NJ 2020 SHSP

Data Emphasis Area

Completed Priority Action 3.A.1.b.

Review of data collection technologies and identified list of best practices for data collection and data management.

Driving Toward ZERO Deaths

October 5, 2021

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Best practices for collecting and calculating pedestrian and bicycle volumes

Introduction

As part of the New Jersey 2020 Strategic Highway Safety Plan, the Data Emphasis Area Team performed a review of best practices for non-motorized (e.g., bicycles, pedestrians, etc.) traffic monitoring, including data collection methods and count programs. Although non-motorized traffic monitoring is a relatively new and emerging area of data collection, there is a growing need for better, more comprehensive data to support decision making for bicycle and pedestrian infrastructure and safety improvement projects, particularly in New Jersey. The Federal Highway Administration (FHWA) has identified New Jersey as a pedestrian safety focus state due to the high incidence of pedestrian fatalities and injuries. There is no New Jersey specific non-motorized count program for the state, however, the information in this document can be utilized for developing a comprehensive count program that addresses the data collection and management needs of non-motorized transportation modes in the state.

The report consists of three sections:
1) Review of non-motorized data collection technologies
2) Review of count programs
3) Near miss crash data collection

The goal of this report is to review existing and evolving non-motorized data collection technologies, review guidance from other state count programs and summarize best practices for non-motorized traffic data collection and management, and safety. The FHWA 2016 Traffic Monitoring Guide (TMG) for current guidance and standards on non-motorized data collection was reviewed as part of this effort.

1. Review of non-motorized data collection technologies

Different types of technologies including traditional methods (such as Automated Video Imaging, Induction Loops, Sensor, and Infrared technologies) used to count pedestrians and bicyclists and the benefits and shortcomings of each of those technologies were reviewed and documented in this section. More recent location and application-based count technologies were also evaluated and summarized.

1.1. Traditional data collection technologies

The TMG contains guidance on the benefits and drawbacks of different traditional types of non-motorized data collection technologies and selecting the most appropriate methods for a desired application. When selecting proper and appropriate equipment, the type of data being collected, and the duration of the count are two vital decision points. Types of data include bicyclists and pedestrians combined, bicyclists only, pedestrians only, or pedestrians and bicyclists separately. There are typically two types of count durations: short-term (one hour up to one month) and permanent (continuously for more than one month).

The TMG presents a simplified flowchart that assists in narrowing potential methods based on these two decision points. The columns across the top of Figure 1 contain the type of data being collected for the first decision points and the duration is listed vertically on the left side.

Table 1 provides additional traditional technology information for counting bicyclists and pedestrians, attributes of each technology, and the strengths and weaknesses. This table is best used after relevant technologies have been narrowed down using Figure 1. The TMG includes additional detail and recommendations on the capabilities and limitations of various technologies in Chapter 4.2.

1. What Are You Counting?

2. How Long? (Permanent ↔ Temporary/Short Term)

Technology	Bicyclists Only	Pedestrians Only	Pedestrians & Bicyclist Combined	Pedestrians & Bicyclist Separately	Cost
Inductance Loops[1]	●			◐	$$
Magnetometer[2]	○				$-$$
Pressure Sensor[2]	○	○	○	○	$$
Radar Sensor	○	○	○		$-$$
Seismic Sensor	○	○	○		$$
Video Imaging: Automated	○	○	○	○	$-$$
Infrared Sensor (Active or Passive)	○[3]	●	●	◐	$-$$
Pneumatic Tubes	●			◐	$-$$
Video Imaging: Manual	○	○	○	●	$-$$$
Manual Observers	●	●	●	●	$$-$$$

○ Indicates what is technologically possible.
● Indicates a common practice.
◐ Indicates a common practice, but must be combined with another technology to classify pedestrians and bicyclists separately.
$, $$, $$$: Indicates relative cost per data point.
[1] Typically requires a unique loop configuration separate from motor vehicle loops, especially in a traffic lane shared by bicyclists and motor vehicles.
[2] Permanent installation is typical for asphalt or concrete pavements; temporary installation is possible for unpaved, natural surface trails.
[3] Requires specific mounting configuration to avoid counting cars in main traffic lanes or counting pedestrians on the sidewalk.

Source: FHWA Traffic Monitoring Guide, 2016

Figure 1 - Simplified Flowchart for Selecting Non-Motorized Count Equipment

Table 1 - Traditional Pedestrian and Bicyclist Counting Technologies

Technology	Typical Applications	Strengths	Weaknesses
Inductance Loop	Permanent counts Bicyclists only	Accurate when properly installed and configured Uses traditional motor vehicle counting technology	Capable of counting bicyclists only Requires saw cuts in existing pavement or pre-formed loops in new pavement construction May have higher error with groups
Magnetometer	Permanent counts Bicyclists only	May be possible to use existing motor vehicle sensors	Commercially available, off-the-shelf products for counting bicyclists are limited

Technology	Typical Applications	Strengths	Weaknesses
			May have higher error with groups
Pressure sensor/pressure mats	Permanent counts Typically unpaved trails or paths	Some equipment may be able to distinguish bicyclists and pedestrians	Expensive/disruptive for installation under asphalt or concrete pavement
Seismic sensor	Short-term counts on unpaved trails	Equipment is hidden from view	Commercially available, off-the-shelf products for counting are limited
Radar sensor	Short-term or permanent counts Bicyclists and pedestrians combined	Capable of counting bicyclists in dedicated bike lanes or bikeways	Commercially available, off-the-shelf products for counting are limited
Video Imaging – Automated	Short-term or permanent counts Bicyclists and pedestrians separately	Potential accuracy in dense, high-traffic areas	Typically more expensive for exclusive installations Algorithm development still maturing
Infrared – Active	Short-term or permanent counts Bicyclists and pedestrians combined	Relatively portable Low profile, unobtrusive appearance	Cannot distinguish between bicyclists and pedestrians unless combined with another bicycle detection technology Very difficult to use for bike lanes and shared lanes May have higher error with groups
Infrared – Passive	Short-term or permanent counts Bicyclists and pedestrians combined	Very portable with easy setup Low profile, unobtrusive appearance	Cannot distinguish between bicyclists and pedestrians unless combined with another bicycle detector Difficult to use for bike lanes and shared lanes, requires careful site selection and configuration May have higher error when ambient air temperature approaches body temperature range May have higher error with groups Direct sunlight on sensor may create false counts
Pneumatic Tube	Short-term counts Bicyclists only	Relatively portable, low-cost May be possible to use existing motor vehicle counting technology and equipment	Capable of counting bicyclists only Tubes may pose hazard to trail users Greater risk of vandalism

Technology	Typical Applications	Strengths	Weaknesses
Video Imaging – Manual Reduction	Short-term counts Bicyclists and pedestrians separately	Can be lower cost when existing video cameras are already installed	Limited to short-term use Manual video reduction is labor-intensive
Manual Observer	Short-term counts Bicyclists and pedestrians separately	Very portable Can be used for automated equipment validation	Expensive and possibly inaccurate for longer duration counts

Source: FHWA Traffic Monitoring Guide, 2016

1.2. Newer data collection technologies

Smartphone data, navigation devices, and location-based services have evolved and matured over time, leading the way for newer technologies to extract locational "Big Data" and making it available for transportation planners and engineers. Modern trends in fitness activities and utilization of smartphones and GPS by users for tracking their activities are changing the way cities plan for active transportation and justify decision making. Crowdsourced data through mobile and GPS technology offer a new approach for filling the spatial gap in cycling ridership and pedestrian foot traffic. Other newer video and sensor-based technologies have also provided better ways to capture non-vehicular traffic. A review of these newer technologies along with their strengths and weaknesses is documented in this section and a summary is provided in Table 2.

1.2.1. StreetLight Data

StreetLight Data turns data points from location-based services including cell phones, in-car navigation devices, commercial fleets, and other location data into transportation metrics. StreetLight Data is an interactive online platform that uses already available tools to give accurate information regarding traffic counts, origin-destination for trip, and travel patterns. StreetLight Data currently utilizes two types of locational data to derive transportation metrics: one major navigation-GPS data supplier, INRIX, and one Location-Based Services data supplier, Cuebiq.

StreetLight data from location-based services is normalized to adjust for any population sampling bias and the data from navigation-GPS trips is normalized through external calibration points such as public, high-quality vehicle count sensors, survey reports, etc. Data is aggregated for queries based on historical data for an area or at a regional level. StreetLight Data has the potential to provide statewide coverage, however, availability of additional calibration data can ensure accuracy. Additional data calibration may be needed for pedestrian and bicycle modes. Analytical data for E-Scooters, e-bikes, and other emerging mobility is not made available yet. However, the Multimodal Measurement (M2) initiative is currently being developed to provide for a comprehensive multimodal measurement. Additional information regarding this technology can be obtained at https://www.streetlightdata.com/.

1.2.2. Replica

Replica is an online data platform that provides a collective representation of the built environment- people, mobility, economic activity, and land use. The platform utilizes machine learning technology to turn de-identified data points into insights, providing a quick and accessible way to combine traditional data about cities (like Census data) with new sources of data (like smartphones and payment data). Replica combines various data sources to surface patterns and trends about how groups of people move and interact with the built environment. Replica validates its data through available observed data, such as auto counts or transit ridership.

Replica can provide activity-based travel models for specific regions at specific points-in-time. The platform enables customized investigations, allowing the user to filter by the characteristics of trip takers (e.g., only trips taken by those of a certain race, of a specific income-level, or living in a certain neighborhood) or by the characteristics of trips themselves (e.g., only trips of a certain mode, at a certain time, or for a specific purpose). Replica does not disclose specific vendors it purchases cell phone location data from which has led to privacy and data transparency concerns in the past. Additional information regarding this technology can be obtained at https://replicahq.com/.

1.2.3. Strava

Strava is a smartphone application used by runners and cyclists to track their activities. The application has gained a lot of popularity recently and has over 76 million users worldwide. Strava connects with a variety of GPS devices and is continuously generating data on non-vehicular activities at very high spatial and temporal resolutions. The application can track popular pedestrian/biking routes and trails along with activity and provides counts across all locations, rather than select pedestrian/bicyclist count locations. Strava also allows to measure usage patterns based on gender while also helping track progress and route usage based on infrastructure improvements.

Maps of Strava data can represent a sample of pedestrian and bicycling volumes, where the sample is generated from application users. In order to utilize Strava to map all pedestrians or bicyclists, it becomes essential to build a statistical relationship between Strava and official counts and to calculate how many runners or bicyclists are represented by one Strava pedestrian or rider, across different types of streets. This application is not useful in classifying the purpose of the trip, whether it is a commute vs. recreational trip, and also raises concerns regarding market penetration to underserved populations.

Strava Metro is the platform that aggregates, de-identifies and contextualizes the dataset from the Strava application. Additional information regarding this application can be found at: https://www.strava.com/mobile. Additional information about the Strava Metro data platform can be found at: https://metro.strava.com/.

1.2.4. Moovit

Moovit is a smartphone application with features that include multimodal trip planning, real-time arrival and service alerts, ticketing and payment integration, and all mobility options such as ride hailing, micro-mobility, and car sharing. The application utilizes big data analytics to provide for accurate on-demand transit services. Moovit’s transit APIs are used by their partners such as Microsoft, Uber and Lyft to provide for a convenient and accurate way to integrate the best public transit options. The application provides the first and last mile information for any trip and route. Moovit has capabilities that gives nearby mobility options of modes like bikes, scooters, and mopeds.

Moovit gathers feedback from its users about their travel experience, congestion levels for transit, cleanliness, and more. The application generates a large volume of data points everyday, creating a large repository of people’s movement data that can be made available for utilization by transportation agencies for analyses. Utilization of big data poses risks for privacy issues which is recognized by the application owners. The usefulness of the application is also dependent on the location for which it is being used since the application does not provide information for all cities of the world. Additional information regarding this application can be found at: https://moovit.com/.

1.2.5. Miovision

Miovision is a video detection system that collects the traffic videos from the field, and provides an online software that analyses the video and produces the data and reports. The system provides verifiable traffic data for different types of transportation modes. This method of data collection allows for e-scooter classification that provides better multimodal insights to planners and engineers. Mopeds are not included in the e-scooter classification for Miovision, they are reported as motorcycles. The device and platform can help in identifying near miss crashes; however, it requires permanent installation of the camera devices. Miovision system provides for local conditions and counts only.

Miovision DataLink Platform is a traffic data management cloud application that connects transportation engineers and planners with their data. Using a modern web-based interface the traffic count data is visualized and stored in the cloud so the user can analyze the data quickly. Additional information regarding this technology can be found at: https://miovision.com/.

1.2.6. Iteris

Iteris is a company that provides software and consulting services for smart mobility infrastructure management, as well as products such as video detection, radar detection, and hybrid detection that record and predict traffic conditions. Iteris is mainly installed at traffic signals providing information for local conditions only. The company applies cloud computing, artificial intelligence, advanced sensors, advisory services and managed services to achieve safe, efficient and sustainable mobility. Features from Iteris include accurate and real-time detection and differentiation for pedestrians, bicyclist, and other modes. SmartCycle Bike Indicator is a device from Iteris that detects cyclists waiting when mounted on traffic signals. PedTrax is a similar feature from Iteris to detect pedestrian activity at crosswalks.

Devices from Iteris can be integrated with traffic signals and the detectors can help provide traffic signal optimization. Iteris ensures that vulnerable road users are detected separately, and they get prioritized at the traffic signals. Iteris can be utilized for detecting near-miss crashes and for incident management where there is permanent installation of the devices. Additional information about the technology can be found at: https://www.iteris.com/.

1.2.7. Numina

Numina measures mobility in streets and open spaces through computer vision algorithms to help city planners, mobility companies, and other stakeholders design better systems for people, bicycles, wheelchairs, strollers, and more. The company offers a standalone sensor that is easy to install, aim, and activate and attaches to any fixed infrastructure. Numina offers strong encryption and secure practices. Traffic data from Numina hardware can be accessed online with real-time updates. The sensor uses a camera and an attached processor running machine learning algorithms.

Numina measures multiple modes accurately including pedestrians, bicyclists, e-scooters, and other vulnerable road users. It provides traffic data trends over time. The sensor allow real-time detection of activity for any neighborhood, park, institution, business, or streets. Numina is a company started in 2015 and is still in its development stages. Additional information regarding this technology can be found at: https://numina.co/.

1.2.8. Ubicquia

Ubicquia offers smart sensors and streetlight audio and video processing applications that generates Big Data to monitor and predict transportation movement. The products offered by the company can be plugged into existing streetlights that can be utilized to improve pedestrian and public safety. Additional information regarding this technology can be found at: https://www.ubicquia.com/.

Table 2 - Newer Pedestrian and Bicyclist Counting Technologies

Technology	Typical Applications	Strengths	Weaknesses
StreetLight Data	Pedestrian and Bicyclist counts, Origin-Destination, travel patterns	Location based services data, accurate spatial precision, ability to infer trip purpose and modes	Less mature suppliers for location-based services data Variation in sample size Data for E-Scooters, e-bikes, and other emerging mobility not available yet
Replica	Pedestrian and Bicyclist counts, transit ridership, vehicle miles traveled	Location based services data, Combines traditional data sources with new data sources to provide accurate insights	Variation in sample size, Data source disclosure
Strava	Pedestrian and Bicyclist counts, specific routes, duration	Application based data, High spatial and temporal detail, Crowdsourced data, Monitoring change in bicycling patterns, Gender based route usage patterns	Modeling statistical relationship between Strava app and official volume counts; Sample size/market penetration; Trip classification; Equity concerns
Moovit	Pedestrian and bicycle counts, scooter counts, moped counts, specific routes	Application based data, Multimodal route planning, Real-time data, Integration with popular services such as bike-share, ride-share, and car-share	Sample size/market penetration; Privacy concerns; Primary use for transit options such as bus and rail
Miovision	Pedestrians, e-Scooter and bicycle counts, Travel time	Video based data, Permanent multimodal traffic counts, Accurate real-time data, Monitor performance measures, Near-miss crashes can be captured with permanent installation	Installation of devices and maintenance; Only reliable for local conditions

Technology	Typical Applications	Strengths	Weaknesses
Iteris	Pedestrians and bicycle counts, Traffic signal optimization, Incident management	Video based data, Permanent multimodal traffic counts, Accurate real-time data, Integration with traffic signals, Near-miss crashes can be captured with permanent installation	Installation of devices and maintenance; Only reliable for local conditions
Numina	Pedestrian and bicycle counts, scooter counts, moped counts, Stroller and Wheelchair counts, Street usage	Video based data, Permanent multimodal traffic counts, Accurate real-time data, No surveillance (data use and privacy)	Only reliable for local conditions; Relatively newer technology
Ubicquia	Pedestrian and bicycle counts,	Video based data, Real-time data	Only reliable for local conditions; Installation on streetlights only; Extensive information not available

2. Review of non-motorized data collection count programs

This section provides a summary of the non-motorized vehicles and pedestrians count programs and data collection practices by different states. Information regarding use of equipment, technology, storage, etc. is included in the section. There is a general lack of standards for bicycle and pedestrian data collection when it comes to the use of newer technologies. The FHWA 2016 Traffic Monitoring Guide can be used when traditional technologies and equipment are utilized for data collection. Substantive standards are still needed for non-motorized data collection practices to ensure adequate quality and quantity. New Jersey does not have a non-motorized count program. However, best practices from these states could be utilized to develop a statewide standard and count program for New Jersey. Table 3 summarizes the various count programs of five other states.

2.1. Texas Department of Transportation (TxDOT) Bicycle & Pedestrian Count Program

TxDOT's Bicycle and Pedestrian Count Program is a partnership program with local and regional governments around Texas and includes a statewide network of continuous and short-term bicycle and pedestrian count equipment, an interface for sharing data, and data management tools for local agency partners. The continuous count sites provide extensive time coverage at a limited number of locations, while the short-duration sites provide extensive geographic coverage for a limited duration. When combined in a systematic manner, the continuous and short-duration count sites provide a more comprehensive picture of pedestrian and bicyclist traffic levels, patterns, and trends.

The program has compiled a set of resources about non-motorized counting, from site selection and counter setup to quality control and data uses. The department has developed an online count exchange to import, manage, quality review, factor, and export bicycle and pedestrian count data for use. A counter loan program is also available for utilizing the pneumatic tubes and infrared counter equipment. The resources developed under the program include a guide for applying seasonal adjustment factors to short duration counts as well as scaling crowdsourced data samples to represent total biking activity. TxDOT utilized data from Strava and RideReport to develop their model for estimating total pedestrian and bicyclist volumes from a small sample size captured through the crowdsourced data of the applications. Additional information about the count program can be obtained at: https://www.txdot.gov/inside-txdot/modes-of-travel/bicycle/bicycle-pedestrian-count.html.

2.2. Colorado Department of Transportation (CDOT) Bicycle & Pedestrian Count Program

CDOT's Bicycle and Pedestrian Count Program helped in developing a systemic approach to collecting pedestrian and bicycle volume data in the state. CDOT has established a combination of permanent continuous count sites and short duration counts for bicycle and pedestrian counts throughout the state as part of this program. In 2016, CDOT completed a strategic plan to ensure that the non-motorized data collected is meeting the needs of stakeholders, and the data is being collected and managed efficiently. The plan establishes clear goals and objectives for the non-motorized data collection program and provides a thorough evaluation of the current program to address any organizational gaps as well as data collection, management, analysis and sharing gaps. The state has developed processes to choose counter technologies, select count locations, deploy counters, collect, store and process data.

CDOT has teamed up with Strava Metro to supplement their bicycle and pedestrian counts to help improve planning, safety, and infrastructure for cyclists and pedestrians throughout Colorado. CDOT recognizes the limitations of Big Data including the data collection biases related to smart phone users, data ownership and privacy concerns, as well as the technical capacity to process and interpret the data. CDOT considers Big Data to be reliable when validated against a robust sample of counts conducted over a wide geographic distribution and a variety of facility types and contexts. CDOT analyzed two years of Strava data to develop best practices for data management and quality control, correlate permanent continuous counter data with Strava data for extrapolating actual activity, and identifying and classifying bicycle corridors based on usage. Additional information about the count program can be obtained at: https://www.codot.gov/programs/bikeped/bicycle-pedestrian-counts.

2.3. Delaware Department of Transportation (DelDOT) Bicycle & Pedestrian Count Program

DelDOT's Bicycle & Pedestrian Count Program has three types of counts: recurring short-duration counts, permanent continuous counts, and special study counts (one-time, or request driven counts). The DelDOT Bicycle and Pedestrian Count Program includes guidance on identification of count locations, site-specific considerations for count locations, obtaining support from local partners, factor typology, counter placement and set up, data management, data extrapolation

and factor groups. Factor groups were identified from the pilot program analysis that allows for extrapolation of short duration counts to longer term figures. The state utilized Eco-counter pneumatic tubes and Pyro box counters that use passive infrared beam technology for their pilot count program. Considerations and lessons learned from the pilot program have also been referenced in the guidance document. Additional information about the count program can be obtained at:
https://deldot.gov/Publications/plans/bikeandped/pdfs/DelDOT_Count_Program_Guide.pdf.

2.4. Minnesota Department of Transportation (MnDOT) Pedestrian & Bicyclist Data Program

MnDOT's Pedestrian & Bicycle Data Program started in 2013 and a collaborative program with state and local agencies to collect bicycle and pedestrian traffic counts throughout the State of Minnesota. The state has built a network of automated counters that includes a combination of permanent continuous counters, and portable counters. MnDOT has also established a portable counter borrowing program with eight short-duration counters. Each borrower counter kit includes an Eco-Counter Pyro (passive infrared), an Eco-Counter Tube, and an installation manual. The bicycle and pedestrian data collection manual describes methods by which bicycle and pedestrian data are collected and recorded, provides information on count types, site selection, and basic calculation and analytic techniques. Additional information about the count program can be obtained at: https://www.dot.state.mn.us/bike-ped-counting/index.html.

2.5. Florida Department of Transportation (FDOT) Non-Motorized Traffic Monitoring Program

FDOT's Non-Motorized Traffic Monitoring Program began in 2018 to collect statistically valid bicycle and pedestrian (non-motorized) traffic volume data and supporting statistics and information. The non-motorized state data will be used for analyses such as safety studies, planning and programming FDOT facilities, pavement and trail maintenance, etc. The program establishes four structural components: a statewide repository, statewide short-term count program, statewide continuous count program, and statewide outreach.

The statewide data repository serves as the data warehouse for all non-motorized data obtained by any statewide agency for existing and proposed non-motorized count stations. The statewide outreach was a vital component in developing the program and is an ongoing dynamic process of keeping the state and other agency staff informed about the program status, as well as discovering opportunities to collaborate with other entities to maximize non-motorized traffic monitoring data collection resources. The continuous and short-term count programs are coordinated with local agencies and follow national guidelines. A counter loaner program is also available for statewide agencies. Guidance from the program helps in determining count locations, duration of counts, establishing seasonal factors, and the appropriate technology to be used for the counts. The program typically uses tubes, infrared and camera technology for the non-motorized counts. Additional information about the count program can be obtained at: https://www.fdot.gov/statistics/trafficdata/florida-non-motorized-traffic-monitoring.

Table 3 – Other States Non-motorized Data Collection Count Programs

Count Program	Highlights
Texas Department of Transportation (TxDOT) Bicycle & Pedestrian Count Program	• Local and regional partnership • Combination of continuous and short-term count sites • Compilation of resources for counter setup and installation, site selection, etc. • Use of Strava and RideReport crowdsourced data applications • Seasonal adjustment factors • Model for scaling crowdsourced data • Statewide count data clearinghouse/database • Counter loan program • Count training programs • Sharing of best practices within Texas • Online count exchange programs that include a public data portal for viewing counts and trends throughout the state
Colarado Department of Transportation (CDOT) Bicycle & Pedestrian Count Program	• Non-motorized monitoring strategic plan • Combination of permanent continuous count sites and short-term counts throughout the state • Processes to choose counter technologies, select count locations, deploy counters, collect, store and process data • Thorough current program evaluation including surveys and interviews with other state DOTs and FHWA • Partnership with Strava Metro • Guidelines on Strava data management and quality control • Correlation with permanent count locations • Identification and classification of bicycle corridor based on usage and Strava data
Delaware Department of Transportation (DelDOT) Bicycle & Pedestrian Count Program	• Three types of counts: recurring short-duration counts, permanent continuous counts, and special study counts (one-time, or request driven counts) • Guidance on counter location, site-specific locations, counter placement, and setup • Emphasis on local partnership opportunities • Factor groups for extrapolating data • Use of pneumatic tubes and passive infrared beam count technologies for the pilot program
Minnesota Department of Transportation (MnDOT) Pedestrian & Bicyclist Data Program	• Collaborative program with state and local agencies • Combination of permanent continuous counters and portable counters along with installation manual • Use of Eco-Counter Pyro (passive infrared) and Eco-Counter Tube counters • Guidance developed for collecting and recording data, count types, site selection, and calculation and analytic techniques
Florida Department of Transportation (FDOT) Bicycle & Pedestrian Count Program	• Statewide data repository • Statewide short-term count program • Statewide continuous count program • Statewide outreach • Use of tubes, infrared, and camera technology

3. Near-miss crash data collection

Safety investments and planning are often based on crash data information reported through police crash records. However, not all crashes or near-miss incidents are reported, and the crash data alone may not present an accurate picture of hazardous locations for non-motorized traffic. An analysis of near-miss crashes can be used to predict the potential for crashes and thereby increase the ability to prevent crashes. A review was done to assess the viability of collecting near-miss incidents to supplement crash data information and other safety data. Following methodologies were identified in the review for collecting near-miss crashes:

- Traffic Safety Officer surveys / Crossing guard surveys
- Traditional public surveys
- Permanent installation of video detectors with human monitoring
- Crowdsourced safety data (e.g., BikeMaps.Org – global online mapping tool that allows cyclists to record the location and details of near misses and collisions they experience)
- Driver recorders installed in passenger cars (analysis of motion pictures capturing pedestrian behaviors)

Considerations can be made for collecting near-miss crashes and potential hazardous locations for non-motorized traffic when developing a program for data collection, monitoring, and safety.