Needs and Equity in Prioritizing Sidewalk

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Context

- For decades sidewalk needs were ignored
- Greensboro Walkability Policy 2003 changed that
- Committed to ongoing actions including sidewalk construction targeted to high need locations

Walkability Policy in City of Greensboro
Greensboro City Council adopted the Policy in 2002 in recognition of the need to promote the development of a safe, convenient, and attractive system of pedestrian facilities throughout Greensboro.
Context

- Between 2006 & 2015, City built 133.3 miles of sidewalk.
- Currently, there is 525 miles of sidewalk throughout the City; 76.8 miles under design or construction.
- Much of this is independent priority sidewalk.
MILES of Sidewalk
ADDED IN THE CITY OF GREENSBORO SINCE 2006

Independent Sidewalk Projects

- 44.2 miles

City Roadway Bond Projects

- 11.5 miles

NCDOT Road Projects

- 14 miles

Private Developers

- 56.9 miles

Annexation

- 6.7 miles

TOTAL: 133.3 MILES
Overview

- Context
- Methodology
- Validation
- Conclusion

http://www.greensborodailyphoto.com/current-affairs/
Context

Why prioritize independent priority sidewalks?

Prioritization is KEY

Needs

Limited Resources

Public/Political Support

Prioritization is KEY
Staff developed a **Manual Prioritization Method** based on literature, field experience, city council guidance, and data:

- Roadway type, volume, speed
- Land use – multifamily, commercial, school, park and recreation center
- Demand – transit stop, path wom
- Connectivity – filling gap
- Distribution across city
Manual Methods to GIS model

- Manual method effective but time consuming
- Wanted a new automated, GIS based tool to support & streamline the process
- Established to conceptually mirror the thought process of the manual method
- Needed to apply an equity adjustment to identify most needed sidewalks by district as well as City-wide
ActiveTrans Priority methodology  GUAMPO methodology
Introduction

- Introduce 2-step sidewalk prioritization:
  - **Address the needs & identify City-wide needs**: Land use connection, transit, connectivity, socio-economic, safety, and street classification.
  - **Geographic equity adjustment** to identify most needed projects by district

- **Validation**: Compare the Citywide walk rankings (absolute – result of Step 1) and geographic equity adjusted priorities (relative by district – result of Step 2) with manual planned sidewalk projects
Step 1: Address Needs

1. Define Purpose
2. Literature Review & Stakeholder Input
3. Select Factors
4. Assess Data
5. Set Up Prioritization Model in GIS
6. Measure and Input Data
7. Establish Weights

Step 2: Geographic Equity Adjustment

1. Geographic Equity Adjustment

Final Steps:

1. Validate Result
2. Create Ranked List
Step 1: Needs-Based Criteria

<table>
<thead>
<tr>
<th>Factor</th>
<th>Variable</th>
<th>Data Input</th>
<th>Weight</th>
<th>Geographic Equity Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Use</td>
<td>Land Use Connection Score</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mixed Land Use Index Score</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transit User</td>
<td>Top 50 Bus Stops by Ridership Score</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transit Connection Score</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Trail Connection Score</td>
<td></td>
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<td></td>
<td>Sidewalk Gap Score</td>
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<td></td>
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<tr>
<td>Socio-economic</td>
<td>Worker With No Vehicle Score</td>
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<td>Household Poverty Score</td>
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<tr>
<td>Safety</td>
<td>Pedestrian Crash Score</td>
<td></td>
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</tr>
<tr>
<td>Street Classification</td>
<td>Street Classification Score</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Field data collection to collect current sidewalk presence and condition.

Selecting road segments with sidewalk needs.

Prioritizing road segments with sidewalk needs using geographic equity into Tiers.

- Tier 1 has the highest score range and Tier 4 has the lowest score range.
- Tier 1: Short Term
- Tier 2: Middle Term
- Tier 3: Long Term
- Tier 4: Long Term (After Tier 3)
Step 1: Address Needs

Step 2: Geographic Equity Adjustment

Define Purpose

Literature Review & Stakeholder Input

Select Factors

Select Variables

Assess Data

Set Up Prioritization Model in GIS

Measure and Input Data

Establish Weights

Geographic Equity Adjustment

Validate Result

Create Ranked List
Methodology

Step 1: Needs-based criteria

1. Land use
Land Use Connection
Mixed Land Use Diversity Index
Methodology

Step 1: Needs-based criteria

2. Transit User
   - Top 50 Bus Stops by Ridership Score

4. Socio-Economic
   - Worker With No Vehicle Score
   - Household Poverty Score

3. Connectivity
   - Transit Connection Score
   - Trail Connection Score
   - Sidewalk Gap Score

5. Safety
   - Pedestrian Crash Score

6. Street Classification
   - Street Classification Score
Tier 1: 33 - 39 points
Tier 2: 25 - 32 points
Tier 3: 17 - 24 points
Tier 4: 9 - 16 points
Step 1: Address Needs

Step 2: Geographic Equity Adjustment
Methodology
Step 2: Geographic Equity

- Adjusted priorities based on geographic equity
  - Identify most needed project by city council districts
  - Ensure that projects are sufficiently distributed throughout the city
  - Avoid funding conflicts
  - Avoid spotty and unconnected sidewalk development
Step 1: Address Needs

- Define Purpose
- Literature Review & Stakeholder Input
  - Select Factors
  - Assess Data
  - Set Up Prioritization Model in GIS
  - Measure and Input Data
  - Establish Weights

Step 2: Geographic Equity Adjustment

- Geographic Equity Adjustment

Validate Result

Create Ranked List
Validation

- **Test 1:** Compare percentage of sidewalk mileage overall Roadway mileage by Tier by District
  - Ratio of max & min of % sidewalk by district represents the evenness of sidewalk distribution between districts

- **Test 2:** Compare number of short term planned sidewalk construction projects by Tier by District
  - Test the consistency of the manual methodology and automated prioritization methodology
## Validation - Test 1

Percentage of Sidewalk mileage overall Roadway mileage by Tier by District

<table>
<thead>
<tr>
<th>Tier</th>
<th>District 1</th>
<th>District 2</th>
<th>District 3</th>
<th>District 4</th>
<th>District 5</th>
<th>Mean</th>
<th>Max/Min</th>
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</thead>
<tbody>
<tr>
<td>Tier 1</td>
<td>1.5</td>
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<td><strong>19.1</strong></td>
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<td><strong>14.9</strong></td>
<td><strong>14.6</strong></td>
<td><strong>14.8</strong></td>
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<td>Tier 2</td>
<td>11.0</td>
<td>12.4</td>
<td>8.9</td>
<td>8.7</td>
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<td></td>
<td><strong>17.7</strong></td>
<td><strong>14.7</strong></td>
<td><strong>13.0</strong></td>
<td><strong>14.6</strong></td>
<td><strong>11.7</strong></td>
<td><strong>14.3</strong></td>
<td><strong>1.5</strong></td>
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<tr>
<td>Tier 3</td>
<td>24.8</td>
<td>19.4</td>
<td>17.1</td>
<td>17.6</td>
<td>15.4</td>
<td>18.9</td>
<td>1.6</td>
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<tr>
<td></td>
<td><strong>10.7</strong></td>
<td><strong>11.4</strong></td>
<td><strong>10.3</strong></td>
<td><strong>9.2</strong></td>
<td><strong>12.8</strong></td>
<td><strong>10.9</strong></td>
<td><strong>1.4</strong></td>
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<tr>
<td>Tier 4</td>
<td>41.0</td>
<td>39.1</td>
<td>31.0</td>
<td>32.5</td>
<td>36.2</td>
<td>35.9</td>
<td>1.3</td>
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<td><strong>14.6</strong></td>
<td><strong>15.1</strong></td>
<td><strong>12.6</strong></td>
<td><strong>12.3</strong></td>
<td><strong>14.8</strong></td>
<td><strong>13.9</strong></td>
<td><strong>1.2</strong></td>
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<td>Unrated</td>
<td>21.7</td>
<td>27.2</td>
<td>42.0</td>
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<td></td>
<td><strong>37.9</strong></td>
<td><strong>40.8</strong></td>
<td><strong>49.2</strong></td>
<td><strong>49.3</strong></td>
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<td><strong>44.6</strong></td>
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</table>
Validation - Test 2

Number of short term planned sidewalk construction projects by tier by district

<table>
<thead>
<tr>
<th>District</th>
<th>District 2</th>
<th>District 3</th>
<th>District 4</th>
<th>District 5</th>
<th>Total</th>
<th>%</th>
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</thead>
<tbody>
<tr>
<td>Tier 1</td>
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<td>2</td>
<td>3</td>
<td>0</td>
<td>12</td>
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<tr>
<td>Tier 2</td>
<td>5</td>
<td>13</td>
<td>6</td>
<td>7</td>
<td>4</td>
<td>35</td>
</tr>
<tr>
<td>Tier 3</td>
<td>5</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>20</td>
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<td>Tier 4</td>
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<td>0</td>
<td>1</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Total for each tier and district represent the number of planned sidewalk construction projects.
## Sidewalk mileage by tier by district

<table>
<thead>
<tr>
<th>Tier</th>
<th>Major roads</th>
<th>Minor roads</th>
<th>Collectors</th>
<th>Local roads</th>
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<tbody>
<tr>
<td>Tier 1</td>
<td>113.9</td>
<td>28.7</td>
<td>42.7</td>
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<tr>
<td>Tier 2</td>
<td>36.6</td>
<td>29.0</td>
<td>91.1</td>
<td>6.4</td>
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<tr>
<td>Tier 3</td>
<td>0.0</td>
<td>24.0</td>
<td>60.2</td>
<td>39.9</td>
</tr>
<tr>
<td>Tier 4</td>
<td>0.0</td>
<td>1.1</td>
<td>69.2</td>
<td>88.2</td>
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<tr>
<td>Unrated</td>
<td>0.0</td>
<td>0.0</td>
<td>6.0</td>
<td>499.7</td>
</tr>
</tbody>
</table>
Conclusion: How did we do?

- Created fully functional & automatic prioritization tool that met our needs and expectations
- Validated it against established priorities
  - 85% of planned sidewalk projects are in tier 1
- Identified most needed projects in all five districts, minimized funding conflicts between the districts, and reduced spotty and unconnected sidewalk development throughout the city
- Used results for Long Range Comprehensive Planning; can be used for project level funding decisions and other purposes
**Big Picture Conclusions**

- Though our work preceded it, NCHRP Report 803 is an excellent place to start, whether you want to design your own GIS tool from scratch or use their programmed spreadsheet.

- Effective prioritization models require realistic assessments of what's important, and adequate information and data.

- Thinking through the criteria and their weights is the most important part of any prioritization model; validation is important!

- GIS models & spreadsheet methods can identify high need locations that are reasonably consistent with manual methods, but some manual interpretation & field work will always be necessary.
Publication

Plan:
2015 Bicycle, Pedestrian, Trails & Greenway Plan Update - Greensboro MPO
www.guampo.org

Paper:
TRB 15-0672 Accounting for Geographic Equity in Prioritizing Sidewalks
http://trid.trb.org/view.aspx?id=1336733
THANK YOU!

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