Using the APT Priority Tool

A flexible, data-driven methodology for prioritizing bicycle and pedestrian improvements along existing roads
Agenda

- What is the APT?
- Why prioritize with the APT?
- How the APT was developed
- APT overview
- The APT in action
- APT resources
- Walk-through APT tool

If you have follow-up questions, please contact

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Describe your agency’s current pedestrian and bicycle project prioritization methodology?
What’s the APT?

- A method for prioritizing pedestrian and bicycle facility improvement locations along existing roads.

- APT Materials:
  - APT Guidebook
  - GIS guidance
  - Programmed Spreadsheet and User Guide
  - Screencast
  - Brochure/Poster
  - NCHRP 07-17 Final Report with research approach and findings
Why is prioritization important?

• To make wise choices about how resources are used
• To communicate choices to others
• To build public/political support for action
• May be required for funding purposes
Uses of the APT

Use to:

• Prioritize locations for applying countermeasures (e.g. 10 corridors experience high pedestrian crash rates – prioritize)

• Prioritize locations for applying a selected countermeasure (e.g. 100 locations need curb ramps - prioritize)

• *Does not provide guidance for determining pedestrian and bicycle facility design solutions*
• Originally designed to prioritize locations for pedestrian and bicycle improvements
• Can also be used to prioritize locations for other modes
• Can be applied at the state, regional, and local levels.
• May be applied once or iteratively
APT can prioritize pedestrian safety projects quickly, easily, and uses a clear methodology:

- **Intersections/Crossings**
  - Pedestrian Hybrid Beacon, pedestrian refuge islands, crosswalks, curb extensions, etc.

- **Roadway Segments**
  - Closing sidewalk gaps, improved lighting, etc.

- **Roadway Corridors**
  - Road diet, etc.

- **Neighborhoods/Areas**
  - Installing sidewalk network, neighborhood greenway, etc.
Why prioritize with the APT?

- Transparent
- Flexible
- Responsive
- Supported by research

- Save time and effort ($$$) versus creating a prioritization method from scratch
How was the APT developed?
• Literature review
• Survey
• Interviews with transportation agencies
• Feedback from NCHRP panel
• Pilot tests
Pilot Testing the APT

• Pilot Communities
  – Bellingham, WA
  – Bend, OR
  – Carmel, IN
  – Gastonia, NC
  – Miami, FL
  – Phoenix, AZ
  – Alameda County, CA
    Transportation Commission
  – Casper Area MPO, WY
  – Humboldt County, CA
    Association Of Governments
  – New Mexico DOT

Photos by Toole Design Group
State of the Practice: Lessons Learned

- Prioritization is common among agencies (though some efforts are poorly documented)
- Wide range of methods, but similar frameworks
- Prioritization = balancing needs vs. feasibility

Photos by Michael Ronkin
State of the Practice: Lessons Learned

• Found that there is a demand for an adaptable method
• Pedestrian & bicycle modes sometimes prioritized separately; sometimes together
• Pedestrian & bicycle prioritization differed by scale, emphasis (segment vs. intersection; focus areas vs. connectivity)
• Different weights used for criteria; reflect agency goals
• Many methods are “data hungry”
• Data collection & analysis technologies evolving quickly
• Existing tools cost money to use and are not transparent
• Pedestrian prioritization = safety (crash data)
• Bicycle prioritization = public input and opportunity
• Don’t reinvent the wheel
  – Similar approach used by many agencies: common factors
  – But still provide flexibility
• Open the “black box”
  – qualitative, political → quantitative, transparent
• Develop common language
• Offer guidance for important decision points
Questions before covering how the APT tool works?
How does the APT work?

- **Phase I: Scoping**
  - Initial deliberation and preparation necessary to set up the prioritization process
- **Phase II: Prioritization**
  - Process of calculating prioritization scores for each improvement location based on scoping in Phase I
• Improvement Locations
  – Specific intersections, roadway segments, corridors or areas that are prioritized.

• Factors
  – Categories used to express community/agency values and group variables with similar characteristics (e.g. equity, demand).

• Variables
  – Characteristics of roadways, households, neighborhood areas, and other features that can be measured (e.g. population density, sidewalk presence).

• Weights
  – Numbers used to indicate the relative importance of different factors based on community or agency values.

• Scaling (or normalizing)
  – Process of making variables comparable to one another, such as using a scale of 0 to 10.
APT Overview—Phase I: Scoping

Step 1: Define Purpose

Step 2: Select Factors

Step 3: Establish Factor Weights

Step 4: Select Variables

Step 5: Assess Data

Step 6: Assess Technical Resources

If data and technical resources are not available, reassess factors and variables.
Step 1: Define Purpose

- Mode
- Goals
- Improvement-specific vs. general location
- Type/extent of improvement locations
- Number of improvement locations
Step 2: Select Factors

1. Stakeholder Input
2. Constraints
3. Opportunities
4. Safety
5. Existing Conditions
6. Demand
7. Connectivity
8. Equity
9. Compliance
### Step 2: Select Factors

<table>
<thead>
<tr>
<th>Prioritization Purpose Examples</th>
<th>Stakeholder Input</th>
<th>Constraints</th>
<th>Opportunities</th>
<th>Safety</th>
<th>Existing Conditions</th>
<th>Demand</th>
<th>Connectivity</th>
<th>Equity</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Segment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Given a neighborhood where sidewalks are absent, select 30 segments to construct new sidewalks over the next three years</td>
<td>●</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>○</td>
</tr>
<tr>
<td><strong>Intersection/Crossing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Given a regional trail with 50 unsignalized roadway crossings, identify 12 crossings for safety enhancements</td>
<td>●</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>○</td>
<td>●</td>
</tr>
</tbody>
</table>

● = Very relevant; ○ = Less relevant; ○= Not likely relevant
Step 3: Establish Weights

Equal Weights

Different Weights

Relative impact of factors if weighted differently
Step 4: Select Variables

• Set of possible variables is included for each factor category

• Possible variables came from:
  – Literature review
  – Agency survey
  – Best practice guidance from organizations such as NCHRP, FHWA, AASHTO, NACTO, and ITE.
  – Professional experience of research team
What is your biggest challenge with prioritizing projects?
Step 5: Assess Data

Inventory readily available data
(e.g., roadway data, land use, traffic counts)

Seek other data sources (if necessary)
(e.g., regional, state or federal agency data, open data sources)

Collect new data (if necessary)
• Generate data from GIS analysis (see Step 8)
• High-level collection (e.g., using aerials, Street View imagery)
• Field verification/assessment
• Automatic (counters, video)

Or- don’t use that variable if no data is available!
<table>
<thead>
<tr>
<th>Example Demand Proxy Variables</th>
<th>Data Considerations/Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population density</td>
<td>Population of given geography divided by its area, U.S. Census</td>
</tr>
<tr>
<td>Employment density</td>
<td>Employment is often compiled at the regional level and made available to local agencies by request from the Census Transportation Planning Package for traffic analysis zones. Density is calculated by dividing the number of employees by a measure of area. Longitudinal Employer-Household Dynamics (LEHD) is another U.S. Census program that can provide employer/employee data estimates.</td>
</tr>
<tr>
<td>Transit station or stop density/proximity/accessibility</td>
<td>Point data typically maintained by transit agency</td>
</tr>
<tr>
<td>Socioeconomic characteristics (e.g., proportion of neighborhood residents living in poverty or without access to an automobile)</td>
<td>U.S. Census data (block group-level data may be most appropriate for projecting demand). Note: This type of data may also be used for variables within the Equity factor.</td>
</tr>
<tr>
<td>Proximity to or number of bike share docking stations</td>
<td>Point data layer of bike share stations</td>
</tr>
</tbody>
</table>
# Guidance on Data Collection

<table>
<thead>
<tr>
<th>Inventory Data Source/Tool</th>
<th>Can be used to inventory data for these variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerial Imagery</td>
<td>• Sidewalk and buffer presence and width</td>
</tr>
<tr>
<td></td>
<td>• Marked crosswalk presence and type</td>
</tr>
<tr>
<td></td>
<td>• Median island presence and width</td>
</tr>
<tr>
<td></td>
<td>• Bicycle facility presence and width</td>
</tr>
<tr>
<td></td>
<td>• Lane width/shoulder width</td>
</tr>
<tr>
<td></td>
<td>• Pedestrian crossing distance</td>
</tr>
<tr>
<td>Street-Level Imagery (e.g. video log, Street View)</td>
<td>• Curb ramp presence</td>
</tr>
<tr>
<td></td>
<td>• Truncated domes presence</td>
</tr>
<tr>
<td></td>
<td>• Pedestrian/bicycle-related signage</td>
</tr>
<tr>
<td></td>
<td>• Major sidewalk obstructions</td>
</tr>
<tr>
<td></td>
<td>• Pedestrian signal heads</td>
</tr>
<tr>
<td></td>
<td>• Pedestrian push buttons</td>
</tr>
<tr>
<td>Direct Field Observation (using technological data collection tools or manual observations)</td>
<td>• More precise lane width/shoulder width</td>
</tr>
<tr>
<td></td>
<td>• Traffic volume</td>
</tr>
<tr>
<td></td>
<td>• Traffic speed</td>
</tr>
<tr>
<td></td>
<td>• Sidewalk condition</td>
</tr>
<tr>
<td></td>
<td>• Crosswalk condition</td>
</tr>
<tr>
<td></td>
<td>• Pavement condition</td>
</tr>
<tr>
<td></td>
<td>• Curb ramp slope</td>
</tr>
<tr>
<td></td>
<td>• On-street parking presence and occupancy</td>
</tr>
</tbody>
</table>
APT is intended to work for a range of technological capabilities.
APT Overview—Phase II

Step 7: Set Up Prioritization Tool

Step 8: Measure and Input Data

Step 9: Scale Variables

Step 10: Create Ranked List

Rerun with additional data, different scales, etc. if needed
Questions?

Questions before we discuss a pilot community’s APT experience?
The APT in Action-Phoenix

Develop Demand Heat Map and Identify Corridors

Prioritize Corridors and Separate into 3 Tiers

Rank Improvements along Corridors

Map by Lee Engineering
Calculating DEMAND

<table>
<thead>
<tr>
<th>Variable</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schools</td>
<td>City of Phoenix</td>
</tr>
<tr>
<td>Bus Stops</td>
<td>City of Phoenix</td>
</tr>
<tr>
<td>City Facilities (e.g. libraries, municipal offices, etc.)</td>
<td>City of Phoenix</td>
</tr>
<tr>
<td>Community Centers</td>
<td>City of Phoenix</td>
</tr>
<tr>
<td>Light Rail Stops</td>
<td>Valley Metro</td>
</tr>
<tr>
<td>Park and Rides</td>
<td>Valley Metro</td>
</tr>
<tr>
<td>Parks</td>
<td>City of Phoenix</td>
</tr>
<tr>
<td>Existing Bikeways</td>
<td>City of Phoenix</td>
</tr>
<tr>
<td>Wikimap Routes</td>
<td>Wikimap</td>
</tr>
<tr>
<td>Wikimap Destinations</td>
<td>Wikimap</td>
</tr>
<tr>
<td>% of Households in Poverty</td>
<td>U.S. Census</td>
</tr>
<tr>
<td>% of Population under 18</td>
<td>U.S. Census</td>
</tr>
<tr>
<td>% Households with No Vehicle</td>
<td>U.S. Census</td>
</tr>
<tr>
<td>Population Density</td>
<td>City of Phoenix</td>
</tr>
</tbody>
</table>
### Phoenix – Iteration 2
Identify Priority Corridors

<table>
<thead>
<tr>
<th>Factor</th>
<th>Weight</th>
<th>Variable</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connectivity</td>
<td>10</td>
<td>Number of times corridor intersects other corridors</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Number times corridor intersects bicycle facilities</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Presence of existing bicycle facilities</td>
<td>City of Phoenix</td>
</tr>
<tr>
<td>Demand</td>
<td>7</td>
<td>Primary attractors (light rail stops, colleges/universities) within 1 mile of the corridor</td>
<td>Valley Metro Google Maps</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Secondary attractors (schools, city facilities, community centers, park and rides, parks) within ¼ mile of the corridor. Also includes bus stops directly on the corridor</td>
<td>City of Phoenix Valley Metro</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Land Use (commercial and high-density housing)</td>
<td>City of Phoenix</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Population Density</td>
<td>City of Phoenix</td>
</tr>
<tr>
<td></td>
<td></td>
<td>% Households in Poverty</td>
<td>U.S. Census</td>
</tr>
<tr>
<td></td>
<td></td>
<td>% Households with No Vehicle</td>
<td>U.S. Census</td>
</tr>
<tr>
<td></td>
<td></td>
<td>% of Population under 18</td>
<td>U.S. Census</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bicycle Trip Origin and Destination Zip Codes from the Maricopa County Trip Reduction Survey</td>
<td>MAG</td>
</tr>
<tr>
<td>Stakeholder Input</td>
<td>3</td>
<td>Wikimap Destinations (included public meeting input and transit center surveys)</td>
<td>Wikimap</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wikimap Routes (included public meeting input)</td>
<td>Wikimap</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ad Hoc Task Force input</td>
<td>Task Force</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Technical Advisory Committee input</td>
<td>TAC</td>
</tr>
</tbody>
</table>

Map by Lee Engineering
# Phoenix – Iteration 3

## Identify Priority Projects

<table>
<thead>
<tr>
<th>Factor</th>
<th>Variable</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connectivity</td>
<td>Bicycling Barriers</td>
<td>Wikimap</td>
</tr>
<tr>
<td></td>
<td>Existing Bikeways</td>
<td>City of Phoenix</td>
</tr>
<tr>
<td>Safety</td>
<td>Bicycle Crashes</td>
<td>MAG</td>
</tr>
<tr>
<td></td>
<td>% of Population under 18</td>
<td>U.S. Census</td>
</tr>
<tr>
<td>Existing</td>
<td>Posted Speed Limit</td>
<td>City of Phoenix</td>
</tr>
<tr>
<td>Conditions</td>
<td>Street Classification</td>
<td>City of Phoenix</td>
</tr>
<tr>
<td>Constraints</td>
<td>Order of Magnitude Cost</td>
<td>Lee Engineering</td>
</tr>
<tr>
<td></td>
<td>Available Rights of Way</td>
<td>City of Phoenix</td>
</tr>
<tr>
<td>Demand</td>
<td>Tier 1 Attractors (light rail stops, colleges/universities, schools)</td>
<td>Valley Metro</td>
</tr>
<tr>
<td></td>
<td>Tier II Attractors (bus stops, bikeshare stations, city facilities,</td>
<td>Valley Metro</td>
</tr>
<tr>
<td></td>
<td>community centers, park-and-rides, parks)</td>
<td>City of Phoenix</td>
</tr>
<tr>
<td></td>
<td>Population Density</td>
<td>City of Phoenix</td>
</tr>
<tr>
<td></td>
<td>Land Use (commercial and high-density housing)</td>
<td>Maricopa County</td>
</tr>
<tr>
<td>Equity</td>
<td>% Households in Poverty</td>
<td>U.S. Census</td>
</tr>
<tr>
<td></td>
<td>% Households with No Vehicle</td>
<td>U.S. Census</td>
</tr>
</tbody>
</table>
APT Resources

- APT Guidebook
- APT Spreadsheet User Guide
- Screencast
- GIS guidance
- Brochure
- NCHRP 07-17 Final Report with research approach and findings

www.pedbikeinfo.org/apt
How the APT can help you

- Prioritize pedestrian or bicycle improvements for the first time.
- Update /compare an existing prioritization process
- Identify areas most in need of investment for walking or biking (Planning Level Prioritization)
- Prioritize walking or biking investments at specific identified locations (Project Prioritization)
- Conduct funding-decision prioritization
- Engage stakeholders/express community values in prioritization decisions.
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GIS

QGIS

ArcGIS® ArcMap™

10.4

Initializing License...
Programmed spreadsheet and GIS Tutorial Outline

• Walkthrough Phase I of spreadsheet
• Use GIS to pull data
• Input data into programmed spreadsheet
• Scale variables
• Calculate priority scores
• Rank projects
• Discussion
I would like to know how experienced you are using GIS and Microsoft Excel.