U.S.Department of Transportation
Federal Highway Administration

Micromobility Research at FHWA

Shari Schaftlein
Danielle Blackshear
Darren Buck

Federal Highway Administration
Office of Human Environment

Agenda

An overview and discussion of FHWA's micromobility activities through the lens of:

- Research and Coordination
- Shared Mobility Planning
- Bicycle Planning

Shari Schaftlein

Danielle Blackshear

Darren Buck

A look at micromobility through

RESEARCH AND COORDINATION

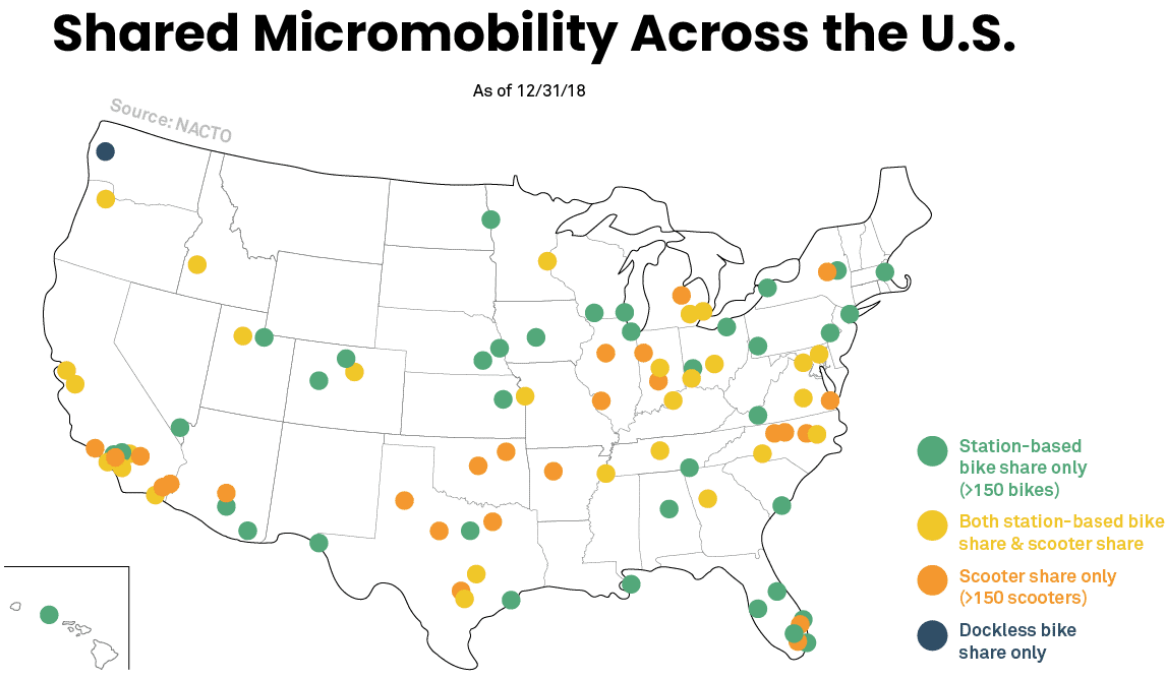
What is Micromobility?

Micromobility refers to any small, low-speed, human or electric-powered transportation device, including:

- bicycles
- scooters
- electric-assist bicycles (e-bikes)
- electric scooters (e-scooters)
- other small, lightweight, wheeled conveyances

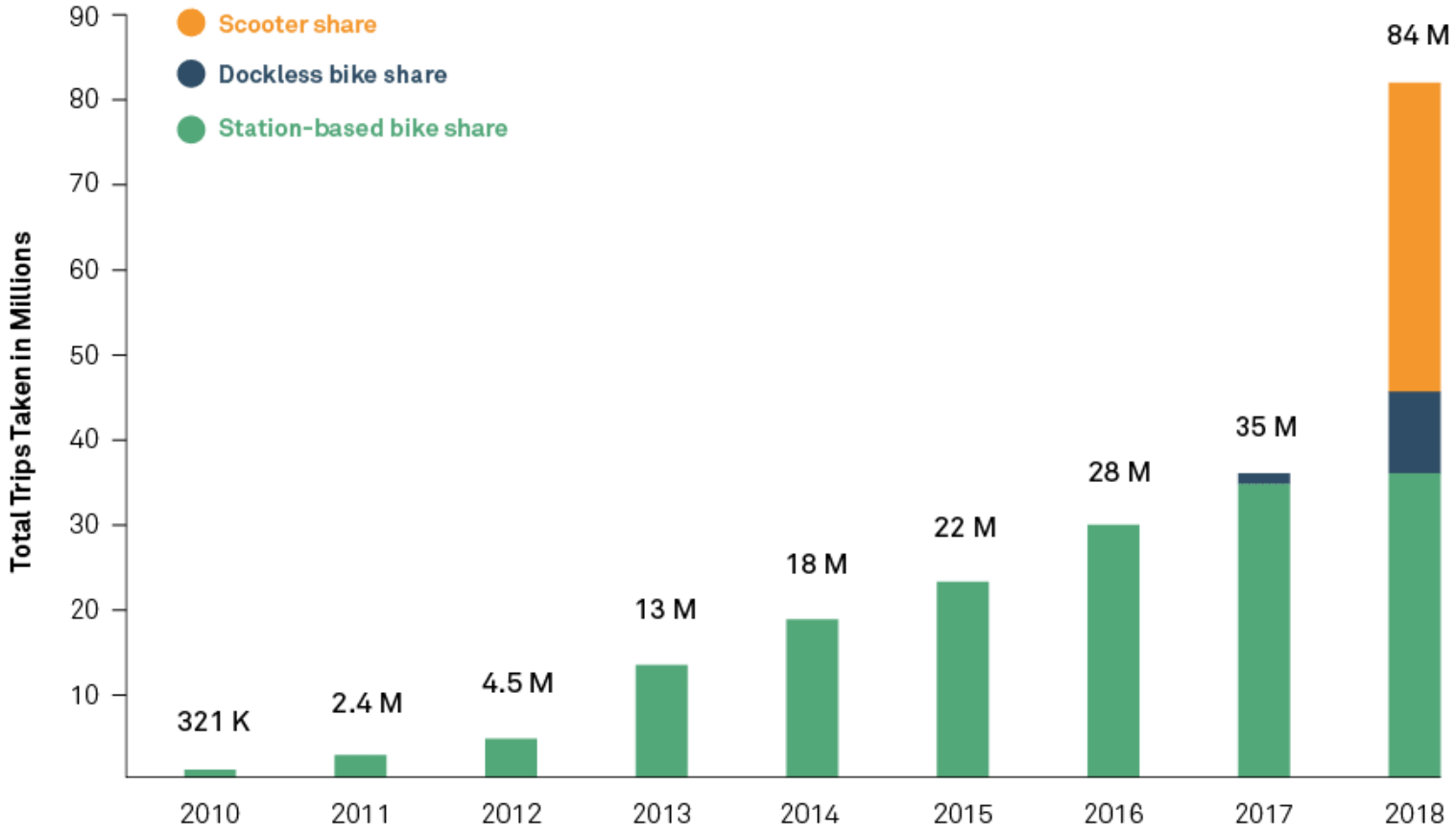
What are the trends?

- 1960s-1990s: Bikeshare 1.0 *(informal systems)*
- 2000s: Bikeshare 2.0 *(formal, app-based system)*
- 2016: Dockless bikeshare and e-bikes
- 2017: E-scooters



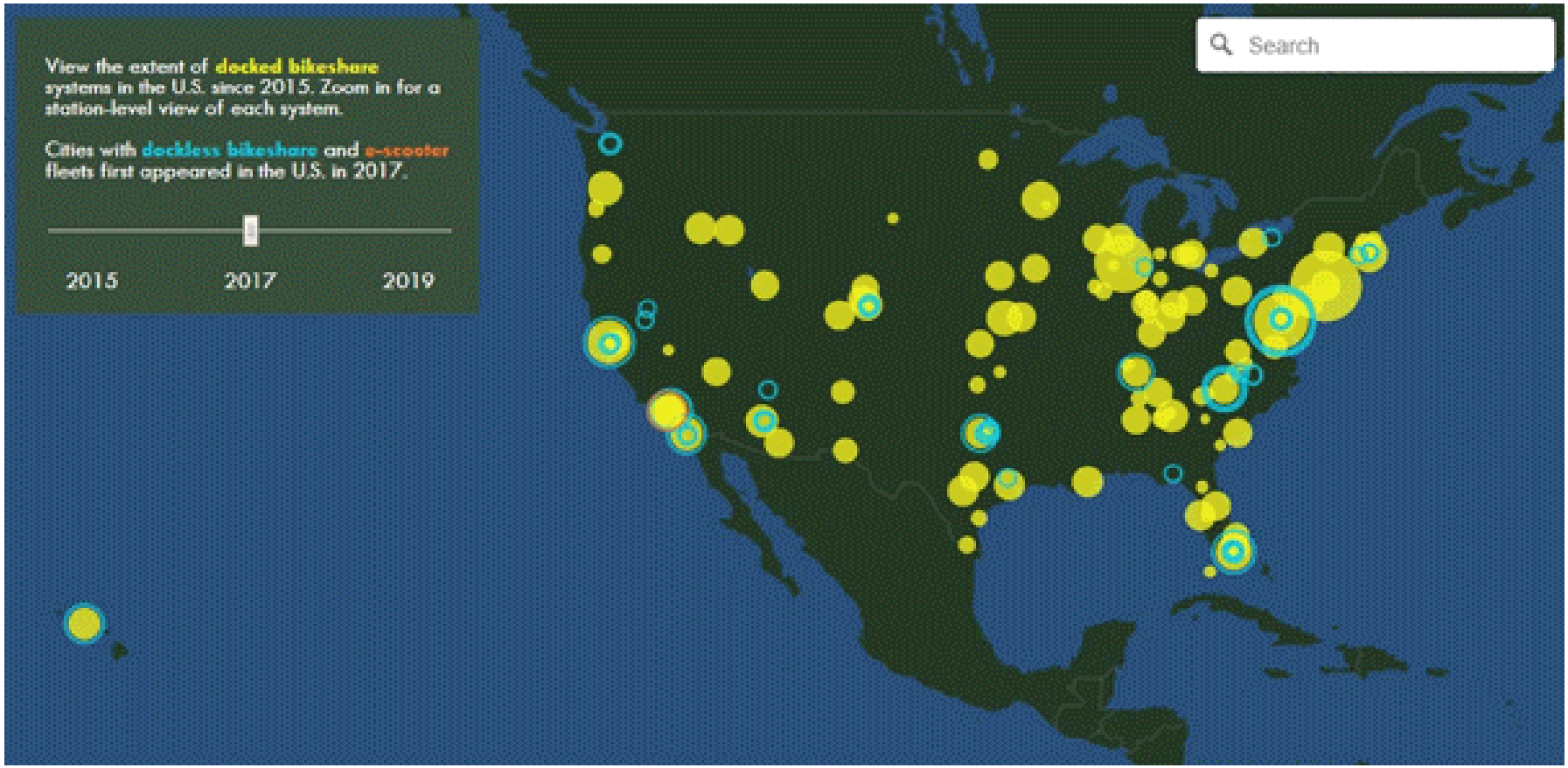
Source: National Association of City Transportation Officials, *Shared Micromobility in the U.S.: 2018*

84 Million Trips on Shared Micromobility in 2018



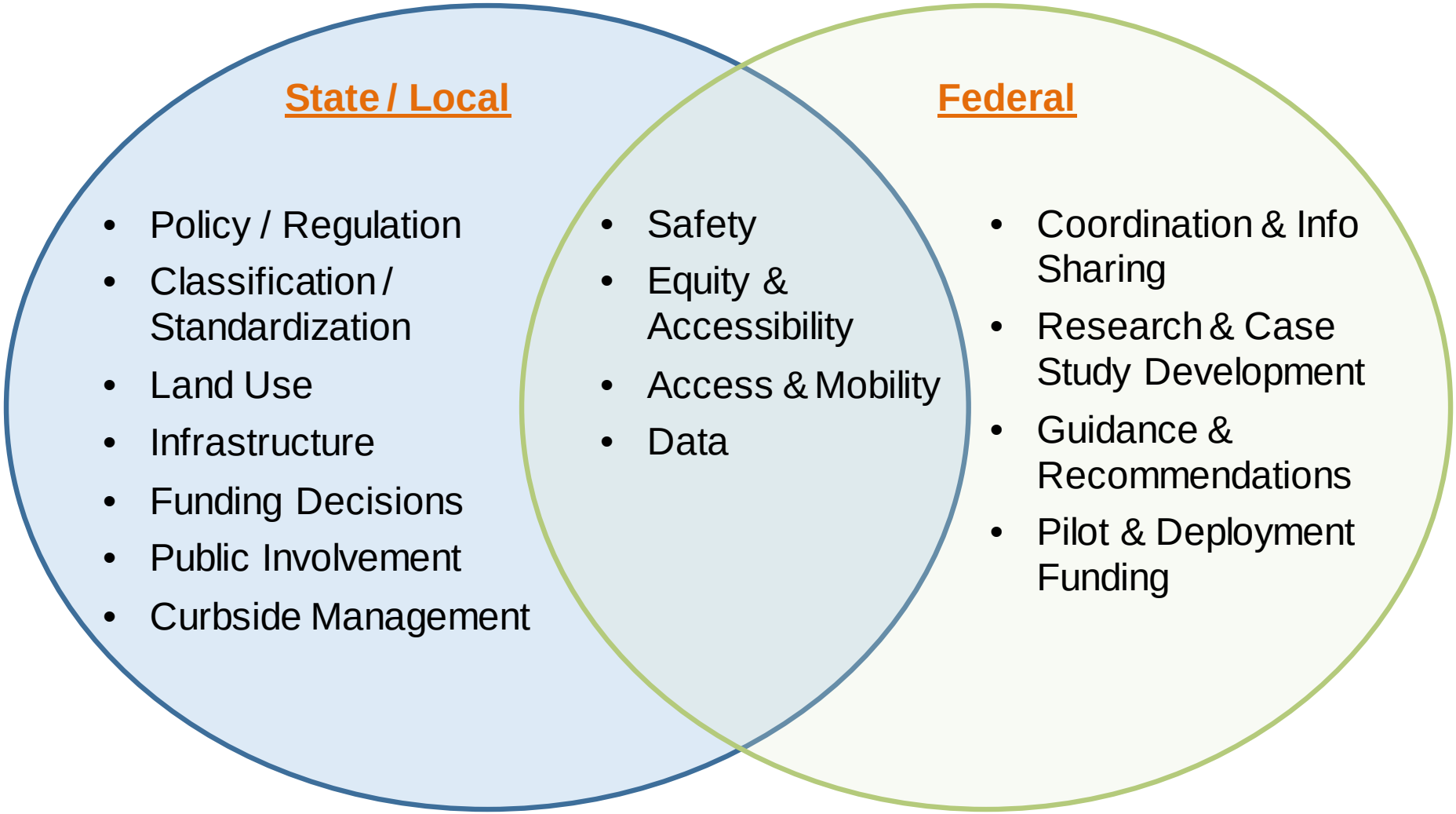
Source: National Association of City Transportation Officials, *Shared Micromobility in the U.S.: 2018*

Bureau of Transportation Statistics (BTS) Interactive Bikeshare and e-Scooter Map



https://www.bts.gov/topics/passenger-travel/bikeshare-and-e-scooters

Current Roles and Responsibilities



Micromobility Activities

Internal Working Groups

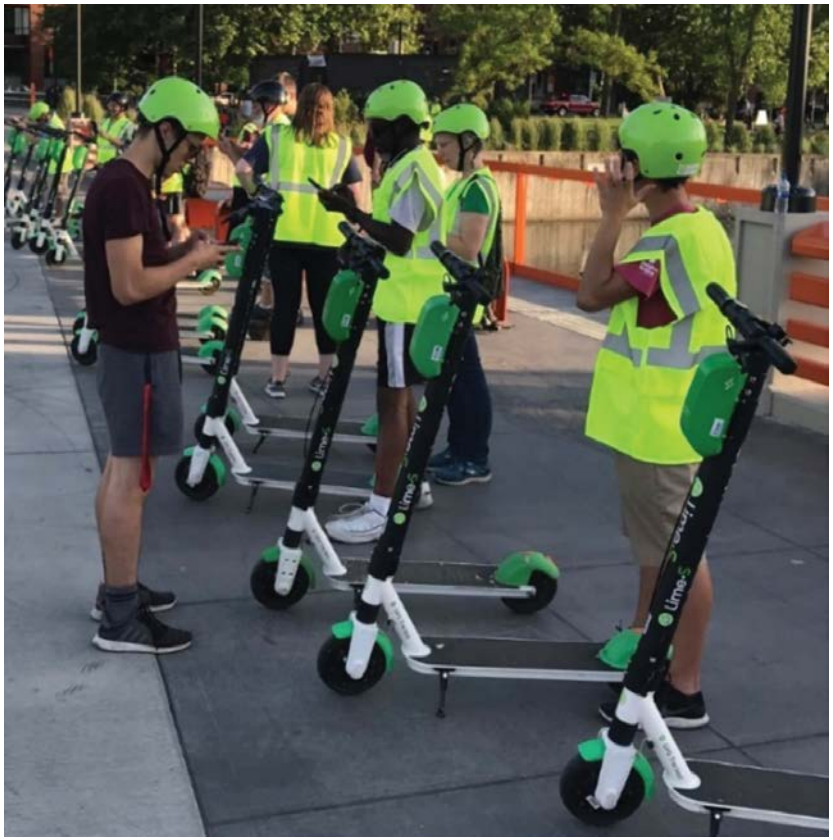
- **Mobility Innovation**
  - Maintains a list of current and past mobility research
- **Micromobility**
  - Maintains a list of ongoing micromobility research
- **Mobility on Demand**
  - Tracks research, events, and publications that promote MOD

External Coordination Activities

- APTA Integrated Mobility and Communities Consortium
- TRB Mobility Management Committee
- NSF Smart and Connected Communities
- North American Bikeshare Association

FHWA Internal Micromobility Research

- **Micromobility Memo**
  - Federal, State, and local roles in developing policies and establishing regulatory frameworks
  - Questions for future research
- **Micromobility and Children research**
  - Explores child usage and injuries from micromobility devices
  - Safe Routes to School and micromobility



External Resource: The Basics of Micromobility and Related Motorized Devices for Personal Transport

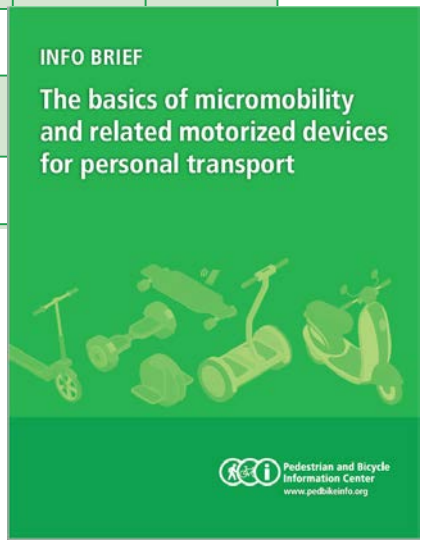
- Establishes common vocabulary and characteristics
  - Motorized
  - Low Speed
  - Small Size
- Provides a micromobility device typology chart

Categories of Micromobility Devices

The following table provides examples and key characteristics of common micromobility devices.

Table 1: Common micromobility devices

	Electric standing or sitting scooters (e scooters)	Electric bicycles (e-bikes)			Other[1]
Device					
		Class 1 Pedal assist (pedalec)	Class 2 Throttle assist	Class 3 Pedal assist (pedalec) at higher speed	
Example brands	**Shared:** Bird, Lime, and many others **Owned:** Inboard Glider, Segway 9Bot	**Shared:** Lime, Mobike, Ofo, Pace, Spin, and many others **Owned:** Most major bike brands; multiple passenger versions include Organic Transit (ELF) and Yuba	**Owned:** Several bike brands (less common than Class 1 and 3)	**Owned:** Several major brands; multiple passenger versions include Better Bike (PEBL), and Podride	**Owned:** Boosted, Inboard, Mellow Boards, Metroboard
Weight	Typically < 50 lbs	Typically < 100 lbs; multiple passenger versions near 200 lbs	Typically < 100 lbs		
Occupants	Single rider	Usually a single rider; some cargo e-bikes or bike cars designed for multiple riders	Typically designed for single riders		
Power supply	Electric motor typically < 750 watts	Electric motor typically < 750 watts	Electric motor typically < 750 watts		



http://pedbikeinfo.org/resources/resources_details.cfm?id=5200

External Resource: E-Scooter Management in Midsized Cities in the United States

- Interviews with 9 cities on challenges and successes
  - Safety
  - Regulation & Permitting
  - Infrastructure Design
- Identifies issues for future discussion

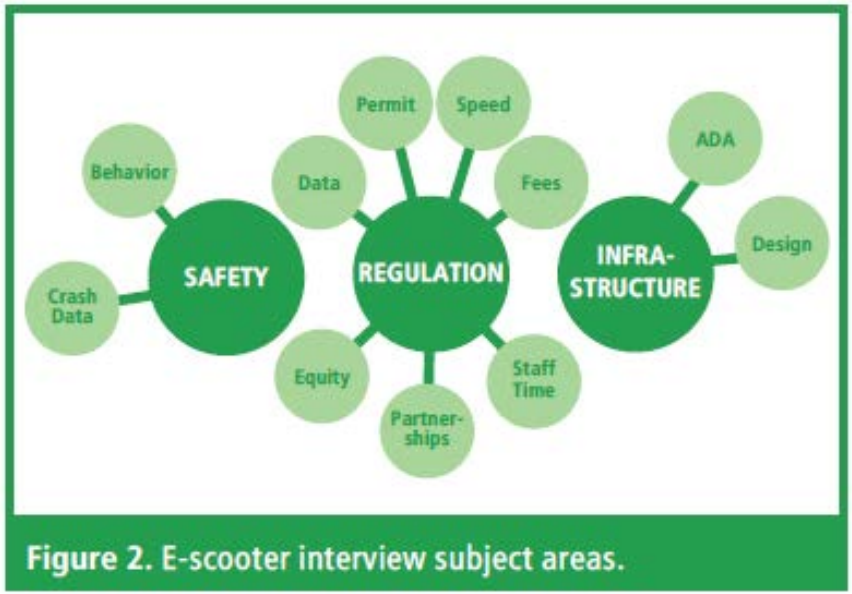
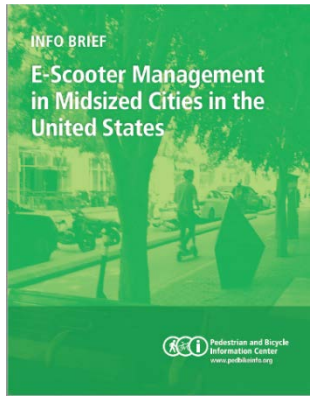


Figure 2. E-scooter interview subject areas.

City	Population
Columbus, Ohio	880,000
Charlotte, North Carolina	860,000
Portland, Oregon	650,000
Memphis, Tennessee	650,000
Tucson, Arizona	540,000
Spokane, Washington	220,000
Providence, Rhode Island	180,000
South Bend, Indiana	100,000
Charlottesville, Virginia	50,000



http://pedbikeinfo.org/resources/resources_details.cfm?id=5201

Micromobility Research Under Development

FHWA

- Integrating Emerging Mobility into Transportation Management
- Planning Multimodal Networks in a Connected and Automated Vehicle Future
- Curbside Management Tool & Resources

ITS/JPO

- Mobility on Demand (MOD) Special Studies – Opportunities and Challenges of Shared Micromobility Infrastructure
- Impact of New Transportation Providers on the Transportation System

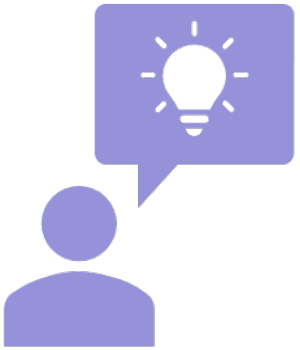
TRB

- TCRP B-47: "Impact of Transformational Technologies on Underserved Populations"
- TCRP J-11/Task 37: "Transit and Micro-Mobility (Bikeshare, Scooter-share, etc.)"

Discussion Break

***Please refer to the Research Handout.**

- Does the research currently underway adequately inform the state of practice related to micromobility?
- If no, what additional micromobility research topics should be explored to more fully understand the state of practice?
- Next Steps?



Upcoming Events & Publications

- TRB Presentation – Micromobility and Scenario Planning
  - Sunday, January 12, 2020 | Mobility Innovation: A Vision for Our Transportation Future, Part 2
- OST E-Scooter Summit – February 2020 (Tentative)
- NABSA Shared Micromobility State of the Industry Report – April 2020
- AASHTO Guide for the Development of Bicycle Facilities (under development)

A look at micromobility through

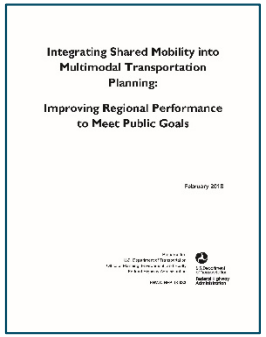
SHARED MOBILITY PLANNING

Integrating Shared Mobility into Multimodal Transportation Planning

Improving Regional Performance to Meet Public Goals

- Scan of practices in 13 Metropolitan areas
- Shared Mobility Conceptual Framework
  - Multimodal Planning
  - Planning Interventions
  - Evaluation and Learning
  - Project Implementation
- Key Takeaway: A Cooperative Approach is Needed
- List of Emerging Practices and Strategies

	MPO	Local Government	Transit Agency	State DOT
Regulating shared mobility operations		☑		☑
Regulating the use of public right-of-way and curb space		☑	☑	☑
Data collection, analysis and dissemination	☑	☑	☑	☑
Partnerships with shared mobility providers to complement transit or TDM	☑		☑	
Training and technical assistance for regional partners	☑			
Thought leadership and research	☑			☑
Regional coordination and consensus building	☑			
Integration into transportation plans and programs of projects	☑	☑	☑	☑

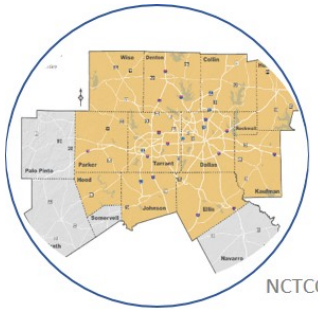


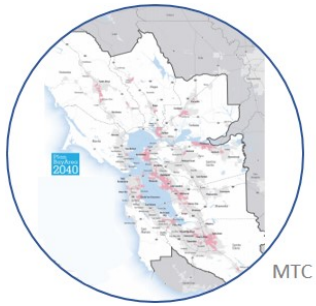
Find the document online:
https://www.planning.dot.gov/documents/SharedMobility_Whitepaper_02-2018.pdf

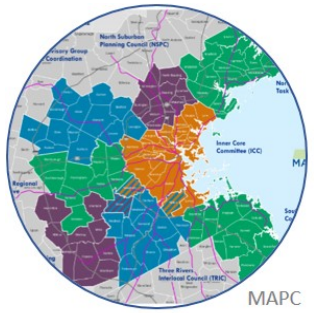
Integrating Shared Mobility into Multimodal Transportation Planning

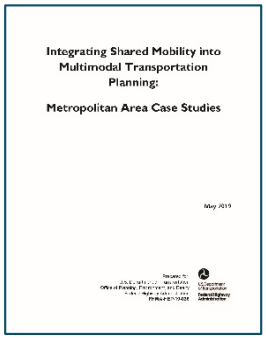
Metropolitan Area Case Studies

- More in-depth look at three metropolitan areas
- Boston, MA – dockless bikeshare case study
- Key Takeaways:
  - MPOs Creating Forums for Working Together
  - MPOs are Well-Positioned to Support Pilots and Regional Studies
  - Pilot Projects provide Opportunities for Experimentation and Learning
  - Integrating Shared Mobility into Models and Planning Frameworks is a Priority


NCTCOG


MTC


MAPC


Integrating Shared Mobility into Multimodal Transportation Planning:

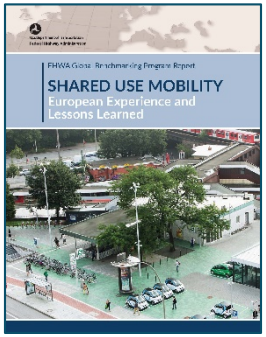
Metropolitan Area Case Studies

Find the document online:
https://www.planning.dot.gov/documents/regional_shared_mobility_planning_caseStudies.pdf

Shared Use Mobility - European Experience and Lessons Learned

FHWA Global Benchmarking Program Report

- 3 European Site Visits – Munich, Germany; Paris, France; and Brussels, Belgium
- Effective Practices and Lessons Learned
- Key Takeaway: Cities and transit agencies can use policies related to marketing and outreach, parking regulations, and shared infrastructure.



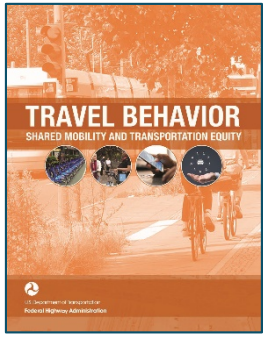
Find the document online:
https://international.fhwa.dot.gov/sum/fhwapl18026.pdf

Travel Behavior: Shared Mobility and Transportation Equity

- *STEPs to Transportation Equity* framework barrier categories (Spatial, Temporal, Economic, Physiological, Social)
- Shared Mobility Opportunities & Challenges and Policy Recommendations
- Key Takeaway: Government has many potential roles within shared mobility equity
  - Knowledge Transfer and Partnership Facilitation
  - Funding
  - Regulation/Legislation
  - Data and Metrics

Table 1: STEPS to Transportation Equity

Transportation Barriers	Definition	Shared Mobility Opportunities	Shared Mobility Challenges
Spatial	Spatial factors that compromise daily travel needs (e.g., excessively long distances between destinations, lack of public transit within walking distance)	• Public transit operators and ridesourcing first- and last-mile partnerships • Microtransit for lower-density areas	• Higher operating costs in lower-density exurban and rural settings • Limited curb space for increasing variety of mobility services
Temporal	Travel time barriers that inhibit a user from completing time-sensitive trips, such as arriving to work (e.g. public transit reliability issues, limited operating hours, traffic congestion)	• Dynamic microtransit • Late-night ridesourcing and shuttle services • Commuter carpooling services	• Wait-time and travel-time volatility on congested roadways • Unpredictable wait times due to supply fluctuations
Economic	Direct costs (e.g., fares, tolls, vehicle ownership costs) and indirect costs (e.g., smartphone, Internet, credit card access) that create economic hardship or preclude users from completing basic travel	• Shared mobility subsidies for low-income users • Multiple payment options for shared mobility services • Multi-modal hubs with Wi-Fi access	• Credit/Debit Card payment • High cost for longer distance and peak-demand trips • Maintaining affordability, while providing livable wages



Find the document online:
https://www.fhwa.dot.gov/policy/otps/shared_use_mobility_equity_final.pdf

Discussion Break

- Do the resources help to increase understanding of micromobility considerations for transportation planning?
- Should future shared mobility resources be more specific to particular technologies or devices (i.e. scooters, bicycles)
- Other considerations?

FHWA Program Links and Resources

- **Transportation Planning Capacity Building (TPCB) Shared Mobility**
  - https://www.planning.dot.gov/planning/topic_sharedmobility.aspx
- **Bicycle & Pedestrian Program**
  - https://www.fhwa.dot.gov/environment/bicycle_pedestrian/
- **Pedestrian and Bicycle Information Center (PBIC)**
  - http://www.pedbikeinfo.org/
- **Environmental Justice, Title VI, Non-Discrimination, and Equity**
  - https://www.fhwa.dot.gov/environment/environmental_justice/equity/
- **Office of Transportation Policy Studies**
  - https://www.fhwa.dot.gov/policy/otps/
- **Intelligent Transportation Systems Joint Program Office (ITS JPO) MOD Program**
  - https://www.its.dot.gov/research_areas/MOD/index.htm

A look at micromobility through

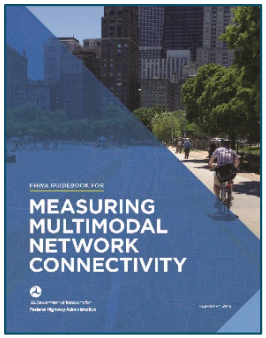
BICYCLE PLANNING

Ped/Bike Pooled Fund Study

- Sign Comprehension study
  - Simulator testing of “shared streets” and “left-turn yield to bikes” signs
  - Complete, not yet released
- Safety study of curb extensions & green intersection markings
  - To evaluate safety data availability to see if a CMF is feasible
  - Complete, not yet released
- Crosswalk marking selection guide
  - Just beginning

Guidebook for Measuring Multimodal Network Connectivity

- Focus on Bicycles and Pedestrian Network Connectivity
- Analysis methods and supporting measures for 5 Core Components
- 5 Case Study Assessments
- Key Takeaways:
  - Identify the Planning Context
  - Define the Analysis Method
  - Assemble Data
  - Compute Metrics
  - Package Results



Find the document online:
https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/multimodal_connectivity/fhwahep18032.pdf

Multimodal Network Planning Pilot Projects in Eight Communities

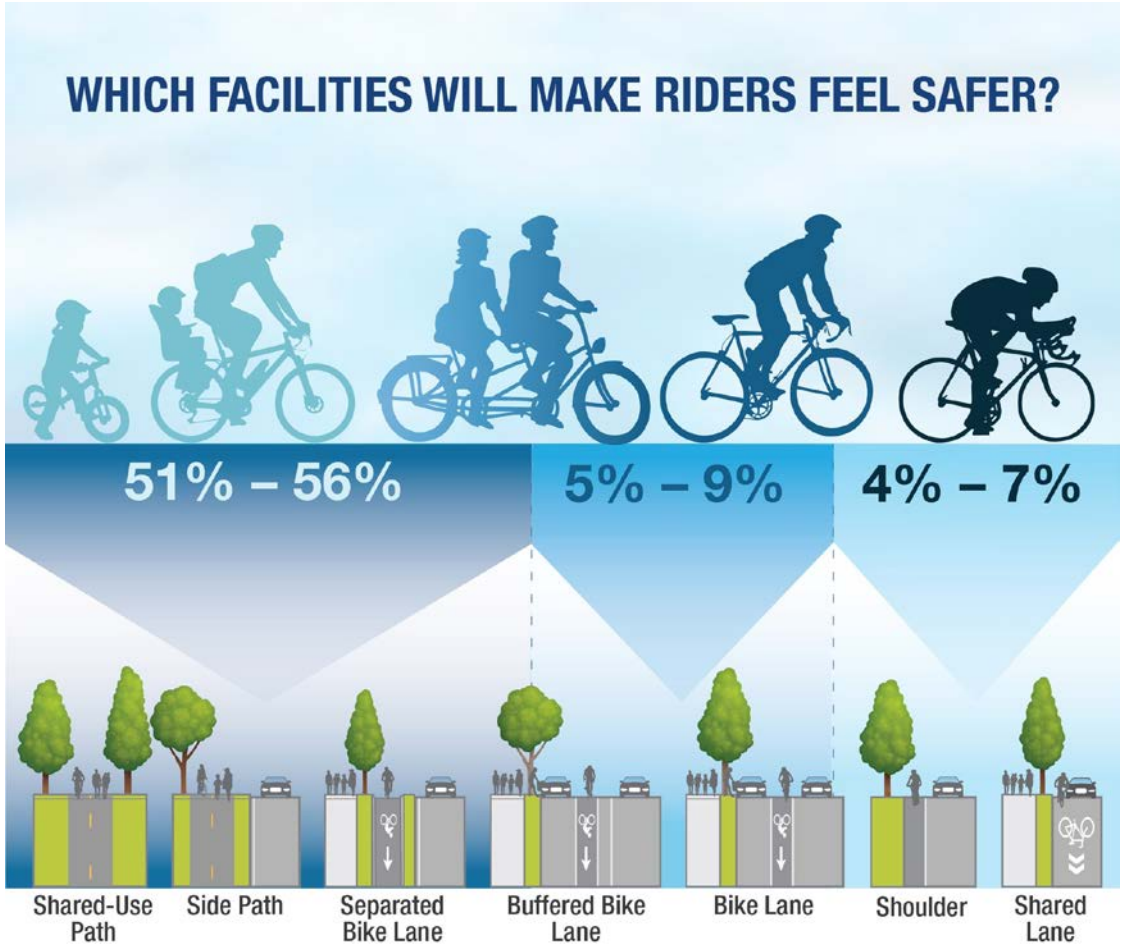
- Using variety of network measurement tools (including Level of Traffic Stress)
- New data sources (including Streetlight, Sidewalk Labs)
- Variety of contexts (arterial corridors all the way to statewide)
- Answering different questions (safety, planning, project prioritization)

Using Micromobility Data to Estimate Volumes

- Fusing multiple datasets to estimate volume/exposure
  - NITC Data Fusion Study
  - SCRAM Tool
- Micromobility data
  - Aggregated route data could supplement other data sources
- Possible outcomes
  - Better exposure models for safety analyses
  - Project performance evaluations
  - Network forecast models for scenario planning and project prioritization

Strava Global Heatmap bicycle trip data: https://www.strava.com/heatmap

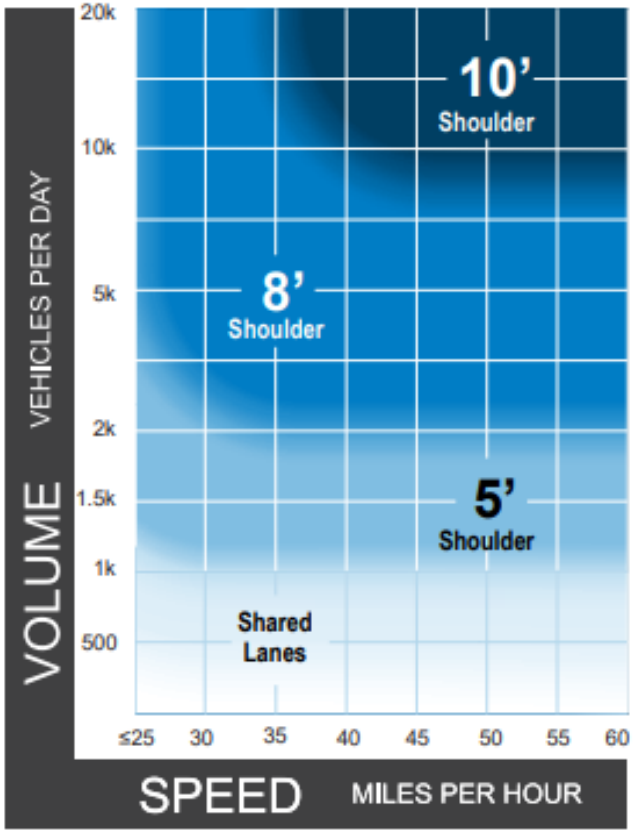
Planning and Designing Bicycle Facilities for All Ages and Abilities



Note: Percentages represent the level of comfort that people feel bicycling, according to peer-reviewed surveys as recently as 2016.
Source: FHWA Bikeway Selection Guide: https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/fhwasa18077.pdf
For more information, please visit FHWA's Bicycle and Pedestrian Program webpage: https://www.fhwa.dot.gov/environment/bicycle_pedestrian/

Bikeway Selection Guide

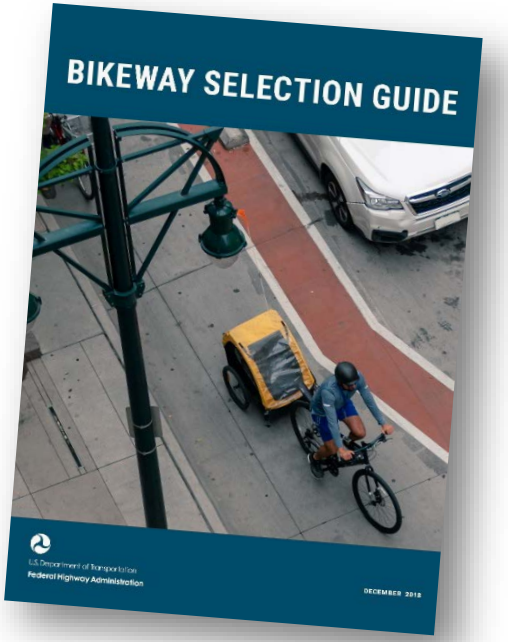
- Help practitioners make informed decisions about tradeoffs relating to the selection of bikeway types.
- Highlight linkages between the bikeway selection process and the transportation planning process.
- Emphasizes engineering judgment, design flexibility, documentation, and experimentation.



https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/fhwasa18077.pdf

Bikeway Selection Process

- Policy
- Planning
- Selection
- Design



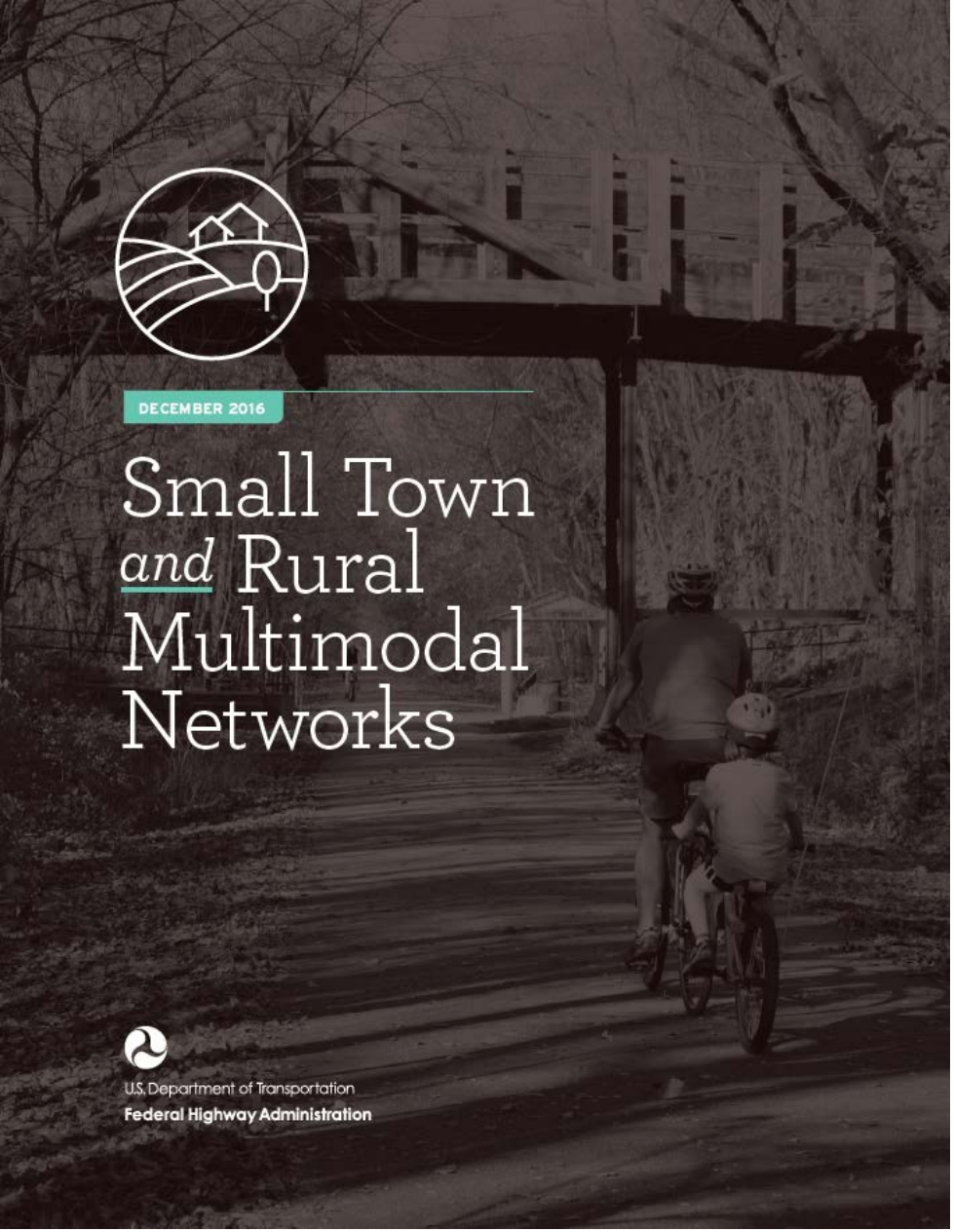
Upcoming NHI Bicycle Facility Design Web Training

Bicycle Planning Principles

Safety

Comfort

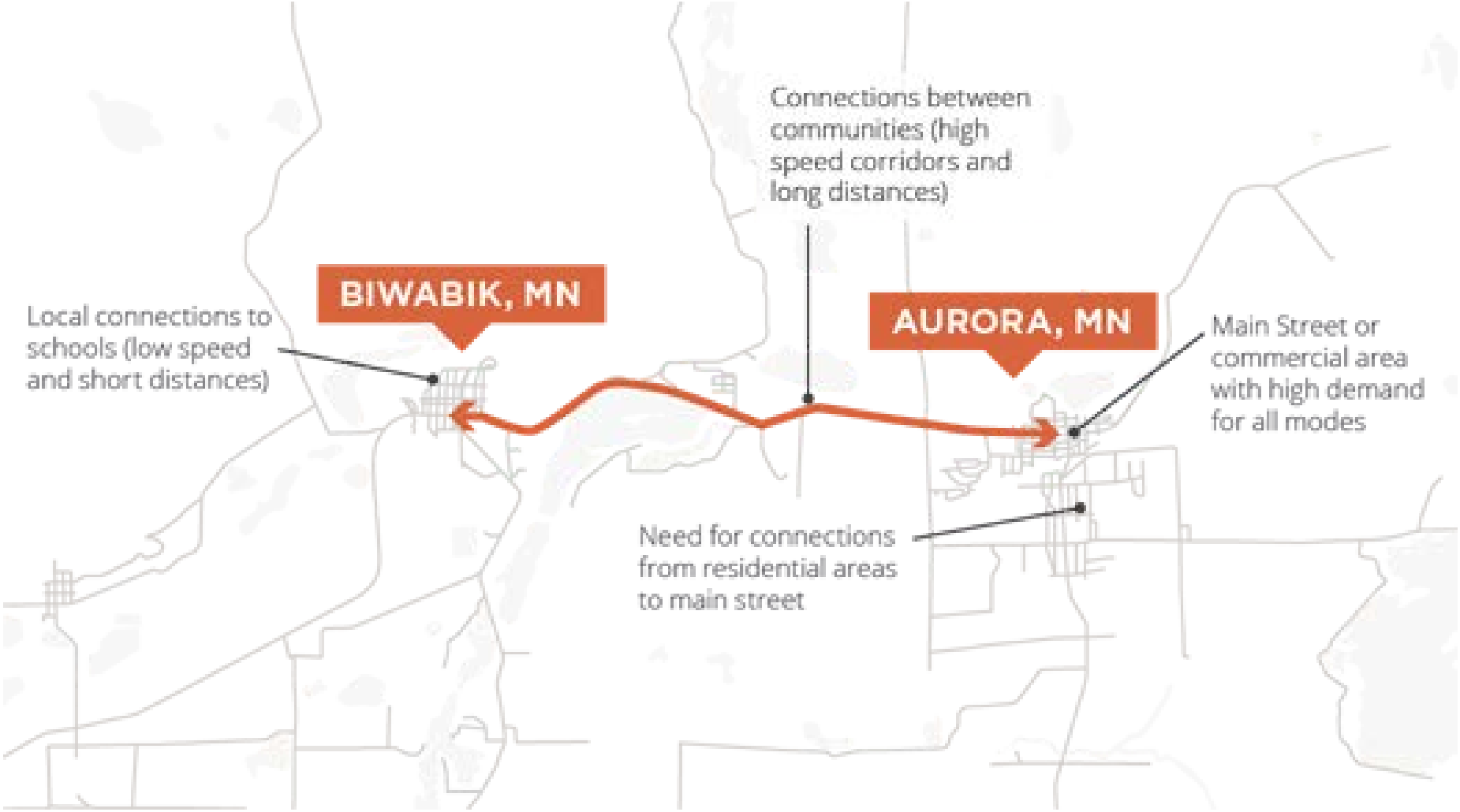
Connectivity



- Provide a bridge between existing guidance on bicycle and pedestrian design and rural practice.
- Encourage innovation in development of safe and appealing networks for bicycling and walking in small towns and rural areas.
- Provide examples of peer communities and project implementation that is appropriate for rural communities.

www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/

Building a Rural and Small Town Multimodal Network



Resources

- FHWA Bicycle and Pedestrian Program
- FHWA Guidance: Bicycle and Pedestrian Provisions of Federal Transportation Legislation
- FHWA Division Office Bicycle and Pedestrian Points of Contact
- State DOT Bicycle and Pedestrian Coordinators
- Pedestrian and Bicycle Funding Opportunities
- Bicycle and Pedestrian Resources
- Pedestrian and Bicycle Information Center