water Demand

Water Demand for Chicago Region HUC 8 watersheds
Measuring Infrastructure Spending

- SCALDS Modeling

### Residential Land Consumption by Type (acres)

<table>
<thead>
<tr>
<th>Year</th>
<th>Reference LEAMcon</th>
<th>Reference 250K</th>
<th>MED LEAMcon</th>
<th>MED 250K</th>
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<tbody>
<tr>
<td>2000</td>
<td>784</td>
<td>79</td>
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<tr>
<td>2005</td>
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<td>150</td>
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<td>2010</td>
<td>1,793</td>
<td>240</td>
<td>4,621</td>
<td>609</td>
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<tr>
<td>2015</td>
<td>841</td>
<td>144</td>
<td>2,240</td>
<td>334</td>
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<td>2020</td>
<td>632</td>
<td>163</td>
<td>1,979</td>
<td>372</td>
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<td>2025</td>
<td>956</td>
<td>137</td>
<td>2,414</td>
<td>347</td>
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<td>2030</td>
<td>877</td>
<td>141</td>
<td>2,177</td>
<td>251</td>
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<tr>
<td>2035</td>
<td>896</td>
<td>144</td>
<td>2,531</td>
<td>367</td>
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<td>Total</td>
<td>7,987</td>
<td>1,198</td>
<td>10,131</td>
<td>2,509</td>
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### Total Vehicle Transportation Costs with Value of Time (SM)

<table>
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<th>Year</th>
<th>Ref LEAMcon</th>
<th>Ref 250K</th>
<th>MED LEAMcon</th>
<th>MED 250K</th>
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<td>1,593</td>
<td>1,841</td>
<td>1,548</td>
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<td>2015</td>
<td>1,674</td>
<td>2,049</td>
<td>1,606</td>
<td>1,914</td>
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<td>2020</td>
<td>1,753</td>
<td>2,273</td>
<td>1,674</td>
<td>2,090</td>
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<td>2025</td>
<td>1,854</td>
<td>2,502</td>
<td>1,743</td>
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<td>2030</td>
<td>1,948</td>
<td>2,738</td>
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<td>2,043</td>
<td>2,981</td>
<td>1,888</td>
<td>2,647</td>
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<td>Total</td>
<td>13,566</td>
<td>17,073</td>
<td>12,964</td>
<td>15,820</td>
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Champaign IL transportation cost scenarios
Visualizing land use change

- Showing development shifts

McHenry County IL47 upgrade
Runoff impact: L-THIA

Impact of land use change in Montgomery county, MD
Advancing modeling environments
Web-based environment (portal)

Chesapeake Bay Megaregion

The Federal Highway Administration wants its members to engage in transportation investment decisions at the mega-region scale, in part because mega-regions reflect the “national competitive regions” that are competing in the future global economy. Despite their efforts to model the mega-region scale, the Federal Highway Administration has to tackle the force of such a modeling framework and tools, which include the need for a 10-30 year horizon approach, 25-50 year project elements, and 50 multi-modal transportation networks, and it impacts of short and long distance travel.

Our proposed data analysis focuses on a critical, overarching, complex, and evolving aspect of transportation policy decisions: how the cost and the pricing of different regional transportation investments affects travel performance within the large region. Specifically, we will conduct a number of transportation pricing experiments and examine how changes in prices affect travel behavior, land use, economic growth, residential energy consumption, and traffic conditions throughout the Baltimore-Washington region—which is what we mean by mega-regional, integrated transportation modeling. To create different scenarios we will increase prices in different ways, at different places, at different times, and in different amounts. The goal is to focus on scenarios that would impact passenger travel costs within the region, where we have most price sensitive travel choice and make choice travel within the megaregion. The planned analysis and modeling framework is built on a set of models originally developed at the University of Michigan.

Although ELM (NLCD) is primarily concerned with land use modeling, this tool can model for additional purposes related to the project. Following is a list of agendas modeled with different parts of the project.

National Center for Smart Growth (NC2G): Prime contractor and ultimate responsible for the conduct and recommendations of the project. Land use, transportation, and economic modeling.

IC2I: Assistance with implementation of the management of the project, consistent and quality control for documents, and incorporating pricing into the models and scenarios.

- Parsons Brinckerhoff (PB): Advanced transportation modeling is general and specific expertise gained throughout the development of the Baltimore (DC) megaregion model as well as their MMP 2035 models they have developed in Oregon and Ohio.
- CNU: helped with the formation of the board and the organization of the project.
- Metropolitan Institute at Virginia Tech University (VTC) and Applied Knowledge of mega-regional planning and connections with all aspects of planning in the part of the megaregion that is in Virginia.
- David Stierweht: International perspective on planning for mega-regions.

Click here to see the project report.
Iowa-Cedar Rivers Basin
Interagency Watershed Plan
Distributed Data Management
Individualized Access and Control
Loosely Coupled Models
Watershed Analysis

Based on land use change modeling dynamics
Water Quantity Modeling
Tightly Coupled Models
Tightly Integrated LUC Model
Policy evaluation
Megaregion Modeling framework
Differences in total runoff by county
Scenario comparison
Groundwater Protection Mask
Groundwater Protection Change Map
High quality Ag land Stress
Green Infrastructure Change

- Policy context – where to focus attention
Resources

• [http://www.leam.illinois.edu/maryland/](http://www.leam.illinois.edu/maryland/)

• [www.leamgroup.com](http://www.leamgroup.com)
  ▫ [http://datacenter.leamgroup.com/iowa_cedar](http://datacenter.leamgroup.com/iowa_cedar)

• [www.leam.illinois.edu](http://www.leam.illinois.edu)
  ▫ [www.leam.illinois.edu/lmwpss](http://www.leam.illinois.edu/lmwpss)