GIS in Transportation Planning

GIS in Urban Analysis
GEOG 5995

Andrea Grygo
Duluth-Superior Metropolitan Interstate Council
Arrowhead Regional Development Commission
Outline

• Metropolitan Interstate Council - MIC
• GIS in transportation planning
• Case studies / examples
• Visualization
• Questions and discussion
Who is the MIC?

- Federally mandated metropolitan planning organization (MPO) since 1975
- Transportation planning (all modes)
- Staff of 7
- www.dsmic.org
Transportation planning

- UMD-CSS Transportation Plan
- East 2nd St Access Management Plan
- MN/WI Freight Plan
- Bike Route Planning
- Proctor Comprehensive Plan
- Long Range Plan
- Transportation Improvement Program
- MIC Area Trails Plan
- Duluth / Superior Port Land Use Plans
- Duluth Heights Traffic Circulation
- Safe Routes to School
- Rice Lake Road Corridor Study
- Transportation Safety Management
- Endion Transportation and Land Use
- NW Superior Traffic Circulation
Using geography to plan

• What is the question we’re trying to answer
  – How can geography help

• Base Data
• Land Use (current & future)
• Zoning
• Aerial imagery
• Road network, bike routes, transit routes, sidewalks
• Specialty data (project-specific)

www.ncddc.noaa.gov
GIS in Urban Planning

Data creation
• Land Use
• Zoning

Proctor Comprehensive Plan
2009
Map 4
Zoning

Legend
Zoning districts
- C-1 Central Commercial/Retail
- C-2 Highway Commercial
- Industrial
- Open Space/Recreational
- O-S Single family residential
- O-I Single family residential
- O-2 Two family residential
- A Apartment residential
Suburbs
- City boundary
- Road
- Stream
Spatial relationships

2003 Average Daily Traffic (ADT)
- 0 - 2500
- 10001 - 15000
- 2501 - 5000
- 5001 - 10000
- 15001 - 20000
- 2006 ADT for I-35: 41,000

Average Daily Traffic
Source: MnDOT
Planning process
Data analysis

Percent of Transit-Supportive Area Served

*Transit-supportive* = 3 or more households/acre

<table>
<thead>
<tr>
<th>LOS</th>
<th>% Transit-supportive area covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90 - 100%</td>
</tr>
<tr>
<td>B</td>
<td>80 - 89.9%</td>
</tr>
<tr>
<td>C</td>
<td>70 - 79.9%</td>
</tr>
<tr>
<td>D</td>
<td>60 - 69.9%</td>
</tr>
<tr>
<td>E</td>
<td>50 - 59.9%</td>
</tr>
<tr>
<td>F</td>
<td>&lt; 50%</td>
</tr>
</tbody>
</table>

Legend

- Route 17
- Route 16
- Roads
- 1/4 mile buffer
- Transit-supportive area

Legend

- 6.5 Intersection crash rate per million vehicle miles
- **Segment crash rate** per million vehicle miles
  - 0.41 - 0.69
  - 1.05 - 1.00
  - 3.51
  - 7.18

Rice Lake Road Plan
Crash rates for segments and intersections

Map 3
Bike Compatibility Index

- # lanes
- Curb lane width
- Paved shoulder width
- Residential
- Speed limit
- AADT
- Turn lanes
- Parking lanes
- Slope
Data analysis

• Safe Routes to School (SRTS)
Long Range Planning

- Demographics
  - Census / American Community Survey
- Development
  - Suitability
  - Infrastructure

This map illustrates a long-term plan to extend utility services, in five-year stages, to those areas identified in this plan as most suitable for future growth. As described in the text, the future growth areas were identified through a process that combined GIS analysis, information from the jurisdictions’ comprehensive plans and study committee input. This staging plan is conceptual and its implementation would depend on other factors such as the condition of the existing utility infrastructure and the amount of funding available for upgrades and expansions.
Modeling

- **Travel Demand Model (Transportation Model)**
  - Predict travel changes
  - Computerized network (Network Analyst)
  - → Level of Service
  - → AADT (traffic volume)

- **Land Use Model**
  - Linkages between land uses: movement of people, freight, and information
Planning and Public Participation

London Road 10th to 26th Aves E
Future Concepts*
*potential configurations

Option A
- Continuous left-turn lane
- 2 driving lanes (1 each direction)
- 2 bike lanes (1 each direction)
- 2 parking lanes (1 each direction)

Option B
- Various potential types of medians
  ~24' wide
- Left turn lanes where appropriate
- 2 driving lanes (1 each direction)
- 2 parking lanes (1 each direction)

Option C
- Center median, various potential types
- 2 driving lanes (1 each direction)
- 2 bike lanes (1 each direction)
- 2 parking lanes (1 each direction)
GIS Tools
Visualization
Current configuration

Proposed reconfiguration

<table>
<thead>
<tr>
<th>Tool</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rubber stamp</td>
<td>cover up center line</td>
</tr>
<tr>
<td>Pencil</td>
<td>draw yellow median lines</td>
</tr>
<tr>
<td>Select/Paste</td>
<td>add turn arrows from another photo</td>
</tr>
</tbody>
</table>

Resource: GIMP
free image editing program  www.gimp.org
Map 4.1 Visualization of recommendations

A. London Rd. reconfiguration with a center lighted median and one travel lane in either direction.
B. Bulbouts and lamps on London Rd at 24th Ave E
Installation of Lakewalk Arch for I-35 overpass pedestrian bridges, 16th/17th Ave E shown.
Visualization

- Google SketchUp
Visualization
• Export layer to KML (available at 9.3)
• 3D Analyst Tools / Conversion / To KML
• Open in Google Earth
• Can put on website for public download
• Provide Google Earth KMZ file as link on website
• Save to desktop, user opens Google Earth and adds KMZ file
Resources

• URiSA – Urban and Regional Information Systems Association  urisa.org

• ESRI: GIS Solutions for Urban and Regional Planning


  Mapping Global Cities  GIS Methods in Urban Analysis

• APA – American Planning Association

  planning.org  •  mnapa.com

• American Institute of Certified Planners (AICP)
References


• The Geography of Transport Systems
  http://people.hofstra.edu/geotrans/eng/ch6en/conc6en/activityuse.html

• Projecting Land-Use Change: A Summary of Models for Assessing the Effects of Community Growth and Change on Land-Use Patterns
  http://faculty.washington.edu/pwaddell/Models/REPORTfinal2.pdf

• St. Cloud Area Planning Organization www.stcloudapo.org
Interested?

Metropolitan Interstate Council Planning Internship

- Summer 2009
- Fall Semester 2009

Projects
- UMD-CSS Area Transportation Study
- Bike Route and Trail Planning
- Long Range Transportation Plan 2035
- Harbor Planning

Send cover letter and resume by Friday May 8th to
Andy McDonald, Principal Planner  amcdonald@ardc.org

Andrea Grygo - agrygo@ardc.org - 529.7515