Use of Big Data and Accessibility Analysis to Inform Planning and Project Programming

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A network of reform-oriented state DOTs, operated by the University Wisconsin and Smart Growth America.
1. Big Data
Where and how are people traveling?

2. Accessibility analysis
How easily can people get where they need to go?
1. Big Data
Data sources

- From in-vehicle GPS, mobile devices, and mobile apps.

StreetLight Data

AirSage, Teralytics

<table>
<thead>
<tr>
<th>Cellular</th>
<th>~200-1,000 meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pings 15+ minutes</td>
<td></td>
</tr>
<tr>
<td>~10-30% sample</td>
<td></td>
</tr>
</tbody>
</table>

Cuebiq

<table>
<thead>
<tr>
<th>Location-based services</th>
<th>~5-50 meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable pings</td>
<td></td>
</tr>
<tr>
<td>&gt;10% sample</td>
<td></td>
</tr>
</tbody>
</table>

Inrix, HERE

<table>
<thead>
<tr>
<th>GPS</th>
<th>~5 meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pings &lt;1 minute</td>
<td></td>
</tr>
<tr>
<td>~1-4% sample (personal)</td>
<td></td>
</tr>
<tr>
<td>~10-12% sample (commercial)</td>
<td></td>
</tr>
</tbody>
</table>

Overview based on input from StreetLight Data and SSTI
Case study: Northern Virginia

- Identify opportunities to reduce car travel
  - Large flows between zones
  - Short trips
  - Circuitous trips

Streetlight Data

800+ zones
Example: Van Dorn St. Metro Station

Streetlight Data

Data
- Several thousand daily trips to/from just north (<1 mile)
- Circuitous

Opportunities
- Better bicycle and pedestrian connections
New “traffic busting” tools

Traffic Throughout the Day

Distribution of traffic by trip length

Distribution of traffic by trip purpose

Distribution of traffic by income

Explore Solutions

Walking

Biking

Network connections

Employee incentives

Trucks

Transit
Example trips identified by mode using StreetLight’s proprietary machine learning algorithms, considering interactions among 20+ trip attributes.
Walking to and from stations

Streetlight Data

- Many people walk from nearby shopping centers
- Many people crossing Lincoln Highway to the south
2. Accessibility analysis
Measuring accessibility

1. Transportation networks
   • Roads and vehicle speeds, bike paths, sidewalks, and transit routes and schedules

2. Opportunities
   • Jobs other destinations

3. Method of calculation

4. Applications in decision-making

How many jobs can someone walk to within 15 minutes?
SMART SCALE is about investing limited tax dollars in the right projects that meet the most critical transportation needs in Virginia.
Access to jobs by driving (morning)

<table>
<thead>
<tr>
<th>Jobs accessible</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 15 min</td>
<td>29,000</td>
</tr>
<tr>
<td>&lt; 30 min</td>
<td>293,000</td>
</tr>
<tr>
<td>&lt; 45 min</td>
<td>308,000</td>
</tr>
<tr>
<td>Weighted</td>
<td>212,000</td>
</tr>
</tbody>
</table>

Access to jobs (automobile)

- 0 - 100k
- 100 - 120k
- 120 - 140k
- 140 - 160k
- 160 - 180k
- 180 - 200k
- 200 - 220k
- 220k +

Weights

Minutes (by driving)
Access to jobs by transit (morning)

<table>
<thead>
<tr>
<th>Weighted</th>
<th>18,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 15 min</td>
<td>250</td>
</tr>
<tr>
<td>&lt; 30 min</td>
<td>24,000</td>
</tr>
<tr>
<td>&lt; 45 min</td>
<td>33,000</td>
</tr>
</tbody>
</table>

Jobs accessible

Weights

Access to jobs (transit)

- 0 - 5k
- 5 - 10k
- 10 - 15k
- 15 - 20k
- 20 - 25k
- 25 - 35k
- 35 - 45k
- 45k +

Minutes (by transit)

0 30 60 90 120

Weights

0.00 0.25 0.50 0.75 1.00
Project evaluation: Route 31 bus

Total impact
- 1.03 million household-jobs

Average impact
- 5 jobs
- Across 200,000 households

<table>
<thead>
<tr>
<th>Jobs accessible</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 15 min</td>
<td>270</td>
<td>280</td>
</tr>
<tr>
<td>&lt; 30 min</td>
<td>1,400</td>
<td>8,800</td>
</tr>
<tr>
<td>&lt; 45 min</td>
<td>3,100</td>
<td>34,800</td>
</tr>
<tr>
<td>Weighted</td>
<td>1,200</td>
<td>8,500</td>
</tr>
</tbody>
</table>

Change in work accessibility (transit)
- No change
- < 100
- 100 - 500
- 500 - 1,000
- 1,000 - 2,000
- 2,000 - 4,000
- 4,000 +
Access to destinations by walking

Access to:
- Schools (up to 2)
- Entertainment (2)
- Grocery stores (3)
- Recreation (3)
- Healthcare (3)
- Public services (3)
- Banks and ATMs (15)
- Shopping (33)
- Food and drink (45)

Non-work access (walking)
- 0.0 - 12.5
- 12.5 - 25.0
- 25.0 - 37.5
- 37.5 - 50.0
- 50.0 - 62.5
- 62.5 - 75.0
- 75.0 - 87.5
- 87.5 - 100

Weights

Minutes (by walking)
Accessibility analysis: Pedestrian improvements
Accessibility analysis: Mixed use development

Walking accessibility
- 0 - 12.5
- 12.5 - 25
- 25 - 37.5
- 37.5 - 50
- 50 - 62.5
- 62.5 - 75
- 75 - 87.5
- 87.5 - 100

Change in walking accessibility
- < 0.5
- 0.5 - 1.0
- 1.0 - 2.0
- 2.0 - 5.0
- 5+
Applications in decision-making

- Scan conditions
- Diagnose problems
- Assess solutions
- Engage stakeholders
- Track performance
- Predict outcomes
Predicting outcomes

- Mode share and VMT
- Transit ridership
- Active transportation
- Land values

Right: Walking accessibility in Virginia
Available resources

- Visit ssti.us (search for “trip-making” or “accessibility”)
- Contact Chris McCahill – mccahill@ssti.us