Non-motorized Volume Data Collection and Management Peer Exchange

A TPCB Peer Exchange Event

Location:	Virtual
Date:	July 14-15, 2021
Host Agency:	Mid-Ohio Regional Planning Commission (MORPC)
National Peers:	Lauren Cardoni, MORPC Josh Clark, San Diego Association of Governments Eric Katz, Florida Department of Transportation Jennifer Noll, MORPC Jeff Peel, StreetLight Data Michael Petesch, Minnesota Department of Transportation (MnDOT) Suzanne Scotty, MnDOT Sarah Searcy, Institute for Transportation Research and Education, North Carolina State University Shawn Turner, Texas A&M Transportation Institute
Sponsoring Agency:	Federal Highway Administration (FHWA)

U.S. Department of Transportation
Federal Highway Administration

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13. ABSTRACT (Maximum 200 words)

This report summarizes proceedings of a virtual peer exchange sponsored by the Federal Highway Administration (FHWA) and hosted by the Mid-Ohio Regional Planning Commission (MORPC) on July 14-15, 2021. The purpose of the peer exchange was to discuss techniques for collecting and managing non-motorized volume data that could be used for better transportation policy, planning, and research. The event provided an opportunity for State departments of transportation, metropolitan planning organizations, and other public agencies across the U.S. to share experiences, lessons learned, successes, and challenges related to the topic. Specifically, participants discussed data collection program development and management, the different types of equipment available for such programs, and potential data uses. The event was sponsored by FHWA through its Transportation Planning Capacity Building Program, led in partnership with the Federal Transit Administration.

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Contents

Peer Exchange Overview

This report highlights the presentations, discussions, and key takeaways from the "Non-motorized Volume Data Collection and Management" virtual peer exchange, held over two half-days on July 14-15, 2021. The event was sponsored by the Federal Highway Administration (FHWA) through its Transportation Planning Capacity Building (TPCB) program, led jointly with the Federal Transit Administration. The event was held at the request of the Mid-Ohio Regional Planning Commission (MORPC) to bring together peers from across the country to discuss ways to implement non-motorized volume data collection programs, as well as opportunities for further research and resources.

The peer exchange featured four main sessions: "lightning round" peer introductions, overviews, and presentations; uses of data; program development and management; and Big Data. Each session ended with a facilitated discussion, and the peer exchange closed with a breakout session focused on next steps as participants shared what they learned and what they would take back to their respective agencies.

Session Discussions

Opening Remarks

Representatives from the FHWA Office of Planning, FHWA Ohio Division, and MORPC provided opening remarks, recognizing that the purpose of the peer exchange is to share information about non-motorized volume data collection and management, as well as how it fits in with FHWA's current initiatives such as Complete Streets.

The FHWA noted that the TPCB website hosts a variety of other valuable resources for the transportation planning community, including summary reports from TPCB peer exchanges, case studies, and past research.

After opening remarks, a poll was administered asking participants to share their level of experience with collecting and using non-motorized volume data (Figure 1). Less than a quarter of respondents (24 percent) reported having advanced experience. An equal number of respondents (38 percent) reported having beginner and intermediate experience.

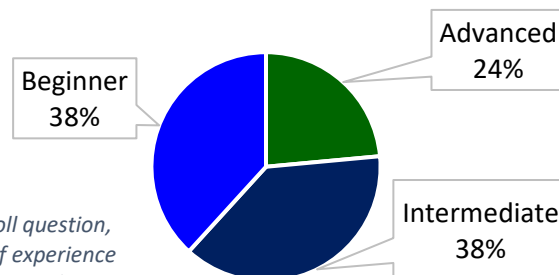**What is your current level of experience collecting and using non-motorized volume data?**

Figure 1: Responses to the poll question, "What is your current level of experience collecting and using non-motorized volume data?

MORPC Overview Presentation

MORPC's goal in organizing this peer exchange was to invite agencies at all stages in the non-motorized volume data collection and management program development process to share their experiences and advice, discuss potential solutions to existing challenges, and identify next steps.

Representatives from MORPC explained the need for better non-motorized volume data to improve their bicycle and pedestrian transportation program and learn from peers about effective tools, practices, and resources. Before transitioning to peer introductions, MORPC presented information on its non-motorized data collection program and experiences in developing and implementing it.

Notable Takeaways
- Partnering with local agencies makes it easier to install and maintain more counters.
- Certain equipment may not provide the most reliable data, and there can be a tendency for them to undercount. These types of counters may be better suited for lower-volume areas.
- Short duration counts on a rotating basis may help address gaps in data for locations that are not permanently monitored.

Peer Introductions, Overviews, and Presentations[1]

This session included six practitioners to discuss their experiences developing and implementing non-motorized volume data collection programs, as well as insights on the variety of equipment available, partnership and funding opportunities, and other key considerations.

The session highlighted the need to maintain counters following initial grant funding, conduct public outreach to determine effective site locations for counters, establish roles and responsibilities to allow for rigorously evaluated and accurate data, collaborate with partners, and the potential of using Big Data.

Notable Takeaways
- Shawn Turner, Texas A&M Transportation Institute (TTI) – College Station, TX
  - It is important to work with other agencies, especially if funding and human resources are concerns.
  - It is essential to maintain momentum and recognize that the first few years will potentially be marked by growing pains and challenges.
  - Agencies may have different priorities; effective partnerships require time and patience.
- Josh Clark, San Diego Association of Governments (SANDAG) – San Diego, CA
  - Developing long-term funding and maintenance plans benefits data collection programs.
  - One possibility to address funding concerns is to partner with higher education institutions.
- Eric Katz, Florida Department of Transportation (FDOT) – Tallahassee, FL
  - A rigorous site selection process that includes comprehensive statewide surveys, site visits, and discussions with locals, can result in better placement of counters and therefore, more effective data.

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[1] References to various tools in this report do not represent an endorsement. FHWA recognizes that many tools are available and encourages agencies to use the tools that work best for them.

- o Video technology enhances data collection programs, as it captures not just counts but also travel behavior.
- Sarah Searcy, Institute for Transportation Research and Education, North Carolina State University (ITRE, NC State) – Raleigh, NC
  - o Short duration counts were used to evaluate the suitability of a counting location before investing in the installation of a permanent continuous counter.
  - o Local environment context is an important consideration in determining equipment type and maintenance plans.
- Suzanne Scotty, Minnesota Department of Transportation (MnDOT) – St. Paul, MN
  - o A counter loan program helps address local needs while also expanding data coverage.
  - o In developing data warehouses, key considerations include data standardization and accessibility.
- Jeff Peel, StreetLight Data – New York, NY
  - o Big Data provides easy access to data from all road users at all times.
  - o "Pings" are not assigned a single mode, but rather a mode probability distribution developed using geospatial features (speed, road network, location context).
  - o The data is frequently validated for accuracy.

Uses of Data

This session included two transportation practitioners to discuss how they share and illustrate collected data and how they utilize data to inform decision-making and guide implementation. Panelists shared available tools and resources and appropriate research and lessons learned in data collection, usage, and management.

Notable Takeaways
- Shawn Turner, TTI
  - o Figuring out how data will be used is the first step in developing a thorough data collection and management program.
  - o Non-motorized volume data will have various uses, and it is important to balance the requirements for the different uses as they will all have slightly different needs and parameters.
  - o One "chicken or the egg" paradox that advocates for non-motorized volume data programs often encounter is the circular logic of, "We shouldn't collect pedestrian and bike data count until we have a defined process for it," and "We don't have a defined process for it because we don't have that data."
  - o Recommended resources:
    - TxDOT Bicycle and Pedestrian Program & Texas A&M Transportation Institute's (TTI) "Everything You Wanted to Know about Bicyclist and Pedestrian Count Data"
    - Pedestrian & Bicycle Information Center (PBIC) Information Brief
- Josh Clark, SANDAG
  - o In storing data, recognize that it may be requested by external parties such as journalists and colleagues in other departments and plan accordingly by monitoring certain variables and adjusting how data is stored.

- One recent popular use of pedestrian and bike data was monitoring and presenting the impacts of COVID-19.
- Pedestrian and bike data can also be used for grant applications, particularly those that require cost-benefit analyses.
- Recommended resources:
  - [SanDAG InfoBits' "Bike Riding in the San Diego Region Since COVID-19"](#)
  - [SanDAG InfoBits' "2020 State of the Commute Report"](#)
  - [San Diego Regional Bike and Pedestrian Counters](#) (hosted by Eco-Counter)
  - [SanDAG Non-Motorized Database System](#) (hosted by MS2)

Main Challenges

- Publicizing data to those who need it for grant applications and research.
  - Regularly scheduled meetings or workshops with partners are a potential solution. This will also help to reaffirm the relationship between agency and vendor to ensure maintenance is addressed.
- Restricted coordination between State departments of transportation (State DOTs) and local partners.
  - Some State DOTs may wish to maintain a firewall and only use data that they have certified themselves.
- Difficulty using new technologies as they come out due to incompatibilities with existing software.
  - Ensure that data management software can accept data from multiple sensor technologies and can adapt to new incoming technologies, such as smart cameras.

Opportunities

- Developing a statewide user data group to facilitate partnership and collaboration.
- Developing guidelines and training local agencies to import data.

During this session, a poll was administered to ask what data-sharing dashboards (specifically for non-motorized volume data) their agencies use, if any (Figure 2). The feedback provided by 12 respondents was used in discussions about how each dashboard type facilitated or limited the ability to use certain counter equipment, and the ability to share data.

If your agency has access to a data-sharing dashboard (specifically for non-motorized volume data), what type is it?

Other 17%

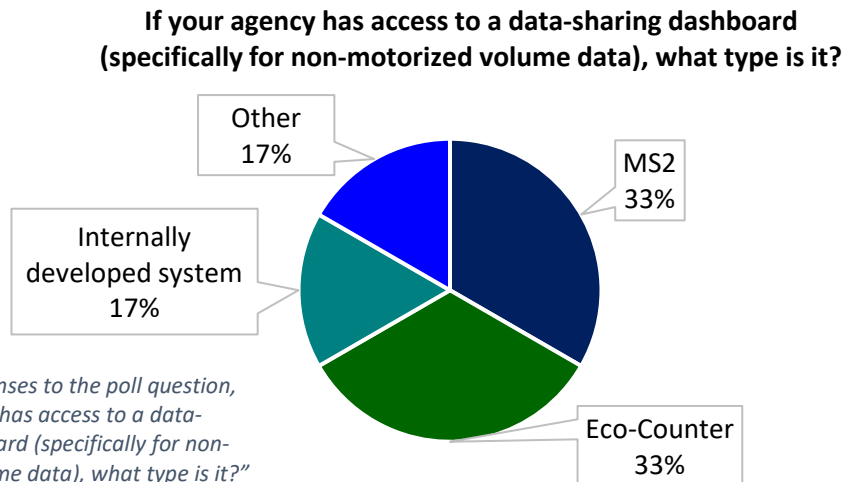Internally developed system 17%

MS2 33%

Eco-Counter 33%

Figure 2: Responses to the poll question, "If your agency has access to a data-sharing dashboard (specifically for non-motorized volume data), what type is it?"

Program Development and Management

This session included two transportation practitioners to discuss the equipment and processes they use to collect bicycle and pedestrian volume data on trails and streets, and how they address data quality. Panelists also explored network creation, local agency coordination, and equipment and positioning.

Notable Takeaways

- Eric Katz, FDOT
    - o Short term counts are useful in selecting continuous counter installations.
    - o One effective way to work with local agencies is to provide them with short term count equipment.
    - o Local agencies can use non-motorized data collected to support their local planning efforts.
    - o There are a variety of equipment types available; important factors to consider in selecting equipment are budget, ease of implementation and maintenance, accuracy and type of data gathered, and data management software compatibility.
- Sarah Searcy, ITRE, NC State
    - o A hybrid combination system, such as a passive infrared-inductive loop system, can be used to count bicycles and pedestrians separately at the same location during the same time period.
    - o Local climate is important to consider, especially in regions like North Carolina that have extreme weather, which can affect the performance of counters.
    - o Counter validation, weekly data monitoring, and maintenance help ensure quality data.
    - o Recommended resources:
        - North Carolina Non-Motorized Volume Data Program (NC NMVDP): Overview and Data Reports
        - North Carolina Non-Motorized Volume Data Program (NC NMVDP): Phase 2 Final Report
        - North Carolina Non-Motorized Volume Data Program (NC NMVDP): Local Agency Resources
        - ITRE, NC State and East Carolina University's "State of the Art Approaches to Bicycle and Pedestrian Counters"

Post-Presentation Discussion

This session was followed by a facilitated discussion led by MORPC in a question-and-answer format.

If you have experience with MioVision, what did you use it for and how was it?
- FDOT has used it for manual count validation. However, the FDOT representative cautioned that MioVision (portable units) has limited battery life (maximum 72 hours), which should be taken into consideration.
- ITRE, NC State has tested MioVision and confirmed that accuracy is very high for bike and pedestrian counts, but the battery life and costliness posed barriers to implementing it for long-term counts.
- MioVision may be useful for short-term counts if complex data beyond just the number of people is of interest (e.g., behavioral information).
- Lighting of the site selected must be factored in for camera-based equipment; otherwise, agencies can expect to lose at least 12 hours of data whenever it is dark.

How often do the ideal sites for monitoring motor vehicles line up with the ideal sites for monitoring walking/biking?
- FDOT found that a good number of the proposed bike and pedestrian count sites in their initial site selection process were also motorized vehicle count sites. Not all motorized vehicle counts sites are good bike and pedestrian count sites, but when it is, it provides an opportunity to maximize resources in regard to count site implementation and maintenance.

Big Data

This session included two transportation practitioners to discuss how they source and manipulate Big Data for bike and pedestrian volume data. Panelists also reviewed data accuracy and calibration and how to account for outliers and potential errors.

Notable Takeaways
- Michael Petesch, MnDOT
  - Big Data helped MnDOT forecast scenarios (e.g., where pedestrians and bicyclists might reroute if a major bridge closed for a year), thus improving planning and design.
  - Big Data from global heat maps also helped MnDOT facilitate permanent count site selection.
- Jeff Peel, StreetLight Data
  - Big Data can be used in a variety of ways, including but not limited to analyzing impact of street closures, informing placement of permanent bike and pedestrian infrastructure, and evaluating safety risks based on multimodal crash data.
  - Big Data was helpful for quantifying the impacts of COVID-19 on pedestrian and bike habits.

Main Challenges
- Developing a data warehouse that can help standardize and store large data sets.
- Equity concerns with Big Data as it does not factor in community contexts.
- Accuracy of information from Big Data; MnDOT referenced two studies – [Mapping Ridership Using Crowdsourced Cycling Data](#) and [Using Strava Data for Active Transportation Planning](#) – that suggest that one Strava user might actually be ten to fifty people on the ground.

Opportunities
- While Big Data might not make a good substitute for counters, it may complement a counter program by helping to validate counts and informing site selection.

Post-Presentation Discussion
This session was followed by a facilitated discussion led by MORPC in a question-and-answer format.

How do we begin to bring all these pieces of information into one single data warehouse? Is that possible?
- MnDOT is currently in the midst of a research project to figure out the answer, as they have both Big Data and decades of manual count data. They've established that they can't use the same warehouse where they store their motorized vehicle data. However, this opens up their frontiers and provides them increased flexibility in pursuing alternative options.
- One participant noted that it may not be necessary to have a singular data warehouse; as long as it is good quality data, some agencies would be open to having multiple sources.

- Geospatial conflation is a potential solution, but cost is a barrier.
- Unlike motorized data, non-motorized data does not yet have the same level of standardization in regards to tools and outputs. This poses an additional barrier.
- Whether the end goal is a public facing or internal tool also affects how data could and should be stored.

Looking Ahead

This session opened with four breakout groups where participants shared perspectives regarding equipment types, program development and management, and the opportunities for and benefits of partnering with other agencies and institutions. Afterwards, all participants reconvened for report-outs from the groups to share their insights and potential next steps.

Notable Takeaways (Breakout Groups)
What are the key takeaways you learned during the past two days of discussion?
- The importance of documenting everything, as demonstrated by ITRE, NC State and TTI.
- The time and patience program development takes.
- The need to standardize and store data in a way that makes it easy to use and share.
- The variety of methods and equipment to measure, manage, and store data.
- The ability of partnership to help overcome barriers posed by limited funding and human resources.
- The value of partnerships with local research institutions or state DOTs to provide formal structure and resources for the program.

What are some noteworthy practices or procedures you would like to bring back to your agency?
- The integration of non-motorized vehicle and vehicle data collection programs, as demonstrated by [FDOT](#).
- The usage of short-term counters and Big Data in selecting permanent count sites.
- The robust testing of data for quality control, as demonstrated by [ITRE, NC State](#).
- The empowerment of locals to manage short-term counts, potentially through counter loan and training programs.

How could guidance for non-motorized data collection programs for improved?
- Standardized processes at the Federal level for data collection programs.
    - E.g., a standardized format for data warehousing that is accessible for all agencies, a program for feeding that standardized data into Big Data sources to provide more accurate data on a larger scale, guidance for conducting quality control on data, etc.
- Federal support to standardize and fund programs to bring non-motorized data collection up to the same level as motorized.
- Templates for how to write to legislators.

Where are there opportunities for further coordination?
- Partnerships with "traditional" partners, such as FHWA, and "non-traditional" partners, such as public health departments and departments of natural resources.
    - Collaboration with these partners could increase the potential to move the field towards standardized national data to feed into validation and calibration of big data.
- Joint effort among all State DOTs.

- o Participants shared that having collaboration among state DOTs could be useful in conducting rigorous accuracy assessments to help develop useful standards.
- Partnership between smaller and larger agencies.
  - o This would improve data sharing and minimize redundant data collection.
  - o As an example, there are some sites that have multiple cameras from different agencies.
- Federal pool-funded studies to combine state and regional resources to update and expand on National Cooperative Highway Research Program reports.
- Coordination within state DOTs between non-motorized and motorized volume data collection programs.

Conclusion and Key Takeaways

This peer exchange, led by FHWA and MORPC, convened representatives from Federal, State, regional, and local agencies across the U.S. to discuss how to design and improve non-motorized volume data collection and management programs. Participants shared their experiences, lessons learned, and key challenges during several group discussions and identified opportunities for engagement. Peers shared resources with notable practices and training opportunities to help advance capabilities.

Key takeaways from discussions:

- Partnership with Federal, State, regional, and local agencies is key to ensuring a rigorous and long-lasting non-motorized volume data collection and management program.
  - o Partnerships, pooled resources, and training programs help address barriers regarding limited human resources and funding. This allows local agencies to use resources they could not have otherwise and gain additional data without expending further resources.
  - o Coordination between various state DOTs, along with Federal guidance, will improve standardization of data collection and management, thus improving the ease of using and sharing data for transportation planning and research.
  - o Non-motorized volume data collection and management is a relatively new field, and there is a need for collaboration and information sharing. Better understanding the needs of those who might be using the data will help improve how the data is collected and managed.
- There is a wide variety of technology available, but each has their limitations and weaknesses.
  - o Important considerations include how easy it is to implement and maintain, the quality and type of data gathered, data management software compatibility, and cost.
  - o One solution to address the weaknesses of individual equipment types is to form hybrid counter systems that combine two equipment types, such as a passive infrared-inductive loop system.
  - o Big Data is helpful but also has its limitations. For the time being, it is best used to supplement non-motorized volume data collection programs.
- Time and patience are key.
  - o Developing a non-motorized volume data collection program will not happen overnight. Agencies must be prepared to invest in the program long-term.
  - o It will take time for momentum to build, but once it does you can capitalize on it. Continue to build partnerships and improve the program over time.

Appendices

Appendix A: Key Contacts

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