Addressing Multimodal Transportation Needs Through Complete Streets Implementation

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Research Report
KTC-24-29

Addressing Multimodal Transportation Needs Through Complete Streets Implementation

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16. Abstract

Since the early 2000s, over 1,600 transportation agencies in the United States have adopted Complete Streets policies. Recently, the Kentucky Transportation Cabinet (KYTC) published its *Complete Streets, Roads, and Highways Manual*, which aims to implement a safe and equitable transportation system throughout the state, as well as a Complete Streets policy. The manual and policy offer guidance on integrating Complete Streets principles into road design, however, KYTC currently lacks tools or methods to evaluate how well specific projects address Complete Streets goals. This is problematic because systematic assessments are needed to effectively prioritize projects and allocate scarce funding. Based on a review of Complete Streets initiatives in North America and around the world, as well as input from subject-matter experts, this report proposes a KYTC Complete Streets Scorecard that evaluates project benefits across seven categories — mobility, accessibility, connectivity, equity, safety, and effectiveness. Because the scorecard contains metrics focused on different user types (i.e., pedestrians, bicyclists, transit user), project teams have the flexibility to evaluate either an entire project or the impact of a project on specific user groups. Statewide implementation of the scorecard will help the Cabinet allocate funding and prioritize projects based on the extent to which they contribute to Complete Streets policy goals.

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Executive Summary

In transportation planning and project development, the adoption of Complete Streets (CS) policies has emerged as a vital strategy to create more inclusive and accessible road environments and promote multimodal designs. Since the advent of CS concepts in the early 2000s, over 1,600 agencies in the U.S. have adopted CS policies. Recently, the Kentucky Transportation Cabinet (KYTC) published its *Complete Streets, Roads, and Highways Manual*, which aims to implement a safe and equitable transportation system throughout the state. This publication affirms the Cabinet's commitment to addressing multimodal transportation needs and expanding the reach of CS concepts. KYTC has also put into place a CS policy that supports the agency's statewide efforts to build CS. But successful implementation of CS policies requires transportation agencies to systematically evaluate the impacts of projects to determine their potential CS-related benefits. KYTC currently lacks tools or methods staff can use to determine how factors such as land use, equity, and pedestrian and bicycle volumes influence transportation needs and efforts to design and implement CS.

Many transportation agencies have adopted systematic evaluation frameworks to assess CS projects as well as checklists to document existing conditions and propose CS-oriented solutions. Checklists address user needs across modes and are helpful tools for determining how design decisions will impact multiple modes. Effective project assessments require agencies and project teams to identify desired outcomes (e.g., accessibility, safety, equity) and determine what indicators or metrics should be used to quantify the likelihood of a project achieving its stated goals. Agencies that have deepened their focus on CS have prioritized outcomes related to access, economic development, environmental sustainability, community compatibility, safety, equity, public health, bicyclist and pedestrian activity, improved land use, inclusivity, citizen feedback, multimodal level of service, efficient mobility, and livable, accessible, and comfortable streets.

Using a review of CS evaluation practices transportation agencies in North America and around the world, a canvas of academic literature, and input from Study Advisory Committee members, this report proposes a method KYTC can use to score and rank CS-oriented projects. Establishing systematic, objective scoring practices will help the Cabinet allocate funding to and prioritize projects based on the extent to which they contribute to CS policy goals. The Planning, Design ,and Maintenance divisions can utilize the scoring process developed here.

The KYTC Complete Streets Scorecard evaluates the CS benefits of proposed projects. The scorecard focuses on pedestrian, bicyclist, and transit user accommodations. It evaluates benefits across seven categories — mobility, accessibility, connectivity, equity, safety, and effectiveness. The scorecard provides the option of summing scores by benefit category or user type within each benefit category. As such, it gives KYTC a powerful, detailed, practical, and objective tool for ranking and evaluating projects. Because the scorecard contains metrics focused on each user type (i.e., pedestrian, bicyclist, transit user), project teams have the flexibility to evaluate either entire projects or the impact of a project on specific user groups.

Chapter 1 Introduction

Transportation agencies throughout the U.S. recognize that roads need to safely accommodate all users and modes of transport. The American Association of Highway Transportation Officials (AASHTO) emphasized this with the adoption of Context Classification in the 7th Edition of the *Policy for Geometric Design of Highways and Streets* (2018; Green Book), which defines five contexts to promote multimodal road design — rural, rural town, suburban, urban, and urban core. The Green Book identifies modal priorities for each context.

In transportation planning and project development, the adoption of Complete Streets (CS) policies has emerged as a vital strategy to create more inclusive and accessible road environments and promote multimodal designs. The Kentucky Transportation Cabinet (KYTC) considers CS as "an evolution of the way streets, roads, and highways address the transportation needs of the communities they serve, shifting from a motor vehicle-centric transportation system to a new, holistic approach for building a network that supports the needs of all users" (KYTC, 2022a). CS accommodate all user types — regardless of ability — safely and equitably, allowing pedestrians, bicyclists, transit users, and vehicle drivers to share the roadway (Hui et al., 2018). Traditionally, most CS projects are found in urbanized environments but several state agencies, including KYTC, incorporate CS principles into rural projects.

Since the advent of CS concepts in the early 2000s, over 1,600 agencies in the U.S. have implemented CS policies (Smart Growth America, 2023). Recently, KYTC published its *Complete Streets, Roads, and Highways Manual*, which aims to implement a safe and equitable transportation system throughout the state (KYTC, 2022a). This publication affirms the Cabinet's commitment to addressing multimodal transportation needs and expanding the reach of CS concepts. KYTC has also developed a CS policy that further underscores the agency's efforts to build CS throughout the Commonwealth (KYTC, 2022b).

Two aspects are central to the implementation of CS policies. The first is the ability to evaluate the impacts of CS implementations and thus define their potential benefits. Quantitative metrics that can estimate these benefits are needed to quantify impacts. The second deals with the definition of CS and the identification of a project qualifying as a CS project. The original concept of "know it when you see it" as Kingsbury et al. (2011) indicated is not sufficient to define a project as a CS. A more systematic approach is required. This task is further complicated by the fact that often CS goals transcend user safety; they often include other goals such as mobility, connectivity, place making, security, recreation/health, and lifestyle.

KYTC lacks tools or methodologies staff can use to determine how factors such as land use, equity, and pedestrian and bicycle volumes influence transportation needs and efforts to design and implement CS. Yet, identifying and delivering projects that address multimodal needs is critical. State funding is typically limited, and many projects compete for limited funds. State departments of transportation (DOTs) need to balance user needs and deliver a balanced program to build a multimodal network though CS projects. Establishing a process that can be used to evaluate the potential benefits of CS projects is critical. Evaluation criteria can be used to score and rank competing projects. Rankings can help KYTC prioritize multimodal transportation needs and increase investment benefit-cost ratios.

A nationwide review of practices used to rank CS projects found that many jurisdictions have developed their own methods for scoring and ranking projects (Moini, 2015). Using the experiences of other agencies as a springboard, this report proposes an analytical methodology for quantifying CS-related metrics. Developing metrics to score CS projects will help KYTC fairly allocate funding based on project contributions to policy goals.

This report describes efforts to address KYTC's lack of tools for evaluating CS projects by:

1. Developing an assessment process for CS-related projects and establishing a prioritization index for each project.
2. Developing a CS review process to determine if projects meet the policy's goals.

Researchers addressed these objectives through a literature review that explores how other transportation agencies have dealt with CS, including the development of tools that can help distinguish CS projects as such and approaches for scoring these projects. The review also examines the benefits of CS projects and identified those that could be useful to KYTC. The findings of these reviews underpinned development of an assessment tool KYTC can use to identify CS projects and score them based on their potential impacts and benefits.

Chapter 2 Literature Review

Researchers began with an in-depth examination of CS policies agencies across the U.S. have adopted. The literature review:

- Documents the influence of CS policies in establishing project priorities and evaluating CS projects
- Explores methodologies for scoring CS-aligned projects
- Illuminates tools and data used by agencies to rank and assess the impacts of CS projects
- Assesses the strengths and weaknesses of each agency's approach
- Identifies agencies that have developed checklists to determine whether a project qualifies as a CS project
- Examines the benefits of CS projects
- Captures metrics that can be used to evaluate CS projects

2.1 Complete Streets Initiatives in the United States

Over the past decade, CS policies have been adopted by hundreds of agencies in the U.S. and the local, state, and regional levels (R. Bian & Tolford, 2023). However, the implementation and success of these policies vary (Jordan et al., 2022). While these policies vary in content and specificity, they share common provisions that promote safe mobility for pedestrians, bicyclists, motorists, and public transit users. Researchers primarily focused on the state-level efforts, since KYTC's CS manual focuses on all roads in the Kentucky.

The research team collected information on CS policies from state DOT and agency websites as well as the Inventory of Smart Growth America (2023). Following data collection, each agency's efforts were categorized one of into five groups based on the level of CS engagement. Table 2.1 identifies the categories in descending order of significance. In some cases, researchers looked at multiple agencies in a state. In these cases, the categorization assigned to the state reflects the highest classification among all agency initiatives. That is, if the state DOT is classified as Category 3 but a local agency is Category 2, the state is considered as a Category 2 state.

Table 2.1 Categories of Complete Streets Involvement

Category	Description
1	• States highly committed to CS. They have policies, comprehensive guidelines, and tools for evaluating and justifying CS projects. This proactive approach ensures a structured decision-making process.
2	• States with CS design guidelines, which contribute to project consistency and effectiveness.
3	• States with CS policies that include an integrated checklist
4	• States with CS policies, plans, or executive orders that lay the groundwork for inclusive transportation planning and infrastructure.
5	• States with CS resolutions or laws/ordinances in place legal instruments provide a formal framework, indicating a state's acknowledgment of the need for streets to address the spectrum of user needs.

Across at all levels of government, at least one agency in each state has advanced CS concepts (Figure 2.1). Four states qualify as Category 1 (California, Florida, North Carolina, and New York), 21 states are Category 2, two states are Category 3, 22 states are Category 4, and two states are Category 5.

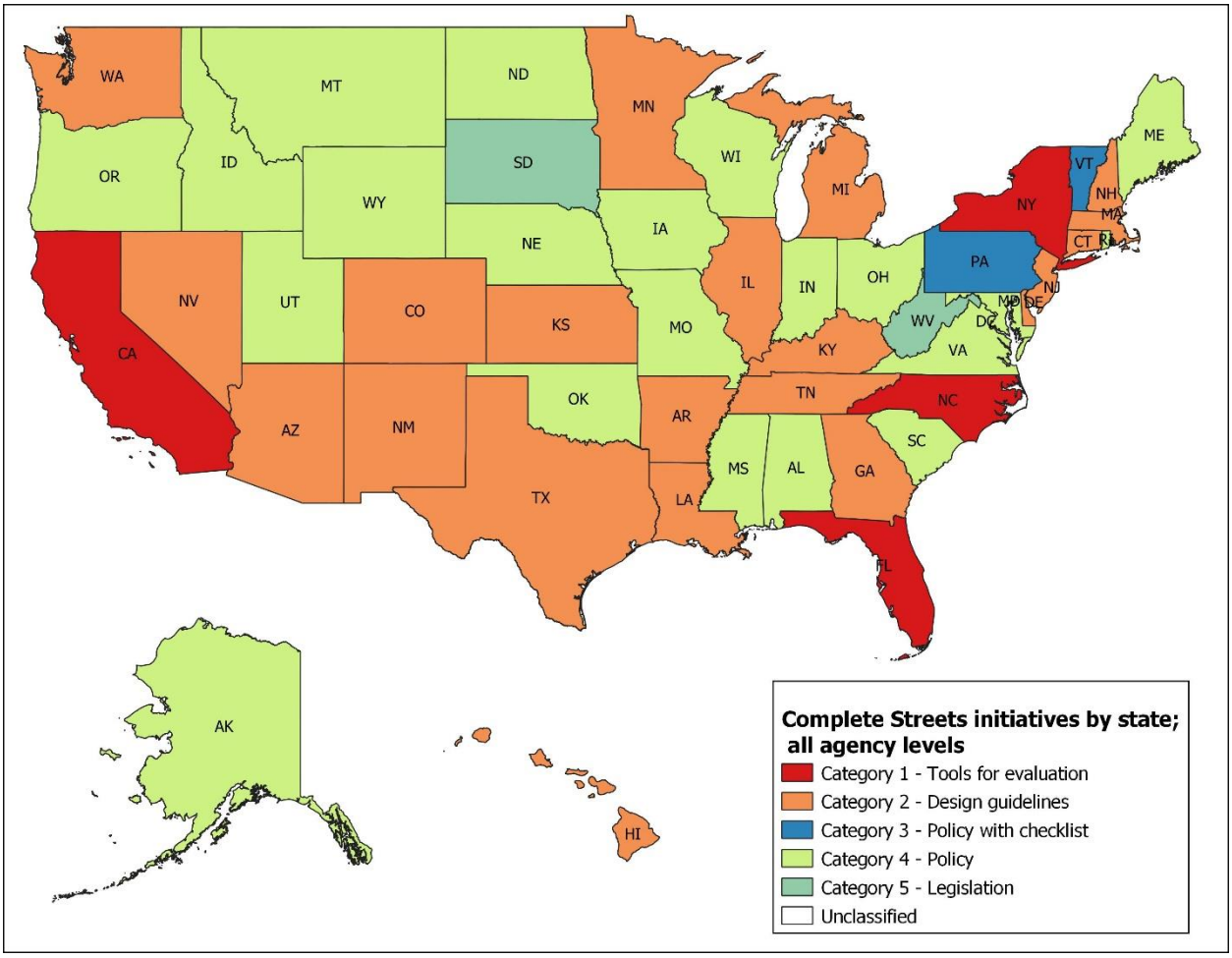


Figure 2.1 Complete Streets Initiatives by State (All Agencies)

At the state level, 35 DOTs have developed CS-related initiatives. Two states are Category 1, six states are Category 2, two states are Category 3, 15 states are Category 4, and 10 states are Category 5. A state DOT may have multiple CS-related efforts. Figure 2.2 depicts the highest category that a DOT belongs to. Appendix A presents all efforts for each state DOT.

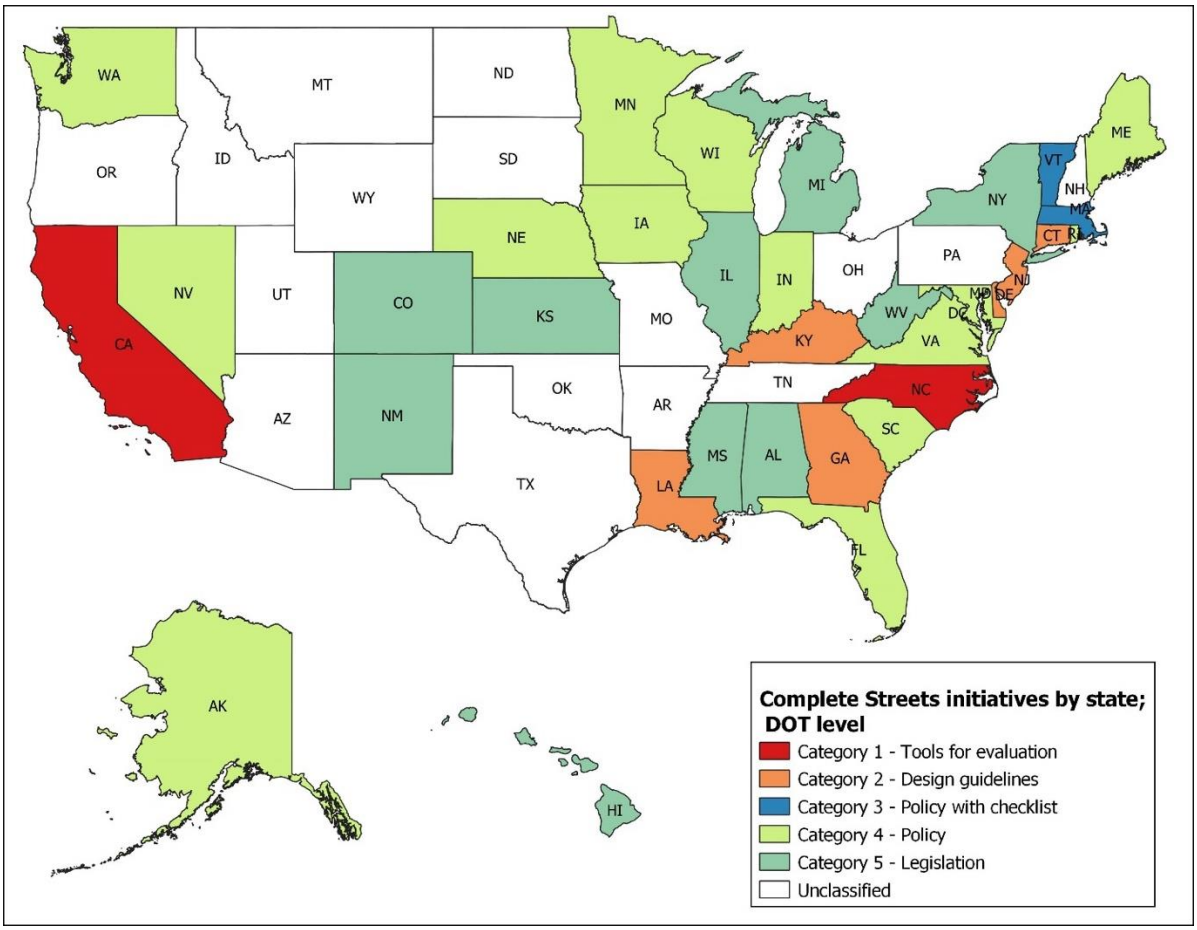


Figure 2.2 State DOT Complete Streets Initiatives

2.2 Review of Agency Efforts

This section provides details for agencies based on the categorization noted in Appendix A and results as displayed in Appendix B.

2.2.1 Category 1: Established Evaluation Tools

Broward County, Florida

The Broward Metropolitan Planning Organization's (MPO) *Complete Streets Evaluation Toolkit User Manual* (Garces et al., 2015) provides information, instructions, tools, and guidelines for collecting comprehensive baseline and evaluation data for a CS corridor or program. While the *Toolkit* is designed for Broward County CS projects, it can be applied to CS or other multimodal transportation projects in other jurisdictions.

The toolkit was has concise, quantifiable metrics and performance measures for evaluating CS or other multimodal transportation projects. The Broward County CS evaluation framework measures the benefits and impacts of CS projects on the local community. Its defined goals are balanced mobility, safety, health and sustainability, and economic vitality. The evaluation framework's metrics are mode share, vehicle speeds, and vacant properties, while performance measures provide more specific information on mode share data collection methods. The goals of both metrics and measures come from the Long-Range Transportation Plan (LRTP) 2040 goals, which are moving people, strengthening communities, and creating jobs.

Figure 2.3 presents the metrics and performance measures for corridor-level projects. Figure 2.4 shows metrics and performance measures appropriate for program-level evaluations. Both frameworks share the same goals, but the program-level framework includes more metrics to address mobility at the system level.

Table 1: Corridor Level Complete Streets Evaluation Framework

Goals	Objectives	Metrics	Performance Measures	Tools
1. Balanced Mobility	1.1 Increase the incidence of bicycling and walking by X% at X months post-baseline.	Mode Share	Change in Bicycle Counts	Pedestrian and Bicyclist Counts Field Data Collection and Worksheet Tools
			Change in Pedestrian Count	
	1.2 Increase the number of transit users by X% at X months post-baseline.	Transit Ridership	Boarding and alighting transit activity along the Corridor	Automatic Passenger Counter Worksheet Tool
	1.3 Provide X% new facilities for bicyclists and pedestrians that improves the roadway environment for all users at X months post-baseline.	Multimodal Facilities	Percentage of Sidewalks and Bicycle Lanes/Paths Facilities	Multimodal Facility Coverage Worksheet Tool
			Multimodal Level of Service (MMLOS)	MMLOS Worksheet Tool
2. Safety	2.1 Decrease crash injury and mortality rates for bicyclists and pedestrians by X% at X months post-baseline.	Crashes and Severity	Number of Crash Injuries and Mortalities	Crash Injury and Mortality Worksheet Tools
	2.2 Implement safe design countermeasures to calm traffic and reduce crashes by X% at X months post-baseline.	Vehicle Speeds	Change in Actual Automobile Speeds	Vehicle Speeds Worksheet Tool
		Safer Facilities	Number and Value of Crash Modification Factors (CMFs) and Crash Reduction Factors (CRFs) from Design Countermeasures	CMFs Inventory Worksheet Tool
3. Health and Sustainability	3.1 Reduce vehicle emissions by X% and fuel consumption by X% through increased bicycle/pedestrian activity at X months post-baseline.	Environmental Impacts	Pounds of Carbon Dioxide Car Emissions Reduction from Bicycle and Pedestrian Usage	Conserve by Bicycle and Pedestrian Study Benefits Worksheet Tools
			Gallons of Fuel Savings	
	3.2 Increase physical activity by X% at X months post-baseline.	Physical Activity	Number of Walking and Biking Trips	Pedestrian and Bicyclist Counts Field Data Collection and Worksheet Tool
	3.3 Incorporate natural design elements throughout the corridor by X% at X months post-baseline.	Environmental Infrastructure	Percentage Tree Canopy Coverage	Tree Canopy Field Data Collection and Worksheet Tools
			Green Infrastructure for Water and Drainage	National Stormwater Calculator Field Data Collection and Worksheet Tools
	3.4 Increase community support and satisfaction by X% at X months post-baseline.	User Satisfaction	Self-Reported User Satisfaction	Complete Streets User Satisfaction Survey and Worksheet Tools
4. Economic Vitality	4.1 Increase property values and business sales along the corridor by X% at X months post-baseline.	Property Values	Commercial and Residential Property Values	Property Values Worksheet Tool
		Retail Activity	Business Sales Volume	Sales Volume Worksheet Tool
	4.2 Reduce the number of parcel/business vacancies along the corridor by X%/$X at X months post-baseline.	Vacancies	Number of Vacant Parcels	Vacant Parcels Worksheet Tool
	4.3 Reduce healthcare costs by X%/$X at X months post-baseline.	Healthcare Costs	Dollars of Healthcare Cost Savings from Bicycle and Pedestrian Usage	Conserve by Bicycle and Pedestrian Study Benefits Worksheet Tools

Figure 2.3 Broward Country Corridor-Level Complete Streets Evaluation Framework
Source: Garces et al. (2015)

Table 2: Program Level Complete Streets Evaluation Framework

Goals	Objectives	Metrics	Performance Measures	Tools
1. Balanced Mobility	1.1 Increase the incidence of bicycling and walking by X% at X months post-baseline.	Mode Share	Change in Bicycle Counts	Pedestrian and Bicyclist Counts Field Data Collection and Worksheet Tools
			Change in Pedestrian Count	
	1.2 Increase the number of transit users by X% at X months post-baseline.	Transit Ridership	Boarding and alighting transit activity along the Corridor	Automatic Passenger Counter Worksheet Tool
	1.3 Provide X% new facilities for bicyclists and pedestrians that improves the roadway environment for all users at X months post-baseline.	Multimodal Facilities	Percentage of Sidewalks and Bicycle Lanes/Paths Facilities	Multimodal Facility Coverage Worksheet Tool
			Multimodal Level of Service (MMLOS)	MMLOS Worksheet Tool
	1.4 Decrease in traffic volume by X% at X months post-baseline.	Traffic Volume	Number of Annual Average Daily Traffic (AADTs)	
			Number of Vehicle Miles Traveled (VMTs)	
	1.5 Increase network connectivity by X% at X months post-baseline.	Equitable Network Connectivity	Equitable Multimodal Network Connectivity	Connectivity Worksheet Tool
2. Safety	2.1 Decrease crash injury and mortality rates for bicyclists and pedestrians by X% at X months post-baseline.	Crashes and Severity	Number of Crash Injuries and Mortalities	Crash Injury and Mortality Worksheet Tool
	2.2 Implement safe design countermeasures to calm traffic and reduce crashes by X% at X months post-baseline.	Vehicle Speeds	Change in Actual Automobile Speeds	Vehicle Speeds Worksheet Tool
		Safer Facilities	Number and Value of Crash Modification Factors (CMFs) and Crash Reduction Factors (CRFs) from Design Countermeasures	CMFs Inventory Worksheet Tool
3. Health and Sustainability	3.1 Reduce vehicle emissions by X% and fuel consumption by X% through increased bicycle/pedestrian activity at X months post-baseline.	Environmental Impacts	Pounds of Carbon Dioxide Car Emissions Reduction from Bicycle and Pedestrian Usage	Conserve by Bicycle and Pedestrian Study Benefits Worksheet Tools
			Gallons of Fuel Savings	
	3.2 Increase physical activity by X% at X months post-baseline.	Physical Activity	Number of Walking and Biking Trips	Pedestrian and Bicyclist Counts Field Data Collection and Worksheet Tools
	3.3 Incorporate natural design elements in the program area by X% at X months post-baseline.	Environmental Infrastructure	Percentage Tree Canopy Coverage	Tree Canopy Field Data Collection and Worksheet Tools
			Green Infrastructure for Water and Drainage	National Stormwater Calculator Survey and Worksheet Tools
	3.4 Increase community support and satisfaction by X% at X months post-baseline.	User Satisfaction	Self-Reported User Satisfaction	Complete Streets User Satisfaction Survey and Worksheet Tools
4. Economic Vitality	4.1 Increase property values and business sales volume in the program area by X% at X months post-baseline.	Property Values	Commercial and Residential Property Values	Property Values Inventory Worksheet Tool
		Retail Activity	Business Sales Volume	Sales Volume Worksheet Tool
	4.2 Reduce the number of vacant parcels in the program area by X%/$X at X months post-baseline.	Vacancies	Number of Vacant Parcels	Vacant Parcels Inventory Worksheet Tool
	4.3 Reduce healthcare costs by X%/$X at X months post-baseline.	Healthcare Costs	Dollars of Healthcare Cost Savings from Bicycle and Pedestrian Usage	Conserve by Bicycle and Pedestrian Study Benefits Worksheet Tools

Figure 2.4 Broward County Program-Level Complete Streets Evaluation Framework
Source: Garces et al. (2015)

Designed to be easy to use, the tools allow for the CS evaluation to leverage existing resources and partnerships. Evaluation tools include checklists that guide users through a corridor- and program- level CS assessments. Checklists are organized according to the four goals (Figure 2.5).

Table 3: Evaluation Tools Checklists

The following checklists provide a list of each of the evaluation tools for corridor and program level Complete Streets evaluation. The checklists are grouped by each of the four goals. The tools are not necessarily listed in the order that your evaluation will take place.

Printable versions of these checklists are available in **Appendix C** and **Appendix D**.

Corridor Level Evaluation Tools Checklist

Goal 1: **Balanced Mobility**		
1.	Pedestrian and Bicyclist Counts Field Data Collection and Worksheet Tools	☐
2.	Automatic Passenger Counter Worksheet Tool	☐
3.	Multimodal Facility Coverage Worksheet Tool	☐
4.	MMLOS Worksheet Tools	☐
Goal 2: **Safety**		
1.	Crash Injury and Mortality Worksheet Tool	☐
2.	Vehicle Speeds Worksheet Tool	☐
3.	Crash Modification Factors (CMF) Inventory Worksheet Tool	☐
Goal 3: **Health and Sustainability**		
1.	Conserve by Bicycle and Pedestrian Study Benefits Worksheet Tools	☐
2.	Pedestrian and Bicyclist Counts Field Data Collection and Worksheet Tools	☐
3.	Tree Canopy Field Data Collection Tool	☐
4.	National Stormwater Calculator Field Data Collection and Worksheet Tools	☐
5.	Complete Streets User Satisfaction Survey and Worksheet Tools	☐
Goal 4: **Economic Vitality**		
1.	Property Values Element	☐
2.	Sales Volume Element	☐
3.	Vacant Parcels Element	☐
4.	Conserve by Bicycle and Pedestrian Study Benefits Worksheet Tools	☐

Program Level Evaluation Tools Checklist

Goal 1: **Balanced Mobility**		
1.	MMLOS Worksheet Tools	☐
2.	Automatic Passenger Counter Worksheet Tool	☐
3.	Multimodal Facility Coverage Worksheet Tool	☐
4.	Connectivity Worksheet Tool	☐
Goal 2: **Safety**		
1.	Crash Injury and Mortality Worksheet Tool	☐
2.	Vehicle Speeds Worksheet Tool	☐
3.	Crash Modification Factors (CMF) Inventory Worksheet Tool	☐
Goal 3: **Health and Sustainability**		
1.	Conserve by Bicycle and Pedestrian Study Benefits Worksheet Tools	☐
2.	Pedestrian and Bicyclist Counts Field Data Collection and Worksheet Tools	☐
3.	Tree Canopy Field Data Collection and Worksheet Tool	☐
4.	National Stormwater Calculator Field Data Collection and Worksheet Tools	☐
5.	Complete Streets User Satisfaction Survey and Worksheet Tools	☐
Goal 4: **Economic Vitality**		
1.	Property Values Element	☐
2.	Sales Volume Element	☐
3.	Vacant Parcels Element	☐
4.	Conserve by Bicycle and Pedestrian Study Benefits Worksheet Tools	☐

Figure 2.5 Broward Country Complete Streets Evaluation Tool Checklists
Source: Garces et al. (2015)

This toolkit offers a comprehensive evaluation framework applicable not only to Broward County but also to CS and multimodal transportation projects elsewhere. The emphasis on concise, quantifiable metrics ensures an efficient and results-oriented evaluation process. Stakeholder participated in the toolkit's development, which enhances its relevance, incorporating diverse perspectives. Moreover, the alignment of goals with LRTP 2040 goals demonstrates a commitment to broader community and transportation objectives. The user-friendly design of the toolkit and checklists caters to evaluators with different levels of experience.

Potential disadvantages include dependency on existing tools that may limit innovation and reliance on available resources. While adaptable, the toolkit's primary focus on Broward County may result in less specificity for projects in different contexts, requiring adjustments to measures or metrics. Despite these issues, the toolkit is a valuable resource for comprehensive CS evaluation.

GOBike Buffalo, New York

GOBike Buffalo promotes active mobility options, trails, greenways, and CS throughout Western New York. It issued a comprehensive report describing the impact evaluations of CS initiatives (Ranahan et al., 2014). The report guides municipalities on collecting program evaluation data as well as on efficient measurement tools that capture the outputs and impacts of CS projects. Data collection efforts provide a starting point for municipalities seeking to create a report card of indicators demonstrating the impact of their CS initiatives. Measures identified in the report assess seven impact areas:

- Bicycle/pedestrian: Measures the impacts of CS projects on usage of bicycle and pedestrian infrastructure.

- Citizen feedback: Measures the impacts of CS projects on perceived safety, satisfaction, comfort, and quality of life among community residents. Feedback can be sought from drivers, pedestrians, bicyclists, transit users, neighborhood residents, and business owners.
- Economic: Measures the fiscal impacts of CS projects.
- Environmental: Measures the impacts of CS initiatives on greenhouse gas emissions and stormwater runoff.
- Health: Measures the impacts of CS projects on physical activity, obesity, and other public-health issues.
- Multi-modal level of service (MMLOS): Measures the impact of CS projects on the efficiency of transportation infrastructure for drivers, bicyclists, pedestrians, and transit riders.
- Safety: Measures the impact of CS projects on the rates of accidents, collisions, injuries, and fatalities.

The report categorized 800 indicators using McCann and Rynne's (2010) framework for evaluating CS projects in terms of outputs and outcomes:

- *Outputs* are salient features that distinguish CS projects (e.g., miles of on-street bicycle routes, number of crosswalk enhancements, installed curb ramps).
- *Outcomes* are impacts experienced by residents, businesses, and the environment (e.g., level of service, crash and injury data, mode share, perceived safety, user satisfaction) because of CS projects.

The report's outcomes can be used to develop a comprehensive CS project evaluation tool (Figure 2.6). Associated indicators were identified for each outcome category that could help measure the impact of CS projects. The agency developed potential measurement approaches that other agencies can adopt in quantifying their indicators. Some of the approaches require systemic data collection while others require customer surveys or the use of models to assess impacts.

Common approaches to measuring bicycle/pedestrian impact

OUTCOME CATEGORY	RELATED INDICATORS (units)	MEASUREMENT APPROACH
Bicycle/pedestrian activity	Mode share (# of bike/ped trips per total # of trips) Usage (# of bicyclists/pedestrians per unit time)	Inductance loops Infrared sensors: active/passive Magnetometer Manual observers Pneumatic tubes Pressure sensor/pressure mat Seismic sensor State/municipal DOT Video imaging: automated or manual

Common approaches to measuring citizen feedback

OUTCOME CATEGORY	RELATED INDICATORS (units)	MEASUREMENT APPROACH
Citizen feedback	Perceived safety, satisfaction, comfort, quality of life	Context-sensitive survey that can be administered via phone, mail, or in-person. Neighborhood Environment Walkability Scale (NEWS), 2003, U.S.

Common approaches to measuring economic impact

OUTCOME CATEGORY	RELATED INDICATORS (units)	MEASUREMENT APPROACH
Economic impact	Commercial property values ($/ft^2) Employment data Foreclosure data (risk rating) Residential property values ($/ft^2) Retail sales ($/ft^2; $/yr)	County property tax database www.foreclosure-response.org Sales tax receipts Surveys of business owners

Common approaches to measuring environmental impact

OUTCOME CATEGORY	RELATED INDICATORS (units)	MEASUREMENT APPROACH
Air Quality	Air Quality Index (# of days with AQI>100) Asthma (prevalence per 1000; # of ER visits for asthma-related cases)	EPA AirNow Air Quality Index report Local hospital records National Environmental Public Health Tracking Program
Transportation-related pollution	Transportation emissions VMT per capita VMT per household	EPA AirNow Air Quality Index report Travel-based emissions models, MOtor Vehicle Emission Simulator (MOVES Travel demand models
Stormwater run-off	Ratio of pervious to impervious surfaces on urban arterials	Not commonly reported. For local options, consult with municipal water authority, water resource council, or advocacy organization involved with water quality.

Common approaches to measuring health impact

OUTCOME CATEGORY	RELATED INDICATORS (units)	MEASUREMENT APPROACH
Physical activity	Duration (distance, time) of activity Frequency (# trips/week) of activity	Electromechanical measures of physical activity (accelerometers, GPS) Observation of physical activity (corridor and pedestrian counts) Self-report measures of physical activity (surveys, interviews)
Physical health	Asthma (incidence, prevalence, acute episodes) Chronic disease (incidence, prevalence) Diabetes-type 2 (incidence, prevalence) Obesity (incidence, prevalence)	Hospital records State & local departments of health

Common approaches to measuring level of service

OUTCOME CATEGORY	RELATED INDICATORS (units)	MEASUREMENT APPROACH
Level of Service	MMLOS	CompleteStreetsLOS Sustainable Transportation Analysis and Rating System (STARS)

Common approaches to measuring safety

OUTCOME CATEGORY	RELATED OUTCOME INDICATORS	MEASUREMENT APPROACH
Safety	Accident/collision (auto crashes/1000 drivers; bicycle crashes/1000 cyclists; pedestrian collisions/1000 pedestrians) Emergency room visits Injury/fatality (injuries/1000; fatalities/1000) Self-reports of perceived safety	Citizen surveys to ascertain perceived safety State and local departments of health State and local police departments/DOT

Figure 2.6 Common Approaches to Measure Impact Categories
Source: Ranahan et al. (2014)

North Carolina DOT

The North Carolina DOT (NCDOT) adopted its CS policy in 2009. In 2012, *Complete Streets Planning and Design Guidelines* were issued to provide direction in the "decision-making and design processes to ensure that all users are considered during the planning, design, construction, funding, and operations of the state's transportation system" (NCDOT, 2018). In 2018, NCDOT's Secretary of Transportation emphasized the prioritization of CS implementation across the state and the importance of evaluating the policy's success (NCDOT, 2018). In response, NCDOT developed the *NCDOT Complete Streets Evaluation* to assess use of the CS policy across NCDOT business units, evaluate how agency policies work in relation to other state policies, conduct a best practice review, and make recommendations about implementation and tracking (NCDOT, 2019). The publication made several recommendations for planning and design:

- Establish clear roles and responsibilities for each stakeholder to enhance accountability
- Integrate CS considerations into project development, encompassing prioritization, funding, and tracking
- Update design guidelines regularly
- Strengthen communication with internal and external stakeholders
- Update institutional mechanisms and procedures to facilitate a shift from automobile-focused transportation planning to a comprehensive multimodal approach

The report contains performance metrics that can be used to evaluate the performance of CS projects:

- Safety
- Congestion
- Inventory
- Economic development
- Equity

NCDOT recognized performance measures are needed to ensure accountability for statewide CS implementation and verify the effectiveness of NCDOT's execution of the initiative (NCDOT, 2018). However, the agency has not yet developed specific measures or metrics to accomplish this.

California Department of Transportation

Harvey et al. (2018) developed an Environmental Life Cycle Assessment (LCA) framework for California Department of Transportation (Caltrans) projects. This framework quantifies energy, resource usage, and emissions associated with CS projects. The authors found a deficiency in current LCA impact indicators — the absence of socioeconomic indicators to complement existing environmental ones. To fill this gap in performance metrics, they formulated a framework for LCA of CS projects, incorporating the development of socioeconomic impact indicators that account for equity.

CS environmental impacts were assessed by employing LCA data for multiple CS street designs (e.g., intersection types, bicycle lanes, sidewalks, parking). Additionally, the authors performed a parametric sensitivity analysis to evaluate the impacts of different levels of mode choice and trip change. Also pivotal was the identification of diverse social goals (e.g., economic, health, safety) that should be considered and the exploration of methods to integrate

equity into the performance metrics for these social goals. Table 2.2 lists the recommended social performance measures for use in the framework for LCA of CS projects.

Table 2.2 Social Performance Measures

Selected Category	Selected Performance Measure
Accessibility	Access to Community Destinations
	Access to Schools
Jobs	Access to Jobs
	Job Creation
Mobility/Connectivity	Active Transportation to Local and Regional Transit Connectivity Index
	Connectivity Index
	Bike/Pedestrian Delay
	Level of Service (Auto)
Safety/Public Health	Level of Service (Bicycle Level of Service)
	Level of Service (Pedestrian level of Service)
	Level of Service (Bicycle Level of Stress)
	Crashes
	Physical Activity and Health
	Vehicle Miles Traveled (VMT) Impacts
	Pedestrian Miles Traveled (PMT)
	Bicycle Miles Traveled (BMT)
Livability	Green Space
	Street Trees

Source: Harvey et al. (2018)

2.2.2 Category 2: Established Policy and Design Guidance

Fifty-one agencies at different levels of government have developed CS policies with design guidelines. Appendix A includes a complete list.

Kentucky Transportation Cabinet

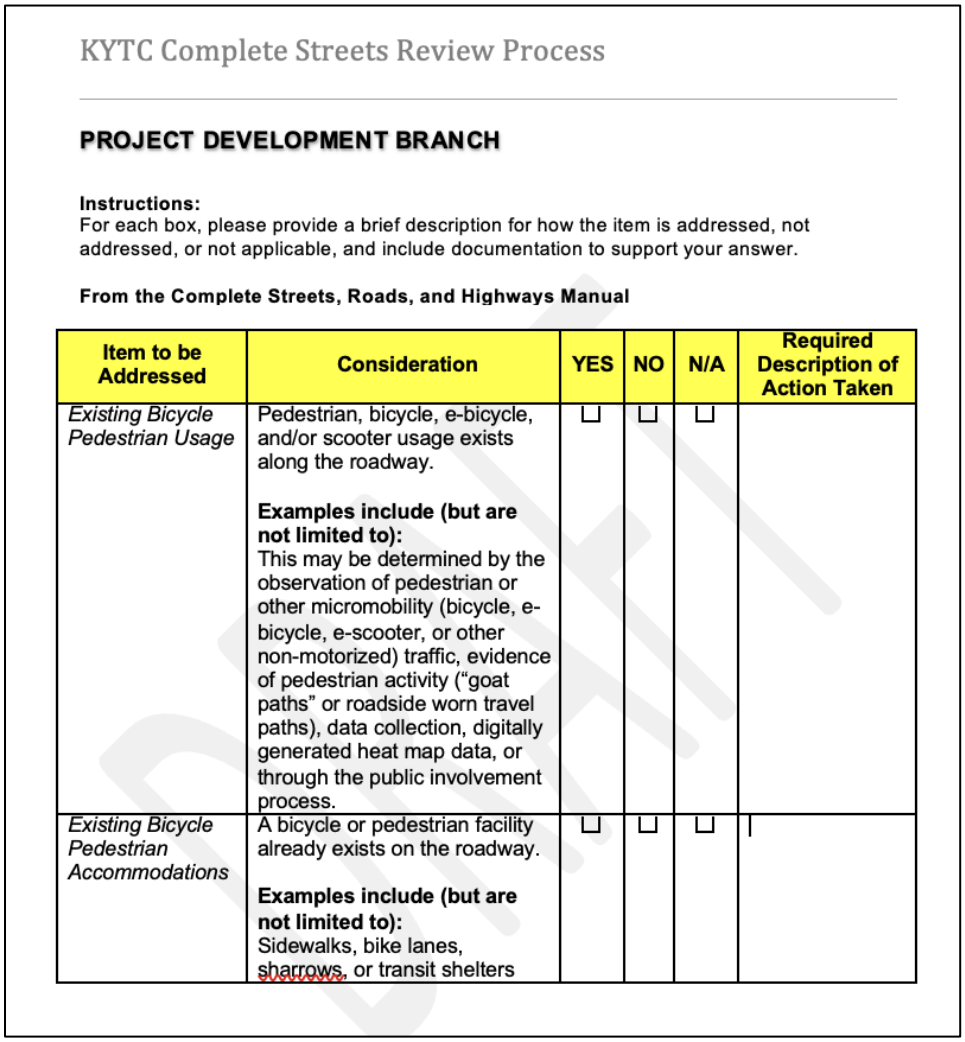
KYTC's *Complete Streets, Roads and Highways Manual* (KYTC, 2022a) is a comprehensive guide for planning, designing, and implementing CS. It emphasizes safety, accessibility, and multimodal considerations. The manual explores various aspects of CS; showcases examples from Kentucky; discusses planning and design flexibility; presents best practices, guidance, and policies; and offers insights into the overall process of development.

Designing a street, road, or highway with a CS approach requires an analysis of individual site conditions to determine appropriate treatments and solutions (KYTC, 2022a). Factors that should be considered include the street's physical and operating characteristics, general land use type (urban, suburban, small town, rural), adjacent and surrounding land use context (e.g. retail, office, residential, industrial), current and anticipated pedestrian volumes, bicycle and/or other micromobility volumes, and transit use.

KYTC's *Complete Streets, Roads, and Highways Policy* (KYTC, 2022b) affirms the Cabinet's commitment to addressing multimodal transportation needs and expanding CS concepts while recognizing their value in providing safe and equitable transportation options for all. The *Policy* requires that all projects "shall consider the needs of all current

and anticipated users of all abilities" and summarizes design considerations noted in the *Manual*. The *Policy* also identifies a phased implementation where all projects starting in 2022 will require application of the policy while others currently though the project development process will be reviewed to "determine potential viable implementation strategies."

As part of this effort, KYTC developed a draft CS Review Process form used to ensure project compliance with CS policies (Figure 2.7). The form is based on other national efforts and attempted to combine existing checklists and forms that require choices be justified. The form should be used during the earliest stages of project development (e.g., scoping or planning studies, preliminary engineering) so pedestrian or bicycle considerations are included in the project budget. The form requires descriptions of areas where action is needed to address the policy. The form requires input for all user types and accommodates projects in the planning stage (Project Development) and construction and maintenance (Delivery and Preservation). The form has items pertaining to connectivity, equity, and public interest, and it provides an opportunity to justify exempting a project from the CS policy. The complete form is presented in Appendix D.



KYTC Complete Streets Review Process

PROJECT DEVELOPMENT BRANCH

Instructions:
For each box, please provide a brief description for how the item is addressed, not addressed, or not applicable, and include documentation to support your answer.

From the Complete Streets, Roads, and Highways Manual

Item to be Addressed	Consideration	YES	NO	N/A	Required Description of Action Taken
Existing Bicycle Pedestrian Usage	Pedestrian, bicycle, e-bicycle, and/or scooter usage exists along the roadway. **Examples include (but are not limited to):** This may be determined by the observation of pedestrian or other micromobility (bicycle, e-bicycle, e-scooter, or other non-motorized) traffic, evidence of pedestrian activity ("goat paths" or roadside worn travel paths), data collection, digitally generated heat map data, or through the public involvement process.	☐	☐	☐	
Existing Bicycle Pedestrian Accommodations	A bicycle or pedestrian facility already exists on the roadway. **Examples include (but are not limited to):** Sidewalks, bike lanes, sharrows, or transit shelters	☐	☐	☐	

Figure 2.7 KYTC Draft Complete Streets Review Process Excerpt

Georgia Department of Transportation

The Georgia Department of Transportation (GDOT) is pursuing implementation of CS which involves integrating bicycle, pedestrian, and transit accommodations into road construction and maintenance. Local governments and planning agencies can adopt CS by partnering with GDOT and managing locally funded projects and programs. The CS Design Policy is in Chapter 9 of the *GDOT Design Policy Manual* (GDOT, 2024). This chapter addresses the main principles of CS, typical users, non-motorized/transit use and needs, and pedestrian, bicycle, and transit networks. Additionally, it speaks to pedestrian, bicycle, and transit warrants as well as the design of accommodations in CS projects.

An example of the information provided in the *Manual* is Figure 2.8 which depicts acceptable methods of separating bike lanes from vehicle lanes on roads with design speeds of 45 mph or less. The following instructions accompany the drawing:

- Widths shown in the figure are minimum values and may be increased.
- Travel lane gutter spread values must be maintained.
- Drainage structures may be required beside both the vehicle lane and bike lane when selecting the raised bike median option.
- The delineator post option may only be considered for a design speed of ≤ 40mph.

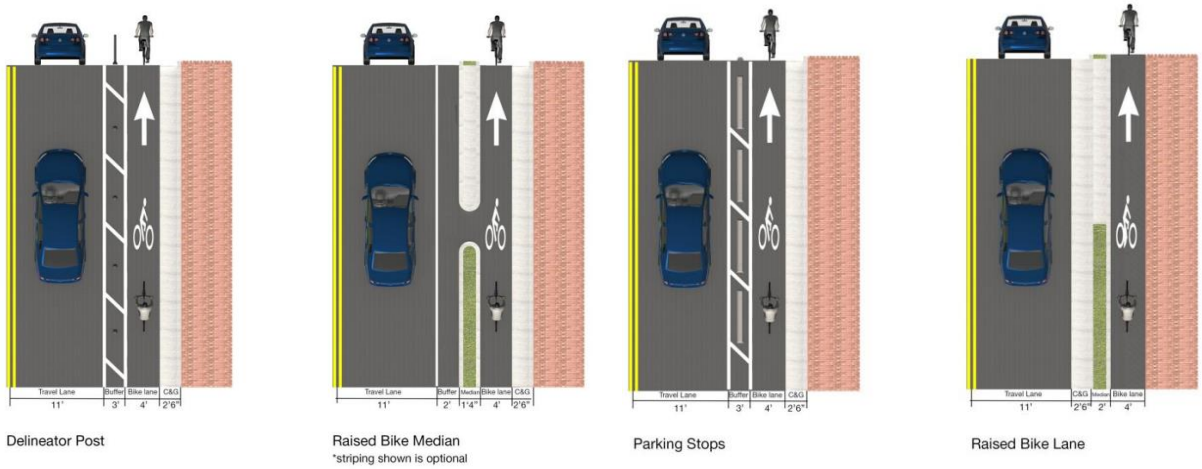


Figure 2.8 Acceptable Forms of Bike Lane Separation
Source: GDOT (2024)

New Jersey Department of Transportation

The *New Jersey Complete Streets Design Guide* (NJDOT, 2017) contains tools and methods for designing CS in different settings and emphasizes the importance of paying attention to the specific needs of each community. The *Guide* can be used by municipal and state agency staff, design professionals, private developers, community groups, and others involved in planning and designing streets in New Jersey. It can inform all projects that impact public rights of way, including the construction of new streets and improvements to existing streets. Standards in the guide are a compilation of current best practice guidance and do not supersede existing federal, state, or city laws, rules, or regulations.

The *Guide* is divided into four chapters and addresses the following topics:

- Definition and benefits of CS
- Adoption and implementation of a CS policies, including public policy changes that facilitate CS implementation and strategies for integrating CS principles into the planning and design.
- Guidance on of tools and treatment options designed to enhance the safety, mobility, access, and vitality of streets.
- Guidance on how the CS toolbox aligns with unique street contexts, offering a holistic understanding of how to apply CS principles.

The toolbox is organized into three sections to reflect the primary physical spaces of a street network: sidewalks, roadways, intersections. Figure 2.9 is an example from the guide illustrating the placement of sharrows, indicating shared-lane markings.

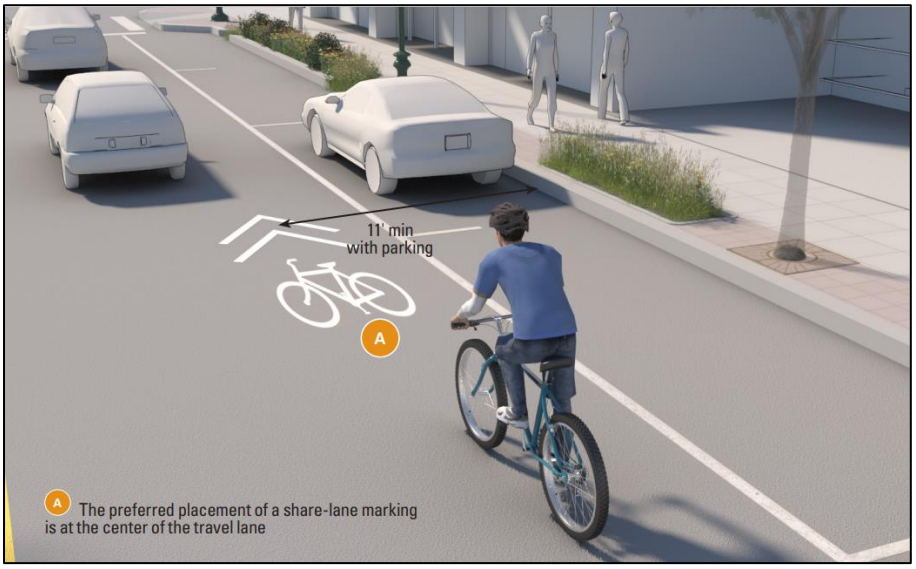


Figure 2.9 Shared Lanes — Design Standards
Source: NJDOT (2017)

City and County of Honolulu

The *City and County of Honolulu Complete Streets Design Manual* (City and County of Honolulu, 2016) provides guidance to plan and design streets that adhere to established legal frameworks. The manual is intended for use by City and County of Honolulu staff, design professionals, private developers, community groups, and others involved in the planning and design of Honolulu streets. It applies to all projects, including the construction of new streets and improvements to existing streets.

The manual has nine sections. The first section details the manual's background, legal framework, and policies critical for achieving CS. Later sections classify Honolulu's streets, provide detailed cross sections, and address intersection design for optimal accommodation of all street users. Safety considerations for pedestrian crossings are outlined, along with guidelines for integrating cyclists into the road network. The manual also presents strategies for ensuring universal accessibility in pedestrian environments and prioritizing transit integration. The final section delves into

creating a streetscape ecosystem through the seamless incorporation of natural design elements into the transportation system.

2.2.3 Category 3: Established Policy and Checklists

Seventeen agencies have developed CS policies that include checklists. A complete list is presented in Appendix A. This section summarizes some of their approaches.

Most of the CS checklists apply to the city or county level rather than the state level. Almost all checklists request a set of standard information as input, such as the project's title and location, date, street's name, project mile points, length of the section, and a brief description of the project. Documentation of existing conditions is also typically included in checklists along with project objectives, proposed design, and possible design exceptions. The description of existing conditions documents the presence or absence of pedestrian and bicycle infrastructure as well as their condition. Some checklists consider the transit network; pavement conditions; land use, bicycle, pedestrian, transit, motor vehicle, truck, and freight operations; contextual factors; and freight infrastructure.

Once background information is entered, typically checklists proceed to focus on the proposed design, where key considerations include bicycle and pedestrian infrastructure, public transport facilities, accessibility and mobility for different users, streetscape elements, and connectivity. Questions are typically presented in two fields: (1) Existing or preliminary/ concept development, and (2) Proposed or final design checklist. These questions aim to collect data and assess factors related to accessibility, safety, functionality, equity, and connectivity. Checklists usually require users to answer questions *Yes/No* or *N/A* and provide a brief comment in each field. Many checklists let users add extra comments at the end and identify design exceptions.

Some checklists request information on street type, arterial classification (Dutchess NY, n.d.), context (NYSDOT, n.d.), traffic volumes (Seattle DOT, 2017) and land uses (MetroPlan Orlando, n.d.). Additionally, some checklists account for advanced factors like Intelligent Transport Systems (ITS) (Seattle DOT, 2017), road diets (Oakland city, n.d.), and maintenance and construction phase considerations (City of San Leandro, n.d.). Some also require specific data, such as the Annual Average Daily Traffic (AADT) for channelization (Dutchess NY, n.d.), speed limits (City of Lawrence, n.d.), 85th percentile speed for safety purposes (Dutchess NY, n.d.), and width measurements (City of San Leandro, n.d.).

American Association of Retired Persons (AARP) Southeast

AARP's toolkit (Seskin et al., 2014) for CS contains case studies and fact sheets that can guide implementation of CS in the Southeast U.S. It reviews CS and how the concept has been adopted in Southeast. Advice on building support for CS policies and practices is provided, followed by a brief discussion on the types of activities needed for successful implementation. A variety of resources based on six case studies from communities in the Southeast round out the toolkit. Fact sheets for each state are provided along with an introductory presentation, sample letters to the editor and editorials, and a document checklist for completing a CS policy. The toolkit also includes a model implementation plan from Cobb County, Georgia, a template implementation plan, and an excerpt from Charlotte, North Carolina's,6-step decision-making process and a worksheet to model that process locally.

AARP, Smart Growth America, and the National Complete Streets Coalition

A collaboration between AARP, Smart Growth America, and the National Complete Streets Coalition resulted in the development of a guide for practitioners to evaluate CS projects (Seskin et al., 2015). The report lists CS measures and metrics (i.e., ways to quantify each measure) to evaluate a project before and after completion. Common goals include providing access to destinations, supporting the local economy, preserving environmental quality, providing

vital public places, and improving safety for all users. Additionally, many communities focus on the goals of improving public health and addressing equity, both of which have measures that cut across other goals. The recommended measures and metrics for each category are as follows:

Access: These measures quantify how well people are connected to places via different modes of travel. Measures include auto trips, bicycle trips, community connections, freight movement, on-street parking, presence of bicycling/ transit/walking facilities, transit reliability, transit trips, transportation connections, trip consistency, and walk trips.

Economy: These measures are used to demonstrate how a project contributes to economic performance, whether by connecting people to jobs, providing employment in transportation construction and operations, or boosting the value and attractiveness of abutting land. Measures include access to opportunities, employment, investments from other sectors, land value, parking utilization, and retail vibrancy.

Environment: These measures are used to evaluate the environmental impact of transportation systems. Minimizing impacts on the natural environment reduce the cost of project materials and maintenance, and it can improve public health outcomes by minimizing pollutants. Measures include air quality, energy efficiency, providing/preserving native species habitat, stormwater runoff, sustainable sourcing of construction materials, and vegetation.

Place: These measures are used to estimate how well the product fits into and enhances the community. Measures include building vacancy; embracing of cultural, historical, and architectural resources; public art; quality of vehicle trips; quality of bicycling/pedestrian/transit environment; resident engagement in place; resident participation in the process; satisfaction; scenic views; seating; and shade.

Safety: These measures are used to track characteristics related to injury crashes and those related to perceptions of safety. Measures include adequate lighting, compliance with speed limit, minor crashes, fatalities, personal security, and serious injuries.

Equity: These measures are used to estimate the distribution of impacts and benefits within project evaluations, particularly focusing on their implications for social equity. Transportation services and infrastructure frequently exert outsized effects on specific populations and neighborhoods, emphasizing the need for careful consideration in project assessment. Measures include a mix of measures from the other categories.

Public health: These measures are used to indicate whether transportation investments help people live healthier lifestyles through increased access to physical activity and active transportation, decreased incidence of serious or fatal injury, and reduced exposure to pollutants. Measures include a mix of measures from the other categories.

Measures are scaled at either the project or network level. Using these measures and metrics, communities can ensure that transportation investments and projects align with their goals and contribute to a more livable and sustainable community.

International Complete Streets Efforts

This section detail CS initiatives undertaken in international contexts.

Center for Active Transportation, Toronto, Canada

The Center for Active Transportation (TCAT) has developed a vision of vibrant cities with clean air, a healthy population, and a transportation system that prioritizes walking and cycling. TCAT produced a CS evaluation tool

(Mitra et al., 2015) as part of efforts to help Greater Golden Horseshoe (GGH) municipalities plan for and evaluate transportation infrastructure, particularly around active transportation.

The tool contains 21 performance indicators that can be used to assess the effectiveness of CS project outputs and outcomes. Project outputs are enhancements expected to have positive impacts, such as number of kilometers of bicycle lanes, length of sidewalk improvements, intersection improvements (e.g., bike boxes, sidewalk bulb-outs, pedestrian scramble), and number of trees planted. Collecting and maintaining this information is critical for documenting advances in CS planning practice. These data can also be used to elicit political support for and public awareness of ongoing projects. The main goal of a project performance evaluation is to establish a cause-effect relationship between the outputs and desired outcomes. Project outcomes are the effects or impacts that result from a project output (i.e., causes) as experienced by citizens and road users on the surrounding environment.

To produce a comprehensive list of measurable outcomes or performance indicators, 26 (22 USA and 4 Canadian) CS policies, active transportation plans, and other documents were reviewed. Project-level outcome performance indicators identified were classified into four broad groups (Table 2.3)

Table 2.3 Complete Streets Performance Indicators

Complete Street Goal	Outcome Performance Indicator (with Desired Effects)
Active Transportation	Changes in pedestrian counts (increase) Changes in cycling counts (increase) Changes in transit ridership (increase) Changes in motor vehicle counts (decrease)
Level of Safety	Changes in collision severity (decrease) Changes in collision frequency (decrease) Changes in all collision types (pedestrian/bike vs. car) (decrease) Changes in traffic speeds (decrease)
Level of Service	Changes in transit travel time (decrease) Changes in motor vehicle travel times (and wait times) (decrease) Changes in average delay for a motor vehicle to clear an intersection (decrease) Multi-modal level of service (improve) Perceived safety and comfort (increase)
Surrounding Environment	Changes in local property values (increase) Changes in retail sales (increase) Changes in air quality (improve) Changes in physical activity (duration and frequency) (increase)

Source: Mitra et al. (2015)

Victoria Transport Policy Institute, Canada

The Victoria Transport Policy Institute's (VTPI) *Evaluating Complete Streets: The Value of Designing Roads for Diverse Modes, Users and Activities* slots CS impacts in three categories: accessibility, travel, and land use (Litman, 2015). These are presented in Table 2.4 (accessibility) and Table 2.5 (travel and land use).

Table 2.4 Impacts on Accessibility

Accessibility Factors	Automobile-Oriented Streets	Complete Streets
Maximum traffic speeds	Higher maximum (peak) traffic speeds	Optimal (often reduced) traffic speeds
Traffic capacity	Higher design speeds and lack of left turn lanes can reduce peak traffic capacity	Center turn and bike lanes, and lower design speeds increase peak capacity
Vehicle travel efficiency (directness to destinations)	Hierarchy road systems reduce connectivity, increasing travel distances	More connected roadway networks reduce travel distances
Parking convenience	High priority. On-street parking and driveways wherever possible	Moderate priority. On-street parking is provided after sidewalks and bike and bus lanes
Non-motorized access	Wider roads and increased traffic tend to create barriers to non-motorized access	Significantly improves walking and cycling access
Public transport access	Since most transit trips include nonmotorized links, auto-oriented streets can reduce transit access	Improves walking and cycling access, and may include bus lanes and other transit support features
Transport affordability (quality of affordable modes)	May reduce vehicle operating costs but reduces access by affordable modes	Significantly improves walking and cycling access, and may improve transit access
Land use accessibility (distances between activities)	Tends to stimulate more dispersed, urban fringe development (sprawl)	Encourages more compact, accessible land-use development

Source: Litman (2015)

Table 2.5 Travel and Land Use Impacts

Factor	Description
Lower motor vehicle traffic speeds	CS often reduce maximum traffic speeds, typically from 30-50 mph (50-80 km/h) down to 20-30 mph (30-40 km/h.). This reduces mobility and distances motorists can travel in a given time period.
Increased safety	Lower traffic speeds tend to reduce traffic collision rates and severity and therefore crash costs, particularly injury risk for pedestrians and cyclists.
Improved non-motorized conditions	CS generally include wider sidewalks, better crosswalks, bike lanes, and reduced traffic speeds, which improve walking and cycling convenience, comfort, and safety.
Improved public transit service	CS often include improved bus stops and pedestrian access, and sometimes bus lanes, which increase public transit speed, reliability, comfort, and efficiency.
Mode shifts	By improving walking, cycling and public transit, and reducing maximum vehicle traffic speeds, CS encourage shifts from automobiles to alternative modes, reducing total vehicle travel.
Reduced local air and noise pollution	By reducing traffic speeds and total motor vehicle travel, and improving bus flow, CS tend to reduce local air and noise pollution.
Improved aesthetics	CS often include landscaping and other design changes that tend to improve aesthetics.

Factor	Description
Improved livability	By improving walkability, accessibility, and aesthetics, and reducing pollution, CS tend to improve livability (local environmental quality and affordability).
Increase economic activity and local property values	By improving livability, CS can increase local business activity and property values.

Source: Litman (2015)

CS projects focus on lower traffic speeds, improved infrastructure for non-motorized modes of transportation, and enhanced public transit access. They offer many benefits, including increased safety, improved livability, reduced pollution, and potential economic growth. These benefits suggest that designing streets with a comprehensive, multimodal approach can positively impact various aspects of urban life and transportation. Positive impacts include improved safety, enhanced livability, reduced pollution, encouragement of alternative modes of transportation, improved public transit service, increased economic activity and property values, compact and accessible land use development, and more pleasing aesthetics.

University of Toronto, Canada

Hui et al. (2018) developed a tool to measure the completeness of CS. Implementing this tool can help with policy development, prioritizing areas for infrastructure investment, and solving allocation problems for individual streets. Hui et al. contended that standards for what makes a street complete must be established by considering factors like street classification, priorities, and target performance levels for different street types.

Performance standards should address a street's ability to fulfill its functions related to movement, the environment, and creating a sense of place. They should be flexible enough to accommodate the multiple ways these functions can be achieved. Many existing frameworks for street design were deemed unsuitable for evaluating CS because of their focus on specifying design elements rather than assessing overall completeness.

Hui et al. suggested that a street's performance can be evaluated based on transportation, environmental, and place-related criteria. Assessments can be compared to target performance levels based on a street's classification. Given the diverse impacts streets can have, additional work is needed to define priorities and performance objectives for different street types. Examples of performance metrics are summarized in Table 2.6.

Table 2.6 Examples of Complete Streets Performance Measures Used by Municipalities

	Facility-Based measures	Infrastructure Evaluation Measures	Outcome Measures
Description	Assess the quantity of new facilities	Use consistent criteria to evaluate the quality of a facility	Before-and-after comparison of performance metrics
Examples	• Total new miles of on-street bicycle routes. • Number of new curb ramps • Size of city's green canopy • Number of destinations within a quarter mile	• Highway Capacity Manual multimodal level-of-service • Pedestrian Environmental Quality Index • Bicycle Environmental Quality Index	• Change in vehicle miles travelled per capita • Percentage of service population within a quarter mile of bicycle facilities

	Facility-Based measures	Infrastructure Evaluation Measures	Outcome Measures
			• Percent of service population within a quarter mile of transit facilities • Reduction of traffic-related fatalities • Reduction of traffic-related injuries • Change in commuter mode shares

Source: Hui et al. (2018)

To assess completeness, performance levels must be measured for different street functions. Hui et al. summarized practices for assessing a street's most prominent impacts. The impacts are organized into three categories as part of the fulfillment of the movement function, environment function, or place function. Figure 2.10 is an excerpt from that table.

Table 3. Summary of state of practice in assessing the different functions of a complete street.

Function	Characteristic	Description	Assessment procedure	Has been studied specifically in context of complete streets?	Challenges in assessing this function on complete streets
Movement	User-perceived quality of movement LOS	• Street design affects the quality of movement through a facility, by improving user comfort or throughput • Dowling et al. (2008), and NRC and TRB (2010)	• There are many methods available with which to measure or predict LOS for different modes	Yes: Lovas et al. (2015) and Carter et al. (2013)	• It is unclear which techniques are most appropriate for different applications
	Safety	• Physical elements, or changes in design volumes as a result of project implementation, will affect the collision frequency on a street (Harwood et al., 2007)	• Collisions frequency can be measured *in situ*, or estimated using the HSM (NRC (U.S.) et al., 2010)	Yes: Barua et al. (2014)	• Collision frequency estimation using the HSM is not accurate for complex, multimodal facilities (Barua et al., 2014)
Environment	Air quality	• Changes in vehicle volumes and movement patterns have effects on the quantity of vehicle emissions. Emission from a street are affected by the vehicle fleet composition, vehicle operating characteristics, and terrain (Misra, Roorda, & MacLean, 2013) • A complete streets design may not necessarily improve air quality (Peiravian & Derrible, 2014)	• Emission outputs can be modelled using vehicle movement profiles and volumes (Misra et al., 2013) • Air quality impacts can be reported as raw measurements/model outputs, or considered in terms of their health and economic impacts (Litman, 2015; Litman & Doherty, 2009)	Yes: Peiravian and Derrible (2014)	• Accurate estimates in air quality impacts of a street rely on accurate estimates of user volumes of the street for all modes

Figure 2.10 Assessing Functions of Complete Streets
Source: Hui et al. (2018)

Institute for Transportation and Development Policy, India

The Institute for Transportation and Development Policy (ITDP) aims to design and implement high-quality transport and urban development systems and policy solutions that make cities more livable, equitable, and sustainable. ITDP developed an evaluation toolkit and metrics for evaluating CS (ITDP, 2019). Cities can use the toolkit to conduct periodic evaluations to identify areas for improvement and work toward realizing policy goals more efficiently. Continuous evaluation lets cities demonstrate the success or progress of programs and communicate findings to the public.

This toolkit provides a CS policy framework cities can use to develop their own. It includes workbooks to facilitate policy development. The workbooks cover planning, design, and implementation of CS along with evaluation metrics and best practices. ITDP emphasizes that cities should work toward evaluating and achieving goals set forth in the CS policy to achieve a sustainable future vision. A 15-year planning horizon is long enough to ensure all goals are attainable. However, cities should strive to implement projects within a 10-year planning horizon and focus the last five years on maintaining projects and completing upgrades as needed.

Outcome indicators represent broader sustainability transportation goals that cities should aim for to achieve their desired visions. Outputs are measurable indicators for walking and cycling infrastructure and services that will help cities achieve sustainability outcomes. Each output is connected to one or more outcomes, and collectively they all lead to their fulfillment.

CS outcomes include:

- Efficient mobility: mode share, registered vehicles data
- Livable, accessible, and comfortable streets: perception surveys on comfort; percentage of non-walking activities like sitting, children play spaces, and vending on streets; share of local streets with traffic calming measures
- Safety: traffic injuries per lakh[1] population
- Environmental sustainability: annual mean particulate matter concentration of PM10 and PM2.5, reduction in carbon emissions from urban transport by 20%, choice of materials or design of sidewalks

CS outputs include:

- Infrastructural outputs
- Extent and quality of walking environment
- Extent and quality of cycling tracks
- Parking management
- Access to public transportation
- Vibrant and inclusive streets
- Management and monitoring outputs
- Monitoring and coordination
- Financial outputs
- Budgeting for monitoring and evaluation (M&E)
- Communication and outreach outputs
- Capacity development
- Communication and outreach

For both outcomes and outputs, the report lists indicators along with data sources, frequency, level of difficulty and benchmark/level of service. Figure 2.11 and Figure 2.12 show examples of recommended outcomes and outputs.

[1] **Lakh** is a unit in the Indian numbering system equal to one hundred thousand (10^5).

efficient mobility

Indicator	Data Source	Frequency	Level of difficulty	Benchmark / Level of service
Mode share - disaggregated by: Walk, cycle, bus, rail, metro, IPT, personal two-wheelers and personal four-wheelers	Household Survey	Every 5 years		20% or more increase in walking and cycling from baseline
Registered vehicles data for last (financial) year and the preceding decade	Regional Transport Office (RTO)	Every year		Relative percentage decrease from baseline

livable, accessible, and comfortable streets

Indicator	Data Source	Frequency	Level of difficulty	Benchmark / Level of service
Mode share (disaggregated by gender, ability, income, and age-people above the age of 60 as elderly and below the age of 15 as children)	Household Survey	Every 5 years		20% or more increase in walking and cycling from baseline women, children (5-15 years), elderly (more than 60 years), and people with disabilities
Perception surveys (disaggregated by gender, age, ability, and income) on: • access • comfort • satisfaction • security	Primary Survey	Every 5 years		80% of people should feel that the streets are accessible, comfortable, and safe
Share of sub-arterial and arterial streets with mixed land use	Primary Survey	Every 5 years		20% or more increase in streets with mixed land use

Figure 2.11 Outcome Indicators
Source: ITDP (2019)

infrastructural outputs

extent and quality of walking environment

All streets have continuous, safe, accessible, secure, and comfortable walking environment.

Indicator	Data Source	Frequency	Level of difficulty	Benchmark / Level of service
1. Percentage of street length with -Continuous, -Barrier free clear walking zone of minimum 1.8 m as per IRC:103-2012, (Also refer IRC:103 for footpath widths as per adjoining landuse and pedestrian LOS) -Maximum footpath height of 150 mm	Accessibility Audit	Every year		1. 75% - 100% 2. 50% - 74% 3. 25% - 49% 4. 0% - 24%
2. Accessibility: Percentage of blocks with a median block length of 100-150 m bounded by publicly accessible roads (for pedestrian and cyclists) on all sides (only for new street network)	City-wide street network plan	Every year		1. 75% - 100% 2. 50% - 74% 3. 25% - 49% 4. 0% - 24%
3. Traffic safety: Percentage of street length design with motor vehicle design speeds of more than 15kmph having at least 1.8 m of clear footpath walking zone (does not include dead and furniture zone, as per IRC:103-2012)	Accessibility Audit	Every year		1. 75% - 100% 2. 50% - 74% 3. 25% - 49% 4. 0% - 24%
4. Traffic Safety: Percentage of street length with motor vehicle design speeds of less than 15 kmph being traffic calmed	Observational Survey with GIS Mapping	Every year		1. 75% - 100% 2. 50% - 74% 3. 25% - 49% 4. 0% - 24%

Low
Moderate
High

Figure 2.12 Output Indicators
Source: ITDP (2019)

2.3 Benefits of Complete Streets

To understand the benefits of CS projects and identify appropriate items to include in a KYTC evaluation framework, researchers reviewed 38 studies published since 2000.

A considerable number of the research studies focused on evaluating CS case studies either through analyses or review, with some also employing case studies to validate proposed frameworks. For instance, Stevanovic et al. (2020) modeled and calibrated networks for real-word conditions to carry out multiresolution analysis methods using VISSIM simulation to quantitatively assess the effectiveness and impact of CS designs. Ostovar et al. (2022) utilized case studies for three area types (urban, suburban, and rural) to validate their Social Life Cycle Assessment (LCA) framework. Harvey et al. (2018) validated the full LCA framework by using it to quantify the environmental and social impacts of CS case studies and comparing them to leaving a street in a vehicle-centric configuration.

Additionally, some studies employed case studies to extract measurable outcomes (Cox et al., 2015; Fonseca-Sarmiento et al., 2022; Jordan & Ivey, 2021; Perk, 2015; Schlossberg et al., 2013; Seskin et al., 2015) or conduct alternative assessments (Barua et al., 2014). Jordan and Ivey (2021) reviewed five projects with different CS goals to identify key elements of successful CS projects. Cox et al. (2015) collected before-and-after data from CS projects to derive outcomes, and other authors used case studies combined with control areas to identify economic impacts (Fonseca-Sarmiento et al., 2022; Perk, 2015). Schlossberg et al. (2013) and Seskin et al. (2015) identified measurable outcomes and evaluation metrics through case studies, while Barua et al. (2014) performed safety assessments of alternative CS designs using the *Highway Safety Manual* (HSM) predictive methods. Only one study implemented its results. It used the Maryland Statewide Transportation Model as a case study, modifying modal choice model to account for walking and bike modes (Jeihani et al., 2022). Findings were derived from statistical analysis and modeling of behavioral data on CS and nonmotorized transportation preferences.

In studies employing case studies as their method, data used includes measurements such as traffic volumes (Cox et al., 2015; Grahn et al., 2020), data from interviews (Fonseca-Sarmiento et al., 2022; Harvey et al., 2018), behavioral data (Jeihani et al., 2022), data from agencies, or emerging data sources, such as Longitudinal Employer-Household Dynamics (LEHD) (Cox et al., 2015; Perk, 2015) at different locations and contexts. Studies that conducted solely literature reviews tend to rely on reviewing other studies or case studies (Hui et al., 2018; Lee & Jin, 2020; Litman, 2015; Macdonald et al., 2010; Ranahan et al., 2014), while the remaining studies mainly depend on data from emerging data sources.

These studies reveal a plethora of insights into CS impacts and benefits across different contexts. One key finding is the positive effect of CS projects on safety, mobility, and accessibility. Studies such as Cox et al. (2015), Grahn et al. (2020) and Barua et al. (2014) demonstrated that CS improvements lead to safer streets, increased walking and biking, and enhanced multimodal travel options, ultimately contributing to improved transportation efficiency and reduced traffic congestion. Moreover, these projects often complete the last mile of connectivity, serving diverse transportation needs while offering broad economic gains.

Economic benefits also emerge as a key issue in these studies. Some studies highlight only the economic benefits of CS projects, including increased property values, enhanced business activity, and improved economic resilience (Fonseca-Sarmiento et al., 2022; Liu et al., 2020; Perk, 2015; Yu et al., 2018). CS projects have been shown to stimulate local economic development, attract investment, and create vibrant, pedestrian-friendly commercial corridors, which fosters economic growth and revitalization in urban areas.

Environmental sustainability is another significant aspect addressed in several studies. Many studies, such as Grahn et al. (2020) and Litman (2015), emphasize the environmental benefits of CS projects, including reduced carbon emissions, improved air quality, and sustainable land use patterns. CS projects can contribute to environmental conservation and climate resilience in urban environments by integrating green infrastructure and prioritizing non-motorized transportation options.

The social benefits of CS projects are apparent in these studies. Ostovar et al. (2022), Harvey et al. (2018), Jordan and Ivey (2021), and Bian et al. (2023) emphasized the importance of equity and social inclusion in transportation planning. They accounted for projects that prioritize the needs of marginalized communities and enhance access to transportation options for all residents. CS have the potential to improve public health, promote social equity, and foster community cohesion by creating inclusive and accessible urban environments.

Each study provides unique contributions and adds valuable insights to the body of knowledge on CS benefits. Table 2.7 summarizes these findings.

Table 2.7 Unique Contribution of Each Study in Determining CS Benefits

Study	Unique Contribution
Hosking et al. (2022)	Use of control areas with similar characteristics as intervention areas to enhance the reliability of findings.
Fonseca-Sarmiento et al. (2022)	Impacts of CS projects on small-city businesses.
Ostovar et al. (2022)	Integration of socioeconomic indicators in LCA for transportation projects at both project level and neighborhood scale.
Jeihani et al. (2022)	Guidelines for transportation planners and modelers that intend to improve their existing modeling tools to support plans that seek to transform highway like corridors into CS; adding the options of walking and biking in the modal choice model into Maryland Statewide Transportation Model (MSTM).
Bian et al. (2023)	Before-and-after analysis of CS project outcomes that is quite limited in practice.
Lee and Jin (2020)	Assessment of project health impacts in terms of increasing participation in active transportation, improving air quality, and reducing traffic crashes.
Stevanovic et al. (2020)	Address the need for quantitative assessment of CS from both operational and planning perspectives.
Liu et al. (2020)	Use of econometric methods, DID[1] and ITS[2] (rigorous quasi-experimental analysis approaches) — instead of case studies or visual comparisons — to increase the validity of the results. Data must fit the assumptions of the chosen methodology.
Harvey et al. (2018)	Integration of socioeconomic impact indicators that consider equity.
Yu et al. (2018)	The first CS intervention assessment on both a housing market boom and downturn using a natural experimental design.
Hui et al. (2018)	Development of a strong, quantitative evaluation framework to complement the predominantly qualitative approaches CS; helpful in fully understanding the tradeoffs inherent in CS design.

Study	Unique Contribution
Perk (2015)	Identification of differences in economic impacts between CS projects and traditional road capacity investment projects that do not contain elements of CS.
Sisiopiku et al. (2012)	Definition and use of appropriate TOD[3] measures that show the effectiveness of transit systems in reducing automobile-related costs and meeting community needs.
Sanders et al. (2011)	Establishment of performance measures for pedestrian and bicycle safety and mobility along urban arterials.

[1] Difference-indifference (DID)

[2] Interrupted time series (ITS)

[3] Transit-oriented development (TOD)

2.3 Complete Streets Metrics

This section reviews metrics used to quantify the performance and benefits of CS across seven categories:

- Mobility
- Accessibility
- Connectivity
- Safety
- Economy
- Society
- Environment

Mobility relates to issues such as traffic volumes, capacity, level of service (LOS), delays, trips, and ridership. Previous research has looked at changes in traffic volumes across street types (change in VMT), using methods such as difference-in-difference analysis and camera recordings (Grahn et al., 2020; Hosking et al., 2022), and employing before-and-after analysis to estimate bicycle, pedestrian, and transit activity as well as multimodal travel (Cox et al., 2015; Grahn et al., 2020; Jeihani et al., 2022; Schlossberg et al., 2013).

Accessibility focuses on access to important destinations such as schools, jobs, and transit stops (Harvey et al., 2018; Ostovar et al., 2022) as well as the presence of facilities that alleviate pressure on active transportation modes (Seskin et al., 2015). FHWA published a guidebook for developing bicycle and pedestrian performance measures that could be applicable to CS projects (Semler et al., 2016). Potential accessibility metrics include access of pedestrians, cyclists, and transit users to destinations within a specific distance from the project, access to the project (number of homes within certain range), and facility improvements that enhance access.

Connectivity captures connections to adjacent major destinations (R. R. Bian et al., 2023; Cox et al., 2015; Seskin et al., 2015), transportation connections (R. R. Bian et al., 2023; Seskin et al., 2015), a connectivity index that defines intersection frequency (Harvey et al., 2018; Ostovar et al., 2022), and connections between nodes and similar metrics that estimate of how well a project facilitates connections with the network.

Safety typically addresses crashes, injuries, and fatalities, particularly among pedestrian and bicyclists (Barua et al., 2014; R. R. Bian et al., 2023; Grahn et al., 2020; Harvey et al., 2018; Hui et al., 2018; Jeihani et al., 2022; Jordan and Ivey, 2021; Macdonald et al., 2010; Ranahan et al., 2014; Sanders et al., 2011; Seskin et al., 2015). Also important are personal security issues related to crime (R. R. Bian et al., 2023; Macdonald et al., 2010; Sanders et al., 2011; Schlossberg et al., 2013). One significant aspect addressed within this category is speed management, where studies such as those by Hosking et al. (2022) and Schlossberg et al. (2013) analyzed changes in vehicle speed across different street types.

Economy is divided into direct and indirect benefits. Direct benefits include employment, gross sales, and property values, while indirect benefits cover user benefits, crashes, and access to opportunities. Fonseca-Sarmiento et al. (2022) and Sisiopiku et al. (2012) explored indirect economic benefits, such as increased access to jobs, cost savings for users, enhanced public health outcomes, and reduced crashes.

Society includes benefits related to physical activity, public health, equity, user satisfaction, and the quality of pedestrian, bicycling, and transit environment. Studies within this category examine the benefits of CS projects on physical activity levels, health outcomes, and community well-being (Ostovar et al. (2022); Ranahan et al. (2014); Plowden (2020)). Equity is addressed through metrics such as creating job opportunities, serving vulnerable populations, and enhancing transport affordability for underserved communities (Jordan and Ivey (2021); Harvey et al. (2018); Bian et al. (2023); Jeihani et al. (2022)). User satisfaction and perception are also key aspects of this category, with previous studies examining factors like perceived safety, comfort, quality of life, and satisfaction with transportation services (R. R. Bian et al., 2023; Hui et al., 2018; Seskin et al., 2015). Additionally, this category considers the quality of transportation environment (Seskin et al., 2015), citizen feedback (Dock et al., 2012; Ranahan et al., 2014), resident participation (Jordan and Ivey, 2021; Seskin et al., 2015), engagement in place, scenic views, seating, shade, cultural preservation, public art (Seskin), and home value appreciation/resilience (Yu et al., 2018).

Environment pertains to environmental benefits, including air and water quality, vegetation, livability, and pollution reduction. Livability encompasses features such as green land consumption, street trees, tree canopy coverage, and traffic calming (R. R. Bian et al., 2023; Dock et al., 2012; Harvey et al., 2018; Jordan & Ivey, 2021; Ostovar et al., 2022). Vegetation-related indicators focus on tree planting and retention, use of native plants, and implementation of water-conserving landscaping techniques (R. R. Bian et al., 2023; Jordan & Ivey, 2021; Seskin et al., 2015). Air pollution can be measured by air quality indexes or changes in vehicle volumes and particulate concentrations, such as ozone, nitrogen oxides, and PM2.5 (Grahn et al., 2020; Hui et al., 2018; Jeihani et al., 2022; Jordan & Ivey, 2021; Ranahan et al., 2014; Seskin et al., 2015). Other metrics relate to stormwater runoff (R. R. Bian et al., 2023; Jordan and Ivey, 2021; Ranahan et al., 2014; Seskin et al., 2015), energy efficiency (R. R. Bian et al., 2023; Jordan and Ivey, 2021; Seskin et al., 2015), and preserving natural habitat (Seskin et al., 2015).

These categories are used in the next chapter to organize the KYTC CS evaluation framework and scorecard.

2.4 Summary

Agencies across all levels of government clearly believe it is imperative to adopt a systematic evaluation framework to assess CS projects. This generates evaluations that measure how effectively projects achieve the multifaceted goals and principles of CS initiatives. One consideration related to metrics that should be kept in mind is that they may require extensive data collection, some of which may be challenging to acquire (e.g., change in traffic volumes, increased sales, household surveys, community attitudes after project completion).

Many agencies have adopted checklists to document existing conditions and propose actions aligned with the CS approach. These checklists address users across modes, underlining the necessity for a comprehensive assessment that considers multiple modes and reflecting the inclusive and integrated nature of CS initiatives.

Some agencies have transcended checklists and policies by publishing CS design guidance. This trend suggests federal agencies need to examine the feasibility of standardizing CS policies. Standardization will require collaboration and the development of unified design guidance to foster consistency across jurisdictions.

Effective CS project assessments require agencies and project teams to identify desired outcomes (e.g., accessibility, safety, equity) and determining indicators/metrics necessary for their quantification. Agencies that have deepened their focus on CS prioritize outcomes related to access, economic development, environmental sustainability, community compatibility, safety, equity, public health, bicyclist and pedestrian activity, land use, inclusivity, citizen feedback, multimodal level of service, efficient mobility, and livable, accessible, and comfortable streets.

Chapter 3 Complete Streets Evaluation Framework

This chapter proposes a scoring framework that KYTC can implement to evaluate CS projects at the planning, design, and evaluation stages. Because the Cabinet's CS policy emphasizes accommodation of non-motorized users, metrics focus on pedestrians, bicyclists, and transit users. The scoring framework omits metrics that would require the use of data that are not readily available from KYTC or other easily accessible databases. This chapter does not provide a detailed treatment of metrics used to evaluate the performance CS projects once they are completed (Appendix C contains information to consider when devising evaluation metrics). The Maintenance division could also utilize the proposed scoring framework since resurfacing projects could be used to advance the implementation of CS concepts. Table 3.1 lists proposed metrics.

Table 3.1 Proposed Evaluation Metrics

Category	Project Stage		
	Planning	**Design**	**Evaluation**
Mobility	• Network improvements • Anticipated change in LOS	• Change in LOS	• Transit access and ridership
Accessibility	• Access to destinations • Access to project	• Facility improvements	• Transit improvements
Equity	• Access of disadvantaged population		• Access of disadvantaged population
Connectivity	• Network completions		
Safety		• Crash effect	• Speed changes • Pedestrian/Bicycle crash changes
Economy		• Crash cost savings	• VMT changes
Effectiveness	• Facility improvements	• Facility improvements	

* At the planning stage, obtaining data for the Society and Environment categories is difficult.

Table 3.2 lists metrics that can be used to quantify benefits for each category. Some proposed metrics reference distances. These represent the distance non-motorized users or transit users can travel in 20 minutes — 1 mile for pedestrians, 3 miles for bicyclists and 1 mile for transit users (assumes the individual walks to their destination after exiting transit.

Table 3.2 Metrics for Complete Streets Benefits

Category	Benefit	Metrics
Mobility	Network improvements	• Sidewalks added (mi) • Bicycle facilities added (mi by type) • Transit stops added (number) • Transit routes added (number)
	Anticipated change in LOS	• Pedestrian LOS • Bicycle LOS

Category	Benefit	Metrics
		• Transit MMLOS
Accessibility	Access to destinations	• Accessible destinations for pedestrians – within 1.0 mi of project (number) • Accessible destinations for bicyclists – within 3.0 mi of project (number) • Accessible destinations for transit users – within 1.0 mi of transit stops (number)
	Access to project	• Homes within 1.0 mi of project (percent) for pedestrians and transit users • Homes within 3.0 mi of project (percent) for bicycles
	Facility improvement	• Pedestrians improvements (e.g., crosswalks added (number), pedestrian signals added (number), pedestrian signal improvements (type), crossing improvements (type) • Improvements for bicyclists, (e.g., sharrow conversion to bike lane (mi), bike lane conversion to cycle track (mi), bike boxes added (number), painted intersections for bicycles (number), bike signals added (number)) • Improvements for transit users, e.g., transit stops features added (number), transit stops ADA compliance (number), bus pull outs added (number)
	Access to jobs	• Accessible jobs for pedestrians and transit users — within 1.0 mi of project (number) • Accessible jobs for bicyclists – within 3.0 mi of project (number)
Equity	Access of disadvantaged population	• Transportation-disadvantaged population within 1.0 mi of project (percent) for pedestrians and transit users • Transportation-disadvantaged population within 3.0 mi of project (percent) for bicyclists and drivers
Connectivity	Network completion	• Confirmation of project's impact
Safety	Crash effect	• Facility improvement for pedestrians (widen sidewalk, new sidewalk/crosswalk/signal in one side, new sidewalk/crosswalk/signal on both sides, new sidewalk/crosswalk/signal buffered) • Facility improvement for bicycles (new bike boxes, new bicycle lane, new buffered bicycle lane, off road path) • Facility improvement for transit (transit priority signal, bus stop pull-offs, far-side stops)
Effectiveness	Facility options	• Pedestrians improvements (e.g., crosswalks added (number), pedestrian signals added (number), pedestrian signal improvements (type), crossing improvements (type)) • Bicyclist improvements (e.g., sharrow conversion to bike lane (mi), bike lane conversion to cycle track (mi), bike

Category	Benefit	Metrics
		boxes added (number), painted intersections for bicycles (number), bike signals added (number)) • Improvements for transit users (e.g., transit stops features added (number), transit stops (number), route improvement (type))

3.1 Complete Streets Scoring Process

Researchers devised a scorecard for benefits and their associated metrics KYTC can use to prioritize CS projects. First, metrics for each category were ranked. Researchers determined it may be difficult to calculate a project's economic benefits, especially if a project corridor has no crash history. Thus, social and environmental benefits were deemed a better fit for early stages of the project (i.e., design) and are included on the scorecard (these benefits can also be measured during the evaluation stage). The scoring sheet incorporates metrics for pedestrians, bicyclists, and transit riders. Potential scores for each metric in Table 3.2 establish a comparative score for the overall potential benefit. The scoring form is provided in Appendix C.

Researchers used a Delphi approach to develop scores for each category. Study Advisory Committee (SAC) members provided initial scores. Scores were evaluated and averaged to establish a preliminary score. Researchers presented the preliminary scores to SAC members for review. Following this review, scores were adjusted to reflect the SAC's final preferences.

All elements were scored using a 1 – 5 scale to provide consistency among the categories and eliminate the need for normalization. For cases where the absence of an element could be detrimental to compliance with KYTC's CS policy, a score of zero is assigned. If a particular element is not relevant to a project, the project team can refrain from assigning a score. For example, if pedestrians are not a factor, they can be identified as a non-applicable element and a score omitted. However, project teams should not arbitrarily omit scores for applicable elements (e.g., if the project is adjacent to a school, the absence or no consideration for sidewalks would result in a score of zero).

For most items, elements with the lowest impact on the project are assigned score of 1 while those with the highest impact receive a score of 5. For example, in addressing bicyclist mobility, the addition of sharrows results in a score of 1; a bicycle lane on shoulder, 2; bicycle lanes, 3; a cycle track or buffered lane, 4; and an off-road path, 5. A similar approach is used to evaluate the potential impact of facility options. Ranges of values were established for elements that measure numbers or percentage, and these are scored progressively as well.

Safety scores are based on generic improvements identified for user types as expressed in existing crash modification factors (CMFs). CMFs for each user type were evaluated and general improvement groups identified and included in the framework. This process enabled development of a rank order and corresponding scores for safety.

Based on feedback from SAC members collected using the Delphi approach, researchers established the following weights for each benefit category:

- Mobility 20%
- Accessibility 15%
- Connectivity 15%
- Equity 15%

- Safety 25%
- Effectiveness 10%

The scorecard provides the option of summing scores by benefit category or by user type within each category. Components could be averaged for each benefit and summed to yield the score for the category. Once scores by category are estimated, each category is weighted to generate a composite score for the project. A similar approach can be followed for averaging scores by user type.

Figure 3.1 captures scores for an example project that will widen sidewalks on both sides of a street, add a bicycle lane, and provide a boulevard design that delivers adequate LOS for pedestrians and bicyclists. No transit is present on the project corridor, and the local transit authority does not plan to include new transit routes in the area.

MOBILITY				
Does the proposed facility improve mobility of users?				
BENEFIT	**USER**	**COMPONENT**	**ELEMENT**	**SCORE**
Network improvements	Pedestrian	Sidewalks	Maintain existing sidewalk/infrastructure	1
			Widen existing one side	2
			Widen existing both sides	3
			New one side project length	4
			New both sides project length	5
			Removal of sidewalk	0
			-	-
	Bicycle	Bike facility	Sharrows	1
			Shoulder	2
			Bike lanes	3
			Cycle track	4
			Off road path (in ROW)	5
			Removal of bike lane	0
			-	-
	Transit	Route and stop(s)	Improve transit stop	1
			New transit stop	3
			Improving a route	4
			Add new route	5
			-	-
BENEFIT	**USER**	**COMPONENT**	**ELEMENT**	**SCORE**
LOS adequacy	Pedestrian	LOS adequacy	Not appropriate	0
			Appropriate	5
			-	-
	Bicycle	LOS adequacy	Not appropriate	0
			Appropriate	5
			-	-
	Transit	LOS adequacy	Not appropriate	0
			Appropriate	5
			-	-
Note: LOS adequacy can be assessed based on facility type provide and anticipated users.				

Figure 3.1 Example Mobility Component Scoring for a Complete Streets Project

The average score for mobility is computed using the average of the Network improvements and the LOS adequacy:

- Network improvements: [(3+3)/2] = 3.0
- LOS adequacy of [(5+5)/2)] = 5.0

This yields an average score of 4.0. This score is weighted with the other scores to produce an overall estimate for the project.

If a project team wants to generate scores for a particular user type, they follow a similar approach. Scores for user types are calculated as follows:

- Pedestrian: [(3+5)/2] = 4.0
- Bicycle: [(3+5)/2] = 4.0
- Transit: No score assigned

Scores are weighted with all other benefits to develop an overall project estimate project by user type.

3.2 Summary

The proposed CS evaluation framework is a systematic, structured process for identifying and scoring anticipated project benefits. Project teams can score projects as a whole or generate scores for individual user types. This lets project teams review benefits for each user type and then modify design concepts and treatments to optimize the benefits for different user groups.

Chapter 4 Conclusions

Agencies across all levels of government believe it is imperative to adopt systematic evaluation frameworks to assess how well projects address CS principles. Building off CS initiatives undertaken at transportation agencies across the U.S. and globally, as well as academic literature, this report advanced an evaluation framework and scorecard that KYTC can use to assess project compliance with the agency's CS policy as well as to prioritize CS projects competing for funds. One benefit of the evaluation framework is that it relies on data that can be readily accessed at the project planning stage. Evaluations are critical for identifying benefit categories where a project is lacking. This information can be used to add CS-oriented design interventions as appropriate.

The scorecard gives KYTC a powerful, detailed, practical, and objective tool for ranking and evaluating projects. Because the scorecard contains metrics focused on each user type (i.e., pedestrian, bicyclist, transit user), project teams have the flexibility to evaluate either entire projects or the impact of a project on specific user groups.

4.1 Framework Limitations

Several aspects of the evaluation framework and scoring sheet merit further investigation and refinement. Although scores for different benefit metrics were developed with input from SAC members, it is important to validate the evaluation framework and scoring sheet to ensure they generate expected outcomes that move KYTC closer to fully realizing its CS policy. Validation can occur through case studies or scoring upcoming projects. Another area requiring further attention is the weighting of benefit categories. While SAC members gave input on proposed weights, these weights should be refined through actual scoring exercises. Using different weights for different users could be also explored.

By establishing scoring ranges that define levels of compliance, KYTC can use the scoring sheet to evaluate policy compliance. Levels of compliance need to be defined and tested to verify they reflect a project's context and actual conditions. Project location (e.g., rural, urban) could factor into defining levels of compliance. For example, some benefits in the Accessibility and Equity categories (e.g., percent of population, access to jobs, access to project) will always tend to be lower in rural areas. As such, to accurately gauge compliance with its CS policy, the Cabinet may need to define acceptable score ranges for different project types and locations.

KYTC has developed a draft Review Process form to determine if a project complies with its CS policy. But there is no clear approach for determining how the form can be used to ascertain if and how a project complies with the CS policy. It will be helpful to evaluate this form and determine required steps and changes to ensure that it achieves its intended goal of evaluating policy compliance. It is possible that this form can be used alongside the scoring framework.

4.2 Future Research

In light of the limitations noted in Section 4.1, the research team proposes the following activities:

Review Process Form refinement. The draft Review Process form should be re-examined to evaluate its usefulness for verifying policy compliance. Identifying areas for improvement, refining entries, and examining data needed to support decisions will enhance its utility as a decision-making tool.

Framework validation. The evaluation framework and scoring tool have not been tested on actual projects. The sensitivity of the tool's outputs merit further investigation to determine its range of application and make

refinements as necessary. This will result in more accurate estimates of the benefits CS-oriented design principles confer to projects.

Case study development. A set of case studies for projects both completed or under development could provide the foundation for validating the framework and scoring tool. This will also help build a library of use cases, where lessons learned can be gleaned and appropriate adjustments implemented.

Framework and Review Process. The scoring framework and draft Review Process form were developed independently. Each serves a specific purpose. However, they can work in tandem to improve policy compliance and optimize the benefits of CS projects for all user groups. Future research could review use cases for each tool to define the stages of project development where each is most applicable.

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Appendix A Summary of Complete Streets Initiatives

Table A1 corresponds to Figure 2.1 and links to associated policies. For each state, only the agency with the highest category is identified.

Table A1 Summary of Agency CS Efforts (All Levels of Government)

State	Agency	Policy	Level	Year	Category	Source
AK	Anchorage Metropolitan Area Transportation Solutions, AK	AMATS Complete Streets Policy	region	2018	4	https://www.muni.org/Departments/OCPD/Planning/AMATS/Policy_Committee/2018/072618/5B_Attachment%20A_Draft%20Complete%20Streets%20Policy.pdf
AL	Birmingham, AL	Complete Streets Ordinance	city	2018	4	https://www.birminghamal.gov/wp-content/uploads/2018/02/Proposed-Complete-Streets-Ordinance.pdf
AR	Fayetteville, AR	Master Street Plan	city	2011	2	https://www.fayetteville-ar.gov/1217/Master-Street-Plan
AZ	Maricopa Association of Governments (Pheonix, AZ area)	Complete Streets Guide	region	2011	2	https://azmag.gov/Portals/0/Documents/BaP_2011-01-25_MAG-Complete-Streets-Guide-December-2010.pdf
CA	Caltrans Division of Research, Innovation and System Information, CA	Life Cycle Assessment for Complete Streets: Framework and Pilot Studies	state	2017	1	https://dot.ca.gov/-/media/dot-media/programs/research-innovation-system-information/documents/research-results/task3091-rrs-5-19-a11y.pdf
CO	Basalt, CO	Complete Street Design	city	2005	2	https://www.basalt.net/DocumentCenter/View/438/Complete-Streets-Design-Manual?bidId=
CT	New Haven, CT	Complete Streets Design Manual	city	2010	2	https://www.ctdatahaven.org/sites/ctdatahaven/files/NewHaven%20CS%20Manual%20040510%20NoMapsDiagrams.pdf
DC	National Capital Region Transportation Planning Board	Complete Streets Policy	region	2012	4	https://www.mwcog.org/documents/2012/05/16/r15-2012-resolution-approving-the-complete-streets-policy-for-the-national-capital-region-complete-streets/
DE	State of Delaware DOT	Complete Streets Design Guide	state	2023	2	https://deldot.gov/Publications/pdfs/DelDOT-Complete-Streets-Design-Guide.pdf?cache=1681491358414

State	Agency	Policy	Level	Year	Category	Source
FL	Broward County, FL	Complete Streets Evaluation Toolkit	county	2015	1	https://www.browardmpo.org/images/WhatWeDo/completestreetsinitiative/EvaluationToolkit.pdf
GA	Georgia DOT, GA	Design Policy Manual Chapter 9	state	2023	2	https://www.dot.ga.gov/PartnerSmart/DesignManuals/DesignPolicy/GDOT-DPM.pdf
HI	Honolulu County, HI	Complete Streets Design Manual	county	2016	2	https://www4.honolulu.gov/docushare/dsweb/Get/Document-187742/160908%20Honolulu%20Complete%20Streets%20Design%20Manual_Final.pdf
IA	Ames, IA	Complete Streets Plan	city	2018	4	https://www.cityofames.org/home/showpublisheddocument/47852/636747597415130000
ID	Sandpoint, ID	Resolution	city	2010	4	
IL	Chicago, IL	Complete Streets Guidelines	city	2013	2	https://www.chicago.gov/content/dam/city/depts/cdot/Complete%20Streets/CompleteStreetsGuidelines.pdf
IN	Indianapolis, IN	Complete Streets Policy	city	2022	4	https://www.indy.gov/activity/complete-streets-policy
KS	Wichita, KS	Multimodal Accommodation Policy and Street Design Guidelines	city	2014	2	https://www.wichita.gov/Planning/Pages/MultiModalPolicyandStreetDesignGuidance.aspx
KY	Kentucky Transportation Cabinet, KY	Complete Streets, Roads, and Highways Manual	state	2022	2	https://transportation.ky.gov/BikeWalk/Documents/Complete%20Streets,%20Roads,%20and%20Highways%20Manual.pdf
LA	Louisiana DOT, LA	Complete Streets of Louisiana Design and Implementation	state	2018	2	https://www.ltrc.lsu.edu/complete_streets/story_content/external_files/Complete%20Streets%20Manual.pdf
MA	Springfield, MA	Complete Streets Implementation Guide	city	2014	2	https://www.pvpc.org/sites/default/files/doc-springfield-complete-streets3885.pdf
MD	Howard County, MD	Complete Streets Design Manual	county	2021	4	https://www.howardcountymd.gov/DM-updates
ME	Maine Department of Transportation	Complete Streets Policy	state	2019	4	https://www.maine.gov/mdot/completestreets/docs/MaineDOTCompleteStreetsPolicyFinal.pdf

State	Agency	Policy	Level	Year	Category	Source
MI	Oakland County, MI	Complete Streets General Guidelines	county	2012	2	https://www.rcocweb.org/DocumentCenter/View/106/RCOC-Complete-Streets-Guidelines-PDF?bidId=
MN	St. Paul, MN	Street Design Manual	city	2016	2	https://www.stpaul.gov/sites/default/files/Media%20Root/Planning%20%26%20Economic%20Development/Street%20Design%20Manual%20Final101416.pdf
MO	Riverside, MO	Complete Streets Policy	city	2022	4	
MS	Ridgeland,MS	Complete Streets Policy	city	2017	4	https://www.ridgelandms.org/wp-content/uploads/City-of-Ridgeland-Complete-Street-Policy.pdf
MT	Polson, MT	Safe and Accessible Streets Policy	city	2015	4	
NC	North Carolina Department of Transportation	Complete Streets Evaluation	state	2018	1	https://connect.ncdot.gov/projects/BikePed/BikePed%20Documents/complete-streets-evaluation-final-report.pdf
ND	Fargo-Moorhead Metropolitan Council of Governments, ND	Complete Streets Policy Statement	region	2010	4	https://www.fmmetrocog.org/application/files/9015/3858/5057/Final_Complete_Streets_Policy_November_18_2010.pdf
NE	Omaha, NE	Complete Streets Policy	city	2015	4	https://urbanplanning.cityofomaha.org/images/stories/Complete_Streets/FINAL_omaha-complete-streets-policy-document-1.pdf
NH	Jaffrey, NH	Jaffrey Complete Streets Planning and Design Guidelines	city	2017	2	https://www.townofjaffrey.com/sites/g/files/vyhlif4561/f/uploads/draft_complete_streets_guidelines.pdf
NJ	New Jersey Department of Transportation	Complete Streets Design Guide	state	2017	2	https://www.nj.gov/transportation/eng/completestreets/pdf/NJCS_DesignGuide.pdf
NM	Farmington Metropolitan Planning Organization, NM	Context Sensitive Street Design Guidelines, A Complete Streets Approach	region	2016	2	https://fmtn.org/DocumentCenter/View/8947/Final-Draft-CS-92216?bidId=

State	Agency	Policy	Level	Year	Category	Source
NV	Regional Transportation Commission of Southern Nevada (Las Vegas, NV area), NV	Complete Streets for Livable Communities: A Design Manual	region	2013	2	https://assets.rtcsnv.com/wp-content/uploads/sites/4/2019/06/18095226/Complete-Streets-Design-Guidelines-for-Livable-Communities.pdf
NY	GOBike Buffalo, NY	Evaluating the Impact of Complete Streets Initiatives	region	2019	1	https://idea.ap.buffalo.edu/idea/wp-content/uploads/sites/110/2019/07/IDeACenter_GoBike_CompleteStreets_web.pdf
OH	Cincinnati	Complete Streets Ordinance	city	2022	4	https://cincinnatioh.legistar.com/View.ashx?M=F&ID=11446947&GUID=24173A6D-B130-4763-A9BB-C3F6585736F8
OK	Association of Central Oklahoma	Complete Streets Policy	region	2021	4	https://www.acogok.org/wp-content/uploads/2021/08/ACOG-Complete-Streets-Policy_Adopted.pdf
OR	Portland, OR	Transportation System Plan	city	2020	4	https://www.portland.gov/transportation/planning/tsp-document-downloads
PA	Elizabethtown Borough, PA	Complete Streets Checklist	region	2018	3	https://www.etownonline.com/sites/g/files/vyhlif3091/f/uploads/complete_streets_checklist.pdf
RI	Providence, RI	Complete Streets Policy	city	2021	4	https://www.providenceri.gov/wp-content/uploads/2021/09/Green-and-Complete-Streets-Signed-Ordinance.pdf
SC	South Carolina Department of Transportation	Department Directive 28	state	2021	4	http://info2.scdot.org/SCDOTPress/PublishingImages/DD%2028%20Complete%20Streets.pdf
SD	Sioux Falls, SD	Resolution No. 53-15	city	2015	5	https://www.siouxfalls.gov/files/assets/public/v/1/planning-and-development/parking-amp-street-services/complete-streets/53-15.pdf
TN	Memphis, TN	Complete Streets Project Delivery Manual	city	2015	2	https://bikepedmemphis.wordpress.com/plans-and-publications/complete-streets-project-delivery-manual/
TX	Dallas, TX	Complete Streets Design Manual	city	2016	2	https://dallascityhall.com/departments/pnv/DCH%20Documents/DCS_ADOPTED_Jan272016.pdf

State	Agency	Policy	Level	Year	Category	Source
UT	Saint George, UT	Complete Streets Policy	city	2021	4	https://www.sgcity.org/pdf/transportationandengineering/general/activetransportationplan/stgeorgecompletestreetspolicy11-22-2021.pdf
VA	Virginia Beach, VA	Complete Streets Administrative Directive	city	2014	4	https://planning.virginiabeach.gov/comp-plan/master-transportation-plan/complete-streets
VT	Vermont Agency of Transportation, VT	Complete Streets Guidance	state	2012	3	https://vtrans.vermont.gov/sites/aot/files/highway/documents/publications/Complete%20Streets%20Guidance%20Document.pdf
WA	Tacoma, WA	Complete Street Guidelines	city	2009	2	https://cms.cityoftacoma.org/Planning/CompleteStreets/CS_Project_Summary111709.pdf
WI	Madison, WI	Complete Green Streets Policy	city	2023	4	https://www.cityofmadison.com/transportation/documents/complete-green-streets/CGS%20Guide%20Final.pdf
WV	Beckley, WV	Resolution adopting Complete Streets guiding principles	city	2019	5	https://activeswv.org/wp-content/uploads/2020/09/Complete-Streets.pdf
WY	Cheyenne, WY MPO	PlayCheyenne	region	2006	4	https://www.plancheyenne.org/PlanCheyenne2014FINAL/Original2006Plan/ExecutiveSummaryFinal.pdf
DC	National Capital Region Transportation Planning Board	Complete Streets Policy	region	2012	4	https://www.mwcog.org/documents/2012/05/16/r15-2012-resolution-approving-the-complete-streets-policy-for-the-national-capital-region-complete-streets/

Table A2 corresponds to Figure 2.2 All relevant activities for each DOT, including the Washington, DC DOT, are noted but Figure 2.2 shows only their highest category.

Table A2 State DOT Complete Streets efforts

State	Document name	Type	Level	Year	Category	Source
Alabama	RESOLUTION 19 - 28	Resolution	state	2022	5	https://www.dot.state.al.us/programs/pdf/MPO/GuidanceHistory/UPWP/UPWPChecklist.pdf
Alaska	Alaska Statewide Active Transportation Plan - Masterplan 2019	Plan	state	2019	4	https://dot.alaska.gov/stwdplng/areaplans/modal_system/docs/AK-Statewide-Active-Transportation-Plan.pdf
California	Director's Policy Number: DP-37	Policy	state	2021	4	https://dot.ca.gov/-/media/dot-media/programs/esta/documents/dp-37-complete-streets-a11y.pdf
	Deputy Directive Number: DD-64-R1	Policy	state	2008	4	https://dot.ca.gov/-/media/dot-media/programs/local-assistance/documents/bike/f0011235-dd-64-r1-signed.pdf
	Deputy Directive Number: DD-64-R2	Policy	state	2014	4	https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/dd-64-r2-a11y.pdf
	Complete Streets Elements Toolbox Version 2.0	Design	state	2018	2	https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/f0020348_complete-streets-elements-toolbox-a11y.pdf
	Complete Streets Elements Toolbox 3.0	Design	state	2023	2	https://storymaps.arcgis.com/stories/38530ceb5e3b4ee08b9b5b569e92587c
	COMPLETE STREETS ACTION PLAN 2022-23	Action Plan	state	2022	4	https://dot.ca.gov/-/media/dot-media/programs/esta/documents/csap-quarterly-report/2022/csap-2022-a11y.pdf
	LCA for Complete Streets: Framework and pilot studies, (NCST)	Evaluation tool	state	2019	1	https://dot.ca.gov/-/media/dot-media/programs/research-innovation-system-information/documents/research-results/task3091-rrs-5-19-a11y.pdf

State	Document name	Type	Level	Year	Category	Source
	Framework for Life Cycle Assessment of Complete Streets Projects	Research report		2018	1	https://escholarship.org/uc/item/0vw335dp#main
Colorado	HOUSE BILL 10-1147	Legislation	state	2010	5	https://www.leg.state.co.us/clics/clics2010a/csl.nsf/fsbillcont3/260E8F2D148FBB6A872576AA00696508?Open&file=1147_enr.pdf
Connecticut	Complete Streets Controlling Design Criteria and Justification Process	Design	state	2023	2	https://portal.ct.gov/-/media/DOT/documents/AEC/ECD-2023-8_Complete_Streets_Controlling_Design_Criteria_final_sah.pdf
	POLICY NO. EX.O. - 31	Policy	state	2014	3	https://portal.ct.gov/-/media/DOT/PLNG_PLANS/BikePedPlan/CSExO31signedpdf.pdf
Delaware	DelDOT Complete Streets Design Guide	Design	state	2023	2	https://deldot.gov/Publications/pdfs/DelDOT-Complete-Streets-Design-Guide.pdf?cache=1681491358414
	Executive Order Number 6 (REQUEST FOR POLICY IMPLEMENT)	Policy	state	2010	4	https://deldot.gov/Publications/manuals/complete_streets/pdfs/o06_complete_streets_policy.pdf
	Executive Order Number 6: Creating a Complete Streets Policy	Policy	state	2009	4	https://regulations.delaware.gov/register/june2009/governor/12%20DE%20Reg%201527%2006-01-09.pdf
Florida	COMPLETE STREETS POLICY	Policy	state	2014	4	https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/roadway/completestreets/000-625-017-a.pdf?sfvrsn=5f76a980_2
Georgia	Complete Streets Policy	Policy	state	2012	4	https://www.dot.ga.gov/PartnerSmart/DesignManuals/PolicyAnnouncements/Complete%20Streets%20Policy%20-Chief%20Engineer%20(9-20-12).pdf

State	Document name	Type	Level	Year	Category	Source
	Design Policy Manual - Chapter 9. Complete Streets Design Policy	Design	state	2023	2	https://www.dot.ga.gov/PartnerSmart/DesignManuals/DesignPolicy/GDOT-DPM.pdf
	Design Policy Manual - Chapter 9. Complete Streets Design Policy	Design	state	2017	2	https://www.ghmpo.org/wp-content/uploads/2019/11/Georgia-Department-of-Transportation-PDF.pdf
Hawaii	Act 54 (SB 718)	Legislation	state	2009	5	https://files.hawaii.gov/dotadmin/library/legislature/act54-complete-streets-task-force.pdf
Illinois	Public Act 095-0665 (SB0314)	Legislation	state	2007	5	https://www.ilga.gov/legislation/publicacts/95/PDF/095-0665.pdf
Indiana	INDOT Complete Streets Guideline & Policy	Policy	state	2014	4	https://www.in.gov/indot/doing-business-with-indot/files/AM_CompleteStreetsGuideline.pdf
Iowa	Complete Street Policy Iowa Bicycle and Pedestrian Plan, Chapter 6	Policy	state	2020	4	https://iowadot.gov/iowainmotion/files/Complete-Streets-Policy.pdf
Kansas	MEMORANDUM - Policy and Project Delivery Process Review	Legislation	state	2020	5	https://www.ksdot.gov/Assets/wwwksdotorg/KansasATP/documents/Task_3.2_Policy_Review_Memo.pdf
Kentucky	KYTC's Complete Streets Policy (Policy 112974)	Policy	state	2022	4	https://transportation.ky.gov/BikeWalk/Documents/Complete%20Streets%20Policy.pdf
	COMPLETE STREETS, ROADS, AND HIGHWAYS MANUAL	Design	state	2022	2	https://transportation.ky.gov/BikeWalk/Documents/Complete%20Streets,%20Roads,%20and%20Highways%20Manual.pdf
Louisiana	COMPLETE STREETS OF LOUISIANA: DESIGN AND IMPLEMENTATION	Design	state	2018	2	https://www.ltrc.lsu.edu/complete_streets/story_content/external_files/Complete%20Streets%20Manual.pdf
	Complete Streets Policy - Revised	Policy	state	2016	4	http://wwwsp.dotd.la.gov/Inside_LaDOTD/Divisions/Multimodal/Highway_Safety/Co

State	Document name	Type	Level	Year	Category	Source
						mplete_Streets/Misc%20Documents/cs-la-dotpolicy.pdf
Maine	Complete Streets Policy	Policy	state	2019	4	https://www.maine.gov/mdot/completestreets/docs/MaineDOTCompleteStreetsPolicyFinal.pdf
Maryland	SHA Complete Streets Policy	Policy	state	2012	4	https://roads.maryland.gov/OPPEN/SHA_Complete_Street_Policy.pdf
Massachusetts	Complete Streets Funding Program Guidance	Checklist	state	2022	3	https://gis.massdot.state.ma.us/CompleteStreets/Content/Docs/Complete%20Streets%20Funding%20Program%20Guidance%20and%20Appendix.pdf
	Complete Streets Funding Program Guidance	Checklist	state	2016	3	https://www.mass.gov/doc/complete-streets-funding-program-guidance/download
	House No. 4046 (Chapter 90I)	Legislation	state	2014	5	https://malegislature.gov/Bills/188/H4046.pdf
Michigan	Public Act 135 of 2010 (HB6151)	Legislation	state	2010	5	https://www.legislature.mi.gov/documents/2009-2010/publicact/htm/2010-PA-0135.htm
Minnesota	MnDOT Policy #OE004 (Policy + Handbook)	Policy	state	2023	4	https://www.dot.state.mn.us/policy/operations/oe004.html
Mississippi	Senate Bill 2632	Legislation	state	2019	5	http://billstatus.ls.state.ms.us/documents/2019/html/SB/2600-2699/SB2632IN.htm
Nebraska	Complete streets policy implementation (RFQ-2217)	Policy	state	2022	4	https://dot.nebraska.gov/media/4iod42ae/rfq-2217-complete-streets-policy-implementation.pdf
Nevada	NDOT Complete Streets Policy	Policy	state	2017	4	https://www.dot.nv.gov/home/showpublisheddocument/8594/636367663457970000
New Jersey	Policy No. 703	Policy	state	2009	4	https://www.nj.gov/transportation/eng/completestreets/pdf/completestreetspolicy.pdf

State	Document name	Type	Level	Year	Category	Source
	Complete Streets Design Guide	Design	state	2017	2	https://www.nj.gov/transportation/eng/completestreets/pdf/NJCS_DesignGuide.pdf
	NJDOT Complete Streets Checklist	Checklist	state	2011	3	https://www.state.nj.us/transportation/capital/pd/documents/CompleteStreetsChecklist.doc
New Mexico	Senate Memorial 35	Legislation	state	2017	5	https://www.nmlegis.gov/Sessions/17%20Regular/memorials/senate/SM035.pdf
New York	S.5411A	Legislation	state	2011	5	https://assembly.state.ny.us/leg/?default_fld=&bn=S05411&term=2011&Summary=Y&Actions=Y&Text=Y&Votes=Y
North Carolina	Memorandum - Complete Streets Policy Guidance	Policy	state	2019	4	https://www.ncdot.gov/divisions/integrated-mobility/multimodal-planning/Documents/2019-08-28-complete-streets-policy.pdf#search=complete%20street
	Complete Streets Review Assessment (CSRA)	Evaluation tool	state	2023	1	https://connect.ncdot.gov/projects/BikePed/Documents/CSRA.pdf
	Complete Streets Project Evaluation Methodology	-	state	2022	1	https://connect.ncdot.gov/projects/BikePed/Documents/Complete%20Streets%20Project%20Development%20Evaluation%20Methodology%20Guidance%20Slides%20(Feb2022).pdf
	Complete Streets Implementation Guide	-	state	2022	1	https://connect.ncdot.gov/projects/BikePed/Documents/Complete%20Streets%20Implementation%20Guide.pdf
	Complete Streets Project Sheet	Evaluation tool	state	2022	1	https://connect.ncdot.gov/projects/BikePed/Documents/NCDOT%20Complete%20Streets%20Project%20Sheet.pdf
	NCDOT Complete Streets Evaluation	Evaluation tool	state	2018	1	https://connect.ncdot.gov/projects/BikePed/BikePed%20Documents/complete-streets-evaluation-final-report.pdf

State	Document name	Type	Level	Year	Category	Source
Rhode Island	Rhode Island's Complete Streets Action Plan	Action plan	state	2015	4	https://www.dot.ri.gov/documents/community/safety/Complete_Streets.pdf
	Rhode Island General Laws Title 24 Chapter 24-16: Safe Access to Public Roads	Legislation	state	2012	5	http://webserver.rilin.state.ri.us/Statutes/TITLE24/24-16/24-16-2.HTM
South Carolina	Department Directive 28	Policy	state	2021	4	http://info2.scdot.org/SCDOTPress/PublishingImages/DD%2028%20Complete%20Streets.pdf
Vermont	COMPLETE STREETS GUIDANCE (+checklist)	Policy	state	2012	3	https://vtrans.vermont.gov/sites/aot/files/highway/documents/publications/Complete%20Streets%20Guidance%20Document.pdf
	Act 034 (H. 198); State Statutes Chapter 23, Section 2310 (Bill S. 350)	Legislation	state	2011	5	https://legislature.vermont.gov/Documents/2012/Docs/ACTS/ACT034/ACT034%20As%20Enacted.pdf
Virginia	VDOT Complete Streets: Bicycle and Pedestrian Facility Guidelines, Bus Stop Design and Parking Guidelines	Policy	state	2004	4	https://www.virginiadot.org/business/resources/locdes/rdm/appenda1.pdf
Washington	Project Delivery Memo #22-03 – Complete Streets Implementation	Policy	state	2022	4	https://wsdot.wa.gov/publications/fulltext/ProjectDev/ProjectDeliveryMemos/Memo22-03.pdf
	RCW 47.24.060	Legislation	state	2022	5	https://app.leg.wa.gov/RCW/default.aspx?cite=47.04.035&pdf=true
	Chapter 257, 2011 Laws	Legislation	state	2011	5	https://leg.wa.gov/CodeReviser/documents/sessionlaw/2011pam2.pdf
West Virginia	Complete Streets Act (SB 158)	Legislation	state	2013	5	https://www.wvlegislature.gov/Bill_Status/bills_text.cfm?billdoc=SB158%20SUB2%20ENR.htm&yr=2013&sesstype=RS&i=158
Wisconsin	Bicycle and Pedestrian Elements Affecting Complete Streets	Policy	state	2021	4	https://wisconsindot.gov/rdwy/fdm/fd-11-46.pdf

State	Document name	Type	Level	Year	Category	Source
District of Columbia	§ 50–2381. Complete Streets policy.	Policy	state	2023	4	https://code.dccouncil.gov/us/dc/council/code/sections/50-2381

Appendix B Complete Streets Benefits and Metrics

Table B1 Transportation Mobility —Benefits and Metrics

CATEGORY 1: TRANSPORTATION MOBILITY		
Benefits/Indicators	**Metric**	**Source**
Traffic volumes in different street types	Change in traffic volume per street type (%)	(R. R. Bian et al., 2023; Grahn et al., 2020; Hosking et al., 2022; Seskin et al., 2015)
	Volume of vehicles, transit riders, pedestrians, bicycle riders, and users of public space	
	Vehicle Miles Traveled (VMT)	
	Vehicle Miles Traveled (VMT) per capita	
Traffic capacity		(Litman, 2015)
Level of Service (Auto)		(R. R. Bian et al., 2023; Ostovar et al., 2022)
Level of Service (bicyclists, pedestrians, autos, transit users, etc.)		(R. R. Bian et al., 2023)
Level of Service (Multimodal)	MMLOS	(R. R. Bian et al., 2023; Ranahan et al., 2014)
Multimodal travel	Number of trips per mode (walking, bicycle, public transit)	(Cox et al., 2015)
Auto trips	Driving trips as portion of total trips along project; measured by gender, age, income, race, ethnicity, and disability status	(Seskin et al., 2015)
	Vehicle Miles Traveled (VMT) per capita	
	Driving commutes as portion of total commutes; measured by gender, age, income, race, ethnicity, and disability status	
	Driving trips to primary and secondary school (ages 5 to 18 years)	
Pedestrian and Bicycling Delay	Seconds of delay at specific locations	(Harvey et al., 2018; Ostovar et al., 2022)
Bicycle and pedestrian (Non-car modes) activity/ use/ trips	Mode share (# of bike/ped trips per total # of trips)	(Grahn et al., 2020; Jeihani et al., 2022; Jordan & Ivey, 2021; Litman, 2015; Ranahan et al., 2014; Schlossberg et al., 2013)
	Usage (# of bicyclists/pedestrians per unit time)	
	Bicycle counts (bikes/hr)	
	Number of bike lane users	
Bicycle trips	Bicycling trips as portion of total trips along project; measured by gender, age, income, race, ethnicity, and disability status	(Seskin et al., 2015)
	Bicycling trips as portion of total trips in community; measured by gender, age, income, race, ethnicity, and disability status	
	Bicycling commutes as portion of total commutes; measured by gender, age, income, race, ethnicity, and disability status	
	Participation in community bicycling events	

CATEGORY 1: TRANSPORTATION MOBILITY		
Benefits/Indicators	**Metric**	**Source**
	Bicycling trips to primary and secondary school (ages 5 to 18 years)	
Walk trips	Walking trips as portion of total trips along project; measured by gender, age, income, race, ethnicity, and disability status	(Seskin et al., 2015)
	Walking trips as portion of total trips in community; measured by gender, age, income, race, ethnicity, and disability status	
	Walking commutes as portion of total commutes; measured by gender, age, income, race, ethnicity, and disability status	
	Participation in community walking events	
	Walking trips to primary and secondary school (ages 5 to 18 years)	
Public transit use/ ridership	Passenger counts in morning and evening peak (weekdays)	(Grahn et al., 2020; Jeihani et al., 2022)
Travel Times for Buses		(Schlossberg et al., 2013)
Transit trips	Transit trips as portion of total trips along project; measured by gender, age, income, race, ethnicity, and disability status	(Seskin et al., 2015)
	Scheduled headways between transit vehicles	
	Average speed of transit vehicles	
	Average wait time for passengers	
	Number of paratransit trips shifted to fixed-route transit trips	
Access - Transit reliability	Frequency of transit service	(Seskin et al., 2015)
	Connectivity of routes (transit-to-transit)	
	Transit trips as portion of total trips in community; measured by gender, age, income, race, ethnicity, and disability status	
	Transit commutes as portion of total commutes; measured by gender, age, income, race, ethnicity, and disability status	
Trip consistency	Travel time (along project length), by mode	(R. R. Bian et al., 2023; Seskin et al., 2015)
	Travel time for trips, by mode and purpose	(Seskin et al., 2015)
	Travel time reliability ((reduced non-reoccurring delay), by mode and purpose)	(R. R. Bian et al., 2023; Seskin et al., 2015)
	Percent of person-hour change in delay, (by mode and purpose)	(R. R. Bian et al., 2023; Seskin et al., 2015)

CATEGORY 1: TRANSPORTATION MOBILITY		
Benefits/Indicators	**Metric**	**Source**
	Emergency response and travel time to health facilities	(Seskin et al., 2015)
Freight movement	Freight trips as portion of total trips along project	(Seskin et al., 2015)
Efficiency in parking/loading		(R. R. Bian et al., 2023)
On-street parking	Presence of parking per goals established in process	(Litman, 2015; Seskin et al., 2015)
Americans with Disabilities Act (ADA) compliance		(R. R. Bian et al., 2023)

Table B2 Accessibility — Benefits and Metrics

CATEGORY 2: ACCESSIBILITY		
Benefits/Indicators	**Metric**	**Source**
Access to Community Destinations	Proportion of residences within a ½-mile walking distance or 2-mile biking distance or combined bike or walk and transit trip of 20 minutes to specific key destinations, such as parks or day care centers	(Dock et al., 2012; Harvey et al., 2018; Litman, 2015; Ostovar et al., 2022)
	Proportion of residences within ½-mile walking distance or 2-mile biking distance or combined bike or walk and transit trip of 20 minutes to specific key destinations along a completed pedestrian or bicycle facility that is functional for children and disabled persons.	
	Proportion of residences with access to a predefined set of "community destinations" within a 20-minute walk or 20-minute bike ride on routes that are that functional for children and disabled persons or combined bike or walk and transit trip of 20 minutes.	
	Percent of the network complete for pedestrians and bicyclists within ½ mile and 2 miles or combined bike or walk and transit trip of 20 minutes respectively of each designated destination.	
	Number of destinations that can be accessed within a ½ mile along a walking network functional for disabled persons from a given point on the network.	
	Number of destinations within 3 miles along a bicycling network from a given point on the network.	
Access to Schools	Proportion of children and school employees attending school with access to biking/walking path that is functional for children and disabled persons within a ½-mile walking distance or 2-mile biking distance or combined bike or walk and transit trip of 20 minutes to schools	(Harvey et al., 2018; Ostovar et al., 2022)
	Proportion of children and school employees within ½-mile walking distance or 2-mile biking distance to school along a	

CATEGORY 2: ACCESSIBILITY		
Benefits/Indicators	**Metric**	**Source**
	completed pedestrian or bicycle facility on routes that are that functional for children and disabled persons or combined bike or walk and transit trip of 20 minutes.	
	Proportion of children and school employees with access to school within a 20-minute walk or 20-minute bike ride or combined bike or walk and transit trip of 20 minutes.	
	Percent of the network complete for pedestrians and bicyclists within ½ mile and 2 miles respectively of each designated school.	
	Number of schools that can be accessed within a ½ mile along a walking network from a given point on the network.	
	Number of schools within 3 miles along a bicycling network from a given point on the network.	
Access to Jobs	Total number of jobs that may be accessed in less than 30 or 45 minutes using walking, bicycling, and transit, data on housing, employment, and the transportation network	(Harvey et al., 2018)
Access to public transport / transit stops	Bus pull-outs created	(Jordan & Ivey, 2021; Litman, 2015)
	Barriers to accessing transit stops removed	
Access - Presence of bicycling facilities	Count of new or refurbished facilities by type, e.g., bike lane (and type), advanced stop lines or bike boxes, bike signal heads, bike racks	(Seskin et al., 2015)
	Percent of intersections with advanced stop lines or bike boxes, painted bike lanes through the intersection, bicycle signal heads, bicycle loop detectors	
Access - Presence of transit facilities	Number of transit stops with new or upgraded shelters	(Seskin et al., 2015)
	Percent of accessible transit stops and stations	
	Miles of new or refurbished transit-only lanes	
	Intersections with transit signal priority	
Access - Presence of walking facilities	Count of new or refurbished facilities by type, e.g., sidewalks, marked crosswalks, islands, curb extensions, countdown signals,	(Seskin et al., 2015)

CATEGORY 2: ACCESSIBILITY		
Benefits/Indicators	**Metric**	**Source**
	Leading Pedestrian Intervals, accessible curb ramps, Accessible Pedestrian Signals	
	Percent of intersections with marked crosswalks, islands, curb extensions, countdown signals, Leading Pedestrian Intervals, accessible curb ramps, Accessible Pedestrian Signals	
	Average distance between signalized or protected crosswalks	

Table B3 Connectivity — Benefits and Metrics

CATEGORY 3: CONNECTIVITY		
Benefits/Indicators	**Metric**	**Source**
Connectivity Index	Intersection Density - Number of intersections in a given land area, such as a square mile or acre.	(Harvey et al., 2018; Ostovar et al., 2022)
	Intersections per Linear Mile - Number of intersections in a given land area divided by the linear network miles in the same given area.	
	Network Density - Number of linear miles of street or other facility per given area (square mile).	
	Connected Node Ratio (CNR) (Portion of Nodes "that are Intersections) - Number of 3- or 4-way intersections divided by the number of 3- or 4-way intersections plus cul-de-sacs or dead ends.	
	Link-to Node Ratio - Number of roadway links divided by the number of given nodes in the network in a given area.	
	Polygon Density - Number of blocks or polygons created by the network within a given area.	
	Street Density - Number of linear Miles of street per square mile of land	
	Average Block Length - Block lengths can be measured from the curb or from the centerline of the street intersection. The GIS measures the street length from center of intersection to center of intersection.	
	Effective walking Area (EWA) - A ratio of the number of parcels within a one quarter mile walking distance from an origin point to the total number of parcels within a one-quarter mile radius of the origin point.	
	Gamma Index - Ratio of the number of links in the network to the maximum possible number of links between nodes.	
	Alpha Index - Ratio of the number of actual circuits to the maximum number of circuits.	

CATEGORY 3: CONNECTIVITY		
Benefits/Indicators	**Metric**	**Source**
Active Transportation to Local and Regional Transit Connectivity Index	Bicycle/ pedestrian facility density within 1 mile of a regionally significant transit or rail station	(Harvey et al., 2018; Ostovar et al., 2022)
	Percent of regionally significant transit or rail stations that have covered, secure bicycle parking facilities within or adjacent to the stations	
	Percent of State Highway System (SHS) roadway miles with complete sidewalks or bicycle facilities on both sides	
	Number of distinct functional walking and bicycle routes with nodes at a regionally significant transit or rail station within 20 minutes active transportation travel time.	
	Number of regionally significant transit or rail stations that have covered, secure bicycle parking facilities within or adjacent to the stations	
Transportation connections / Network connectivity	Closes gap between existing bike/walking facilities	(R. R. Bian et al., 2023; Litman, 2015; Seskin et al., 2015)
	Makes "last mile" connection to transit: ½-mile for walking, 3 miles for bicycling	
Connections to transportation system	the percentage of populations served by walking facilities within 0.5 mile	(R. R. Bian et al., 2023)
First- and last-mile connections to transit stops		(Cox et al., 2015)
Connections to adjacent major destinations	the number of public places covered within 0.2 miles (i.e., 1,000 feet) to the centerline of road segments under evaluation.	(R. R. Bian et al., 2023)
Community connections	Percent of persons living or working within ½-mile (for walking) and 3 miles (for bicycling) of facility; by gender, age, income, race, ethnicity, and disability status	(Seskin et al., 2015)
	Percent of persons living or working within a set distance of transit stop; by gender, age, income, race, ethnicity, and disability status	(Seskin et al., 2015)
	Connects important destinations, e.g., schools, employment centers, homes, parks	(Seskin et al., 2015)

Table B4 Safety — Benefits and Metrics

CATEGORY 4: SAFETY		
Benefits/Indicators	**Metric**	**Source**
Speed in different street types	Change in vehicle speed per street type (km/h)	(Hosking et al., 2022; Litman, 2015; Schlossberg et al., 2013)
Compliance with speed limit	Percent of drivers exceeding the speed limit	(Seskin et al., 2015; Bian et al., 2023)
	Match between target speed, design speed, and 85th percentile	(Seskin et al., 2015)
Enforcement of a street hierarchy	Speed reduction on local streets. Reduced mean traffic volumes on local streets. Change on collectors and arterials	(Hosking et al., 2022)
Level of Service (Bicycle, Pedestrian, Urban, Transit & Bicycle Level of Stress)	Highway Capacity Manual 2010 Multimodal Level of Service (MMLOS) which is a method for evaluating how well urban streets serve the needs of all users.	(Harvey et al., 2018; Ostovar et al., 2022)
	Danish Bicycle/Pedestrian LOS methods for quantifying pedestrian and cyclist stated satisfaction with roundabouts, signalized and unsignalized intersections, midblock crossings, and pedestrian bridges and tunnels	
	Bicycle Environmental Quality Index (BEQI)	
	Pedestrian Environmental Quality Index (PEQI)	
	Level of Traffic Stress (LTS)	
	Shared-Use Path Level of Service Calculator	
	Capacity Analysis of Pedestrian and Bicycle Facilities	
Pedestrian and Bicycle Miles Traveled (PMT & BMT)	PMT and BMT per capita, on an average daily basis, in percentage, in total, and/or on an annual basis	(Harvey et al., 2018)
	PMT and BMT by multiplying the total walk/bike trips by the average trip length by trip purpose	(Harvey et al., 2018)
Crashes - minor	Number of crashes on project; by mode, age, gender, income, race, ethnicity, and disability status	(Seskin et al., 2015; Ostovar et al., 2022; Schlossberg et al., 2013; Cox et al., 2015)
	Total number in network level	
	Rate and location by mode; per 100,000 miles	
	Annual crash count	(Grahn et al., 2020)
	Number of bicycle-involved and/or pedestrian-involved crashes over 5 years.	(Harvey et al., 2018)

CATEGORY 4: SAFETY		
Benefits/Indicators	**Metric**	**Source**
	Crashes per volume of bicyclists and/or pedestrians over 5 years (crash rates)	
Crashes - major (serious or fatal injuries)	Number of fatal or serious injuries of bicyclists and/or pedestrians over 5 years.	(Harvey et al., 2018)
	Number of fatal or serious injury crashes	(Jeihani et al., 2022)
	Frequency, type, and severity of crashes and injuries for motorists, pedestrians, and cyclists	(Bian et al., 2023; Hui et al., 2018)
	Severity and frequency of vehicle collisions	(Jordan & Ivey, 2021)
Serious injuries	Number of injurious crashes; by mode, age, gender, income, race, ethnicity, and disability status	(Seskin et al., 2015)
	Total number of serious injuries suffered by all users	
	Progress toward achieving zero serious injuries	
	Rate of serious injuries as measured per 100,000 miles/use; by mode, age, gender, income, race, ethnicity, and disability status	
	Rate of pedestrian injuries per walking trips.	(Sanders et al., 2011; Macdonald et al., 2010)
	Rate of bicyclist injuries per bicycling trips.	(Sanders et al., 2011; Macdonald et al., 2010)
Fatalities	Number of fatalities; by mode, age, gender, income, race, ethnicity, and disability status	(Seskin et al., 2015)
	Total number of fatalities suffered by all users	
	Progress toward achieving zero serious injuries	
	Rate of serious injuries as measured per 100,000 miles/use; by mode, age, gender, income, race, ethnicity, and disability status	
	Rate of pedestrian fatalities per walking trips.	(Sanders et al., 2011; Macdonald et al., 2010)
	Rate of bicyclist fatalities per bicycling trips.	(Sanders et al., 2011; Macdonald et al., 2010)
Safety	Accident/collision (auto crashes/1000 drivers; bicycle crashes/1000 cyclists; pedestrian collisions/1000 pedestrians)	(Ranahan et al., 2014)
	Emergency room visits	
	Injury/fatality (injuries/1000; fatalities/1000)	
	Self-reports of perceived safety	
	CMFs for lane width	(Barua et al., 2014)

CATEGORY 4: SAFETY		
Benefits/Indicators	**Metric**	**Source**
Safety risk in cross sections of Local, Collector and Arterial Roads	CMFs for presence of a median	
	CMFs for presence of on-street parking	
	CMFs for presence of a bike lane	
	CMFs for roadside fixed object offset	
Safety for non-motorized users	Percent of signalized intersections along urban arterials with marked crosswalks and one or more of the following: countdown signals, leading pedestrian intervals, bulb-outs, or pedestrian refuge islands.	(Sanders et al., 2011; Macdonald et al., 2010)
	Percent of unsignalized 4-way (multilane) intersections along urban arterials with marked crosswalks and one or more of the following: HAWK signal*, yield to pedestrian signage, user-activated overhead warning lights.	(Sanders et al., 2011; Macdonald et al., 2010)
	Percent of urban arterial intersections with one or more of the following improvements geared toward bicyclists: bike box*, painted bicycle lane through the intersection*, bicycle signal, bicycle detectors, bicycle left turn lane.	(Sanders et al., 2011; Macdonald et al., 2010)
	Percent of urban arterials on which the 85th percentile driving speed is no greater than 25 mph.	(Sanders et al., 2011; Macdonald et al., 2010)
Safety feeling	Percentage of people who feel safe using nonmotorized modes on urban arterials.	(Sanders et al., 2011; Macdonald et al., 2010)
Pedestrian and bicycle hotspots (high collision concentrations)	Overall number of pedestrian collision hotspots on urban arterials.	(Sanders et al., 2011; Macdonald et al., 2010)
	Overall number of bicycle collision hotspots on urban arterials.	(Sanders et al., 2011; Macdonald et al., 2010)
Risk of crime	crime-related incidents	(Bian et al., 2023)
Crime declined		(Schlossberg et al., 2013)
Adequate lighting	Presence of ADA/AASHTO compliant lighting for all modes	(Seskin et al., 2015)
	Addition of lighting to dark corners	(Seskin et al., 2015)
Personal security	Survey of visitors, residents, commercial staff and ownership	(Seskin et al., 2015)
	Number of crimes, violent and non-violent	(Seskin et al., 2015)
	Number of calls for service	(Seskin et al., 2015)

CATEGORY 4: SAFETY		
Benefits/Indicators	**Metric**	**Source**
	Removal of obstructions to pedestrian line of sight at intersections and crossings	(Seskin et al., 2015)
Reduced vehicle/pedestrian or vehicle/cyclist conflict points	Number of conflict points	(Jordan & Ivey, 2021)

Table B5 Economy — Benefits and Metrics

CATEGORY 5: ECONOMY		
Benefits/Indicators	**Metric**	**Source**
Job Creation	Number of jobs (by sector, wage, education)	(Ostovar et al., 2022; Bian et al., 2023; Liu et al., 2020; Perk, 2015; Harvey et al., 2018; Fonseca-Sarmiento et al., 2022; Seskin et al., 2015)
	Number of jobs, revenue, business type and age	
	Number of jobs	
	Number of jobs that are expected to change in the neighborhood or region in which the complete street/transit project is built related to modifications in infrastructure and policies for pedestrian and bicycle travel	
	Jobs per firm	
	Temporary and permanent jobs created by project	
Employment	Employment level	(Cox et al., 2015)
	Use of local workforce	(Seskin et al., 2015)
	Stability of employment numbers on segment/corridor	(Seskin et al., 2015)
	Wage	(Liu et al., 2020)
Firms	Number of establishments	(Fonseca-Sarmiento et al., 2022)
	Net new businesses	(Cox et al., 2015)
Gross sales	Annual revenue of a business measured by gross sales	(Fonseca-Sarmiento et al., 2022)
Retail vibrancy	Retail and restaurant sales at businesses directly adjacent to project	(Seskin et al., 2015)
	Number of customers, by mode of travel	
	Number of tourists visiting	
	Customer experience surveys	
	Vacancy rates	
	Taxable retail sales	(Liu et al., 2020)
	Retail sales and visitor spending	(Bian et al., 2023; Hui et al., 2018)
	Retail sales ($/ft2; $/yr)	(Ranahan et al., 2014)
Storefront vacancies	Vacant storefronts along project corridor	(Fonseca-Sarmiento et al., 2022)
Building vacancy	Rate of vacancies along project, and as compared to larger community or comparable corridor	(Seskin et al., 2015)
Property values	Estimated property value	

CATEGORY 5: ECONOMY		
Benefits/Indicators	**Metric**	**Source**
	Property sales data from market transactions	(Fonseca-Sarmiento et al., 2022; Cox et al., 2015; Ranahan et al., 2014; Bian et al., 2023; Jordan & Ivey, 2021; Hui et al., 2018)
	Commercial property values ($/ft2)	
	Residential property values ($/ft2)	
Land values	Tax yield per acre	(Perk, 2015; Seskin et al., 2015)
	Monetary value of residential, commercial properties	
Foreclosure data	foreclosure risk rating	(Ranahan et al., 2014; Bian et al., 2023)
Public/Private investment	Perceptions of public and private investment along the project corridor	(Fonseca-Sarmiento et al., 2022; Cox et al., 2015; Seskin et al., 2015)
	Amount of private and foundation/grant/nontransportation investment in adjacent properties	
Tax revenues (direct measure)	Sales tax revenues	(Fonseca-Sarmiento et al., 2022)
Access to opportunities	Jobs accessible by 30- or 45-minute transit trip	(Seskin et al., 2015; Ostovar et al., 2022)
	Ratio of jobs accessible by a 30- or 45-minute automobile trip to those accessible by a 30- or 45minute transit trip	
User Benefits	Vehicle Owning and Operating Cost Savings	(Sisiopiku et al., 2012)
	Avoided Chauffeuring Costs Savings	
	Traffic Accident Cost Savings for Users	
	Parking Cost Savings	
Health user benefits	Traffic Accident Cost Savings	(Sisiopiku et al., 2012)
	Pain and Suffering Cost Savings	
Social and Community Health Benefits	Traffic Accident Cost Savings	(Sisiopiku et al., 2012)
	Air Pollution Cost Savings	
	Public health	
Pedestrian and Bicycle Activity	Counts of pedestrians and bicyclists along the project corridor	(Fonseca-Sarmiento et al., 2022)
Availability of parking / Parking utilization	Number of available parking spaces along the project corridor	(Fonseca-Sarmiento et al., 2022)
	Portion of provided spaces for cars, bicycles used over course of day	(Seskin et al., 2015)
Outdoor dining / Sidewalk cafés		(Schlossberg et al., 2013)

CATEGORY 5: ECONOMY		
Benefits/Indicators	**Metric**	**Source**
Crashes	Number of crashes along the project corridor	(Fonseca-Sarmiento et al., 2022)
	Severity of crashes along the project corridor	
Total averted costs	total collision costs per year	(Cox et al., 2015)
Average Vehicle Speed	Average vehicle speed along project corridor	(Fonseca-Sarmiento et al., 2022)

Table B6 Society — Benefits and Metrics

CATEGORY 6: SOCIETY		
Benefits/Indicators	**Metric**	**Source**
Physical activity and Health	Duration and frequency of physical activity per day	(Ostovar et al., 2022; Bian et al., 2023; Hui et al., 2018)
	Average minutes of physical activity per day per capita	(Harvey et al., 2018)
	Average minutes of physical activity attributable to active transportation per day	(Harvey et al., 2018)
	Duration (distance, time) of activity	(Ranahan et al., 2014)
	Frequency (# trips/week) of activity	(Ranahan et al., 2014)
	Pedestrian Miles Traveled (PMT)	(Ostovar et al., 2022)
	Bicycle Miles Traveled (BMT)	(Ostovar et al., 2022)
	Rates of obesity, asthma, diabetes	(Bian et al., 2023)
	Expand usable public open space	(Bian et al., 2023)
	Portion of people regularly using active transportation modes	(Harvey et al., 2018; Jordan & Ivey, 2021)
	Number of walking or biking trips	(Harvey et al., 2018)
	Portion of population that is inactive or active	(Harvey et al., 2018)
Physical health / Public health	Asthma (incidence, prevalence, acute episodes)	(Ranahan et al., 2014; Lee & Jin, 2020; Plowden, 2020; Jeihani et al., 2022)
	Chronic disease (incidence, prevalence)	
	Diabetes-type 2 (incidence, prevalence)	
	Obesity (incidence, prevalence)	
	% Changes in Premature Death/Year by cardiovascular diseases, Diabetes, Depression, Dementia, Breast cancer, Colon cancer, road traffic crashes, and in total)	
	Risk in diseases	
	Vehicle Miles Traveled (VMT) Impacts	(Harvey et al., 2018)
Equity	Reduction in need for vehicle ownership helps equalize opportunity across class and racial lines	(Jordan & Ivey, 2021)

CATEGORY 6: SOCIETY		
Benefits/Indicators	**Metric**	**Source**
	Increasing the number of accessible jobs allows more choices for workers and decreases monopsony	(Jordan & Ivey, 2021)
	Number of jobs created by construction project – measure the direct number of temporary construction jobs	(Harvey et al., 2018)
	Employment data – review Census and BLS data to track change in employment over time	(Harvey et al., 2018)
	Vulnerable populations served	(Bian et al., 2023)
	Social Vulnerability Index	(Bian et al., 2023)
	Transport affordability - quality of affordable modes	(Litman, 2015)
	Equity for transportation-deprived communities	(Jeihani et al., 2022)
	Retail sales tax findings – track new employers and associated number of permanent jobs attracted to the project area.	(Harvey et al., 2018)
Users' satisfaction	Perceived safety, comfort, and quality of life	(Bian et al., 2023)
	Perceived economic benefits	
	Survey of visitors, residents, commercial staff and ownership	(Seskin et al., 2015)
User-perceived quality of movement LOS	LOS for different modes	(Hui et al., 2018)
Citizen feedback	Perceived safety, satisfaction, comfort, quality of life	(Ranahan et al., 2014; Dock et al., 2012)
Resident participation in process	Number of responses gathered	(Seskin et al., 2015; Jordan & Ivey, 2021)
	Number of people at meetings/outreach events	
	Public input is representative of community demographics and population size	
Resident engagement in place	Number of people using the project space, measured by activity, age, race, ethnicity, and disability status, gender	(Seskin et al., 2015)
	Number of new and/or returning participants	
	Number of resident-led (non-governmental) placemaking initiatives	
	Instances of temporary activities or installations	

CATEGORY 6: SOCIETY		
Benefits/Indicators	**Metric**	**Source**
	Frequency of community events/programmed activities	
Scenic views	Provides or preserves views of scenery or vistas	(Seskin et al., 2015)
Seating	Presence and quantity of seating available	(Seskin et al., 2015)
	Square feet of outdoor dining space per foot of restaurant façade	(Seskin et al., 2015)
Shade	Percent of public space and travel areas shaded by trees, shelters, tents, etc.	(Seskin et al., 2015)
Embrace of cultural, historical, and architectural resources	Presence, preservation, or augmentation of local assets in project process and completion	(Seskin et al., 2015)
Public art	Number of permanent (or temporary) installations, as part of project or inspired by project	(Seskin et al., 2015)
Higher home value appreciation (single family homes, near Complete Streets)		(Yu et al., 2018)
Higher home value resilience (single family homes, near Complete Streets)		(Yu et al., 2018)
Quality of automobile trips	Driving LOS/MMLOS—at segment and/or intersection	(Seskin et al., 2015)
	Travel lane pavement condition	
	Appropriate and easy-to-read signage	
Quality of bicycling environment	Bicycle Level of Service/Multimodal Level of Service (MMLOS)—at segment and/or intersection	(Seskin et al., 2015)
	Bicycle Environmental Quality Index (BEQI)—at segment and/or intersection	
	Bicycle Level of Traffic Stress (LTS), Level of Comfort	
	Separation from traffic is in accord with volume, speed of cars and with land use	
	Width of bicycle facilities	
	Right Turn on Red restrictions	
	Pavement condition of bicycling facility	
	Presence of bicycle network wayfinding	

CATEGORY 6: SOCIETY		
Benefits/Indicators	**Metric**	**Source**
Quality of pedestrian environment	Pedestrian Level of Service/Multimodal Level of Service (MMLOS)—at segment and/or intersection	(Seskin et al., 2015)
	Pedestrian Environmental Quality Index (PEQI)—at segment and/or intersection	
	Crossing distance and times	
	Wait time at intersection	
	Width of walking facility	
	Width of pedestrian medians	
	Presence of enhanced crosswalks	
	Right Turn on Red restrictions	
	Surface condition of sidewalk/pathway	
	Wayfinding signs, maps	
Quality of transit environment	Transit Level of Service/Multimodal Level of Service (MMLOS)—at segment and/or intersection	(Seskin et al., 2015)
	Quality of accommodations for passengers at stops	
	Presence of wayfinding and system information	
	Real-time arrival information	
	Off-board payment option	

Table B7 Environment —Benefits and Metrics

CATEGORY 7: ENVIRONMENT		
Benefits/Indicators	**Metric**	**Source**
Livability	Green Land Consumption	(Ostovar et al., 2022)
	The percentage of land consumed in comparison with the amount of land conserved	(Harvey et al., 2018)
	Street Trees	(Ostovar et al., 2022)
	Tree canopy coverage for the jurisdiction or a given area	(Harvey et al., 2018; Bian et al., 2023)
	Total number of street trees in a site plan, small area, or jurisdiction	(Harvey et al., 2018)
	Spacing of street trees	(Harvey et al., 2018)
	Number of street trees per roadway mile	(Harvey et al., 2018)
	Number of impermeable surfaces	(Bian et al., 2023)
	Reclamation of streets as space	(Jordan & Ivey, 2021)
	Traffic calming reduces traffic noise and stress	(Jordan & Ivey, 2021)
	Pedestrian Environmental Quality Index (PEQI)	(Dock et al., 2012)
	Bicycle Environmental Quality Index (BEQI)	(Dock et al., 2012)
Vegetation	Number of trees retained and/or newly planted	(Seskin et al., 2015; Jordan & Ivey, 2021; Bian et al., 2023)
	Use of native plants/trees	
	Xeriscaping/water-conserving landscaping	
Air quality	Changes in vehicle volumes and movement patterns have effects on the quantity of vehicle emissions	(Hui et al., 2018)
	Air toxics along project: diesel particulate matter, benzene	(Seskin et al., 2015)
	Clean Air Act contaminants: particulate matter, ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, lead	(Seskin et al., 2015)
	Air Quality Index (# of days with AQI>100)	(Ranahan et al., 2014)
	Asthma (prevalence per 1000, ER visits for asthma-related cases)	(Ranahan et al., 2014)
Air pollution	Ozone, Nox, PM2.5	(Jeihani et al., 2022; Jordan & Ivey, 2021; Bian et al., 2023; Litman, 2015)
	Decrease in mean PM2.5 concentration	(Grahn et al., 2020)
	Decrease in CO concentrations	(Grahn et al., 2020)

CATEGORY 7: ENVIRONMENT		
Benefits/Indicators	**Metric**	**Source**
Transportation-related pollution	Transportation emissions	(Ranahan et al., 2014)
	VMT per capita (miles)	(Ranahan et al., 2014)
	VMT per household (miles)	(Ranahan et al., 2014)
	VMT expressed as per household, per employee, or per capita	(Dock et al., 2012)
Urban heat island		(Bian et al., 2023)
Noise pollution	Changes in vehicle volumes and movement patterns have effects on user-perceived sound levels; Lower speeds	(Hui et al., 2018; Schlossberg et al., 2013; Jordan & Ivey, 2021; Bian et al., 2023; Litman, 2015)
Water quality	Level of surface material runoff	(Hui et al., 2018)
Stormwater runoff	Treats runoff to a higher level of quality than set threshold	(Seskin et al., 2015; Ranahan et al., 2014; Jordan & Ivey, 2021; Bian et al., 2023)
	Corrects poor drainage/flow	
	Reduces rate and volume of runoff	
	Percent of stormwater runoff absorbed through biofiltration	
	Use of pervious surfaces	
	Presence of rain gardens	
	Ratio of pervious to impervious surfaces on urban arterials	
Energy efficiency	Use of reflective surfaces	(Seskin et al., 2015)
	Use of dark-sky, low-energy lighting	(Seskin et al., 2015)
	Energy conservation	(Jordan & Ivey, 2021)
	Energy use	(Bian et al., 2023)
Providing/preserving habitat for native species	Connects or restores habitat	(Seskin et al., 2015)
	Wildlife crossings	(Seskin et al., 2015)
Sustainable sourcing for construction materials	Percentage or recycled materials used in new pavement/construction	(Seskin et al., 2015)
	Use of locally or regionally sourced materials to reduce transportation costs	
Aesthetics		(Litman, 2015)

Appendix C Proposed KYTC Complete Streets Scorecard

Background

KYTC's Complete Streets policy requires the agency to include facilities on projects to meet the needs of all users of the state transportation system. The KYTC Complete Streets Scorecard can be to assess project impacts on all users, with a focus on pedestrians, bicyclists, and transit users. If a project will not include facilities to accommodate these users, the project team must provide supporting documentation justifying this decision. Completing the scorecard is critical for complying with KYTC's Complete Streets policy.

Complete Streets Review Scoring Process

The scorecard should be completed for all projects where a Design Executive Summary (DES) is prepared. On other projects (e.g., rehabilitation, maintenance, HSIP) the scorecard should be integrated to the greatest extent feasible. Scoring needs to occur early in project development (i.e., scoping or planning studies, preliminary engineering) so design features to accommodate pedestrians, bicyclists, and transit users are included in the project budget. The Project Development Branch Manager is responsible for completing the scorecard. They should work with members of the project team to finish the evaluation before a project advances to Phase II Design. The Project Delivery & Preservation (PD&P) Branch Manager is responsible for completing the appropriate review of their section prior to construction.

Using the Complete Streets Scorecard

Planners, designers, project managers, Project Development Branch Managers, and PD&P Branch Managers should consult the scorecard throughout project development to ensure alternatives comply with KYTC's Complete Streets policy. Space is provided at the top of the scorecard to insert of brief project description. Enough description should be provided to establish a foundation for the scores and demonstrate each item has been considered.

PROJECT DESCRIPTION OR EXEMPTION

MOBILITY				
Does the proposed facility improve mobility of users?				
BENEFIT	**USER**	**COMPONENT**	**ELEMENT**	**SCORE**
Network improvements	Pedestrian	Sidewalks*	Maintain existing sidewalk/ infrastructure	1
			Widen existing one side	2
			Widen existing both sides	3
			New one side project length	4
			New both sides project length	5
			Removal of sidewalk	0
			-	-
	Bicycle	Bike facility*	Sharrows	1
			Shoulder	2
			Bike lanes	3
			Cycle track	4
			Off road path (in ROW)	5
			Removal of bike lane	0
			-	-
	Transit	Route and stop(s) *	Improve transit stop	1
			New transit stop	3
			Improving a route	4
			Add new route	5
			-	-
* Note : If the project is replacing an existing facility in kind, use the corresponding facility score				
BENEFIT	**USER**	**COMPONENT**	**ELEMENT**	**SCORE**
LOS adequacy	Pedestrian	LOS adequacy	Not appropriate	0
			Appropriate	5
			-	-
	Bicycle	LOS adequacy	Not appropriate	0
			Appropriate	5
			-	-
	Transit	LOS adequacy	Not appropriate	0
			Appropriate	5
			-	-
Note: LOS adequacy can be assessed based on facility type provide and anticipated users.				

ACCESSIBILITY				
Does the proposed facility improve accessibility of users?				
BENEFIT	**USER**	**COMPONENT**	**ELEMENT**	**SCORE**
Access to destinations	Pedestrian	Number of destinations within 1.0 mi of project	None	0
			1-2	1
			3-4	2
			5-6	3
			7-8	4
			9+	5
			-	-
	Bicycle	Number of destinations within 3.0 mi of project	None	0
			1-2	1
			3-4	2
			5-7	3
			8-10	4
			10+	5
			-	-
	Transit	Number of destinations within 1.0 mi of transit stops	None	0
			1-2	1
			3-4	2
			5-6	3
			7-8	4
			9+	5
			-	-
Note: Destinations include schools, retail, parks, entertainment, government offices, hospitals or health facilities, community centers, libraries, places of worship, retirement centers, transit centers, and bus stops.				
BENEFIT	**USER**	**COMPONENT**	**ELEMENT**	**SCORE**
Access to project	Pedestrian	Percent of homes within 1.0 mi of project	Zero	0
			1-19	1
			20-39	2
			40-59	3
			60+	5
			-	-
	Bicycle	Percent of homes within 3.0 mi of projects	Zero	0
			1-19	1
			20-39	2
			40-59	3
			60+	5
			-	-

	Transit	Percent of homes within 1.0 mi of project	Zero	0
			1-19	1
			20-39	2
			40-59	3
			60+	5
			-	-
BENEFIT	**USER**	**COMPONENT**	**ELEMENT**	**SCORE**
Access to jobs	Pedestrian	Number of jobs within 1.0 mi of project	None	0
			1-9	1
			10- 19	2
			20-29	3
			30+	5
			-	-
	Bicycle	Number of jobs within 3.0 mi of project	None	0
			1-9	1
			10- 19	2
			20-29	3
			30+	5
			-	-
	Transit	Number of jobs within 1.0 mi of project	None	0
			1-9	1
			10- 19	2
			20-29	3
			30+	5
			-	-

CONNECTIVITY				
Does the proposed facility improve connectivity (i.e., connects facilities) for users?				
BENEFIT	**USER**	**COMPONENT**	**ELEMENT**	**SCORE**
Network completion	Pedestrian	Network completion or extension	No	0
			Yes	5
			-	-
	Bicycle	Network completion or extension	No	0
			Yes	5
			-	-
	Transit	Network completion or extension	No	0
			Yes	5
			-	-

EQUITY

Does the proposed facility address equity for users?				
BENEFIT	**USER**	**COMPONENT**	**ELEMENT**	**SCORE**
Access to disadvantaged population	Pedestrian	Percent of transportation-disadvantaged population within 1.0 mi of project	None	0
			1- 14	1
			15-29	2
			30-44	3
			45+	5
			-	-
	Bicycle	Percent of transportation-disadvantaged population within 3.0 mi of project	None	0
			1- 14	1
			15-29	2
			30-44	3
			45+	5
			-	-
	Transit	Percent of transportation-disadvantaged population within 1.0 mi of transit stops	None	0
			1- 14	1
			15-29	2
			30-44	3
			45+	5
			-	-

SAFETY				
Does the proposed facility impact safety of users?				
BENEFIT	**USER**	**COMPONENT**	**ELEMENT**	**SCORE**
Crash effect	Pedestrian	Facility improvement type	Nothing/Missed opportunity	0
			Widen sidewalk	2
			New sidewalk/crosswalk/signal crosswalk in one side	3
			New sidewalk/crosswalk/signal crosswalk in both sides (adjacent to the road)	4
			New sidewalk/crosswalk/signal crosswalk in both sides (buffered)	5
			-	-
	Bicycle	Facility improvement type	Nothing/Missed opportunity	0
			Bike boxes	1
			Bicycle lane	3
			Separated/buffered bicycle lane	4
			Off-road path	5
			-	-
	Transit		Nothing/Missed opportunity	0
			Transit priority signal	2

		Facility improvement type	Bus stop pull offs	3
			Far side stops	5
			-	-

EFFECTIVENESS				
Does the proposed facility improve effectiveness of use for users?				
BENEFIT	**USER**	**COMPONENT**	**ELEMENT**	**SCORE**
Facility options	Pedestrian	Walkability	Opportunity to improve missed	0
			New crosswalks	1
			Crosswalks with signals	2
			Ped signal improvements (lead intervals, countdown, etc.)	3
			Other crossing improvements (curb extensions, islands, etc.)	5
			-	-
	Bicycle	Bikeability	Opportunity to improve missed	0
			Improved bike facility (sharrows to bike lane, bike lane to cycle track, etc.)	2
			Paint through intersections	3
			Bike boxes	5
			-	-
	Transit	Improved transit	Opportunity to improve missed	0
			Route improvement	2
			Improved transit stops (shelter, seating, etc.)	3

Appendix D KYTC Draft Complete Streets Review Process Form

KYTC Complete Streets Review Process

Background
The Kentucky Transportation Cabinet's Complete Streets, Roads, and Highways Policy are for every community, from rural Kentucky to small towns to the densest urban core. They provide safe transportation choices within the context of the surrounding area. They prioritize safe, connected, comfortable, equitable and accessible transportation networks that enable people to freely travel to places they want to go while allowing for the transport of goods and services. Beyond transportation, Complete Streets also provide opportunities and gathering spaces for art, commerce and community events. This policy has been prepared to provide information and guidance to personnel of the Kentucky Transportation Cabinet (KYTC) and its partners. As per the policy, KYTC shall include appropriate facilities to meet the need of all users of the transportation system as the Cabinet plans, builds, rehabilitates, reconstructs, and maintains state jurisdiction streets, roads, and highways. As such, this policy calls for the establishment of a checklist to address pedestrian, bicyclist, and transit accommodations with the assumption that they shall be included in each project unless supporting documentation against inclusion is provided and found to be reasonable.

Complete Streets Review Process
This is referenced in KYTC's Complete Streets Policy. It has been developed to assist KYTC staff in insuring adherence to the policy. Compliance with the policy means KYTC staff plan, design, construct, and maintain all transportation projects to provide appropriate accommodation for motorists, bicyclists, pedestrians, and transit users on Kentucky's roadways and includes people of all ages and abilities. This process applies to all KYTC projects that undergo the Design Executive Summary (DES) process and is intended for use on projects during the earliest stages of project development, including scoping or planning studies, and preliminary engineering so any pedestrian or bicycle considerations are included in the project budget. The Project Development Branch Manager is responsible for completing the review and must work with the Project Team to ensure that the review has been completed prior to advancement of a project to Phase II Design. Other projects, such as rehabilitation, maintenance, and HSIP shall consider items and incorporate to the greatest extent possible. The Project Delivery & Preservation (PD&P) Branch Manager is responsible for completing the appropriate review of their section prior to construction.

Using the Complete Streets Review Process
The Complete Streets Review Process is a tool to be used by planners, designers, project managers, Project Development Branch Managers, and PD&P Branch Managers throughout the project to ensure all developed alternatives reflect compliance with the Policy. When completing the review, a brief description is required for each **"Item to be Addressed"** to document that the item has been considered and can include supporting documentation.

PROJECT DEVELOPMENT BRANCH

Instructions:
For each box, please provide a brief description for how the item is addressed, not addressed, or not applicable, and include documentation to support your answer.

From the Complete Streets, Roads, and Highways Manual

Item to be Addressed	Consideration	YES	NO	N/A	Required Description of Action Taken
Existing Bicycle Pedestrian Usage	Pedestrian, bicycle, e-bicycle, and/or scooter usage exists along the roadway. **Examples include (but are not limited to):** This may be determined by the observation of pedestrian or other micromobility (bicycle, e-bicycle, e-scooter, or other non-motorized) traffic, evidence of pedestrian activity ("goat paths" or roadside worn travel paths), data collection, digitally generated heat map data, or through the public involvement process.	☐	☐	☐	
Existing Bicycle Pedestrian Accommodations	A bicycle or pedestrian facility already exists on the roadway. **Examples include (but are not limited to):** Sidewalks, bike lanes, sharrows, or transit shelters	☐	☐	☐	

Item to be Addressed	Consideration	YES	NO	N/A	Required Description of Action Taken
Land Usage	Planned or anticipated development of residential subdivisions, commercial, industrial, institutional, public or semi-public use areas, or other anticipated developments within the next 20 years with potential pedestrian or bicycle trips. **Examples include (but are not limited to)**: Planned development may be determined by zoning designations from a local comprehensive land use plan, interviews and support from local political and economic leaders to gauge anticipated growth in the project area, or the public involvement process. Encroachment permits approved for a development. Developer investment in a property. Local community leader endorsement	☐	☐	☐	

Item to be Addressed	Consideration	YES	NO	N/A	Required Description of Action Taken
Equity Consideration	Location identified as an Area of Persistent Poverty or a Historically Disadvantaged Community. **Examples include (but are not limited to):** The County in which the project is located consistently had greater than or equal to 20 percent of the population living in poverty in all three of the following datasets: (a) the 2000 decennial census; (b) the 2010 decennial census; and (c) the 2021 Small Area Income Poverty Estimates; or The Census Tract in which the project is located has a poverty rate of at least 20 percent as measured by the 2014-2018 5-year data series available from the American Community Survey of the Bureau of the Census; or The project is located in any territory or possession of the United States.	☐	☐	☐	

Item to be Addressed	Consideration	YES	NO	N/A	Required Description of Action Taken
Existing Plans	State, local, or regional adopted pedestrian and/or bicycle network or policy that calls for pedestrian and/or bicycle improvements in the area of the specific roadway project or for that classification of roadway. **Examples include (but are not limited to):** ☐ City, County and/or Regional Small Area Plans ☐ City, County, Regional or Statewide Bicycle and Pedestrian Plans ☐ Sidewalk Inventories ☐ MPO Transportation Improvement Plans	☐	☐	☐	
Connectivity	Gaps in pedestrian, bicycle, and/or e-bicycle connectivity between two or more developed areas/community destinations currently separated by no more than 1.5 miles for pedestrians or 3 miles for bicyclists.	☐	☐	☐	
Existing Transit Operations	The street, road, or highway is utilized for transit, particularly for stops and/or stations on set transit routes.	☐	☐	☐	
Freight Corridor	The street, road, or highway is an identified freight corridor on Primary Highway Freight System (PHFS) or as a Critical Urban or Rural Freight Corridor (CUFC or CRFC) for additional freight considerations for lane and shoulder width or other facilities.	☐	☐	☐	

Item to be Addressed	Consideration	YES	NO	N/A	Required Description of Action Taken
Public Interest/Demand	Public interest in and demand for pedestrian and/or bicycle facilities are determined at the planning and preliminary engineering public involvement stages. **Examples include (but not limited to):** Documented support (letters of support) from advocacy groups or government organizations. Documented support (letters of support) from locally or regionally elected officials. Commitment from local government to maintain facility. Petition presented with significant participation from local community.	☐	☐	☐	

Note: Current and anticipated user demand for bicyclists and pedestrians should be used in combination with other criteria, and not used as a sole indicator of need for facilities.

Other Considerations

Item to be Addressed	Consideration	YES	NO	N/A	Required Description of Action Taken
Existing Bicycle and Pedestrian Operations	Identified existing bicycle and pedestrian level of service on the current transportation facility.	☐	☐	☐	
	Identified bicycle and pedestrian conditions within the study area, including pedestrian and/or bicyclist treatments, volumes, important connections, and lighting.	☐	☐	☐	
	Bicyclists/pedestrians regularly use the transportation facility for commuting or recreation.	☐	☐	☐	
	Physical or perceived impediments to bicyclist or pedestrian use of the transportation facility.	☐	☐	☐	
	Higher than normal incidence of bicyclist/ pedestrian crashes within the study area.	☐	☐	☐	
	Existing volumes of pedestrian and/or bicyclist crossing activity at intersections including midblock and nighttime crossing collected/provided.	☐	☐	☐	

Item to be Addressed	Consideration	YES	NO	N/A	Required Description of Action Taken
Existing Motor Vehicle Operations	Existing concerns within the study area, regarding motor vehicle safety, traffic volumes/congestion or access.	☐	☐	☐	
Existing Access and Mobility	Existing access or mobility considerations, including ADA compliance.	☐	☐	☐	
	Schools, hospitals, senior care facilities, educational buildings, community centers, residences or businesses of persons with disabilities within or proximate to the study area.	☐	☐	☐	
	Identified predominant land uses and densities within the study area, including any historic districts or special zoning districts.	☐	☐	☐	
	Identified predominant land uses and densities within the study area, including any historic districts or special zoning districts.	☐	☐	☐	
	Transportation facility in a high-density land use area with pedestrian/bicycle/motor vehicle and transit traffic.	☐	☐	☐	
Major Sites	Major sites, destinations, and trip generators within or proximate to the study area, including prominent landmarks, employment centers, recreation, commercial, cultural and civic institutions, and public spaces.	☐	☐	☐	

Item to be Addressed	Consideration	YES	NO	N/A	Required Description of Action Taken
Design Standards or Guidelines	Proposed design follow all applicable design standards or guidelines appropriate for bicycle and/or pedestrian facilities. **Examples include (but are not limited to):** American Association of State Highway and Transportation Officials (AASHTO) - *A Policy on Geometric Design of Highway and Streets, Guide for the Development of Bicycle Facilities, Guide for the Planning, Design, and Operation of Pedestrian Facilities; Public Right-of-Way Accessibility Guide* (PROWAG); *Manual on Uniform Traffic Control Devices* (MUTCD); *Americans with Disabilities Act Accessibility Guidelines* (ADAAG); National Association of City Transportation Officials (NACTO) - *Urban Bikeway Design Guide;* Kentucky Transportation Cabinet (KYTC) – *KYTC Complete Streets, Roads, and Highways Manual* (CSRHM).	☐	☐	☐	

Exemptions to Implementation

Item to be Addressed	Consideration	YES	NO	N/A	Exemption Description
Limited Access	Limited or full access control facilities, where bicyclists, pedestrians, and other non-motorized forms of transportation are prohibited by law.	☐	☐	☐	
Safety	Safety impact outweighs the proposed benefit of implementing identified Complete Streets element or component.	☐	☐	☐	
Cost/Benefit	If the cost of providing bicycle and pedestrian features is 20% of the cost of the total project, it would be determined to be excessively disproportionate to the need or probable use.	☐	☐	☐	
Land Use	Scarcity of existing and future population, travel, and destinations do not demonstrate a current and future need. For example, in rural or undeveloped areas of no anticipated future development, sidewalks and designated bikeways will generally not be provided.	☐	☐	☐	
Maintenance	Maintenance for sidewalks and shared use paths outside the limits of the curb or shoulder is the responsibility of the local jurisdiction. Maintenance agreements are required as a provision of the entire project. Projects in which maintenance or operational agreements cannot be reached.	☐	☐	☐	
Need	Adequate facilities for non-motorized transportation or other Complete Streets infrastructure already exist in the area or there is a documented absence of current or future need.	☐	☐	☐	

Item to be Addressed	Consideration	YES	NO	N/A	Exemption Description
Emergency	Emergency repair and replacement projects, including installation of safety equipment and utilities work.	☐	☐	☐	

All exemptions will be documented and discussed with the State Highway Engineer (SHE), Chief District Engineer (CDE), Project Manager, Metropolitan Planning Organization (MPO), and/or local jurisdiction. If MPO or local jurisdiction is not in agreement with the exemption, a formal appeal may be introduced by means of a resolution adopted by their local governing body or board. The resolution must be submitted to the assigned CDE for review and consideration prior to the final design approval.

PROJECT DEVELOPMENT BRANCH MANAGER SIGN-OFF

Statement of Compliance	YES	NO	If NO, Please Describe Why (refer to Exemptions Clause)
The Project accommodates all users, including bicyclists and pedestrians, as set forth in the KYTC Complete Streets, Roads, and Highways Manual.	☐	☐	

PROJECT DELIVERY & PRESERVATION BRANCH

Rehabilitation, resurfacing, reconstruction and HSIP projects allow for interim improvements toward a future full-build Complete Street with additional modal accommodations, dedicated or physically separated facilities, and other amenities. Resurfacing and reconstruction projects shall meet ADA policy and design guidelines for accessibility for all users.

The following examples of project types that can potentially trigger implementation of a variety of ADA requirements on existing pedestrian facilities, or the consideration of bicycle and/or pedestrian facilities in accordance with the Complete Streets Policy. The decision for the specific facilities that may be incorporated into these projects will depend on the available right-of-way, type of project, and the modal priorities for the identified Complete Street corridor. Resurfacing and reconstruction projects may be considered when land use changes create destinations attracting pedestrians, bicyclists, and/or other micromobility users or to implement safety improvements for all users.

Instructions:
For each box checked, please provide a brief description of the type of improvements included for that specific project and how the item is addressed, not addressed, or not applicable, and include documentation to support your answer.

If uncertain as to whether a project requires consideration of pedestrian and bicycle facilities that meet ADA requirements, the project manager should consult with the KYTC Statewide Bicycle and Pedestrian Coordinator and/ or the KYTC ADA/504 Coordinator.

The following accessibility provisions apply to all rehabilitation projects:

Item to be Addressed	Consideration	YES	NO	N/A	Required Description
Ped facility	All new pedestrian facilities constructed within existing right-of-way meet applicable accessibility requirements.	☐	☐	☐	

Item to be Addressed	Consideration	YES	NO	N/A	Required Description
Existing Bike and Ped facility	All existing pedestrian or bicycle facilities disturbed by construction replaced. The replacement facilities must meet applicable accessibility requirements.	☐	☐	☐	
ADA Requirement	A reconstruction project shall not negatively affect the accessibility of a pedestrian or bicycle facility or an accessible connection to an adjacent building or site.	☐	☐	☐	
Existing Connections	Within the construction impact zone of a reconstruction project, any existing connection from a pedestrian access route to a crosswalk (marked or unmarked) that is missing a required curb ramp requires installation of a curb ramp that meets applicable accessibility requirements.	☐	☐	☐	
Crosswalks and Curb Ramps	A crosswalk served by a curb ramp must also have an existing curb ramp in place on the receiving end unless no curb or sidewalk exists on that end of the crosswalk. If a sidewalk is present and there is no existing curb ramp in place on the receiving end, an accessible curb ramp must be provided. This requirement must be met regardless of whether the receiving end of the crosswalk is located within the project limits.	☐	☐	☐	

Item to be Addressed	Consideration	YES	NO	N/A	Required Description
Curb Ramps and Ped Facility	Within the construction impact zone of a reconstruction project, all existing curb ramps and pedestrian facilities shall be evaluated to determine whether design elements meet the accessibility criteria. Existing curb ramps or pedestrian facilities that do not meet the accessibility criteria should be modified to meet applicable accessibility requirements. This may also trigger modification of other adjacent pedestrian facilities to incorporate transitional segments to ensure specific elements of a curb ramp will meet the accessibility criteria.	☐	☐	☐	
Crosswalks	Within the construction impact zone of a reconstruction project that includes realignment or widening of the roadway, all existing crosswalks (marked or unmarked) shall be evaluated to determine whether crosswalk design elements meet the accessibility criteria. Crosswalks that do not meet the accessibility requirements shall be modified to meet those requirements.	☐	☐	☐	

Several maintenance activities and maintenance projects do not trigger implementation of ADA requirements. Projects such as, but not limited to are spot pavement repairs, crack sealing, culvert replacement, pot hole repair, guardrail repair or replacement, ditching, lane restriping that does not alter the usability of the shoulder, mowing, litter removal, emergency repair, sign replacement, traffic signal equipment upgrades and bridge deck overlays without pedestrian or bicycle access on either side. If uncertain as to whether a project requires consideration of pedestrian and bicycle facilities that meet

ADA requirements, the project manager should consult with the KYTC Statewide Bicycle and Pedestrian Coordinator and/ or the KYTC ADA/504 Coordinator.

Type of facilities with project limits

Item to be Addressed	t Consideration	YES	NO	N/A	Required Description
Bicycle and Pedestrian Accommodations	Proposed project include accommodations for bicyclists and pedestrians.	☐	☐	☐	
Existing Bicycle Pedestrian Accommodations	Bicycle or pedestrian facility already exists on the roadway.	☐	☐	☐	
Existing Bicycle Pedestrian Usage	Pedestrian, bicycle, e-bicycle, and/or scooter usage exists along the roadway.	☐	☐	☐	
Existing Plans	State, local, or regional adopted pedestrian and/or bicycle network or policy that calls for pedestrian and/or bicycle improvements in the area of the specific roadway project or for that classification of roadway.	☐	☐	☐	

The following are to be considered, provided the intent of the project is not jeopardized. Depending upon the Project Type, identify the non-motorized facility impacts and improvements are to be made, if any.

Project Type	YES	NO	Improvements Recommended. Check box if existing, impacted, or improved			
New alignment construction	☐	☐	**Facility**	**Exist**	**Impact**	**Improved**
			Bike Facility	☐	☐	☐
			Sidewalk Facility	☐	☐	☐
			Curb Ramps	☐	☐	☐
			Crosswalks	☐	☐	☐
			Pedestrian Signal	☐	☐	☐

Project Type	YES	NO	Improvements Recommended. Check box if existing, impacted, or improved			
Existing roadway widening	☐	☐	**Facility**	**Exist**	**Impact**	**Improved**
			Bike Facility	☐	☐	☐
			Sidewalk Facility	☐	☐	☐
			Curb Ramps	☐	☐	☐
			Crosswalks	☐	☐	☐
			Pedestrian Signal	☐	☐	☐
Realignment of a roadway (vertical or horizontal)	☐	☐	**Facility**	**Exist**	**Impact**	**Improved**
			Bike Facility	☐	☐	☐
			Sidewalk Facility	☐	☐	☐
			Curb Ramps	☐	☐	☐
			Crosswalks	☐	☐	☐
			Pedestrian Signal	☐	☐	☐
Bridge replacement	☐	☐	**Facility**	**Exist**	**Impact**	**Improved**
			Bike Facility	☐	☐	☐
			Sidewalk Facility	☐	☐	☐
			Curb Ramps	☐	☐	☐
			Crosswalks	☐	☐	☐
			Pedestrian Signal	☐	☐	☐
Raised channelization of the roadway	☐	☐	**Facility**	**Exist**	**Impact**	**Improved**
			Bike Facility	☐	☐	☐
			Sidewalk Facility	☐	☐	☐
			Curb Ramps	☐	☐	☐
			Crosswalks	☐	☐	☐
			Pedestrian Signal	☐	☐	☐
Sidewalk improvement	☐	☐	**Facility**	**Exist**	**Impact**	**Improved**
			Bike Facility	☐	☐	☐
			Sidewalk Facility	☐	☐	☐
			Curb Ramps	☐	☐	☐
			Crosswalks	☐	☐	☐
			Pedestrian Signal	☐	☐	☐
Traffic signal installation or reconstruction	☐	☐	**Facility**	**Exist**	**Impact**	**Improved**
			Bike Facility	☐	☐	☐
			Sidewalk Facility	☐	☐	☐
			Curb Ramps	☐	☐	☐
			Crosswalks	☐	☐	☐
			Pedestrian Signal	☐	☐	☐
Intersection enhancement or ADA accessibility project	☐	☐	**Facility**	**Exist**	**Impact**	**Improved**
			Bike Facility	☐	☐	☐
			Sidewalk Facility	☐	☐	☐
			Curb Ramps	☐	☐	☐
			Crosswalks	☐	☐	☐
			Pedestrian Signal	☐	☐	☐
Resurfacing	☐	☐	**Facility**	**Exist**	**Impact**	**Improved**
			Bike Facility	☐	☐	☐
			Sidewalk Facility	☐	☐	☐
			Curb Ramps	☐	☐	☐
			Crosswalks	☐	☐	☐
			Pedestrian Signal	☐	☐	☐

All exemptions will be documented and discussed with the State Highway Engineer (SHE), Chief District Engineer (CDE), Project Manager, Metropolitan Planning Organization (MPO), and/or local jurisdiction. If MPO or local jurisdiction is not in agreement with the exemption, a formal appeal may be introduced by means of a resolution adopted by their local governing body or board. The resolution must be submitted to the assigned CDE for review and consideration prior to the final design approval.

PROJECT DELIVERY & PRESERVATION MANAGER SIGN-OFF

Statement of Compliance	YES	NO	If NO, Please Describe Why (refer to Exemptions Clause)
The Project accommodates all users, including bicyclists and pedestrians, as set forth in the KYTC Complete Streets, Roads, and Highways Manual.	☐	☐	