

Routes to Sustainable Goods Movement: How Local and Regional Governmental Agencies Can Plan for the Sustainable Freight System of the Future

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16. Abstract Freight transportation plays a critical role in supporting economic activity and everyday consumption across metropolitan regions, but growing freight demand continues to increase congestion, infrastructure strain, greenhouse gas emissions, air pollution, and safety risks. These impacts often disproportionately affect low-income and environmentally burdened communities. This report examines how metropolitan regions across the United States are planning for sustainable freight transportation through content analysis of freight and goods movement plans and interviews with freight planning professionals. The study analyzes plans from eight major metropolitan regions to identify common freight planning strategies, implementation approaches, opportunities, and barriers related to sustainability, resilience, and equity. The findings show that metropolitan planning organizations increasingly prioritize multimodal connectivity, freight corridor planning, congestion reduction, and economic competitiveness, while more recent actions demonstrate growing attention to climate resilience and zero-emission technologies. However, equity and environmental justice considerations often remain underdeveloped, and practitioners continue to face major barriers related to freight data, funding, and institutional coordination. The report argues that sustainable freight planning requires a more integrated approach that balances economic vitality with climate resilience, public health, safety, and equity objectives. By synthesizing lessons from diverse metropolitan regions, this research provides practical insights to help local and regional agencies strengthen freight planning, improve system performance, and reduce environmental impacts while supporting long-term resilience.				
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Executive Summary

Background and Purpose

Freight transportation plays a critical role in supporting economic activity, supply chains, and everyday consumption across the United States. Trucks, rail, ports, airports, and intermodal facilities enable the movement of goods within and between regions, connecting local economies to national and global markets. At the same time, freight activity places substantial pressure on transportation infrastructure and contributes to congestion, safety risks, air pollution, greenhouse gas emissions, and system vulnerability to disruptions. As freight demand continues to grow—driven by population growth, e-commerce, and evolving supply chains—these challenges are becoming increasingly visible at the local and regional scale.

Historically, freight policy and investment decisions have been shaped primarily at the federal and state levels. However, local and regional agencies increasingly influence how freight systems function in practice. Metropolitan planning organizations (MPOs), cities, counties, port authorities, and regional transportation agencies play a direct role in corridor prioritization, land use decisions, multimodal coordination, and project implementation. Despite this growing responsibility, local and regional freight planning practices remain uneven, and practitioners often face limited guidance on how to design and implement effective, sustainable freight strategies.

The purpose of this research is to examine how U.S. metropolitan regions are planning for sustainable freight transportation and to identify common strategies, challenges, and implementation approaches that can inform future practice. The report focuses on freight planning at the metropolitan and regional scale, with particular attention to how sustainability objectives—such as emissions reduction, safety, resilience, and system efficiency—are incorporated into freight and goods movement plans. The intended audience includes regional transportation planners, local government staff, state agencies, and other stakeholders involved in freight planning and investment decisions.

Research Approach and Methods

The research team employed a qualitative, multi-method approach combining document-based content analysis with expert interviews. The primary data source for the study consisted of freight and goods movement planning documents produced by metropolitan regions across the United States. Plans were selected based on geographic diversity, the region's significance within the national freight system, and the availability of recent and accessible planning documents.

In total, freight-related plans and technical reports published between 2016 and 2024 were analyzed for eight major metropolitan regions: Baltimore, Charlotte, Boston, Atlanta, Chicago, Los Angeles, the San Francisco Bay Area, and Seattle. These regions represent a range of freight functions, including major port gateways, national rail hubs, inland distribution centers, and multimodal logistics regions. Most of the documents reviewed were regional or metropolitan freight plans, reflecting the greater availability of such plans relative to city-level freight strategies.

The research team conducted a systematic content analysis of the selected plans. Each document was reviewed and coded to identify the presence of key variables, including freight planning strategies, challenges, opportunities, and implementation measures. Rather than measuring how frequently specific concepts appeared, the analysis focused on whether and how these concepts were addressed, allowing for comparison across regions with different planning contexts and document formats.

To complement the document review, the research team conducted interviews with freight planning professionals and subject-matter experts involved in developing, implementing, or evaluating freight strategies. These interviews provided additional insight into how freight plans are used in practice, the institutional and political constraints planners face, and the factors that influence whether strategies move from planning to implementation.

Overview of Freight Planning Contexts

The metropolitan regions examined in this study vary widely in size, economic structure, and freight activity, yet they all play important roles in the national freight system. Port regions such as Los Angeles, the San Francisco Bay Area, Seattle, Baltimore, and Boston face challenges related to containerized trade, drayage activity, intermodal connectivity, and community impacts near freight facilities. Inland hubs such as Chicago, Atlanta, and Charlotte function as major distribution and rail interchange centers, where highway and rail congestion, network reliability, and land use compatibility are key concerns.

Across regions, trucks remain the dominant mode for freight movement by value and for first- and last-mile connections, even where rail, maritime, or air cargo play a significant role. As a result, many freight challenges identified in the plans—such as congestion, bottlenecks, safety risks, and infrastructure wear—are closely tied to roadway networks and urban arterial systems. At the same time, regions increasingly recognize the importance of multimodal strategies that shift appropriate freight activity to rail or water and improve intermodal efficiency.

Key Findings

1) Freight Planning Strategies

The analysis reveals several freight planning strategies that appear consistently across metropolitan regions. One of the most common approaches is the identification and prioritization of key freight corridors. Many regions designate critical urban or regional freight corridors to focus investments, guide project selection, and support eligibility for state or federal funding. Corridor-based planning is often paired with data on truck volumes, bottlenecks, and reliability to justify improvements.

Multimodal investment strategies also feature prominently. Regions emphasize improving rail capacity, modernizing ports and intermodal terminals, and enhancing connections between modes to reduce congestion and improve system efficiency. Examples include grade separations, on-dock rail at ports, rail clearance projects to support double-stacked trains, and investments in intermodal yards.

Land use coordination emerges as another important theme. Several plans highlight the need to preserve industrial land, manage freight-intensive land uses, and align transportation investments with logistics and employment centers. This includes planning for warehouse and distribution facility growth, managing conflicts between freight activity and surrounding land uses, and ensuring adequate access for trucks.

Many regions also emphasize performance-based planning and data-driven decision-making. Freight plans increasingly include performance measures related to travel time reliability, congestion, safety, emissions, and economic efficiency. However, the level of analytical sophistication varies widely, reflecting differences in data availability and technical capacity.

2) Challenges and Barriers

Despite growing attention to freight sustainability, the plans consistently identify challenges that limit implementation. One of the most frequently cited barriers is limited data availability, particularly at the local and regional level. Freight data can be expensive, proprietary, or difficult to disaggregate, making it challenging for planners to accurately assess freight activity and impacts.

Funding constraints also pose a major challenge. Freight projects are often capital-intensive and compete with passenger transportation investments for limited resources. Many regions rely heavily on state or federal funding programs, which may prioritize certain project types or require complex eligibility criteria.

Institutional coordination is another recurring issue. Freight systems involve a wide range of public and private stakeholders, including state agencies, local governments, railroads, ports, trucking firms, and terminal operators. Aligning priorities, timelines, and responsibilities across these actors can be difficult, particularly where governance structures are fragmented.

Implementation Approaches and Emerging Practices

While implementation remains challenging, the analysis identifies several practices that support more effective freight planning. Stakeholder engagement—particularly with private-sector freight operators—is critical for grounding plans in operational realities and building support for proposed strategies. Many regions have established freight advisory committees or task forces to facilitate ongoing dialogue.

Phased implementation strategies are also common, allowing regions to pursue near-term, lower-cost improvements while planning for longer-term investments. Some plans clearly identify responsible agencies, potential funding sources, and performance measures, improving accountability and follow-through.

Conclusions and Implications

This research demonstrates that metropolitan freight planning in the United States is evolving toward a more integrated and sustainability-oriented approach. While regions differ in context and capacity, many face similar challenges and are experimenting with comparable strategies. By synthesizing lessons from diverse metropolitan areas, this report provides practical insights and a toolkit to help local and regional agencies strengthen freight planning, improve system performance, and reduce environmental impacts while supporting long-term economic vitality.

1. Introduction

Freight represents approximately 30% of transportation emissions, leads to significant quantities of air pollutants detrimental to human and environmental health, and accounts for 13% of all transportation-related fatalities in the United States. The objective of this research is to help local and regional governmental agencies plan for sustainable freight transportation to help meet ambitious climate, air quality, safety, and equity goals. Through expert interviews and comparative case studies of several cities or regional entities in the United States, some of which have recently developed a comprehensive program to establish a sustainable freight system, this research develops a toolkit of options to build sustainable freight systems. The research addresses common challenges and new opportunities faced by cities and regional entities to address the environmental impacts of freight.

The U.S. freight system is the backbone of our economy and a key component of our global competitiveness, yet freight movement is also a significant contributor to GHG emissions and other air pollutants as well as a safety and health concern for many communities, especially disadvantaged communities across the nation. Local and regional entities play a key role in addressing the negative externalities of freight and building sustainable freight systems, but their potential is often underestimated or overlooked in theory and practice. By offering a set of strategies to plan for sustainable freight systems at the local or regional levels, this research supports several USDOT priorities and RD&T strategic goals with respect to Climate and Sustainability, Safety, Equity, and Economic Strength and Global Competitiveness. This research helps transform freight and climate planning practices at the local levels by identifying innovative strategies to reduce the environmental impact of freight, enhance community equity, health, and safety, and boost local economies.

A key output of this research is a toolkit of options for local and regional entities to develop and implement freight strategies to reduce emissions and/or otherwise contribute to community equity, health, and safety. This includes specific strategies to build and maintain a sustainable freight transportation system at the local level; opportunities for collaboration with other freight stakeholders, such as freight companies, ports, local businesses, and community organizations; common implementation hurdles to plan for; and evaluation techniques to assess and prioritize freight strategies with the greatest potential for delivering emissions reduction and other economic, equity, or safety benefits. Throughout the research process, the research team has worked closely with local and regional transportation planners and national freight experts involved in developing, implementing, and/or evaluating sustainable freight strategies.

This project helps to empower local and regional entities to plan for sustainable freight movement within their jurisdiction. The potential of local and regional entities to address freight

externalities and harness the environmental, economic, and community benefits of smooth freight movement is often overlooked or underestimated. The significance of freight externalities has often been understated in local climate action or sustainability plans; the literature does not offer clear and comprehensive paths for sustainable freight planning at the local and regional levels; and freight data is often expensive or difficult to obtain or analyze at the local level. This research identifies a comprehensive set of innovative strategies that local and regional entities can use to build a sustainable freight system. Additionally, this research uncovers gaps in the tools and methods that are currently used to evaluate and address the negative externalities of freight movement, impacting local communities and disproportionately harming disadvantaged communities. As such, this research sets the stage for transforming freight and climate planning at the local and regional levels to better account for and address the negative externalities of freight while amplifying its positive community and economic impacts.

This report is organized as follows: Chapter 2 describes freight planning themes uncovered from government planning documents; Chapter 3 describes themes uncovered from interviews with freight planning professionals; and Chapter 4 provides conclusions and recommendations for cities and metropolitan areas for achieving sustainable freight planning, along with research limitations and directions for future research.

2. An Analysis of Local & Regional Freight Planning Documents

This section discusses sustainable freight planning themes among various freight planning and government documents. Research methods are discussed first, explaining the process behind choosing which documents to include in this research, as well as the specific steps taken to synthesize these documents using content analysis. A summary of several planning documents from various U.S. metropolitan areas and cities follows, focusing on significant themes.

2.1 Research Methods

Data and Research Design

The data were collected through downloading documents from governmental websites from various U.S. states and cities, often from metropolitan planning organization (MPO) websites. The research team created an Excel spreadsheet to keep track of links to planning documents and downloads. This list was periodically updated every couple of months to ensure that it was current. The purpose of downloading government documents was to collect information on local- and metro-level freight-specific planning initiatives.

The research design employed an unobtrusive document-based approach using qualitative content analysis to assess the presence or absence of specific freight planning strategies, challenges, and opportunities. By systematically synthesizing freight and goods movement planning documents, the analysis establishes a foundation for identifying which sustainable freight planning strategies are most commonly articulated and how they are framed across planning contexts. This approach also enables examination of where and how particular strategies are emphasized within planning discourse. Analyzing documents from multiple metropolitan areas further allows for consideration of geographic and contextual variation, highlighting how regional characteristics may shape freight planning priorities and approaches.

Content analysis—particularly in the form of plan analysis—is a well-established method in policy and planning research. It is commonly used to systematically examine planning documents, policies, and reports to identify patterns, priorities, and gaps in planning practice. This approach allows researchers to assess how planning goals are articulated, how issues such as effectiveness or sustainability are addressed, and how plans align with broader policy frameworks. Its widespread use reflects its value in offering structured, replicable insights into the content and quality of planning efforts.

Metro Area Selection Process

The metropolitan areas included in this analysis were selected to represent a diverse cross-section of regions across the United States. Selection was guided by several key criteria. First, geographic diversity was prioritized to ensure representation from the West Coast, Midwest, Northeast, and South, allowing for analysis of regional variation in freight planning challenges and strategies. Second, only metropolitan areas that play a significant role in the national freight system—whether as a major port, logistics hub, or a critical node in the highway or rail network—were considered. Third, regions with recent or accessible freight planning documents were prioritized to ensure the availability of up-to-date and comparable data. Finally, the selection reflects a range of urban typologies, from large multi-county metropolitan areas to mid-sized urban regions, in order to capture differences in planning capacity and local context. Together, these criteria support a comparative analysis of freight planning approaches across varied urban settings.

The selected cases included eight U.S. metropolitan areas from different regions of the country: Baltimore, Charlotte, Boston, Atlanta, Chicago, Los Angeles, the San Francisco Bay Area, and Seattle. Due to the greater availability of metropolitan- or regional-level freight plans compared to city-level freight plans, the analysis focused primarily on metro-scale planning documents. The selected metropolitan areas are all key nodes in the national freight and rail network, each serving distinct roles in goods movement. Chicago functions as a major national rail hub, while Los Angeles and the San Francisco Bay Area host some of the busiest port complexes in the United States. Seattle, Baltimore, and Boston are also important port cities with multimodal freight connections. Atlanta and Charlotte serve as major inland distribution and logistics centers with expanding intermodal infrastructure. Together, these regions capture a range of freight functions—port gateways, rail interchanges, and inland logistics hubs—making them well suited for examining how freight planning is addressed across diverse metropolitan contexts.

To strengthen the analysis, the research team prioritized metropolitan areas where both planning documents and stakeholder interviews (reported in Chapter 3) were available. This intentional pairing of freight plans and interviews from the same regions enabled a more nuanced assessment of how freight strategies are articulated in formal planning documents and how those strategies are interpreted, operationalized, or constrained in practice.

The study focused primarily on mid-sized to large metropolitan areas, which vary considerably in population, freight intensity, and institutional capacity. This variation helps illuminate differences in freight-related challenges and planning approaches across regions, but it also limits the extent to which direct comparisons can be made across cases. Comparability is further complicated by differences in the scope, format, and publication year of the planning documents reviewed. For

this analysis, the research team examined freight or goods movement plans and related White Papers published between 2013 and 2024. While this time frame captures recent planning efforts, inconsistencies in document structure and recency introduce some limitations for cross-case comparison.

Organization

To support systematic content analysis and facilitate comparisons across freight plans from different cities and metropolitan regions, the research team developed a standardized framework for summarizing each document. Each plan summary (reported in Appendix A) is organized into six sections:

- Introduction/Background
- Plan Details
- Freight Planning Strategies
- Challenges
- Opportunities
- Implementation Measures

The Introduction/Background and Plan Details sections provide essential contextual information for interpreting the analytical themes addressed in the subsequent sections. The Introduction/Background section presents an overview of the geographic scope of the plan, dominant freight transportation activities or trends, and relevant economic sectors. To improve consistency and comparability across case studies, supplemental demographic data—most notably population—are drawn from the U.S. Census Bureau. When region-specific data are unavailable, state-level data are used. Where relevant, maps from official government sources are included when such visualizations are not provided in the original plan documents.

The Plan Details section describes the purpose and development of each document, including its timing, motivating factors, stakeholder involvement, and primary data sources. The remaining four sections—Freight Planning Strategies, Challenges, Opportunities, and Implementation Measures—correspond to the core analytical variables used in the content analysis. These variables were defined through a structured process of conceptualization and operationalization and serve as the basis for coding and thematic comparison across plans.

Conceptualization and Operationalization of Variables

The conceptualization stage established baseline definitions for the key analytical variables examined in this study. The operationalization process provided more detailed yet flexible definitions to guide coding and thematic analysis. These definitions are provided below:

- *Freight Planning Strategy* refers to a specific policy, action, or project intended to advance defined goals related to freight system performance or outcomes. This encompasses actions aimed at maximizing the benefits and minimizing the harms of the freight system. These strategies may support broader planning goals such as economic development, environmental sustainability, safety, equity, land use coordination, and multimodal transportation. Examples include efforts to improve freight network connectivity, reduce emissions, or better integrate freight with local land uses.
- *Freight Planning Challenge* denotes any condition or constraint that impedes the efficient, safe, or equitable movement of freight, including negative externalities associated with freight activity. This includes a variety of barriers that limit freight system performance or safety. These may involve infrastructure constraints, disruptions to mobility or storage, environmental or public health risks (e.g., pollution or traffic collisions), and institutional hurdles such as limited funding, legal restrictions, political resistance, or coordination difficulties among stakeholders.
- *Freight Planning Opportunity* refers to a potential or emerging action, policy direction, or innovation that could improve freight system performance but has not yet been fully realized. It refers to promising but underexplored strategies or initiatives for improving freight operations. Opportunities may include ideas that have been proposed but not fully pursued, or innovative responses to anticipated changes in freight demand, technology, or policy. These are often conceptual rather than concrete in terms of implementation.
- *Implementation Measure* describes the mechanisms through which freight strategies or projects are carried out. This details the execution framework for a freight strategy, including who is responsible for leading, monitoring, or managing the effort. It also encompasses performance metrics, funding mechanisms, timelines, and reporting structures used to assess progress and ensure accountability.

Sustainable Freight Planning

Although sustainable freight planning does not have its own dedicated section in the plan summaries, it serves as the central theme of this report—shaping the content analysis and guiding the discussion of both planning documents and interviews.

Sustainable freight planning refers to long-term efforts to enhance the efficiency, safety, and resilience of the freight system while minimizing environmental, social, and economic costs. As McLeod and Curtis observe, “Increasingly, the lens of sustainability has been applied to the management of freight and logistics to meet public interests relating to social, economic, and environmental outcomes” (p. 203).¹ Sustainable freight planning can include efforts to address issues related to freight planning in general, including traffic congestion, safety, storage capacity, toxic emissions, and accessibility of freight shipment locations. Sustainable freight planning is also linked with resilience. According to Potter et al., resilience is “a way of considering the ability of a system to cope with disturbances” (p. 2).² In this study, sustainable freight planning therefore includes efforts to improve system adaptability, modernize goods movement, deploy new technologies, and pursue innovative funding and governance approaches that support long-term system performance under changing conditions.

Content Analysis Process

The content analysis followed an iterative process to identify themes, subthemes, and overarching meta-themes present in the selected planning documents. The primary goal of the analysis was to determine the presence or absence of specific concepts rather than the frequency with which they appeared. The number of times a concept appeared was not used to determine its significance, since repetition alone does not necessarily reflect priority or depth of a policy in the document. A narrative summary of each individual planning document can be found in Appendix A.

To develop an initial list of themes and sub-themes for the content analysis of freight plans, the research team combined established plan quality criteria—such as the inclusion of the fact base and implementation provisions—with freight-specific dimensions, including modal coverage, bottleneck mitigation strategies, and last-mile delivery. This guided the first round of analysis, where the team conducted a systematic scan to document the presence of each sub-theme, noting whether the plan referenced the topic and whether it included a corresponding strategy or action. In the second round, the team undertook a more detailed qualitative review to capture variation in the depth, specificity, and substance of these elements, with a second team member reviewing notes and coding them for terms or phrases corresponding to the study’s core areas of interest, including freight planning strategies, challenges, opportunities, implementation, equity, sustainability, funding, and legislation. For example, plans were initially coded for whether they addressed “equity” and whether they proposed related strategies or programs; subsequent analysis examined the scope and detail of those efforts, including how equity considerations were defined and operationalized. A third review by the same team member involved revisiting the original documents to clarify and expand upon the initial notes. Finally,

each document was reanalyzed to identify any additional relevant terms or concepts that may have been missed in the earlier round.

Content Analysis Results

The summarized and simplified result of the content analysis is shown in Table 1. The content analysis distinguishes whether a plan includes a subtheme and if that subtheme was part of discussions of freight planning strategies. This table is followed by a detailed discussion of the most significant themes found in the content analysis. Chapter 2 concludes with a discussion of subthemes found in plans based on freight planning strategies, challenges, opportunities and implementation. In the content analysis table, plans are simply referred to by their respective metro area or city and the year the plan was published. The full titles of the plans are also provided under Table 1.

Table 1. List of Freight Plans

Themes	Subthemes	Baltimore - 2022	Charlotte - 2016	Boston - 2013*	Boston - 2019*	Southern California - 2020	Southern California - 2024	Chicago - 2017**	Chicago - 2018**	Atlanta - 2016	Atlanta - 2024	Seattle - 2016	Seattle - 2024	San Francisco 2016
Asset management	Infrastructure maintenance/preservation	2	2			2	2	1	2	2	2	2	2	2
	Bridge facilities	2	2	1	2	2	2	1	2	1	2	2	2	2
	Pipelines			1		1				1	1	1	1	1
	Network condition - State	2	2	2	2	2	2	1	2	2	2	2	1	2
	Network condition - Interregional	2	2	2	2	2	2	1	2	2	2	2	2	2
	Network condition - Local	1	2	2	2	2	2	1	2	2	2	2	2	2
	Border crossings			1		2	2							
Freight modes	Truck/roads and routes	2	2	2	2	2	2	1	2	2	2	2	2	2
	Airplane/airports	1	2	2	2	2	2	1	1	2	2	1	1	2
	Ship/seaports	1	2	2	2	2	2	1	1	1	1	2	2	2
	Train/rail network	2	2	1	2	2	2	1	2	2	2	2	2	2
	Bike cargo					2	2		2		1	2	2	
	Intermodal freight/multimobility	2	2	2	2	2	2	1	2	2	2	2	2	2
	Complete streets planning									2	1	1	2	2
	Drones	1					1						1	

Themes	Subthemes	Baltimore - 2022	Charlotte - 2016	Boston - 2013*	Boston - 2019*	Southern California - 2020	Southern California - 2024	Chicago - 2017**	Chicago - 2018**	Atlanta - 2016	Atlanta - 2024	Seattle - 2016	Seattle - 2024	San Francisco 2016
Distribution centers		1	2	2	2	2	2	1	1	2	2	2	2	2
Last-mile		1	2	2		2	2		2	1	2	2	2	2
Congestion/bottlenecks		2	2	1	2	2	2	1	2	2	2	2	2	2
Commodity flows	Inbound	1	1		1	2	2	1	1	1	2	1	1	2
	Outbound	1	1	2	1	2	2	1	1	1	2	1	1	2
	Internal	1	1	1	1	2	2	1	1	1	2	1	1	2
Sectors	Agriculture		2	1		1	2	1	2	1	2	1	1	2
	Retail/e-commerce	1	1			2	2	1	1	2	2	2	2	2
	Urban freight	1	2	2	2	2	2	1	2	2	2	2	2	2
	Rural freight	1	2			2	2		1	1		1		2
	Waste management				1	1				1	2		2	2
	Military				1	1	1			1	1			2
Environmental stewardship	Zero-emission vehicles		1			2	2		1	1	2	2	2	2
	Alternative/renewable fuels	1	2			2	2			2	2	2	1	2
	Climate action plans						1					1		
Environmental impacts/pollution	GHG emissions	2	2			2	2	1	2	2	2	2	2	2
	Noise	1		1		2	2		2	2	2	1	2	2
	Stormwater runoff		1			1	1		1	1	2	1	2	2

Themes	Subthemes	Baltimore - 2022	Charlotte - 2016	Boston - 2013*	Boston - 2019*	Southern California - 2020	Southern California - 2024	Chicago - 2017**	Chicago - 2018**	Atlanta - 2016	Atlanta - 2024	Seattle - 2016	Seattle - 2024	San Francisco 2016
	Wildlife habitats	1	2						1		1	2	1	2
Stakeholder/community outreach	Plan development phase	2	2	1	2	2	2		2	2	2	2	2	2
	Plan implementation Phase	2	2	1	1	2	2		2	2	2	2	2	2
Equity	Disadvantaged communities	1	2			2	2	1	2	1	2	2	2	2
	Native and tribal groups										1			
Technology/innovation	Automation/driverless vehicles	1				1				2	2	2	2	2
	Platooning										1			2
	Information	2	2	2	2	2	2	1	2	2	2	2	2	2
Economy growth/vitality	Supply chain	2	2	1	1	2	2	1	1	1	2	2	2	2
	Jobs/workforce	2	2			2	2	1	2	2	2	2	2	2
	Competitiveness/global competitiveness	1	2	1		2	2	1	2	2	2	2	2	2
	Trade	1	1	1	1	2	2	1	1	1	2	1	1	2
Cross-jurisdictional collaboration/partner agencies	Private-sector stakeholders	2	2	1	2	2	2	1	2	2	2	2	2	2
	Review from commissions and advisory boards	2	2	1	2	2	2		1	2	2	2	2	2

Themes	Subthemes	Baltimore - 2022	Charlotte - 2016	Boston - 2013*	Boston - 2019*	Southern California - 2020	Southern California - 2024	Chicago - 2017**	Chicago - 2018**	Atlanta - 2016	Atlanta - 2024	Seattle - 2016	Seattle - 2024	San Francisco 2016
	Interregional partnerships	2	2	1	2	2	2	1	2	2	2	2	2	2
Consistency with planning context	Federal freight planning	2	2	2	2	2	2	1	2	2	2	2	2	2
	State freight planning	2	2	2	2	2	2	1	2	2	2	2	2	2
	Local planning	2	2	2	2	2	2	1	2	2	2	2	2	2
Implementation	Funding	2	2		1	2	2		2	2	2	2	2	2
	Project prioritization - Quantitative	2	2		2	2	2		2	2	2	2	2	2
	Project prioritization - Qualitative	2	2			1	2		2	2	2	2	2	2
Fact Base/Data/Analysis	Freight activity clusters		2	1		2	2	1	2	2	2	2	2	2
	Highway freight performance	1	2	2		2	2	1	2	2	2	2	2	2
	Mobility and accessibility measures	1	2	1	1	2	2	1	2	2	2	2	2	2
	Gaps/needs analysis	2	2	2	2	2	2	1	2	2	2	2	2	2
	Global trends		1			2	2	1		1	2	1	1	1
	Growth forecasting; future predictions/trends	1	1	2	1	2	2	1	1	2	1	2	2	1
Land use considerations		1	2	2	2	2	2	1	2	2	2	2	2	2
	Connectivity/accessibility	1	1	1	1	2	2	1	2	2	2	2	2	2

Themes	Subthemes	Baltimore - 2022	Charlotte - 2016	Boston - 2013*	Boston - 2019*	Southern California - 2020	Southern California - 2024	Chicago - 2017**	Chicago - 2018**	Atlanta - 2016	Atlanta - 2024	Seattle - 2016	Seattle - 2024	San Francisco 2016
Freight system assessment	Resiliency and redundancy	2	2			2	2		2	2	2	2	2	2
	Safety	2	2	2	1	2	2	1	2	2	2	2	2	2
	Parking	2	2	2	2	2	2		2	2	2	2	2	2
Toolbox/toolkit?			2			2	2		2		2	2	2	1
Study recommendations			2	2	2	2	2	1	2	2	2	2	2	2

List of Freight Plans

- Baltimore 2022: Resilience 2050: Adapting to the Challenges of Tomorrow
- Charlotte 2016: Greater Charlotte Regional Freight Mobility Plan
- Boston 2013*: RE: Proposed Freight Planning Action Plan for the Boston Region MPO: Meeting the Goals and Addressing the Issues
- Boston 2019*: Boston Region MPO Freight Planning Action Plan Update
- Southern California 2020: Connect SoCal Transportation Goods Movement Technical Report
- Southern California 2024: Goods Movement Technical Report
- Chicago 2017**: The Freight System: Leading the Way (Snapshot)
- Chicago 2018**: Regional Strategic Freight Direction
- Atlanta 2016: Atlanta Regional Freight Mobility Plan Update: Final Report
- Atlanta 2024: Atlanta Regional Freight Mobility Plan (2024)
- Seattle 2016: City of Seattle Freight Master Plan
- Seattle 2024: Freight and Urban Goods Movement Element

The Boston and Chicago plans (denoted by * and ** respectively in Table 1) are complimentary documents intended to be analyzed together.

Table Notes

0: Plan does not mention the subtheme, nor does it include other closely related subthemes in a manner which is obvious

1. Plan directly mentions subtheme or closely related subtheme
2. Plan includes discussions of strategies that include subtheme

2.2 Major Themes Among Freight Plans

This section discusses major themes discovered among freight planning documents through content analysis, with additional context provided about the extent to which subthemes were present among plans. In total, 68 themes or subthemes were found among 13 planning

documents. This section is followed by Section 2.3, which provides a detailed discussion of major freight planning strategies found in plans. This process is repeated for the remaining sections of this chapter, including a discussion of major freight planning challenges (Section 2.4), opportunities (Section 2.5), and implementation measures (Section 2.6).

Freight Transportation Planning

In general, broader subthemes which pertained specifically to freight transportation were among the most common themes found among plans. For example, connectivity and accessibility, safety, and parking were subthemes found in most plans. Not every plan had a specific toolbox or a discussion of a freight toolbox, but most plans had study recommendations to support freight planning. Freight planning is a sub-discipline of transportation planning, and overall, the plans were successful in diving deeper into this field to highlight freight-related strategies, challenges, opportunities, and implementation measures which may not have received as much attention in other plans.

In addition, freight planning themes which pertained to various levels of government were also found among many plans, as the freight industry can simultaneously involve federal, state, and local policies to address freight, which can utilize funding and collaboration from many sources. Freight network condition was also discussed in most plans among various geographic levels, including state, interregional, and local. There were often regional strategies which connected to local project recommendations which helped achieve statewide goals for freight.

Truck, Rail, and Bike Cargo Freight

For freight mode, truck, rail, air, water, and multi-modal freight were discussed in most plans, with a priority given to truck and rail freight modes. This priority on trucks and rail makes sense, as compared to other modes, these modes have more of an established geographic network which allows them to transport goods to many different and diverse parts of the country, whether in dense urban areas or in remote rural areas. Less common freight modes discussed among plans were bike cargo and drones. There could be many reasons why these modes were less common. Bike cargo is a relatively new mode of freight which has been investigated in recent years with the rise of e-commerce and home deliveries. Bike cargo can also be sensitive to urban geography and may not always be the most suitable delivery option, especially if a city is less densely designed and lacks the right infrastructure or incentives to support bike cargo. Only a few plans mentioned the term “complete streets planning.”

Multi-Mobility and Intermodal Freight

However, every plan to some degree discussed multi-mobility and intermodal freight, with most plans including these topics as part of a strategy. Goods movement involves the delivery of a

large variety of goods in various quantities and in many different geographic areas. There are multiple kinds of freight delivery modes (e.g., truck, rail, air, water, bike), each of which can have their own benefits and limitations related to transportation access. In many cases, the delivery of goods can utilize more than one mode of transportation to get to its destination. Therefore, plans were in most cases very intentional about including multi-mobility as a part of freight transportation planning.

Last-mile delivery and land use considerations were also common themes, and supporting bikes were sometimes part of the discussion of those themes. As for drones, they are also a relatively new technology which may seem like less of a priority compared to other, more utilized modes such as truck transportation. In some cases, certain freight modes seemed less relevant due to geography and were not discussed in detail, such as water transportation in the Charlotte metro region due to the lack of access to a nearby port.³ Addressing congestion and bottlenecks was a strategy found among most plans.

Commodity Flow & Sector Variability

There was some variation in the discussion of specific sectors and commodity flows among plans. Not every plan discussed these subthemes specifically as part of freight planning strategies; this could be related to the size of the plan. The size of plans varied significantly, with the smallest document being the Resilience 2050 White Paper from the Baltimore metro region at 22 pages⁴ and the largest document being the 2024 Atlanta Regional Freight Mobility Plan report at 562 pages.⁵ It is also possible that certain sectors or commodity flows are more relevant or significant for certain geographic regions. For example, the Southern California region discussed inbound, outbound, and internal commodity flows extensively in both their 2020 and 2024 plans.⁶ Compared to regions from other plans, the Southern California region has a larger population and a globally competitive economy. Every plan discussed urban freight, but rural freight was less common, along with waste management and military subthemes.

Economic Growth & Vitality

Economic growth and vitality were prominent themes found among most plans. Many plans included freight planning strategies which were connected to improving the supply chain, jobs, workforce competitiveness, or global competitiveness. Discussions of trade were slightly less prominent in relation to specific strategies but were still found in a few plans. The freight industry is a key economic engine, as it involves managing the supply and demand of goods and services which support not only essential services such as food and healthcare, but also the growth and vitality of a region.

Environmental Stewardship

For environmental stewardship, the majority of plans touched upon zero-emission vehicles and alternative or renewable vehicles. However, there were a few planning documents which did not discuss these themes at all or mentioned them briefly but not as part of strategies. This could be related to the size and type of planning document. For example, the two planning documents analyzed from the Boston metro region were memorandums,⁷ while the planning document from the Baltimore region was a White Paper.⁸ Each of these documents did not include zero-emission vehicles or alternative or renewable fuels as part of freight planning strategies. Meanwhile, larger freight reports from regions such as the San Francisco Bay area, Atlanta metro region, and Southern California region discussed both as part of freight planning strategies.⁹

There were only a couple of plans which made reference to a climate action plan. However, there were more plans which discussed climate change in general, such as the Freight and Urban Goods Movement Element from Seattle.¹⁰ Climate change is an ongoing threat to the freight industry, and some plans discussed ways to mitigate the effects the freight industry has on climate change and support climate adaptation to improve freight network resilience and reduce susceptibility to disruptions from extreme weather events. Mentions of climate change were more likely to occur if plans were published more recently. Not every city or metro region has a climate action plan, which could be another reason why it was not mentioned in certain plans.

It was also more common to see discussions of extreme weather impacts, which was how most plans included resilience as a subtheme. It was rare to find a dedicated section or well-explained strategy for addressing resilience in general, with one exception including a freight resilience study recommendation from the 2024 Atlanta Region Freight Mobility Report.¹¹

Environmental Externalities

As for environmental impacts and pollution, greenhouse gas emissions were discussed in most plans, along with noise, but the latter was discussed to a lesser extent. This makes sense: these negative transportation externalities can be even more pronounced in the freight industry because it includes large vehicles which expend a higher level of toxic pollutants and make much more noise. Stormwater runoff and wildlife habitats were less common subthemes found among plans. Both subthemes are specific in nature, which could be a reason why they were not mentioned in discussions of strategies in many plans. However, both subthemes are relevant to managing freight planning externalities.

Stakeholder Outreach & Community Impacts

For stakeholder and community outreach, most plans discussed the inclusion of stakeholders in plan development and implementation phases. Stakeholder collaboration was key to navigating

freight obstacles which involved multiple jurisdictions and assigning responsibilities to action items in plans to improve accountability and implementation. Most plans discussed including private-sector stakeholders, interregional partnerships, and review from commissions and advisory boards.

As for equity, disadvantaged communities were also touched upon in most plans. In many cases, this subtheme was discussed through addressing impacts to communities generally. Discussing specifically disadvantaged communities, such as low-income or environmental justice communities, was less common. There was only one plan that was found to have mentioned native or tribal communities. Overall, disadvantaged communities was a topic that, compared to other themes, seemed like an afterthought and could have used more attention.

Technology & Innovation

Almost every plan discussed technology and innovation as a subtheme by improving access to information as a freight planning strategy. Similarly, almost every plan discussed pursuing needs or gap analysis as a strategy to help understand freight mobility patterns and issues and where strategies should be implemented or prioritized. Thus, technology and innovation, when mentioned, were a part of discussions of improving freight data collection and dissemination to various stakeholders. They were also mentioned as part of existing conditions analyses, projections of future trends, and plan implementation tracking. Platooning and autonomous or driverless vehicles were less common subthemes found among plans but are examples of innovative strategies that freight planners are considering to improve freight transportation efficiency.

Freight Data Analysis

Multiple subthemes found in most plans fell under the theme of data analysis. Freight activity clusters, highway freight performance, mobility, and accessibility measures, gaps and needs analysis, and predictions/forecasts of future trends or growth were all common subthemes found in plans. These subthemes were often connected to study recommendations found in plans to support freight planning and informed conversations about freight planning challenges and respective needs to address them. Data analysis about global trends was less common but still found in multiple plans.

Implementation

Most plans touched on the theme of implementation. Multiple plans discussed specific funding strategies or sources of funding to help support freight planning strategies, often from multiple levels of government. Quantitative and qualitative measures were found in project prioritization

strategies, with a slightly greater focus on quantitative data, such as truck volumes, over qualitative data, such as whether a project utilizes multiple funding resources.

Other General Observations

More freight planning themes were discovered in the larger plans or reports, especially from larger metropolitan regions, compared to the smaller plans or complimentary documents from smaller metro regions. Freight planning strategies which were discussed in older planning documents were often carried over into the new planning documents. The one notable difference found between the 2024 plans from Seattle, Atlanta, and Southern California metro regions and the older plans was their discussions of freight resiliency:¹² the 2024 plans had more detailed discussions of resilience, especially within the context of the COVID-19 pandemic.

2.3 Freight Planning Strategies

The following section includes detailed discussions of major themes of freight planning strategies found among plans:

Communicating Information About Freight to Various Stakeholders

Communicating information about freight to various stakeholders was a freight planning strategy found in most plans. For example, both the San Francisco Bay and the Atlanta metro regions included plans which discussed guidelines to influence land use with freight in mind.⁶⁴ For the San Francisco Bay area, these guidelines were meant to coordinate with planning efforts at the regional and state level. For the Atlanta metro region, the guidelines were meant to guide public and private development to support freight depending on the type of location, such as in a downtown or industrial area. The Atlanta metro region also provided fact sheets in their 2024 plan which provide information about freight on a local level for each of the 20 counties in the region. These fact sheets were intended to help guide freight planning in those areas, providing data about jobs, freight flow direction, the freight network, trading partners, and top commodities transported.

Charlotte, Chicago, Southern California, and Seattle have also utilized communicating information about freight as a freight planning strategy. In Charlotte, performance tracking is seen as key to providing data to planners and decision makers to better support freight planning.⁶⁵ In Chicago, there is an interest in communicating and spreading best practices about freight.⁶⁶ In Southern California's 2020 plan, they discussed creating freight handbooks to provide information about freight to support decision making for local jurisdictions and environmental justice communities.⁶⁷ In the Seattle 2016 plan, they mentioned that education along with

enforcement are part of their Vision Zero initiative, which strives to eliminate traffic injuries and deaths.⁶⁸

Defining and Clarifying the Freight Network

Defining and clarifying the freight network was another theme found in several plans. Baltimore, Southern California, and Atlanta have plans which discuss defining and adding Critical Urban Freight Corridors (CUFCs), an element which is part of the National State Highway Program under the FAST Act.⁶⁹ Defining CUFCs allows certain roads to unlock additional federal transportation funding opportunities. Both the 2016 and 2024 plans for Seattle discuss establishing a freight network which specifies major and minor truck streets, first- and last-mile connectors, and limited access facilities for truck drivers passing through the area.⁷⁰ In Chicago's Strategic Freight Direction document, a truck-permitting study is a discussed strategy which includes collaboration with local, regional, and state partners to help define truck route designations and restrictions.⁷¹ Freight route designations in plans were useful for planning how to improve freight movement efficiency and resiliency while minimizing negative externalities such as road maintenance costs.

Strategies to Support Truck Parking

Several plans discussed various strategies to support truck parking. Plans from the Bay Area and Atlanta mentioned pursuing or updating a truck parking study.⁷² In Atlanta, the 2024 plan discussed a truck parking model ordinance in two sections.⁷³ The first section discussed truck parking zoning recommendations for supporting long-term truck parking and storage as well as temporary truck staging. The second section is a Model Short-Term Truck Parking Ordinance for counties and municipalities, providing guidance to communities for providing more opportunities for short-term truck parking access. Both sections provided minimum recommendations as well as more ideal and comprehensive recommendations for addressing truck parking.

In the Baltimore region, an emergency truck parking strategy has been implemented which allows trucks to use park-and-ride spaces as parking spots to avoid major storms.⁷⁴ At the state level, efforts to collect truck parking data and expand the number of parking spaces are initiatives being pursued. In Southern California, the 2020 plan discussed examples of truck parking strategies, including increasing permitted parking areas and extending yellow curb designations.⁷⁵

Multi-Sector Collaboration in Freight Planning

Multiple plans described freight planning strategies which involve collaboration and coordination with multiple sectors. In the Greater Charlotte Regional Freight Mobility Plan, one of the goals is regional coordination, which will be pursued through collaborations with regional agencies and

outreach to private stakeholders.⁷⁶ Supporting agencies involved in regional emergency management is connected to a goal to increase the safety and security of the freight system. In Chicago, the Chicago Region Environmental and Transportation (CREATE) program is a public–private partnership which strives to improve rail connections and capacity.⁷⁷ In Atlanta, development partnerships are a strategy for addressing the lack of freight parking facilities in the private sector, which could be due to land costs, public concerns, and local regulations.⁷⁸ In the San Francisco Bay Area, one of their strategies includes land use guidelines which coordinate with regional and state planning actions. In Southern California’s 2024 freight plan, one strategy is integrating planning of ports and rail infrastructure with supply chains and movement corridors.⁷⁹ In Boston, stakeholder outreach efforts have also been executed through highway safety working groups and meetings with trade associations to help inform decision-making.⁸⁰ Overall, multi-sector collaboration was frequently mentioned as key to overcoming freight planning challenges, supporting inclusive engagement, and improving coordination among different levels of government and various stakeholder parties, including public and private stakeholders.

Strategies to Support Other Plans or Planning Initiatives

A few plans discussed strategies to support other plans or levels of planning. In Boston’s 2013 memo, one strategy is to create a freight action plan which helps to support planning efforts at the state level.⁸¹ This memo serves as a first step towards creating an action plan through preliminary research to identify the needs of the freight industry in the area, including data gaps which need to be addressed and better understood. In the Atlanta metro region’s 2016 plan, strategies include study recommendations to supplement or update previous plans and address freight issues.⁸² Seattle’s 2024 freight plan is also a complimentary plan, as it is designed to support Seattle’s general transportation plan to specifically address freight issues and the freight industry.⁸³

Improving or Adding Infrastructure to Support Freight Mobility and Efficiency

Improving or adding infrastructure to support freight mobility and efficiency was a strategy described in multiple plans, with a focus on truck and rail freight. In Southern California, infrastructure improvement projects mentioned include double and triple tracking, extending rail lines, dredging projects, and acquiring land to support rail yards and storage.⁸⁴ Both Southern California and Atlanta have plans which discuss changes to traffic signals.⁸⁵ Incorrectly timed signals can contribute to delays to both commuter and freight traffic if not addressed.

Both the San Francisco Bay area and Boston metro area discuss strategies to improve highway interchanges.⁸⁶ This is particularly important within the context of truck freight, which relies on the highway network to transport goods efficiently. Both the Atlanta and San Francisco Bay areas discuss adding truck-friendly lanes or auxiliary lanes as a strategy.⁸⁷ Seattle brought up widening

lanes to support truck freight along with other examples of infrastructure improvements, including redesigning curbs for easier turning, modifying bridges, and building ramps for direct freeway access and grade separations.⁸⁸

Reducing Toxic Emissions from the Freight System

Reducing toxic emissions from the freight system was another strategy found in multiple plans, but specific strategies varied. Some focused specifically on reducing emissions directly from freight vehicles. In the Greater Charlotte Freight plan, there is a goal to reduce carbon emissions from congestion and idling vehicles.⁸⁹ Both of Southern California's 2020 and 2024 plans discuss strategies to support zero-emission vehicles, like providing electric vehicle charging infrastructure and incorporating solar panels and clean energy storage.⁹⁰ Southern California as well as Atlanta had plans which discussed alternative fuel as one option to lower the level of emissions.⁹¹ Atlanta's 2016 plan discussed natural gas as a potential alternative fuel.⁹²

Other emission reduction strategies found in plans included various actions to reduce vehicle-miles-traveled or switch to cleaner transportation. In Seattle's 2024 plan, there was an interest in adding green infrastructure and promoting clean travel options, including e-cargo bikes.⁹³ The first strategy that was discussed involved e-cargo bike lending libraries in community hubs to allow nearby businesses to test out cargo bike delivery. The other strategy was a commercial e-cargo bike program, which would incorporate standards for e-cargo bikes, rules for operating them, and curb allowances for parking them in rights-of-way.

Incorporating Data into Freight Planning Strategies

Data collection and incorporation of data in freight planning strategies was found in multiple plans. For the Baltimore metro region, there are efforts to collect truck parking data as part of a state level initiative.⁹⁴ In the Charlotte metro area, one strategy is to improve performance tracking to inform planners and decision-makers about freight.⁹⁵ Multiple plans demonstrated the importance of data collection in freight planning, as it was viewed as key to resolving knowledge gaps among stakeholders and helping to identify where to prioritize improvement projects. In Boston, memos described the need to improve the utilization of data to support federal MAP-21 requirements.⁹⁶ In Atlanta's 2016 plan, strategies included collecting data about truck counts and land use growth patterns to assess future demand and inform strategies to support freight reliability and economic productivity.⁹⁷ Both Seattle and the San Francisco Bay area have plans which discuss the incorporation of intelligent transportation systems.⁹⁸

Improving the Utilization of Rail

Improving the utilization of rail was a freight strategy found in multiple plans. Some strategies focused on improving safety and efficiency of rail freight, while others considered expanding rail

capacity or the rail network. In Southern California, both the 2020 and 2024 plans included strategies to support the efficiency and safety of rail, like improving rail warning systems and signage for alternate routes, as well as previously discussed strategies like incorporating double and triple tracking, extending rail lines, and acquiring new land to support railyards and rail storage.⁹⁹ Chicago has the previously mentioned CREATE program, a public-private partnership to improve the efficiency and safety of rail.¹⁰⁰ Atlanta mentions an at-grade rail crossing study as a strategy to better understand conflicts between rail and other modes.¹⁰¹ The San Francisco Bay area has a specific rail strategy to increase intermodal terminal capacity near a port, with support from public and private investments to reduce truck trips to the Central Valley, where freight is consolidated.¹⁰²

Maintaining Resilience of the Freight System

Maintaining resilience of the freight system was a strategy found in a few plans. Conversations about resilience varied but generally involved discussions about emergency response, extreme weather, and backup strategies to deal with disruptions to the freight network. In the Baltimore metro region, a White Paper mentions an emergency truck parking policy which allows trucks to use park-and-ride spaces as parking spots to avoid major storms.¹⁰³ In the Greater Charlotte metro region, supporting emergency management agencies is a strategy to support safety goals.¹⁰⁴ In the Atlanta metro region, the 2016 plan discussed incorporating planning with considerations for extreme weather impacts.¹⁰⁵ In the Seattle region, the 2016 plan mentioned assessing alternative routing options for truck drivers through reviewing road classifications and clarifying the freight network.¹⁰⁶

Incorporating Environmental Justice in Freight Planning

Incorporating environmental justice in freight planning was a strategy found in a few plans, which helped to prioritize planning efforts in areas or communities that suffer disproportionate impacts while providing opportunities for them to be part of the planning process. In Southern California, both the 2020 and 2024 plans included discussions about environmental justice.¹⁰⁷ The 2020 plan discussed freight handbooks as a strategy to help spread knowledge of freight to people who live in environmental justice communities to help incorporate those communities in freight decision-making. In the 2024 plan, strategies to support environmental justice included supporting workforce development in zero-emissions and clean technology industries. In the Chicago metro area, addressing environmental justice issues was one of a few recommendations which were part of a bigger strategy to support land use policy which supports freight.¹⁰⁸ In Seattle's 2024 plan, one strategy was to center the voices of people of color and underrepresented groups in planning and decision-making and to prioritize investments in communities which experience the greatest negative impacts from freight.¹⁰⁹

Land Use Considerations in Freight Planning

Land use considerations in freight planning strategies were found in a few plans. These considerations were broad and often comprehensive, as they involved discussions of land use needs or urban design preferences to support multi-mobility. In the Greater Charlotte metro area, one strategy was to support land use which makes moving freight more efficient, including supporting multiple modes of transport.¹¹⁰ In Southern California's 2024 plan, supporting multiple modes of transport was also mentioned along with coordination with planning of ports, rail, and supply chains to support an overall comprehensive, system level planning.¹¹¹ In the Atlanta metro region's 2016 plan, collecting data about land use growth patterns was a strategy to help inform decision-making to support freight reliability and economic productivity.¹¹² In Atlanta's 2024 plan, freight design guidelines included considerations of what type of land or setting a development is taking place in, such as downtown or industrial areas.¹¹³ In Seattle's 2016 plan, strategies included making streets more enjoyable for pedestrians while supporting goods movement and delivery.¹¹⁴

2.4 Freight Planning Challenges

The following section includes detailed discussions of major themes of freight planning challenges found among plans. Major freight planning challenges include truck parking; e-commerce and curb-utilization; congestion/bottlenecks; maintenance and aging infrastructure; at-grade rail crossings; greenhouse gas emissions, electric vehicles and alternative fuels; disproportionate community and health impacts; lack of knowledge about freight among various stakeholders; freight planning coordination; freight system resilience; workforce shortage; and height and weight restrictions.

Truck Parking

Most plans discussed truck parking as a freight planning challenge. In the Baltimore metro region, this issue has been compounded by some truck drivers not taking advantage of truck and weight inspection stations due to a lack of amenities, fear of being delayed by receiving an inspection, or simply being unaware of where these stations are located.¹¹⁵ In the Southern California region, truck parking has been found to be limited for both public rest areas and commercial truck stops, which is contributing to illegal parking in places such as freeway shoulders and near local communities.¹¹⁶ In the Atlanta metro region, truck parking demand continues to exceed supply, with most counties in the region having truck parking deficits.¹¹⁷

E-Commerce and Curb Utilization

E-commerce was discussed as a challenge in a few plans. This challenge was particularly prevalent in more recent plans as e-commerce patterns have changed and increased over time. In Baltimore's 2022 White Paper, e-commerce was described as a challenge for truck drivers, as increasing demand and delivery expectations from online shopping has added extra pressure for drivers to complete deliveries on time.¹¹⁸ In the Southern California region, e-commerce has been affecting freight distribution networks by increasing the use of urban-distribution centers.¹¹⁹ In the San Francisco Bay Area, e-commerce has been putting extra pressure on the limited parking spaces that are available to support last-mile deliveries.¹²⁰

The issue of e-commerce is closely related to another freight planning issue: curb-utilization. In Baltimore's 2022 White Paper, curb-utilization was described as competitive, as truck delivery drivers must compete with other essential actions in cities, such as trash pickup and hail-and-ride services.¹²¹ Similar issues were described in Southern California's 2020 freight plan, which explained that competition for curb space can be particularly high in dense, urban areas.¹²² In Seattle's 2016 plan, a limited quantity of loading zones was listed as a challenge.¹²³

Congestion/Bottlenecks

Congestion and bottlenecks were a common challenge found among plans, limiting freight mobility and efficiency while contributing to additional negative externalities. In the Southern California 2020 plan, several truck bottlenecks were mapped out, which result in delays in the freight network and greater greenhouse gas emissions.¹²⁴ In the Chicago metro region, bottlenecks have been observed in the interstate network and on multiple arterial roads.¹²⁵ Congestion issues are connected to other problems in the area, including lane reduction, flawed signal timing, congestion from passenger vehicles, and road geometric issues. In the Atlanta metro region's 2024 plan, bottlenecks were seen to be caused by a pattern of higher demand for freight transportation which has exceeded highway and rail capacity over decades.¹²⁶ In the San Francisco Bay area, there are highway corridors that exist with high levels of traffic from a diverse mix of vehicles which contribute to increased safety risk.¹²⁷

Maintenance and Aging Infrastructure

Maintenance or aging infrastructure were challenges found in most freight plans. In the Baltimore region, the difficulty of truck drivers finding parking is contributing to parking in undesignated areas, which is increasing maintenance costs.¹²⁸ Similarly, in the Chicago metro region, fragmented rules on where trucks can or cannot go have caused some truck drivers to drive in areas that are not designed for truck freight, leading to increased damage on roads.¹²⁹ In the Charlotte metro region, there are size and weight limits in place in rural areas due to aging

infrastructure.¹³⁰ Aging infrastructure can have impacts on the freight network by limiting where trucks can travel. In the Boston metro region, aging infrastructure has contributed to rerouting.¹³¹ In the Atlanta metro region's 2024 plan, structurally deficient bridges are a resiliency issue, as they are particularly vulnerable to extreme weather events.¹³² In Seattle's 2024 plan, maintenance was explained as a challenge because it can alter the network of where freight can travel, whether that is a road that is weaker and in need of maintenance or is in the process of being repaired.¹³³

At-Grade Rail Crossings

Multiple plans mentioned at-grade rail crossings as a freight planning challenge. At these crossings, multiple modes of transportation can intersect, which contributes to increased safety risk and impacts on freight movement efficiency. At-grade rail crossings were listed as a safety issue in plans from the Greater Charlotte and Boston metro regions.¹³⁴ In Chicago, highway-rail grade crossings have contributed to collisions which have led to injuries and fatalities and have blocked emergency response vehicles from reaching their destinations quickly.¹³⁵ In Atlanta's 2016 plan, at-grade railroad crossings were explained to have contributed to traffic delays for both passenger vehicles and truck drivers.¹³⁶

Greenhouse Gas Emissions, Electric Vehicles, and Alternative Fuels

Multiple plans discussed greenhouse gas (GHG) emissions as a challenge, along with pursuing strategies to reduce GHG emissions as a challenge. In the Chicago metro region, fragmented rules about where trucks can and cannot go have led to drivers rerouting around certain areas, which adds time to their drive and increases GHG emissions.¹³⁷ In the Southern California region, the 2020 plan explained that increased GHG emissions are related to the several truck bottlenecks in the region, which lead to idling.¹³⁸ In the 2024 plan, enforcing regulations for supporting the zero-emission vehicle transition at the state level was described as a challenge, as independent truck owner operators may travel to locations outside the state or internationally to Mexico.¹³⁹ GHG emissions from freight have a negative impact on air quality in the region and contribute to negative community health impacts such as asthma. Pursuing zero-emission vehicles remains a challenge in the region, as there is a lack of large-scale infrastructure to support them, and costs to make them remain high due to limited production, the need to complete research and development, and the requirement of certain materials and components. In the Atlanta metro region's 2024 plan, more challenges were discussed in connection to zero-emission vehicles and alternative fuels.¹⁴⁰ There were concerns about the range and reliability of vehicles, especially with the lack of charging or alternative refueling infrastructure. Charging vehicles also takes longer than traditional refueling. There were also concerns about high upfront costs, especially for smaller truck companies who may be limited in their resources.

Disproportionate Community and Health Impacts

Most plans discussed community and health impacts from the freight system as a challenge. Some plans discussed how these impacts are disproportionate, while others were more general in their descriptions. In the San Francisco Bay Area, the 2016 plan highlighted how communities which live near goods movement facilities and connected infrastructure experience the greatest levels of pollution, which includes GHG emissions, noise, and light pollution.¹⁴¹ In the Chicago Strategic Freight Direction, environmental justice was mentioned as a challenge, explaining that there are a greater number of low-income and people of color which are in freight concentrated areas.¹⁴² Similarly, the 2016 Atlanta metro plan explained that freight facilities and infrastructure are disproportionately concentrated, and planning is not harmonious with other land uses.¹⁴³ The Baltimore White Paper and 2024 Southern California plan discussed how illegal parking can lead to higher safety risk for local communities generally.¹⁴⁴ The 2024 Southern California plan discussed how freight negatively impacts air quality in the region, which contributes to health impacts such as asthma. The 2016 Seattle Freight plan discussed truck collisions as a particular issue that affects bikers and pedestrians, as they can lead to serious injury or death.¹⁴⁵

Lack of Knowledge About Freight Systems Among Stakeholders

A few plans discussed how a lack of knowledge about freight from various stakeholders has been a freight planning challenge. One example is a lack of knowledge among truck drivers. In the Baltimore metro region, some truck drivers are unaware of the location of truck weigh and inspection stations.¹⁴⁶ In the Chicago metro region, the lack of centralized and publicly accessible permitting requirements for truck drivers has led to some drivers simply not following the rules and driving in areas that are not meant to handle truck freight, leading to greater damage on roads and safety risk to pedestrians.¹⁴⁷ Beyond truck drivers, it was clear that in general, more needed to be understood about freight to better address freight issues. In the Greater Charlotte metro area plan, a lack of knowledge of best practices was one of a few challenges which limit effective incident management of the freight system.¹⁴⁸ In the Boston metro region's 2013 memo, a lack of freight data collection and analysis has limited the understanding of freight issues at the state and metro level.¹⁴⁹

Coordination of Freight Planning

Coordination of freight planning was part of discussions about challenges in a few plans. In the Greater Charlotte metro area, flawed coordination was mentioned as a bureaucratic issue which makes effective incident management harder to accomplish.¹⁵⁰ In the Atlanta metro region's 2016 plan, planning of freight facilities has not been completely harmonious with other land uses and respective population growth, resulting in many trucks sharing roads with other vehicles, increasing safety risk and contributing to inefficiency of the freight system.¹⁵¹ In the Chicago

metro region, peripheral industrial development in undeveloped areas is leading to concerns and conflicts about the loss of natural and agricultural resources.¹⁵² There is also a lack of incentive for local jurisdictions to alter regulations to support freight friendly land use due to the lower tax revenue they generate and the competition to use that land for other uses which are in demand (e.g., residential). In the San Francisco Bay area, complete street initiatives which strive to support multiple modes of transit can conflict with industrial users who desire streets to be easier for trucks to maneuver.¹⁵³

Freight System Resilience

Freight system resilience was a challenge discussed in a few plans. These discussions were often connected to environmental disruptions, but not always. In the Atlanta metro 2024 plan, extreme weather was a listed challenge, as it can result in the closures of structurally deficient bridges, resulting in detours and greater costs.¹⁵⁴ Both the Southern California 2024 plan and Seattle 2024 plan discussed the COVID-19 pandemic, which affected shipping patterns, including supply and location.¹⁵⁵ The Southern California plan also listed that the goods movement industry is threatened by theft and hacking of computer systems. The Seattle 2024 plan explained that there is a lot of industry which is located on wetlands, which make them particularly vulnerable to climate change impacts.

Workforce Shortage

Workforce shortages in the freight industry were mentioned as a challenge in a few plans. In the Baltimore metro White Paper, a truck driving shortage was listed as a challenge, as it is hard to recruit drivers because it involves an “away from home” lifestyle and requires drivers to be 21 years old or older to be able to cross state lines, making it harder to recruit younger drivers.¹⁵⁶ In the Greater Charlotte metro region, limited manpower was listed as one of a few reasons that limit effective incident management of the freight system.¹⁵⁷ In the Seattle 2024 plan, a workforce shortage was one of a few reasons which have contributed to a more unstable supply chain.¹⁵⁸

Height and Weight Restrictions

Height and weight restrictions for trucks were mentioned as a freight challenge in a few plans. In the Greater Charlotte metro region, size and weight limits in rural areas have been described as a challenge due to aging infrastructure conditions.¹⁵⁹ In the Boston metro region, height and weight restrictions on bridges were listed as a challenge.¹⁶⁰ These restrictions impact where trucks can and cannot go, limiting freight mobility. In the San Francisco Bay area, size and weight restrictions were found to be inconsistent in the road network.¹⁶¹ In the Seattle 2016 plan, height and weight restrictions were listed as a challenge as well.¹⁶²

2.5 Freight Planning Opportunities

The following includes detailed discussions of major freight planning opportunity themes found among plans. Major opportunity themes include last-mile delivery, e-commerce, and truck parking; educating stakeholders about freight; coordinated freight planning, workforce development, and capacity building; reducing toxic emissions; improving data collection and utilization; and infrastructure changes and better efficiency of the freight system.

Last-Mile Delivery, E-Commerce, and Truck Parking

Multiple plans discussed opportunities to support last-mile deliveries. These conversations were often connected to the topic of e-commerce. The Southern California 2024 plan mentioned that e-commerce is growing and is worth monitoring within the context of freight planning.¹⁶³ A similar sentiment was expressed in the Seattle 2016 plan, explaining that e-commerce and home deliveries are expected to continue rising, which could stimulate a diverse fleet of transport modes, including smaller trucks, rideshare, automatic vehicles, and bicycle fleets, along with smaller distributions centers.¹⁶⁴ In the Seattle 2024 plan, there has been a growing interest in and testing of last-mile delivery hubs which incorporate cargo-bikes.¹⁶⁵

Some opportunities were about providing space for truck parking in dense urban areas. The Baltimore metro White Paper discussed multiple opportunities, including providing delivery zones, relocating delivery locations to less congested areas, and encouraging off-peak delivery.¹⁶⁶ In the Chicago metro area, off-peak deliveries were also being discussed, with considerations for night-time deliveries and the respective security and staffing which may be needed to support them, along with cleaner, less noisy trucks.¹⁶⁷

Educating Stakeholders About Freight

A few plans discussed opportunities to increase education about freight to various stakeholders. This need for education was described for those directly involved in the freight industry as well as for those who may be impacted by freight externalities. The Baltimore metro White Paper discussed how educating truck drivers on truck weigh and inspection stations provides an opportunity to help increase use of those stations, which not every truck driver is aware of.¹⁶⁸ In the Greater Charlotte metro area, one opportunity discussed is educating elected officials and the public on freight.¹⁶⁹ In the Southern California 2024 plan, educational programs were discussed as an opportunity to communicate about various industries in the freight supply chain and how to transition into those industries.¹⁷⁰

Coordinated Freight Planning

Multiple plans discussed how there are opportunities to improve coordination of freight planning with other stakeholders. Including private sector stakeholders in the planning process was an opportunity discussed in plans from the Greater Charlotte, Southern California, Chicago, and Atlanta metro regions.¹⁷¹ The Greater Charlotte metro region also discussed opportunities for creating a protocol for a freight advisory committee, using agency partnerships to expand fuel efficiency programs, and coordinating freight planning with other types of plans, such as the Charlotte International Airport Strategic Development Plan.¹⁷² The Boston metro 2013 memo discussed how MAP-21 mandates require state freight planning to report how their efforts are coordinating with regional freight planning efforts.¹⁷³ In the Southern California 2024 plan, integrated land use planning was seen as an opportunity to improve freight system efficiency and support clean technologies.¹⁷⁴ In the Chicago metro region, public-private partnerships are seen as an opportunity to create pilot programs to test out new technologies.¹⁷⁵ In the Atlanta metro region 2024 plan, conversations with utility companies were seen as one of multiple opportunities to support the clean energy transition.¹⁷⁶

Workforce Development and Capacity Building

Multiple plans discussed opportunities to support or address workforce development and capacity building in the freight industry. In the Baltimore metro White Paper, addressing the gender and minority employment gap in the freight transportation industry was seen as an opportunity.¹⁷⁷ To recruit more drivers, there was also a recommendation to lower the age limit for truck drivers to cross state lines. In the Greater Charlotte Regional Freight Mobility Plan, creating incident management teams and task forces was seen as an opportunity to support emergency response.¹⁷⁸ In the Southern California 2024 plan, educational programs were seen as opportunities to help transition employees and increase workforce sustainability within the context of pursuing a clean energy transition.¹⁷⁹ The Atlanta 2016 plan expressed that changes in the global economy could add extra demand to the freight industry, which provides an opportunity to support employment and overall economic competitiveness.¹⁸⁰ In the Atlanta 2024 plan, pursuing workforce development was seen as an opportunity to support alternative fuels and electric vehicles.¹⁸¹ In the San Francisco Bay area plan, supporting the local economy, job diversity and creating local jobs were seen as opportunities.¹⁸²

Reducing Toxic Emissions

Multiple plans discussed opportunities to reduce toxic emissions of the freight industry. Some plans discussed the opportunity of cleaner, zero-emission, or electric vehicles. The Southern California 2020 plan stated that zero-emission technologies should be supported in the near and long term and that the development of the technology and the infrastructure to support that

technology is necessary.¹⁸³ In the Southern California 2024 plan, pursuing clean technologies was seen as an opportunity.¹⁸⁴ In the Chicago metro region, having municipalities push for stronger emission standards and acquire cleaner, less noisy trucks are seen as opportunities to support night-time deliveries.¹⁸⁵ This opportunity addresses not only the negative externality of toxic emissions but also noise pollution from heavy vehicles. In the Atlanta 2024 plan, multiple opportunities were discussed to support alternative fuels and electric vehicles, including expanding infrastructure, improving battery range, lowering upfront costs, providing incentives, facilitating workforce development, supporting smaller truck fleets, upgrading the electrical grid, advocating for increased funds, and communicating with utility companies and partnerships.¹⁸⁶ This opportunity demonstrates how transitioning vehicles involves not only the vehicles themselves but the infrastructure to support these vehicles. In the Seattle 2016 plan, reducing emissions was seen as a key opportunity for combatting climate change as truck volumes are expected to rise in the region.¹⁸⁷ Increasing fuel efficiency for air cargo shipments was also seen as an opportunity to lower operational costs. In the Greater Charlotte metro region, agency partnerships are seen as an opportunity to expand fuel efficiency programs.¹⁸⁸ Creating policy that addresses idling in freight districts is also seen as an opportunity. Similarly, reducing idling was described as an opportunity and recommended study topic in the 2019 Boston metro region memo.¹⁸⁹

Improving Data Collection and Utilization of New Technology to Support Innovation

A few plans discussed how improving data utilization is an opportunity to support freight planning. In the Boston metro region, intermodal stations are seen as a key opportunity to collect and analyze freight data and movement of trucks.¹⁹⁰ In addition, understanding distribution patterns of ocean shipments is seen as an opportunity to better understand the impacts of marine freight on the regional freight system. In the Greater Charlotte metro region, putting together a database to track commercial vehicle crashes is described as an opportunity.¹⁹¹ In the San Francisco Bay Area plan, ITS and connected vehicles were seen as opportunities to better utilize existing roadways.¹⁹²

A couple of plans also discussed the use of newer technologies as an opportunity. Both the Baltimore White Paper and the Seattle 2016 plan discussed autonomous vehicles as opportunities to innovate freight movement and support a diverse fleet of transportation modes.¹⁹³ The Baltimore White Paper also mentioned drones as an opportunity, which can help analyze freight network conditions.¹⁹⁴

Infrastructure Changes and Improving Efficiency

Multiple plans discussed opportunities to modify infrastructure and improve the efficiency of the freight industry. The type of infrastructure changes varied between plans. In the Baltimore White

Paper, improving the amenities that are at truck weigh and inspection stations, such as ensuring bathroom access, were discussed to help address the issue of truck parking.¹⁹⁵ In the Southern California 2020 plan and the Atlanta 2024 plan, the development of infrastructure to support zero-emission technologies was seen as an opportunity.¹⁹⁶ There is a need to expand the electric vehicle charging network to overcome range anxiety. In the Southern California 2024 plan, improving efficiencies in freight system infrastructure was seen as an opportunity to reduce emissions from goods movement.¹⁹⁷ In the Atlanta 2016 plan, adding new infrastructure at the Port of Savannah was seen as an opportunity to increase port capacity and efficiency.¹⁹⁸ In the Seattle 2016 plan, improving the efficiency of rail transportation was seen as an opportunity to support long-distance shipments.¹⁹⁹ In the San Francisco Bay Area plan, modernizing infrastructure was seen as an opportunity to support last-mile truck movements, rail connections, and improve safety of the freight system while providing job opportunities.²⁰⁰

2.6 Implementation

The following includes detailed discussions of major themes related to implementation found among plans. Major implementation themes include the following:

Funding from Federal Sources

Multiple plans discussed acquiring funding from federal sources as part of the implementation of freight planning strategies. The Baltimore White Paper discussed how funds from the National Federal Highway Program are used to fund Critical Urban Freight Corridors (CUFCs) and capital improvement projects, such as bridge reconstruction projects.²⁰¹ In addition, funds from the Moving Ahead for Progress in the 21st Century (MAP-21) bill have helped to pay up to 95% of the cost of interstate highway projects. Similarly, the Atlanta metro region 2016 plan also discussed using federal funding sources to support implementation, such as the Fixing America's Surface Transportation (FAST) Act to fund CUFCs.²⁰² In the Southern California 2024 plan, coordinating state and federal partners to access funding opportunities was an implementation strategy described to support intermodal freight investments.²⁰³ In the Chicago Regional Freight Direction Report, federal transportation funding programs, such as the Congestion Mitigation and Air Quality Improvement Program, were seen as a method to acquire funding to implement freight projects which support environmental justice.²⁰⁴ The Seattle 2016 plan also mentioned the FAST Act as a federal funding source to support implementation.²⁰⁵ In the San Francisco Bay area plan, federal sources identified to support implementation include the National Highway Freight Program (NHFP) and the Nationally Significant Freight and Highway Projects program.²⁰⁶

Funding from State Sources

A few plans also discussed funding sources from the state to support implementation. In the Atlanta metro 2016 plan, one state level funding source identified was the Georgia Transportation Funding Act of 2015, which supports transportation projects and is partially funded by state fuel taxes.²⁰⁷ In the Seattle 2016 plan, a couple state funding sources identified to support implementation include the Transportation Improvement Board and Freight Mobility Strategic Investment Board.²⁰⁸ In the San Francisco Bay Area plan, the State Transportation Improvement Program (STIP) is a multi-year capital improvement program which was listed as a state funding source for projects.²⁰⁹ In the Southern California 2020 plan, advocating for funding along with new legislation was seen as key for supporting implementation of new technologies.²¹⁰

Funding from Regional, Local, or Other Sources

A few plans discussed various strategies from regional, local, or other funding sources. Although these strategies differed considerably from one plan to another, whether it was by funding amount or source, the regional and local level funding strategies present in them demonstrated how there are many creative ways to fund freight planning at this level. In the Atlanta metro 2016 plan, Community Improvement District (CID) assessments were seen as a local funding strategy to support implementation of projects through taxing non-residential property based on its assessed value.²¹¹ In the San Francisco Bay Area plan, a voter approved sales tax to support transportation investments was described as an implementation strategy, along with cap-and-trade funds, bridge tolls, and the Mobile Source Incentive Fund, a fund administered by the Bay Area Air Quality Management District which provides grants for projects that reduce toxic emissions.²¹² In the Seattle 2016 plan, Move Seattle was discussed as a local levy which provides funds to help with maintaining streets and bridges and support the safety of travelers in the city.²¹³

Public–Private Partnerships

A few plans discussed public-private partnerships as a strategy to support project implementation by improving collaboration and minimizing risk of freight projects. In the Seattle 2016 plan, public–private partnerships were identified as a funding source, with one example being the partnership between the Port of Seattle and private railroads.²¹⁴ In the Atlanta metro 2016 plan, public–private partnerships were also mentioned as a method to minimize project risk and bolster projects which are applying for funding through the FAST Act.²¹⁵ In the Southern California 2024 plan, the Southern California Association of Governments (SCAG), a regional planning entity, was described as responsible for leading efforts to facilitate collaboration between multiple parties, including between public agencies and private railroad operators.²¹⁶

Project Prioritization Framework with a Mix of Quantitative and Qualitative Measures

Multiple plans discussed a project prioritization process or a prioritization framework as part of implementation. The formation and makeup of project prioritization varied significantly between plans but often connected to previously declared goals. Some prioritization was connected to funding. One qualitative measure which influenced project prioritization in the Atlanta metro region 2016 plan is if a freight project was financially feasible.²¹⁷ In the Seattle 2016 plan, projects which utilized multiple funding sources was one qualitative measure which influenced project prioritization.²¹⁸ The plan also specified what quantitative data would help assess which goals are being accomplished and where to find that data. Quantitative data measures included truck collision history, average daily truck volumes, and bottleneck analysis. The presence of community interest was another qualitative measure included in the prioritization framework of the Seattle 2016 plan.

Similarly, in the Atlanta metro region 2016 plan, a project prioritization process was developed by narrowing down projects based on the level of community support or opposition and their relevance to the freight or highway network.²¹⁹ The process also involved looking back at previous plans and feedback from a freight movement taskforce and the Atlanta Regional Commission Committee. Projects were also scored based on their potential to meet various goals, which each have their own respective weights toward the overall score. The Atlanta metro region 2024 plan carried over a similar project prioritization process: looking back at previous plans, identifying needs, and scoring projects based on what needs and goals were being addressed.²²⁰

Similarly, in the Greater Charlotte Regional Freight Mobility Plan, a project prioritization strategy was included with performance measures that assess what goals projects are being accomplished, as well as what level projects have a direct effect on the freight industry, are related to the freight industry, or are impacted by it.²²¹ Examples of performance measures included truck crash rate and hours of excessive delays to assess safety and environmental stewardship goals respectively.

Performance Measures that Connect to Freight Network Mobility, Efficiency, and Safety

Multiple plans discussed performance measures which assess the mobility, efficiency, and safety of the freight network in conversations about implementation. These measures were mainly discussed within the context of truck transport. In the Greater Charlotte metro area plan, measures included crash rate and hours of excessive delay.²²² In the Seattle 2016 plan, performance measures included travel time, bottleneck analysis, truck collision history, average daily truck volume counts, and quantity of major truck streets in solid condition.²²³ In the Seattle 2024 plan, performance measures included the number of crashes, the percentage of the freight

network that is operating reliably, and the percentage of major streets in fair or better condition.²²⁴ In the Boston metro area, toll reports have been a key tool for developing and conducting data analysis about heavy vehicles in the region.²²⁵ In addition, recommended study topics include highway interchanges, hazardous cargo routes, and intermodal facilities. In the Atlanta metro region 2024 plan, project criteria categories included freight cluster, freight network, and crash hotspot.²²⁶

A couple of plans included measures to account for reduction of toxic emissions. In the Southern California 2020 plan, emission reduction goals were included in various phases, with a final goal of net-zero emissions.²²⁷ In the Seattle 2024 plan, one specified measure was the percentage of zero-emission vehicles that are in the truck fleet.²²⁸

Assigning Responsibilities for Certain Stakeholders

A few plans described responsibilities for stakeholders implementing certain actions or strategies. These responsibilities increased accountability for strategies in plans. The Greater Charlotte Regional Freight Mobility Plan listed recommended actions and specified parties which are responsible for leading implementation of those actions.²²⁹ Similarly, in the Chicago Strategic Freight Direction document, there was a list of action items with a respective list of key implementers for each item.²³⁰ Responsible stakeholders specified in plans often included both public and private sector stakeholders. In the San Francisco Bay Area plan, key partners were identified along with their assigned roles to support implementation, which included federal, state, and local actors, agencies, the private sector, and business organizations.²³¹ In the Southern California 2020 plan, responsibilities for various agencies and partners were defined in order to achieve environmental goals.²³²

This concludes Chapter 2 of the report, which discussed research methods and summarized themes from freight planning documents from several U.S. metro areas or cities. Detailed summaries of each analyzed plan are included in Appendix A. Chapter 3 summarizes interviewee responses from freight planning professionals to uncover themes related to freight planning.

3. Interviews with Freight Planning Professionals

This chapter presents major themes discovered from interviews with freight planning professionals. Ten interviews were conducted with 14 freight planning professionals between June 2024 and February 2025 to gain insight into real-world sustainable freight planning strategies, as well as the challenges, opportunities, and implementations of these strategies.

3.1 Research Methods

Interview Procedure

The interview process was designed to capture perspectives from a diverse set of metropolitan regions and ensure that each case included at least one freight planning professional with direct, on-the-ground experience. These interviews provided important context for interpreting the themes identified in the freight plans and helped bridge the gap between documented strategies and real-world practice.

As interviews progressed, several common themes began to emerge across participants, particularly in relation to shared challenges, implementation barriers, and planning approaches. By the conclusion of the interview phase, the research team had gathered a consistent and sufficiently comprehensive set of perspectives across regions, allowing for meaningful analysis and comparison with findings from the document review.

Freight planning professionals were invited via email and phone call to participate in an interview; the former included an attached consent notice detailing the purpose of the study, procedures, confidentiality, participant rights, and contact information of the research team. No specific opinions or quotations in the report are attributed to any specific person. Interviews were conducted online via Zoom, where meetings were recorded and transcribed. In addition, notes were taken during interviews by another member of the research team. A list of interviewees is included in Appendix C.

The semi-structured interview protocol was designed to elicit both professional background information and in-depth insights into contemporary freight planning practice. Interviews began by establishing each participant's experience in the field, followed by questions exploring major challenges facing the freight industry and the perceived value of freight-specific planning at different governance scales. Participants were asked to describe how freight system performance is currently assessed, including the use of key performance indicators and, where applicable, environmental metrics. The discussion then focused on strategies used to address freight-related externalities and improve system resilience, including how resilience is conceptualized and measured in practice.

Additional questions examined how agencies balance freight mobility with competing multimodal priorities, particularly in the context of increasing emphasis on active transportation and public transit. Interviewees were also asked about the influence of federal funding programs on project development and maintenance decisions, as well as efforts to shift freight activity to alternative modes such as rail, maritime transport, or emerging last-mile solutions. The protocol further explored the role of new technologies in freight planning, cross-jurisdictional coordination efforts, and the criteria and processes used to prioritize and implement freight projects. Finally, participants were invited to reflect on future opportunities and anticipated trends in freight systems, they were asked to recommend additional experts who could contribute relevant perspectives to the study. A list of interview questions can be found in Appendix D.

The interview guide included brief prompts and illustrative examples to clarify key concepts—such as freight planning strategies, challenges, opportunities, and implementation measures—when needed. It also incorporated optional follow-up prompts to encourage deeper responses or elaboration where initial answers were limited. Interviews were structured to maintain focus on sustainable freight planning while allowing flexibility for participants to emphasize issues most relevant to their experience. Each interview followed a consistent flow, beginning with introductions and then moving into open-ended questions. Interviews concluded by inviting participants to suggest additional individuals with relevant expertise, supporting the expansion of the interview sample.

Interview Data Analysis

The coding process for the interviews was iterative and first involved a member of the research team taking notes of major points or themes during the interview, while another member of the research team asked questions, and if needed, followed up to clarify or expand on answers. Because the interviews were recorded, the research team could review them to clarify and supplement their notes. After interview notes were clarified, the same member of the research team scanned through interview notes and highlighted important points or themes that connected to sustainable freight planning, including strategies, challenges, opportunities, and implementation, as defined in Chapter 2. These themes were compared between interviews question by question to discover which of them occurred in most interviews. Lastly, interview recordings and notes were analyzed one last time to learn about the context of major themes mentioned by interviewees, which informed the discussion and analysis of the themes below. The findings of major sustainable freight planning themes found among interviews, along with respective interviewee perspectives on these themes, are provided below.

3.2 Freight Challenges

There were five major themes for freight challenges discovered among most interviews: 1) congestion or bottlenecks, 2) curb management, 3) transitioning to alternative fuels and electric vehicles, 4) truck parking, and 5) regulations. Other challenges that were mentioned to a lesser degree but were present in multiple interviews include a lack of knowledge or education among stakeholders, conflicting interests between different groups, truck driver shortages, fuel costs, safety, air quality, and equity.

Congestion/Bottlenecks

Congestion and bottlenecks were by far the most mentioned freight challenge in the interviews. One interviewee explained that some highway expansion efforts have been focused on alleviating bottlenecks. Another interviewee explained that alternate routes are needed to overcome height and weight restrictions which can limit the number of potential truck driving routes, contributing to congestion. The level of congestion can vary depending on the size of the population. Some interviewees from larger metro regions expressed that a larger population creates unique challenges, resulting in greater demand for both freight and passenger vehicles. Interviewees shared that congestion was observed both on freeways and in denser downtown areas. E-commerce has also contributed to the issue of congestion, according to several interviewees. Specifically, home deliveries have contributed to congestion as goods are being delivered to more destinations.

Curb Management

Curb management was another theme discussed by most interviewees. One interviewee explained that there are many other competing uses for curbsides which make it harder for trucks to complete deliveries, including hail-and-ride services, trash pickup, bicyclists, parked cars, public transit, and e-commerce deliveries. A couple other interviewees shared similar sentiments, explaining that curb management must allocate space for people and freight while balancing safety, which is a complex task with rising e-commerce demand and deliveries.

3.3 Regional/Local Freight Plan Benefits

Collaboration Between Various Types of Stakeholders

Multiple benefits were discussed for creating regional or local freight plans among interviewees. The most common benefits mentioned were increased collaboration between different stakeholders and increased awareness of freight. The creation of a regional plan can involve improved coordination between various types of stakeholders from different levels of government as well as the private sector and local community. Furthermore, a regional freight

plan can also compile together potential funding sources from various levels of government. Municipalities and counties can then take advantage of this pooled funding to support projects.

Increasing Knowledge and Awareness of Freight Among Stakeholders

Interviewees discussed how a regional plan can increase awareness of freight by providing information on the freight industry and new technologies, including data, guidance, resources, and performance measures, to assess freight challenges and help provide strategies to address them. This type of information can help inform other plans, such as transportation plans. The creation of a regional freight plan also provides opportunities to identify regional priorities in relation to freight to address regional and local concerns from various stakeholders.

Limitations of Regional or Local Freight Plans

Some interviewees warned that a regional or local freight plan may not always be the most appropriate. There were several reasons offered for this. For example, one interviewee was concerned that the follow-through for implementation of regional or local freight plans can be limited, as there is not always consistent support from the state to help with implementation. This connected to concerns about capacity, which may be more limited for smaller regional, local or remote areas. Another interviewee explained that larger geographical context matters, expressing that it may be more relevant in some cases for the state to create a plan versus a city. For example, truck freight is supported considerably by the state road network which cities do not have jurisdiction over, which would support the case for the state to facilitate a freight plan. This supports the claim made by multiple interviewees that regional and local plans can have more relevance and rigor when it comes to issues where they have jurisdiction over. For example, urban freight strategies are best addressed at the local level.

3.4 Freight Network Performance Measures

Freight Network Performance Measures Connected to Travel Time, Congestion, and Safety

When asked about key performance indicators to assess the freight network, multiple interviewees responded with general answers, stating that they follow state or federal indicators or requirements, such as MAP-21 requirements. However, several interviewees brought up similar indicators, including travel time delay and reliability, congestion and bottlenecks, and safety related metrics such as vehicle crashes. Many of the responses pertained to trucks versus other freight modes.

Environmentally Related Performance Measures

Some performance metrics mentioned were environmentally related. For example, several interviewees explained they are looking at carbon emissions that come from moving freight and their respective facilities. Others stressed that they are looking at the financial aspects of carbon emissions of the freight network, such as fuel costs wasted.

3.5 Freight Planning Strategies

Alleviating Congestion

When asked about strategies to mitigate the negative impacts of freight, alleviating congestion was the most common strategy discussed among interviewees. This is not surprising considering that congestion was also the top challenge mentioned by freight planning professionals. Having a well-designed freight network was seen as a key strategy to address this challenge. One interviewee explained that they have freight cluster plans to help increase the efficient movement of freight and reduce environmental impacts. Another interviewee explained they are studying areas with congestion in the freight network in collaboration with other stakeholders to identify opportunities for improvement.

Conducting Research to Better Understand Freight Issues and Potential Strategies

Multiple interviewees mentioned strategies where research was being conducted to better understand freight issues and behaviors. This research helps uncover problematic patterns which strategies can address. Some strategies even involve researching or testing new or innovative strategies. One interviewee mentioned a zero-emission truck infrastructure study was being pursued in their area. Another interviewee mentioned that they are collaborating with a university that is conducting research into alternative modes for delivery. Yet another interviewee brought up a similar strategy, highlighting a neighborhood delivery program which utilizes electric cargo bikes. Overall, there was a broad consensus among interviewees that research and pilot testing new ideas were important tools to design and maintain freight infrastructure.

Improving Safety

Multiple responses related to strategies to improve safety, highlighting a broader recognition that freight transportation planning must better account for multimodal conflicts and exposure to risk. A few interviewees mentioned Vision Zero, a program that aims to eliminate fatal collisions. Freight movement intersects with multiple other routes which support transportation of people, including passive and active transportation modes, increasing safety risk. Another interviewee brought up a different program which focuses on the rail network and includes grade

separations to reduce conflicts between passenger vehicles and freight trains. Together, these responses suggest that interviewees viewed infrastructure design and system coordination as critical components of improving freight-related safety outcomes.

Addressing Negative Externalities

A few interviewees explained that the negative externalities of freight are being addressed indirectly through other planning efforts, such as climate action plans and transportation plans. This makes sense, as freight planning involves transportation planning of goods and freight modes can emit toxic emissions that contribute to climate change. One interviewee explained that there is a green space plan to help green up industrial routes and busier routes. This strategy highlights how co-benefits can be provided to communities by considering land use and adding green space to freight routes. Other strategies mentioned by interviewees include transitioning to cleaner fuels and vehicles.

3.6 Resilience Strategies

Assessing or Clarifying the Freight Network

Responses about resilience strategies varied significantly from one interviewee to another, reflecting the diversity of approaches also observed in freight plans. At the same time, several common themes emerged, particularly around improving the definition, monitoring, and management of freight networks as a foundation for resilience planning. Some strategies focused on clarifying the freight network itself. One interviewee highlighted a master plan that identifies major truck routes, arterial roadways, and alternate routes on a regional level. Another interviewee shared that they established a freight network map defining major and minor truck streets, as well as first- and last-mile connectors.

In addition to network designation efforts, interviewees also emphasized the importance of system monitoring and data collection. For example, one interviewee mentioned using drones as a way of assessing the conditions of the freight network by looking at differences between images taken by drones during daily missions. Together, these responses indicate that resilience strategies often center on improving both the visibility and operational understanding of freight systems.

Climate Change Adaptation

A few responses about resilience were tied to the impacts of climate change, particularly about rising sea levels and flooding. Interviewees that discussed climate change often brought up climate resilience plans or strategies. One interviewee explained that a climate resilience strategy exists at the state level which considers extreme weather impacts and allows for emergency truck

parking in non-traditional spaces during extreme weather events. Overall, while interviewees generally acknowledged exacerbating risks from climate change, climate adaptation was predominantly viewed as a challenge rather than something local and regional governments are prepared to respond to.

The Challenge of Planning for Resilience

The challenge of resilience and strategies to address it were expanded upon by a couple of interviewees, who emphasized the complexity of planning for disruptions that extend far beyond local or regional boundaries. A recurring theme was that resilience planning requires coordination across scales that local and regional governments are not traditionally structured to manage. One interviewee warned that although it is important to look at things that are happening thousands of miles away that affect shipments, it is unclear what control, if any, can be established at the local level. Another interviewee explained that resilience is governed through multiple policies operating at different geographic and institutional levels, which can create inconsistencies in how resilience is approached.

At the same time, several interviewees agreed that more could be done in freight planning to improve the resilience of the freight network itself. Planning for resilience involves forward thinking and being able to anticipate and adapt to changing conditions or unexpected disruptions. No interviewee portrayed their respective areas as fully prepared to address resilience, but many said it is a challenge that should be addressed.

3.7 Balancing Freight Mobility & Multimodal Transportation

Collaboration Between Stakeholders & Assessing Curb Management

When asked about balancing freight mobility with multimodal transportation goals, interviewees frequently emphasized the importance of stakeholder collaboration and assessing curb management. Responses highlighted the need for coordination across agencies, sectors, and transportation modes to address competing priorities. For example, one interviewee explained that they have a community engagement team that helps with coordinating stakeholders, as well as a team that works on multimodal transportation, and that these teams try to work with other groups and programs to get expert feedback.

Multiple kinds of stakeholders were mentioned in interview responses. One interviewee explained that a comprehensive curb management study has been conducted which involved working with local jurisdictions and multiple counties and utilized a SWOT (strengths, weaknesses, opportunities, challenges) analysis. The same interviewee also brought up an integrative passenger and freight rail study, which looks at the needs of passenger and freight

rail and informs a rail traffic controller simulation tool used regionally. Together, these examples suggest that multimodal freight planning increasingly relies on collaborative and data-driven approaches to navigate complex operational tradeoffs.

The Challenge of Balancing Freight Mobility with Multimodal Transportation

Many interviewees expressed how challenging it is in general to balance freight mobility with multimodal transportation. Responses consistently described freight planning as involving competing priorities related to mobility, safety, environmental sustainability, and land use. One interviewee characterized the issue as a complicated balancing act to support freight movement while also improving safety and reducing environmental pollution. Several interviewees also pointed to conflicts between stakeholders and differing levels of support for multimodal strategies across jurisdictions. For instance, one interviewee noted that while the city has a robust list of activities to support complete streets and active transportation, surrounding areas are often less interested in alternative transportation modes.

Another interviewee explained that the state wants to limit the expansion of highways, despite growing freight demand, and the fact that it is not feasible to move everything to rail in the region. These tensions were especially evident in discussions of multimodal planning efforts, where interviewees described ongoing conflicts between municipal goals for pedestrian-oriented infrastructure and concerns from freight and industrial stakeholders about impacts on goods movement operations. For instance, one interviewee said the following:

I think the city really does put an emphasis on complete streets and ensuring that there are spaces for more vulnerable users and for pedestrians, really trying to encourage alternative uses. That at times does come into conflict with the freight community and we see that pretty frequently. There have been attempts to kind of mitigate a lot of those difficult conversations and tense negotiations that can happen. There's a couple examples that are working their way through right now where the business and industrial folks are just vehemently opposed to what the city is planning and it's gotten pretty nasty at times and we're going to see where it moves forward, how it moves forward.

3.8 Impact of Federal Infrastructure Bill

Federal Funding is a Significant Source Which Supports Maintenance and Improvements

Interviewees consistently emphasized the significant role that federal funding has played in advancing freight projects and supporting infrastructure investment. Responses highlighted how the federal infrastructure bill expanded access to grants and enabled jurisdictions to pursue projects that otherwise may not have been financially feasible. Several interviewees noted that

the availability of federal grants has been especially important for large capital projects, with one interviewee explaining that federal programs can cover up to 95% of interstate project costs and 90% of non-interstate freight project costs.

Beyond funding individual projects, interviewees also described how federal investment has expanded local and regional capacity to simultaneously maintain existing infrastructure while pursuing new construction and modernization efforts. Some responses further suggested that the growing federal emphasis on maintenance funding represents a relatively recent shift that has broadened the range of freight-related projects eligible for support. Collectively, interviewees portrayed federal funding as a foundational mechanism enabling freight infrastructure improvements across multiple scales.

Challenges of Acquiring Federal Funds

As helpful as federal funding can be, multiple interviewees discussed the challenges to acquire that funding. A recurring theme was that pursuing grants requires considerable administrative capacity, staff time, and technical expertise. Several interviewees noted that organizations must dedicate significant staffing resources to preparing applications and managing grant cycles, while high staff turnover can make it difficult to maintain continuity in these efforts. Interviewees also pointed to the influence of shifting political priorities at the federal level, which can affect how projects are framed and evaluated for funding eligibility. One interviewee explained that changing political conditions may require agencies to strategically adapt how they describe freight and goods movement benefits in grant applications, particularly when balancing freight justifications with transit-oriented or multimodal objectives:

[...] we know there is going to be funding changes and how we describe our network and how it supports freight and goods movement may well be a key factor as to qualification for grant opportunities. That being said, we can only go so far with goods movement as a reason for improving a roadway that is very highly transit oriented. So we will have to be very choosy about how we take on descriptors.

In addition to application challenges, implementing federally funded projects can also pose their own challenges once funding is secured. Several responses highlighted rising project costs, delays, and the piecemeal nature of assembling funding packages from multiple sources. Inflation was identified as a major concern, with one interviewee describing a grade separation project whose estimated cost increased by 40% over several years. These responses suggest that while federal funding can unlock major freight investments, the administrative complexity, political uncertainty, and escalating costs associated with these projects can create significant implementation challenges.

3.9 Shifting Freight Volume to Alternative Modes

Cargo Bikes

Multiple interviewees discussed cargo bikes in discussions about shifting freight volume to alternative modes. Several interviewees mentioned that they are exploring pilot projects and research on cargo bikes. Bikes can provide freight deliveries on a smaller scale but with greater mobility. Like other freight modes, implementing cargo bikes can involve a collaborative approach. One interviewee expressed that an integrated planning approach is in place where they try to leverage input from other people or teams, including those that focus on biking. Cargo bikes can particularly be an opportunity in denser urban areas, such as downtown or midtown areas, which may be harder to access by other modes such as freight trucks. However, while complete street initiatives can be successfully pursued in cities, supporting alternative modes outside the city can be a challenge, as expressed by one interviewee:

The city [...] it's got a much more robust set of activities to support complete streets, active transportation. You go to some [other] areas. 'I don't even want to hear about a bike or a sidewalk. We're all about the roads here.' This goes part and parcel with what folks prioritize around roads and the way the scoring happens regardless of where you are, at state level, it's going to be biased toward roads generally speaking. You got to really pushback, go against the tide, to get some of these other modes addressed, do a more balanced approach.

Rail and Maritime Transportation as Alternative Freight Modes

Rail and maritime transportation were also frequently discussed as important alternatives for shifting freight away from truck-dependent systems. Interviewees described a range of infrastructure investments intended to expand rail freight capacity and improve intermodal connectivity. For example, one interviewee mentioned that they are working on reconstructing a tunnel to support the double stacking of trains. This will help increase freight delivery capacity by modifying the freight network to support rail freight. Another interviewee explained that rail infrastructure is being added by private companies to the east of the region and are collaborating with inland ports to support rail. Responses often emphasized the economic efficiency of rail freight for long-distance shipments, with one interviewee noting that rail becomes more economically advantageous than trucking for trips exceeding approximately 500 miles.

Interviewees also highlighted the importance of intermodal systems that connect rail, maritime, and truck transportation. Several responses suggested that expanding railyards, inland ports, and port-related infrastructure can reduce truck dependency while improving overall freight system efficiency. At the same time, interviewees acknowledged that rail is unlikely to fully replace

trucking because trucks remain necessary for first- and last-mile deliveries. Collectively, these discussions framed rail and maritime transportation as important strategies for diversifying freight movement and reducing pressure on roadway networks.

3.10 Emerging Technologies

Communicating Using Intelligent Transportation Systems (ITS) and Improved Traffic Signals

Interviewees frequently discussed Intelligent Transportation Systems (ITS), transportation systems management and operations (TSMO), and traffic signal improvements as important emerging technologies for improving freight network efficiency and resilience. Responses from multiple regions emphasized the growing role of operational strategies and real-time system management in addressing congestion and disruptions within freight systems. Several interviewees highlighted ITS and TSMO initiatives already being implemented or expanded, while others identified signal modernization as a key opportunity for improving freight movement.

A recurring theme across interviews was that many freight mobility challenges stem less from inadequate roadway capacity and more from limitations in operational responsiveness. One interviewee explained that congestion often reflects the need for better incident management and quicker responses to disruptions rather than the need for additional infrastructure capacity. Others discussed how improved traffic signaling and connected vehicle infrastructure could help optimize traffic flow and freight operations. At the same time, interviewees also noted implementation challenges, particularly during the COVID-19 pandemic, when supply chain disruptions made it difficult to acquire materials such as computer chips needed for signal and connected vehicle upgrades. Collectively, these responses suggest that emerging operational technologies are increasingly viewed as central to improving freight system performance, though deployment remains dependent on broader technological and supply chain conditions.

Electric and Autonomous Vehicles

Electric and autonomous vehicles also emerged as important themes in discussions about freight-related technological innovation. Interviewees described ongoing efforts to electrify freight fleets and reduce emissions associated with goods movement. For example, one interviewee explained that there are already electric Amazon delivery trucks being used and there is an interest in cleaning up the truck fleet, which could be an initiative led by the state. These responses framed electrification as both a technological and environmental strategy with implications for freight sustainability and public health.

Autonomous and connected vehicle technologies were similarly discussed as part of long-term planning efforts. Several interviewees referenced autonomous vehicles in the context of

emerging freight strategies, with one noting the existence of a dedicated connected and automated vehicle group focused on preparing for future deployment. Together, these responses indicate that interviewees viewed electrification and automation as evolving technologies that may significantly reshape freight operations, infrastructure needs, and planning priorities over time.

3.11 Cross Jurisdictional Collaboration and Partnerships

Cross Jurisdictional Collaboration Can Include Multiple States, MPOs, DOTs, Municipalities, Communities, Collaborative Groups, and Peer Exchanges

Interviewees consistently emphasized the importance of cross-jurisdictional collaboration for addressing freight mobility challenges that extend beyond municipal or regional boundaries. Responses illustrated that freight planning frequently involves coordination across large geographic areas and among a wide range of organizations, including states, metropolitan planning organizations (MPOs), Departments of Transportation (DOTs), municipalities, communities, and regional partnerships. Several interviewees described working with neighboring states, MPOs, and DOTs on freight-related initiatives, while others referenced collaborative programs such as freight subcommittees, traffic operations groups, mobility alliances, and megaregional working groups.

Interviewees also highlighted more informal forms of collaboration, including peer exchanges, webinars, and coordination with local municipalities and community organizations. Some responses acknowledged that collaboration has not always been consistent or seamless. Nevertheless, many interviewees emphasized that cross-jurisdictional partnerships create opportunities to engage diverse stakeholders and address large-scale freight challenges such as truck parking, climate adaptation, and regional mobility. Interviewees further noted that collaborative efforts can strengthen funding opportunities and support projects aimed at improving freight network safety and efficiency. Overall, responses suggest that freight planning increasingly depends on institutional coordination that extends across political and administrative boundaries.

3.12 Implementation Steps and Criteria

Transportation Improvement Programs (TIPs)

Transportation Improvement Programs (TIPs) were frequently discussed as important mechanisms for implementing and funding freight-related projects. Interviewees described TIPs as key pathways through which cities and regions can secure funding for transportation investments. One interviewee explained that cities can apply for funds to support projects

through a TIP application process, which scores projects with freight-related criteria such as safety and key roadways. Another interviewee similarly described the TIP as a critical revenue source and noted ongoing efforts to incorporate additional freight-related projects into the program. Collectively, these responses suggest that TIPs serve not only as funding tools but also as mechanisms for prioritizing freight investments based on regional planning objectives.

Collaborations and the Limited Implementation Power of Metropolitan Planning Organizations

Multiple interviewees discussed the limitations of implementing projects as a Metropolitan Planning Organization (MPO) and shared how they collaborate to support implementation. A recurring theme was that MPOs often play coordinating and advisory roles rather than possessing direct authority over project construction or implementation. Several interviewees explained that their organizations support long-range planning, collaborate with local jurisdictions and state DOTs, and provide technical assistance or policy guidance despite limited implementation power. Responses from both East Coast and West Coast interviewees emphasized that MPOs frequently rely on partnerships with local governments and state agencies to move projects forward. These discussions suggest that collaboration is essential for freight implementation because institutional authority is distributed across multiple levels of government.

Critical Urban Freight Corridors (CUFCs)

Critical Urban Freight Corridors (CUFCs) emerged as another important implementation-related topic. Interviewees described CUFC designation as both a planning tool and a funding opportunity tied to federal freight programs. One interviewee explained that, as an MPO, they have some control over choosing CUFCs, which are also seen as a funding opportunity. Another interviewee expressed a similar sentiment, explaining that as a regional planning entity, they work with the state DOT to identify CUFCs, which are eligible for federal funds. These responses suggest that CUFCs help regions strategically prioritize freight infrastructure investments while improving access to external funding sources.

Freight Network Efficiency and Safety Criteria

When discussing implementation criteria, interviewees most commonly referenced quantitative indicators related to freight efficiency and safety. Responses highlighted the use of freight clusters, bottleneck analyses, and crash data to identify project priorities and guide infrastructure investment decisions. Several interviewees emphasized that detailed freight network analysis enables planners to pursue targeted “spot improvements” that may be more feasible and cost-effective than larger infrastructure projects that trigger more complex planning processes.

Safety-related metrics were also frequently discussed alongside efficiency indicators. One interviewee noted that safety is a formal criterion within TIP evaluations, while another described

using crash data to identify opportunities to reduce injuries and fatalities. Together, these responses indicate that implementation decisions are increasingly driven by data-oriented approaches focused on improving freight mobility while also addressing safety concerns.

Local Levies

A couple interviewees brought up local levies or taxes as part of the implementation discussion. They can be a creative way to fund projects at the local level if municipalities have been granted the authority or approval, whether by the community or the state. One interviewee explained that there is a sales tax that is being used to fund transportation projects, but it comes with its own limitations:

[...] we have voter approved local sales tax measures that are really driving a lot of the investments around the region in terms of transportation. There are pros and cons with using sales tax measures to fund transportation. One of the things they come with is a set list of projects. The way you get the voters to approve it is that you spread out the benefits through all the different projects. So that's the sort of a limitation in our ability [as an MPO] to influence project prioritization is that we have these commitments over several decades that are established already.

This implementation strategy can come with its own long-term commitments. Thus, freight planners must think ahead if they plan to utilize a funding strategy that is tied to certain agreements and lacks scope flexibility.

3.13 Freight Planning Opportunities

Electric Vehicles and Charging Stations

Multiple interviewees discussed electric vehicles and charging stations in discussions about opportunities to improve freight mobility, sustainability, and resilience. Responses highlighted truck electrification as a strategy for reducing environmental burdens and addressing disproportionate impacts on affected communities. Because trucking remains the dominant freight mode and a major source of freight-related emissions, interviewees viewed electrification as a particularly important area for future investment.

Several interviewees discussed opportunities related to zero-emission trucks, workplace charging, and charging infrastructure upgrades. At the same time, responses emphasized the substantial infrastructure investments needed to support widespread electrification, including major electrical system upgrades. Some interviewees also suggested that tax subsidies and partnerships with the private sector could help accelerate deployment of charging infrastructure. Collaboration emerged as a recurring theme, with interviewees discussing the need to coordinate

with private companies to expand charging access, including curbside charging opportunities. However, some responses also acknowledged challenges, such as private-sector reluctance to share charging facilities with outside users. Overall, interviewees framed electrification as a promising but complex transition requiring both public and private coordination.

Improving Efficiency of the Freight System

Improving freight system efficiency was another commonly discussed opportunity. Interviewees emphasized strategies aimed at maintaining reliable goods movement while minimizing congestion and operational disruptions. Responses included examples such as replacing toll booths with electronic tolling systems to reduce travel delays and fuel consumption, as well as using real-time traffic data to support dynamic rerouting during congestion or incidents.

Several interviewees also discussed future operational strategies such as truck platooning and broader traffic management improvements. One interviewee noted that freight transportation has fewer modal alternatives than passenger transportation, making operational efficiency especially critical for the freight industry. Together, these responses suggest that improving efficiency is viewed as essential not only for economic competitiveness but also for supporting broader sustainability and resilience objectives.

Improving Stakeholder Knowledge of Freight

Some interviewees identified public understanding and stakeholder awareness as important opportunities within freight planning. Responses suggested that improving communication about the role of freight systems could help build support for freight-related investments and policies. One interviewee expressed that a better marketing strategy could be implemented to better communicate the importance of trucks and why they have to be on the road to support delivery of everyday goods. Another interviewee shared a similar sentiment, explaining that although people may perceive moving freight as loud and smelly, it is necessary to support freight. These discussions indicate that increasing stakeholder awareness may help address conflicts surrounding freight infrastructure and operations.

Improving Resilience of the Freight System

Interviewees also highlighted opportunities to strengthen freight system resilience. Responses emphasized the importance of interconnected transportation networks capable of adapting to disruptions and maintaining continuity during extreme events. One interviewee explained that network connectivity is fundamental to resilience because it provides alternative routing options when disruptions occur. Another interviewee emphasized the growing importance of considering sea level rise and other climate-related disruptions that may affect freight routes and infrastructure. Collectively, these responses suggest that resilience planning is increasingly

viewed as a necessary component of long-term freight system management and infrastructure investment.

3.14 Freight Plans vs. Freight Interviews

While the freight plans provided a good comprehensive summary of the freight planning strategies, challenges, opportunities, and implementation measures that municipalities and metro areas were planning for, or at least expressed interest in, the interviews allowed for deeper conversations about certain themes and often helped clarify the feasibility and efficacy of strategies—or if they were even being pursued at all. Interviews provided specific real-world experiences and helped to clarify local geographical differences in execution. For example, some interviewees expressed certain freight planning strategies or policies being more effective or accepted in inner core areas versus surrounding areas.

A couple of interviewees even expressed skepticism of the effectiveness of a regional or local freight plan, as they expressed concerns about consistent implementation and capacity to support the plan. The interviewees that expressed this concern often had regional plans which were struggling with implementation and had certain strategies in the plan which were not being acted upon. With that said, the themes and topics freight planning professionals brought up in interviews in most cases could be connected to a theme or concept brought up in a regional or local freight plan. Thus, the freight plans and interviews were complementary to each other, and it was rare when an interviewee brought up a freight planning theme which was not already previously mentioned in the respective region's freight plan.

One of the strongest discoveries found in the freight interviews is the conflict that can arise among various stakeholders, whether it is the business community, communities in suburban areas, etc. These reflections provided more details on the political challenges that the freight plans only touched upon. Stakeholders can and often do disagree on planning priorities, and funding accessibility can change with changing government administrations at various levels. This tension among stakeholders adds additional challenges to freight planning, which in some cases, according to the interviewees, were happening in real-time and ongoing. Interviewees did not always have clear answers to how these challenges would be resolved, but those who did expressed that partnerships with various stakeholders and being able to adapt and modify strategies were effective.

This concludes Chapter 3, which summarized major freight planning themes discovered from interviews with freight planning professionals. Chapter 4 summarizes major themes from freight planning documents and interviews with freight planning professionals, culminating in a sustainable freight planning toolkit which offers recommendations to support a sustainable goods movement. Research limitations are also discussed.

4. Summary & Conclusions

The content analysis of 13 freight planning documents revealed consistent patterns alongside notable differences in focus and depth. Across plans, trucks and rail were the most frequently discussed freight modes, while maritime transport, cargo bikes, and drones appeared far less often. The sectors and commodity flows addressed varied by region, but nearly all plans framed freight as a driver of economic growth and regional vitality.

Themes related to environmental stewardship and mitigation of externalities appeared inconsistently—some plans integrated them into core strategies, while others mentioned them only in passing. Most plans addressed stakeholder engagement and community impacts but often in generalized terms, with limited discussion of how strategies might specifically address the needs of disadvantaged or overburdened communities.

Technology and innovation themes were most often tied to improving freight data acquisition, management, and analysis—reflecting a widely shared emphasis on enhancing information systems to guide decision-making. Implementation strategies frequently included funding approaches, project prioritization frameworks, and performance assessments with qualitative and quantitative metrics.

Building on these findings and insights from interviews with freight planning professionals, this report offers a Sustainable Freight Planning Toolkit. This resource is not a prescriptive formula; rather, it provides adaptable strategies, identifies common challenges, highlights emerging opportunities, and outlines implementation approaches for planners, municipalities, MPOs, and other stakeholders working to advance sustainable freight systems in their specific regional and local contexts.

4.1 Sustainable Freight Planning Toolkit

This section distills the most significant findings from the content analysis and interviews into a practical resource for freight planners and decision-makers. The toolkit organizes key themes into four categories—strategies, challenges, opportunities, and implementation approaches—providing concise, evidence-based guidance that can be adapted to different regional and local contexts. While not intended to prescribe a one-size-fits-all approach, it highlights the actions, constraints, and enabling conditions most frequently identified across the reviewed plans, offering a foundation for building more sustainable, resilient, and equitable freight systems.

Freight Planning Strategies

The following strategies represent the most commonly identified and broadly applicable actions in the studied regions. While individual regions will tailor them to local conditions, these approaches provide a foundation for sustainable, efficient, and equitable freight systems.

1. **Communicate freight's role, benefits, and impacts clearly to diverse stakeholders:** Several plans and interviewees recognized that public understanding of freight is limited, and they emphasized education to build awareness among elected officials, community members, and private-sector partners. Clear, accessible communication supports buy-in for freight projects and ensures broader recognition of freight's economic and community impacts.
2. **Define and clarify the regional or local freight network:** Explicitly mapping and describing the freight network (roads, rail lines, ports, intermodal facilities) enables better prioritization of investments and coordination across jurisdictions. This practice was common in stronger plans, often linked to project selection and performance tracking.
3. **Address truck parking shortages:** Shortages were frequently cited by both plans and interviewees, with strategies including expanding dedicated facilities, identifying underused parcels for truck parking, and integrating parking into broader freight and land use plans. Addressing this need supports safety, efficiency, and compliance with driver hours-of-service regulations.
4. **Foster multi-sector and multi-jurisdictional collaboration:** Effective freight planning often involved coordination among MPOs, state DOTs, municipalities, neighboring states, community groups, and industry stakeholders. Peer exchanges and collaborative groups facilitated knowledge sharing and alignment of cross-border freight priorities.
5. **Integrate freight considerations into other plans and initiatives:** Freight themes were most effectively addressed when integrated into regional transportation plans, economic development strategies, and climate action initiatives. This integration helped align freight goals with broader sustainability and mobility objectives.
6. **Reduce emissions:** Some plans incorporated measures such as cleaner engines, idle reduction, and low-emission zones to mitigate air quality impacts and/or reduce greenhouse gas emissions. Linking these measures to public health benefits was especially compelling when addressing environmental justice concerns.
7. **Incorporate high-quality freight data:** Data collection and analysis were common strengths, with plans using freight flow models, GPS data, and stakeholder surveys to

inform project prioritization. Robust data support targeted investments and helps monitor outcomes.

8. Increase rail utilization: Improving the efficiency and capacity of rail freight was identified as a way to reduce truck traffic, emissions, and roadway wear. Strategies included rail siding extensions, grade separation projects, and intermodal facility enhancements.
9. Strengthen system resilience: Plans highlighted climate adaptation, hazard mitigation, and redundancy as key elements of resilience. Strategies included identifying alternative routes, hardening infrastructure against flooding, and updating design standards for extreme weather.
10. Advance environmental justice: While few plans explicitly addressed EJ, those that did recommended targeting mitigation in communities disproportionately affected by noise, air pollution, and truck traffic. This includes siting freight facilities away from sensitive land uses and implementing localized emission-reduction programs.
11. Balance freight mobility with multimodal land use goals: Several plans acknowledged the tension between goods movement and walkability, cycling, and transit access. Recommended strategies included freight-specific street design guidelines and designated delivery windows to reduce conflicts.

Freight Planning Challenges

Freight planning is shaped as much by its constraints as by its opportunities. The challenges below were consistently identified in the studied regions as critical barriers that must be addressed to ensure efficient, safe, and equitable goods movement.

1. Limited and insecure truck parking: Widespread concern among plans, as it contributes to longer travel times and parking in areas which increase safety risk to drivers and pedestrians. This issue is exacerbated by growing freight volumes and limited urban space.
2. E-commerce–driven curb space competition: Growth in deliveries intensifies competition for loading zones, creating conflicts with passenger and transit uses.
3. Chronic congestion and freight bottlenecks: Delays at major corridors and interchanges reduce system efficiency and increase operating costs.
4. Aging and under-maintained infrastructure: Deferred maintenance of bridges, pavement, and terminals undermines safety and reliability.

5. At-grade rail crossings: Persistent safety hazards and delays occur for both freight and passenger traffic at crossings where multiple transit modes intersect, resulting in bottlenecks and increased risk of collisions.
6. Greenhouse gas and pollutant emissions: Freight is a significant contributor to transportation emissions, with localized impacts in freight corridors.
7. High costs and slow adoption of electric/alternative-fuel vehicles: Infrastructure needs such as EV-chargers and upfront vehicle costs are barriers affecting the pace of electric/alternative-fuel vehicle adoption.
8. Disproportionate burdens on vulnerable communities: Noise, emissions, and truck traffic is often concentrated in low-income or minority neighborhoods.
9. Limited freight awareness among decision-makers/public: Lack of knowledge about freight and goods movement hinders the prioritization of freight in transportation funding and planning.
10. Fragmented freight planning coordination: Lack of alignment between jurisdictions can lead to missed opportunities.
11. Vulnerability to disruptions: Extreme weather, accidents, and supply chain shifts can cause significant impacts.
12. Workforce shortages: Driver and logistics labor shortages were identified as a risk to freight reliability.
13. Restrictive vehicle height/weight limits: Constraints on certain corridors limit efficiency.

Freight Planning Opportunities

Despite persistent challenges, this research identified promising areas for innovation, efficiency, and sustainability. The opportunities below represent practical entry points for advancing freight system improvements that also yield community and environmental benefits.

1. Support efficient, low-impact last-mile delivery solutions: Plans identified cargo bikes, micro-distribution centers, and consolidated delivery programs as promising approaches.
2. Integrate e-commerce growth with truck parking and curb management: Addressing these together helps avoid displacement of essential freight functions.
3. Expand freight education: Training for public officials, planners, and community groups helps improve freight policy decisions.

4. Improve cross-jurisdiction coordination: Collaborative data sharing and joint project planning can reduce duplication and enhance efficiency.
5. Develop workforce programs: Training in emerging technologies and sustainable freight operations builds resilience.
6. Reduce toxic emissions: Lowering freight emissions minimizes environmental and public health impacts, whether it is through reducing vehicle-miles-traveled and/or implementation of clean truck programs and incentives for zero-emission equipment.
7. Enhance data collection and use: Leveraging advanced analytics, sensors, and modeling helps identify freight data patterns and contributes to more informed decision-making.
8. Upgrade infrastructure for efficiency: Examples include grade separations, improved intermodal connections, and ITS systems.
9. Support alternative modes: Investment in rail, maritime, and non-motorized freight can diversify and decarbonize the system.

Implementation

Turning strategies and opportunities into results requires clear, well-resourced implementation. The approaches below reflect the mechanisms, partnerships, and tools identified in the reviewed plans as essential to delivering sustainable freight improvements.

1. Leverage multi-level funding: Federal, state, regional, and local sources combined for project delivery.
2. Public-private partnerships: Used to share costs and risks, especially for terminal and technology projects.
3. Transparent project prioritization: Combining qualitative stakeholder input with quantitative performance metrics.
4. Performance measures linked to outcomes: Metrics such as travel time reliability, bottleneck delay, crash data, and CO₂ emissions.
5. Clear stakeholder roles: Assigning responsibilities improves accountability in plan implementation.
6. Designate Critical Urban Freight Corridors (CUFCs): Focus investments and align with federal freight programs.

7. Integrate freight into TIPs and signal optimization: Ensures freight needs are addressed in broader transportation programs.
8. Conduct targeted local studies: Identify corridor-specific or community-specific issues and solutions.
9. Pilot projects: Test strategies such as low-emission zones or delivery consolidation before scaling up.

4.2 Research Limitations

There were multiple limitations to this study. The sampling approach completed has both strengths and limitations. A key strength is the inclusion of metropolitan areas from multiple regions of the United States, offering a broad national perspective on freight planning priorities and strategies. The focus on major freight hubs reflects the study's emphasis on regions where freight activity is most intensive and where formalized metropolitan freight planning efforts are more common. However, this approach necessarily excludes smaller metropolitan areas and cities that may address freight in different or innovative ways but lack standalone metropolitan freight plans or comparable documentation. In addition, while some large cities have developed city-level freight plans, these were not systematically included in the sample due to the study's emphasis on metropolitan-scale governance and, in some cases, practical constraints related to data access and stakeholder engagement.

As a result, the findings should be interpreted as reflecting freight planning practices in major U.S. metropolitan freight hubs rather than all urban contexts. Although there was an attempt to choose metro areas and cities located throughout the United States, only eight metro areas were selected as a part of this study based on our inclusion and exclusion criteria. Thus, this study does not provide an analysis of all the different freight plans which may exist in other metro areas, something which could be explored in future studies.

The dates of freight plans included in this study differ considerably, with the earliest plan being drafted in 2013 and the most recent plans being drafted in 2024. Providing plans from various years provides an opportunity to discover differences between older and recent plans. However, it is more difficult to directly compare plans, especially when it comes to more recent issues such as the COVID-19 pandemic (which cannot logically appear in plans preceding 2020) and e-commerce curb management, which may be featured more prominently in newer plans. The research team made a conscious effort to include complementary documents and add more recent plans into the report within the collection period ending in March 2025. Any plans published after this period might have been missed.

Some metro areas were examined through multiple plans, whether through examining a more recent plan or a complementary planning document which is supposed to work in conjunction with another plan. Some metro areas were examined through only a single plan. Thus, the freight planning analysis was not even between metro areas. In addition, freight plans varied in type and length; some were simply White Papers or memos, while others were larger plans exceeding 100 pages. Some included detailed maps and appendices, whereas others included minimal figures and tables. This helps explain why some freight plan summaries are more detailed or include more graphics than others. However, these differences make it harder to directly compare and contrast plans and metro areas.

The research team was diligent in ensuring interview responses were received from metro areas in which planning documents were being analyzed as part of this study. Some metro areas included interview responses from one freight planning professional, but a few interviews or metro areas had responses from more than one person. Group interviews occurred when an interviewee would invite a colleague to be on the Zoom call. This colleague played a supporting role during the interview, only answering questions when the interviewee requested additional input. Ultimately, the interviews were designed to be answered by one person, and any input which was provided by another person only occurred when the interviewee requested additional input and was uncertain of the answer. Thus, the amount of interview responses received is not evenly distributed among metro areas. This is worth noting when considering the context of the interview responses, which may disproportionately reflect perspectives from certain areas of the country where more interview responses were received. Potential future research could involve interviews in cities and metro areas which were not covered in this report.

Although criteria were developed to distinguish the prominence of themes in plans in a way that is consistent between plans, the decision of whether a theme was prominent is ultimately subjective and thus vulnerable to human error. Plans were reviewed multiple times to ensure the content analysis was completed as precisely and consistently as possible. The researchers tried to be lenient and flexible with whether a theme was present or absent in a plan by considering other similar words or concepts related to the theme, and they utilized search tools to find themes which may have been missed initially when reviewing documents. The researchers also tried to not spend significantly more time on longer plans compared to the shorter plans. However, this leaves room for potential error in the content analysis process, as some parts of the larger plans had to be skimmed and were not looked at as closely as some of the shorter plans.

Finally, a good topic for future research is seeing how the freight planning strategies, challenges, opportunities, and implementation measures compare and contrast across different disciplines and addressing these themes in practice. Unfortunately, this was beyond the scope of this study.

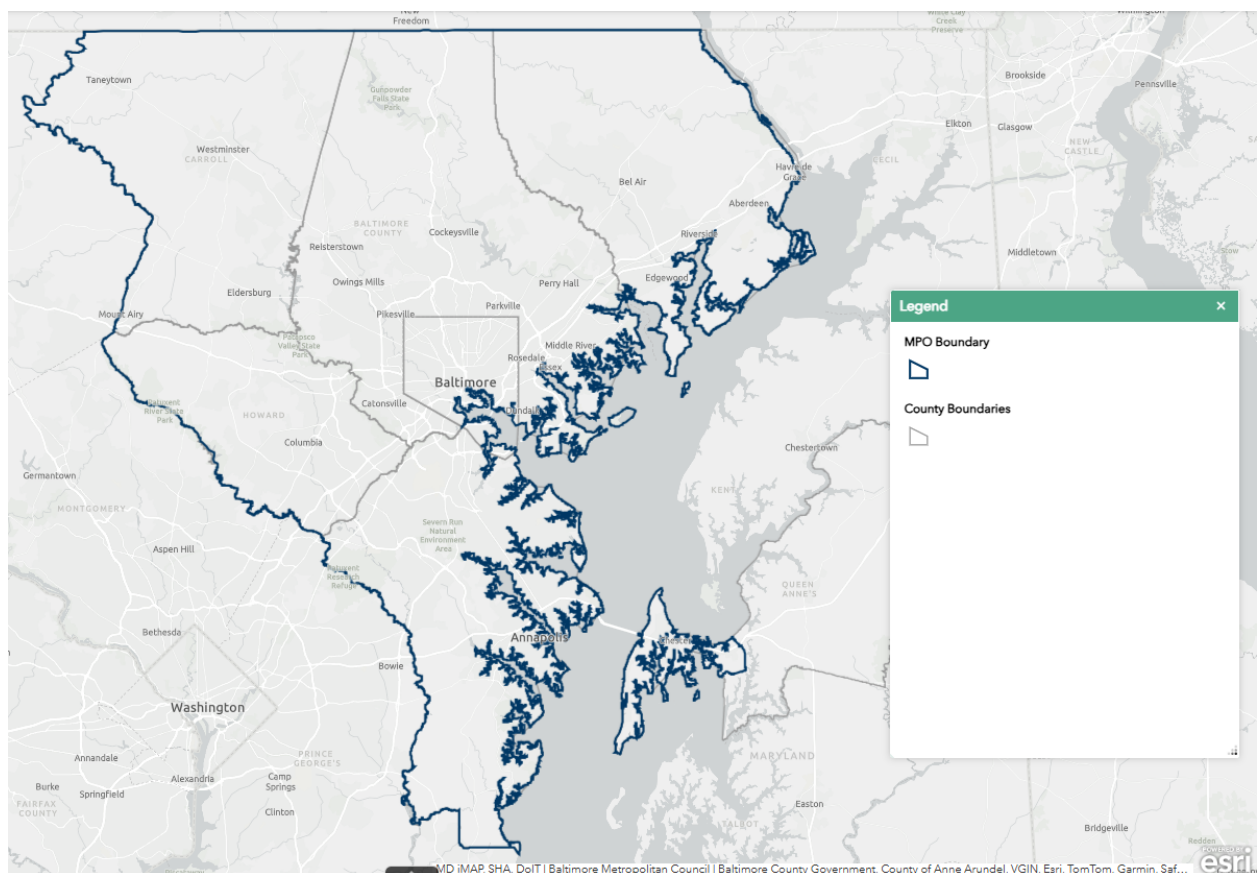
5. Appendix A: Individual Freight Plan Summaries

5.1 Baltimore Metro: *Resilience 2050: Adapting to the Challenges of Tomorrow* (2022)

Introduction/Background

The Baltimore Metro region centers around the city of Baltimore and resides in the state of Maryland. According to the U.S. Census Bureau, the population in the Baltimore-Columbia-Towson Metro Area was estimated to be 2,834,316 in 2023.²³³ A map of the region is shown in Figure 1.²³⁴ The region supports national and international demand for goods through four freight modes: rail, air, water and highway, which supports multi-modal transport.²³⁵ Within the Baltimore region, gasoline is the top product shipped by weight, followed by gravel and non-metal minerals. In terms of value, gasoline is the top product shipped, followed by motorized vehicles and mixed freight.

Figure 1. Map of Baltimore Metropolitan Area



In Maryland, trucks are vital for supporting the economy as well as key services, helping to ship goods through an extensive roadway network. Out of all modes, trucks carry the most freight in terms of value and tonnage, followed by rail transport. The Baltimore Metro region features three regional railroads and two class I railroads: the Baltimore & Ohio (B&O) railroad and the Pennsylvania railroad.

The Baltimore Metro has the nation's 6th largest port, the Port of Baltimore, which acts as a significant source of personal and business revenues. It ranks 11th in the country among ports for tons of cargo shipped, as it carried 43.6 million tons of cargo overall in 2019, with much of it being international cargo (37.4 million tons). In 2017, the port generated \$3.3 billion in personal income and \$2.6 billion in business revenues in Maryland.

There is also an international airport: the Baltimore Washington International (BWI) airport, which is a large employer in the region, employing over 9,700 individuals. The airport has experienced consistent annual increases of 19% or more in air cargo, partially driven by increased e-commerce demand.

Plan Details

The Baltimore Regional Transportation Board (BRTB) released a White Paper in March 2022 discussing their freight planning strategies employed in the Baltimore region. The White Paper is a complement to the general Baltimore regional transportation plan: *Long-Range Transportation Plan: Resilience 2050*.²³⁶ The White Paper provides an overview of freight activity in the State of Maryland and in the Baltimore region, including water, air, rail, and truck transport.²³⁷ The paper also discusses relevant legislation affecting freight, main truck driver issues, and future considerations for planners to support freight, including freight challenges and what the BRTB plans to do to address these challenges.

Supporting data in the White Paper includes quantitative data of various types of railroads in Maryland, including how many miles of rail in the region belong to certain private railroad companies. There is also a list of Baltimore city projects which are currently in progress to support the addition of double stacking capacities for rail transport. Other data included in the paper are freight weight and value estimates of various shipment modes, and the impacts of truck bottlenecks in terms of hours and costs, as shown in Table 2.

Table 2. Truck Bottleneck Driver Delay Hours and Cost in Baltimore Metro Counties in 2019

LOCATION	HOURS OF DELAY	COST OF DELAY
Anne Arundel County	387,835	\$21,884,206
Baltimore County	665,560	\$37,341,134
Baltimore City	84,182	\$4,855,175
Carroll County	128,085	\$7,283,923
Harford County	207,290	\$11,666,376
Howard County	494,873	\$27,360,254
Totals	1,967,825	\$110,391,068

As for stakeholders, the BRTB is guided by a subcommittee known as the Freight Movement Task Force, which provides space for various types of stakeholders within the task force to share information and concerns related to freight and goods movement. Some stakeholders in this task force include representatives from state highway, port, and motor truck administrations and associations, private railroad companies such as CSX, and consultants from the private sector.

Freight Planning Strategies and Implementation

As a metropolitan planning organization (MPO), the BRTB has the power to approve a short-term program and a long-range plan to support freight projects. The short-term program is sponsored by the state and has utilized funds from the National Federal Highway Program to support capital improvement projects, such as bridge reconstruction projects. In addition, the BRTB has the power to choose Critical Urban Freight Corridors (CUFCs), which also receive funds from the National Federal Highway Program. Twenty-five miles of roads in the Baltimore region are CUFCs.

Federal funds are important for larger projects and their respective implementation. For example, federal funds from the Moving Ahead for Progress in the 21st Century (MAP-21) bill have helped to pay up to 95% of the funding for interstate projects. To qualify for funding from this bill, proposed projects need to be included in state freight plans, have a clear explanation of how that project will improve freight movement, and contribute towards freight performance measures at the federal level.

One example of a specific project in progress includes the renovation of the Howard Street Tunnel. This project will address a bottleneck between Baltimore and Philadelphia and provide support for the double stacking of trains. This project is 1 of 11 projects in the city of Baltimore which need to be completed to support double stacking, as shown in Table 3. Funding for this project is being supported by federal infrastructure grants, funds from Pennsylvania and Maryland at the state level, as well as private funds from CSX. Multiple benefits are expected after completion of these projects. By increasing rail carrying capacity for freight, there will be less trucks on the road, which helps reduce highway traffic, fuel consumption and GHG emissions.

Economic growth is also expected with increased capacity to ship containers and provide additional jobs.

A statewide Emergency Truck Parking program has also been implemented, which allows trucks to use park-and-ride spaces as parking spots to avoid major storms. Efforts to collect truck parking data and expand the number of parking spaces are initiatives being pursued at the state level. Overall, the state leads freight planning efforts and implementation, but the BRTB remains a stakeholder that provides input and approval of freight projects.

Table 3. List of Projects to Complete in Baltimore to Support Double Stacking Trains

LOCATION IN BALTIMORE CITY	SCOPE OF WORK
Howard Street Tunnel	Tunnel Modifications
Mount Royal Avenue	Track Lowering
MTA Bridge	Track Lowering
North Avenue	Bridge Modifications
Sisson Street	Track Lowering
Huntington Avenue	Track Lowering
Charles Street	Track Lowering
St. Paul/Calvert Streets	Track Lowering
Guilford Avenue	Bridge Replacement
Barclay Street	Track Lowering
Greenmount Avenue	Track Lowering
Harford Road	Bridge Replacement

Challenges

Challenges in the White Paper focused primarily on truck driver issues. Truck parking is a big challenge. At least 70% of truck parking in Maryland is located on interstate highways, including on I-68, I-70 and I-95. Several Truck Weigh and Inspection stations are in Baltimore which provide parking spaces; however, some drivers are unaware of these stations, and those that are aware may be hesitant to park at these stations due to a lack of amenities or a fear of receiving an inspection, which adds a delay. Delays contribute to extra hours and costs for drivers, as shown in Table 2. There are less truck parking spaces in urban areas, particularly overnight due to the presence of on-street parking.

Competition for curb-utilization is another challenge, as delivery drivers must compete with other essential actions in cities, such as trash pick-up and hail-and-ride services. The increasing demand and delivery expectations of e-commerce have increased competition for curb space. These parking issues contribute to lost wages and undesignated parking in places where trucks are not supposed to park, increasing maintenance costs of roads and the risk of harm to truck drivers and local communities.

A truck driving shortage was cited as the other main challenge. Truck driving involves an “away from home” lifestyle which makes it harder to retain workers. There is also a minimum age limit

of 21 which restricts truck drivers from crossing state lines, which makes it harder to recruit younger drivers.

Opportunities

The document discusses many recommendations to address freight issues and improve freight planning. More could be done to address the gender and minority employment gap in the freight transportation industry. The age limit for truck drivers to cross state lines could be lowered to recruit more drivers. Education could be expanded to increase truck drivers' awareness of Truck Weigh and Inspection stations to utilize parking. Those stations could also have improved amenities like ensuring bathroom access, which would make them more beneficial to drivers.

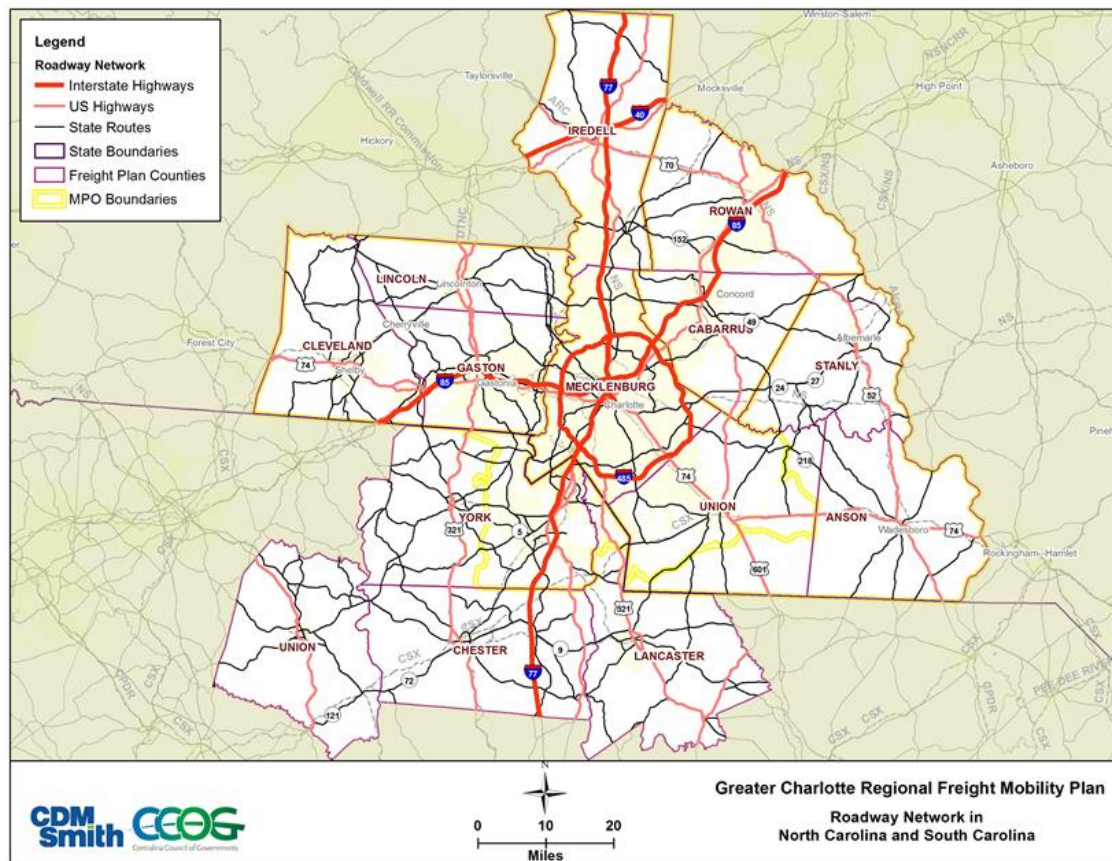
Planning can play a key role in supporting freight by supporting multimodal transportation as well as providing space in cities to support freight movement and needs and considering future demand in plans. Truck parking can be supported by providing delivery zones, relocating delivery locations to less congested areas, paid parking spots, and encouraging off-peak delivery. Technology could be used to innovate freight movement through autonomous trucks and drone deliveries.

5.2 Charlotte Metro: The Greater Charlotte Freight Mobility Plan (2016)

Introduction/Background

The Greater Charlotte region includes the states of North Carolina (NC) and South Carolina (SC), the city of Charlotte at its center, and 14 counties, as shown in Figure 2.²³⁸ According to the U.S. Census Bureau, the population in 2023 was approximately 2,805,115.²³⁹ The population has gradually increased over time, especially in urban areas.²⁴⁰ The manufacturing sector supplies over 140,000 jobs in the region (12%), which heavily depends on transportation. Exports are also important for the regional economy as they support the creation of jobs, revenue, and production. Transportation equipment and machinery (except electrical) were the top export sectors, constituting 30.6% and 16.7% of share of freight value respectively.

Figure 2. Roadway Network in the Greater Charlotte Region



Source: NCDOT and SCDOT

The region has an extensive roadway network to support truck freight, as shown in Figure 2. The region also supports rail, air, and multimodal transport (maps of those networks are in Appendix B). Trucks provide 77% of freight transportation in the region. The region ranks 29th in the country on the Travel Time Index (ratio of time traveled at peak traffic over free flow traffic) with a score of 1.23. The region is 47th in the nation for annual truck congestion costs, at \$131 million.

Rail provides over 5% of freight transportation. The region has 1,042 miles of rail tracks, the majority of which two class I railroads own and operate (NS and CSXT). There are also seven short line railroads in the region. Top commodities shipped by rail include grains, coal and chemicals.

Two commercial service airports as well as 12 general aviation airports exist in the region, which includes the Charlotte Douglas International (CLT) airport. Most of the multimodal facilities are in the city of Charlotte.

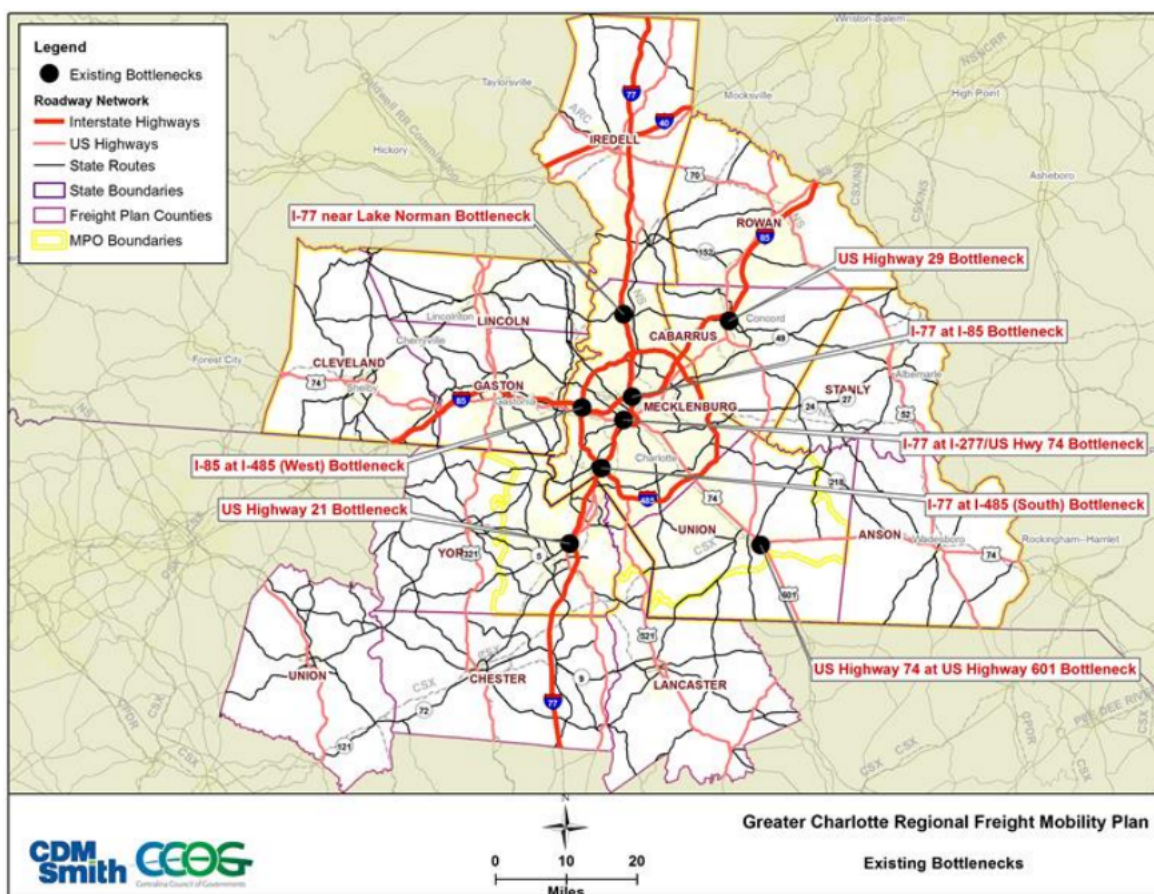
Plan Details

The Greater Charlotte Regional Freight Mobility Plan was published in December 2016 with the purpose of providing recommendations of freight strategies to be implemented at the local and

state level, compiling data to use as a reference for planners, and supporting regional collaboration.²⁴¹ The goals of the plan include identifying and addressing traffic bottlenecks, looking at how economic development goals are connected to freight mobility, minimizing environmental impacts, and promoting land use strategies that support freight mobility, more jobs, and business development.

Many types of data are included to support the plan, including maps of freight networks, corridors, concentrations, average daily truck volumes, crash hotspots, and bottlenecks (a map of bottlenecks is shown in Figure 3). The report also lists top exports by sector and country as well as top commodities of various freight modes. The plan shows how much of the rail system is owned by which businesses as well as population and employment levels of counties in the region.

Figure 3. Truck Bottlenecks in Charlotte Metro Region



Source: American Transportation Research Institute (ATRI), October 2015

The plan is a public-private collaboration that includes metro and rural planning organizations, the Federal Highway Administration, the Department of Transportation from North Carolina and South Carolina, local governments, private rail and truck firms, and economic development

organizations. Various types of stakeholder engagement were employed to inform the plan, including interviews, surveys, and feedback from various committees. The Coordinating Committee looks at overall technical aspects of the plan, the Steering Committee looks at policy aspects, and the Freight Advisory Committee includes private-sector members, which helps increase understanding of freight issues in the region.

Freight Planning Strategies

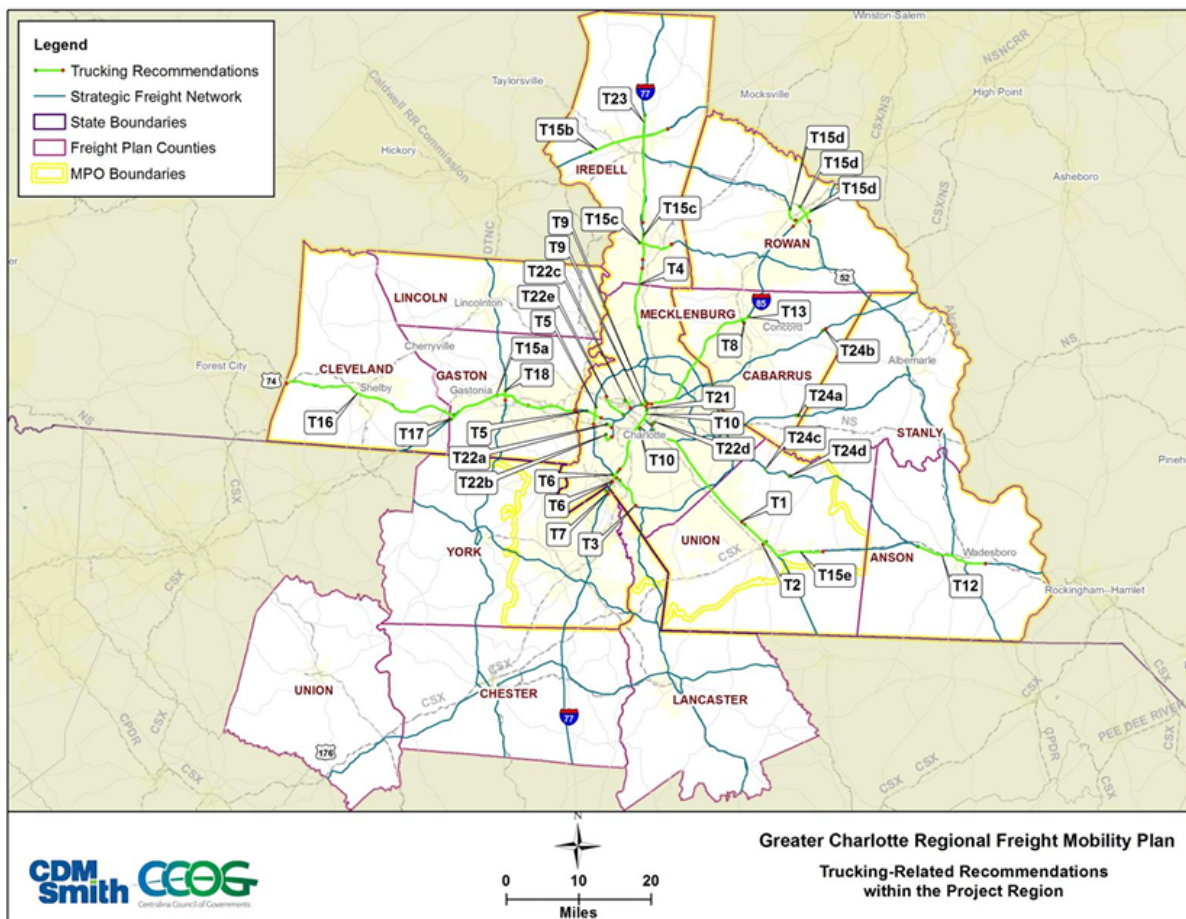
The Greater Charlotte Regional Freight Mobility Plan outlines seven goals with objectives or strategies to accomplish them. To support economic competitiveness and efficiency, they are striving to build a freight transportation system that allows them to be a major freight hub that supports multiple freight modes, encourages regional collaboration, and forms public-private partnerships to utilize resources. Regional coordination is another goal, which will be pursued through collaboration between regional agencies and reaching out to private stakeholders. To improve performance and accountability, there are objectives to improve the knowledge planners and elected officials have about freight. Strategies include improving technology to support knowledge sharing that informs planners and decision-makers, integrating performance-based tracking to see the effectiveness of the freight system and respective investments, and lowering empty backhaul movements to decrease freight movement costs.

For safety and security, they plan to support agencies involved in regional emergency management, reduce the number of locations with high crash rates, and incorporate more technology. To support preservation of infrastructure, the strategy is to focus on maintaining the most vital streets, bridges, and highways so that there is less cargo damage and travel time for truck drivers.

Environmental stewardship will be achieved by reducing emissions from congestion and idling, as well as integrating land use planning that allows for efficient freight movement. Reducing congestion and improving reliability are goals of their own, which will be addressed by lowering the number of regular and non-regular congestion events.

Truck- and rail-specific recommendations are also included in the plan, where specific details about proposed projects are discussed for each, and a couple maps are provided, showing where those recommendations should be implemented (truck specific recommendations shown in Figure 4).

Figure 4. Recommendations for Trucking Improvements in Greater Charlotte Metro Region



Challenges

For trucks, challenges include weight and size limits in rural areas due to conditions. Another challenge is effective incident management, as there are bureaucratic issues like flawed coordination, as well as limited manpower, funding, and lack of knowledge of best practices. Other issues include limited access to parking and funding for maintenance and construction of highways. Some high priority projects can be left unaddressed due to transportation funding mechanisms in programs which reward only specific kinds of projects.

There are also freight rail and air challenges. Freight rail challenges include safety of grade crossings, capacity limitations of intermodal terminals, multimodal support, rail weight limitations, and rail funding, as there is no dedicated state fund for rail improvements. Air cargo freight challenges include the decline of domestic airlines and less storage capacity due to the use of smaller jets.

Opportunities

The Greater Charlotte Regional Freight Mobility Plan discussed several opportunities and recommendations to address freight needs. Opportunities include providing more staff from the Centralina Regional Council to support freight planning, educating elected officials and the public on freight, ensuring inclusion of private sector in planning practices, creating a protocol for a Freight Advisory Committee, and coordinating freight planning with other plans, such as the Charlotte International Airport Strategic Development Plan.

Other recommendations include putting together a database to track commercial vehicle crashes, expanding fuel efficiency programs through agency partnerships, creating a policy that addresses idling in freight districts, supporting emergency response through sharing information with local emergency response agencies, and creating incident management teams and task forces.

Implementation

The Greater Charlotte Regional Freight Mobility Plan provides details on data sources and stakeholders, as well as details on a prioritization strategy to help pursue freight planning strategies and opportunities. For each of the seven goals, there are performance measures listed to help address accountability of completing goals, such as the crash rate of trucks in relation to safety and security, and hours of excessive delay annually per capita to help address the impacts of carbon emissions. Moreover, there is a list of items under each goal that help explain the level of projects that directly affect the freight industry, are related to it, or are impacted by it, which helps influence which projects get prioritized. An example of project prioritization objectives for the goal of Environmental Stewardship is shown in Figure 5. The plan has specified parties responsible for leading implementation of recommendations in the plan, which include the Centralina Council of Governments, MPOs, and/or local governments.

Figure 5. Project Prioritization for Environmental Stewardship Planning Goal

Goal 4: Environmental Stewardship

Project Prioritization	Criteria	Factors
- Reduces air emissions - Reduces impact to wetlands and water quality - Reduces energy consumption - Reduces other adverse residential and community impacts - Separates freight operations from community activities	 Freight Impacted	 Does not improve
	 Freight Related	 Somewhat reduces
	 Freight Focused	 Reduces
		 Significantly reduces
		 Greatly reduces

5.3 Boston Metro: The 2013 Freight Action Plan Memorandum & 2019 Memorandum Update

Introduction/Background

The Boston Metropolitan area is in the Commonwealth of Massachusetts with an estimated population of 4,919,179 in 2023, according to the U.S. Census Bureau.²⁴² It is the 2nd densest metropolitan area in the U.S. after New York City, with 2,167 residents per square mile.²⁴³ The metro area supports truck, rail, air, and ship transport.

Trucks are the most significant of the modes, as they support the regional and state economy and are used to support intermodal transit. 8.6% of vehicle miles traveled (VMT) in the region comes from trucks. According to 2007 statewide estimates, trucks carry the most tonnage, followed by rail, water, and air. Truck transport has continued to grow in the region over time.²⁴⁴

Air freight has grown faster than the other modes, has helped fulfill international demand, and is dependent on trucks to complete freight shipment.²⁴⁵ Intermodal terminals in the region include Conley Terminal and Logan Airport, as well as a couple of others located outside the MPO which serve the area, such as in Worcester and Ayer. Freight that comes into the Conley Terminal is transported throughout the New England region.²⁴⁶

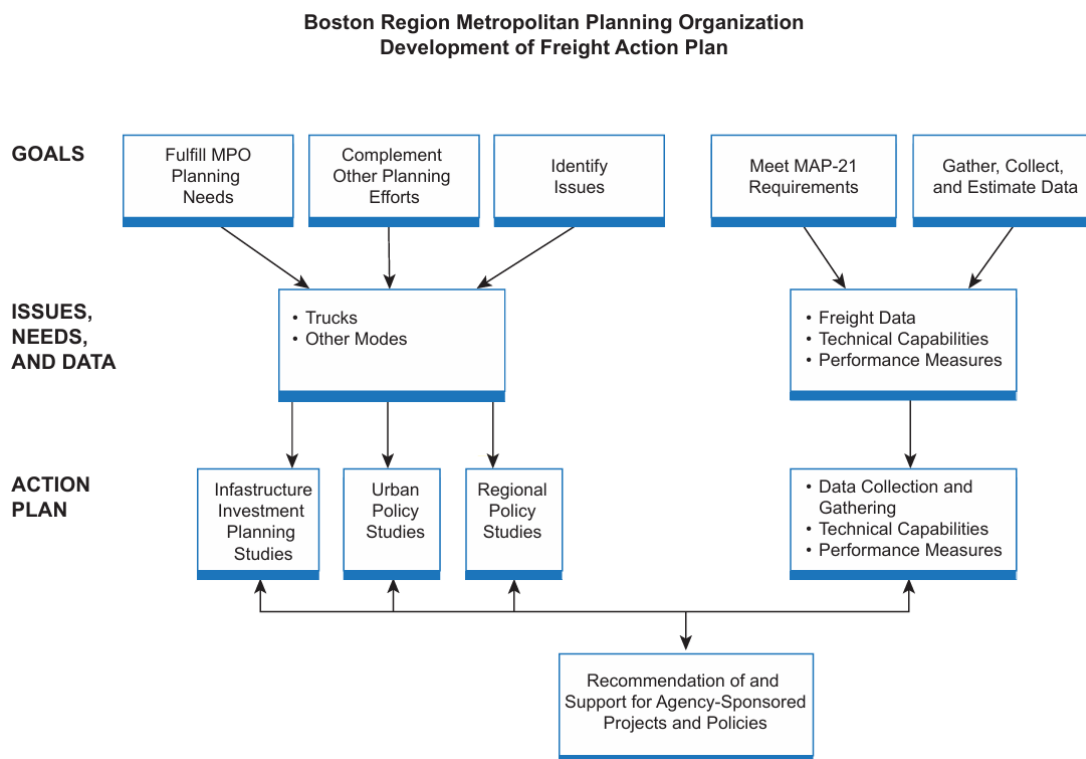
Rail freight has been in a long-term decline but still supports shipment of chemicals, building materials, and bulk commodities.²⁴⁷ Most rail freight which enters the metro area terminates in the intermodal facilities located in Worcester and Ayer, which is then transported by truck into the metro region. Most rail rights-of-way in the region belong to the state and primarily support commuter rail functions. Freight originating from ocean shipments complete their deliveries by truck as well, except for jet fuel which is piped into Logan Airport.

Plan Details

The Boston Region MPO created a memorandum in 2013 expressing interest in creating an official freight planning program to start in 2014 which would include an action plan, as shown in Figure 6.²⁴⁸ This plan would assess freight activity in the region on a multiyear basis in ways that are feasible and connect with statewide planning priorities and federal guidance.

Goals proposed for the plan include identifying and researching freight issues, supporting multimodal freight planning, addressing issues discussed in the MPO's Long-Range Transportation Plan and by other MPOs, complementing freight planning by state and individual agencies, fulfilling federal safety requirements, and improving freight data collection and analysis mandated by MAP-21. The 2013 memo also discusses freight planning issues, truck freight data modeling logistics at the regional level, and recommendations of studies for future research to pursue to support freight planning goals.

Figure 6. Concept Map of Development of Boston Metro Region Action Plan



Data to support the memorandum include state level freight movement trends, population and density comparisons of U.S. MPO regions, topics discovered in U.S. MPO freight planning efforts, and the presence or absence of freight-specific planning in those regions. The 2019 memo discusses completed studies, the MPO advisory council, stakeholder outreach efforts, data

modeling development, critical urban freight corridor issues and potential new topics for research.²⁴⁹

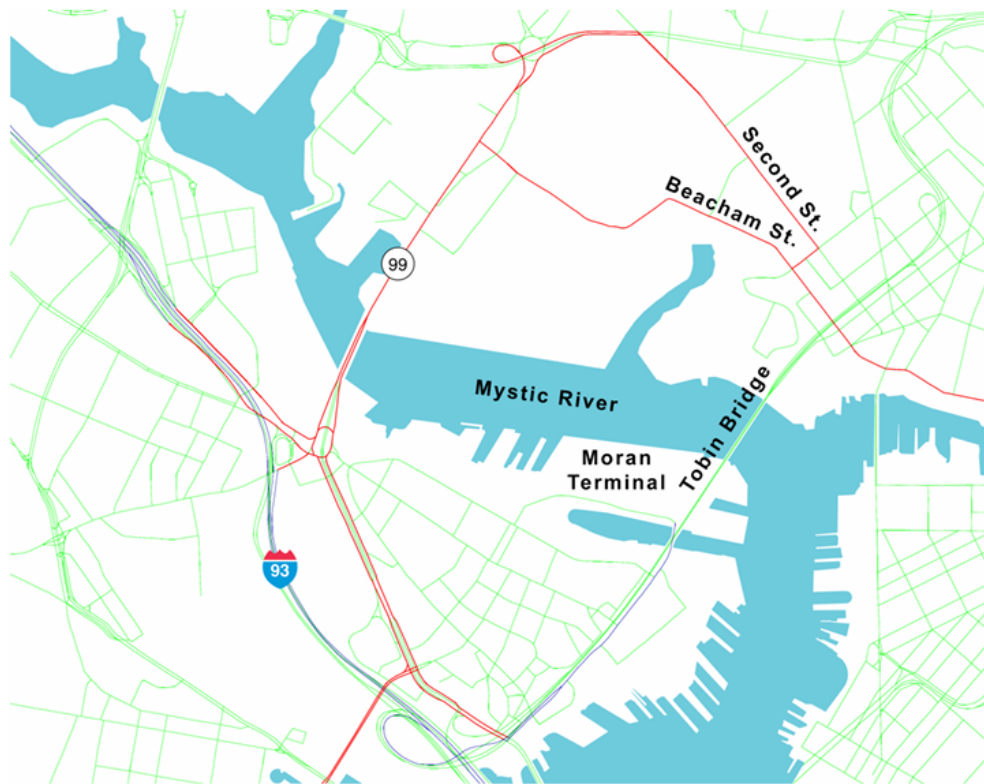
Freight Planning Strategies and Implementation

The 2013 memorandum outlined five major goals to support freight planning in the Boston Metro region and provided action items to address these goals.²⁵⁰ The first three goals include understanding freight issues further in the region, fulfilling metro region freight needs, and creating a plan that is complimentary to state level efforts. To achieve these goals, six studies were proposed to be performed first, which include topics on highway interchanges, hazardous cargo routes, intermodal facilities, the Beacham street industrial corridor, and a portion of interstate I-495: the Northwest arc. The motivation to study these topics was influenced by past planning discussions as well as the need to support the last two goals of the action plan: 1) fulfill MAP-21 freight analysis requirements and 2) improve the capacity of the MPO to collect, estimate, and use freight data.

These last two goals related to improving data utilization are supported by three action items: 1) develop MAP-21 performance measures for the region, 2) improve coordination of freight analysis with general planning, and 3) improve technical capabilities of the MPO. The memorandum mentions generally that for state sponsored initiatives, the Boston MPO has interacted with freight stakeholders, voicing their concerns and helping to support state initiatives.

The 2019 memo update discusses the studies which have been completed.²⁵¹ Studies include topics such as rest locations, the Beacham street industrial corridor, intermodal warehouses, truck travel along the Waterfront in South Boston, and bridge weight and height restrictions that affect trucks. These studies helped create freight data to support planning efforts, such as designation of critical urban freight corridors in the Everett-Chelsea area, as shown in Figure 7.

Figure 7. CUFC in Everett-Chelsea Industrial Area and Charleston Neighborhood



Red: Recently adopted Critical Urban Freight Corridors
Purple: Previously defined National Highway Freight Network elements
Green: Other MPO travel demand model roadways
Source: Central Transportation Planning Staff.

In addition to completed studies, other strategies have helped planners understand freight activity in the region. Toll reports have been a key tool for developing heavy vehicle data for the region, which is being analyzed with big-data techniques. The MPO has utilized a recent statewide travel demand model to support MPO planning. Stakeholder outreach efforts have also been executed through highway safety working groups and meetings with trade associations to help inform decision-making.

Challenges

The 2013 memorandum states that an ongoing policy issue is truck use in dense urban areas.²⁵² Aging infrastructure and flawed design of interchanges have influenced trucking behavior by resulting in rerouting. The lack of freight data collection and analysis is mentioned as a limiting factor in understanding and addressing freight issues at the state level and especially at the metro level. Other challenges include weight and height restrictions on bridges, as well as safety and congestion issues.

Issues in urban areas include a lack of hazardous cargo routes, routes that are prohibited for trucking, as well as curb utilization. There are different levels of noise and adverse conditions in urban cores compared to surrounding suburbs, as the suburbs were built more recently with automobile use in mind. Rest areas, truck parking, and overweight or oversized loads have also been listed as challenges. New federal regulations on hours of service are stated as another challenge for truck drivers. Other challenges include state ownership of rail rights-of-way, double stacking of trains, supporting ethanol unit trains, grade crossing safety, incorporating rail lines at Conley Terminal, limited space at Logan Airport to support long-term growth of air cargo, and expanding dedicated truck routes.

Opportunities

The 2013 memorandum says that intermodal freight is a key opportunity to connect and transport freight between urban areas and rural areas or distant locations. Intermodal stations are also seen as a key spot to collecting and analyzing freight data and movement of trucks. Understanding distribution patterns of ocean shipments would help elaborate on the impacts of port freight on the entire regional freight system. Influenced by MAP-21 mandates, state freight planning decision making processes need to discuss how efforts coordinate with other states and with regional MPO freight planning efforts. The 2019 memorandum highlights further potential study topics which should be executed, including truck stops and reducing idling.²⁵³

5.4 Southern California Region: Connect SoCal Transportation Goods Movement Technical Report (2020)

Introduction/Background (Incorporates 2020 & 2024 Plans)

The Greater Los Angeles area is in the Southwestern U.S. and by the Pacific Ocean. The area includes five counties (Ventura, Los Angeles, Orange County, San Bernardino, and Riverside) that support a diverse goods movement system and transportation network, as shown in Figure 8.²⁵⁴ According to the U.S. Census Bureau, in 2023 the population of the Los Angeles-Long Beach-Anaheim CA metro area was approximately 12,799,100.²⁵⁵ The region supports highway, rail, air, and maritime transport.²⁵⁶

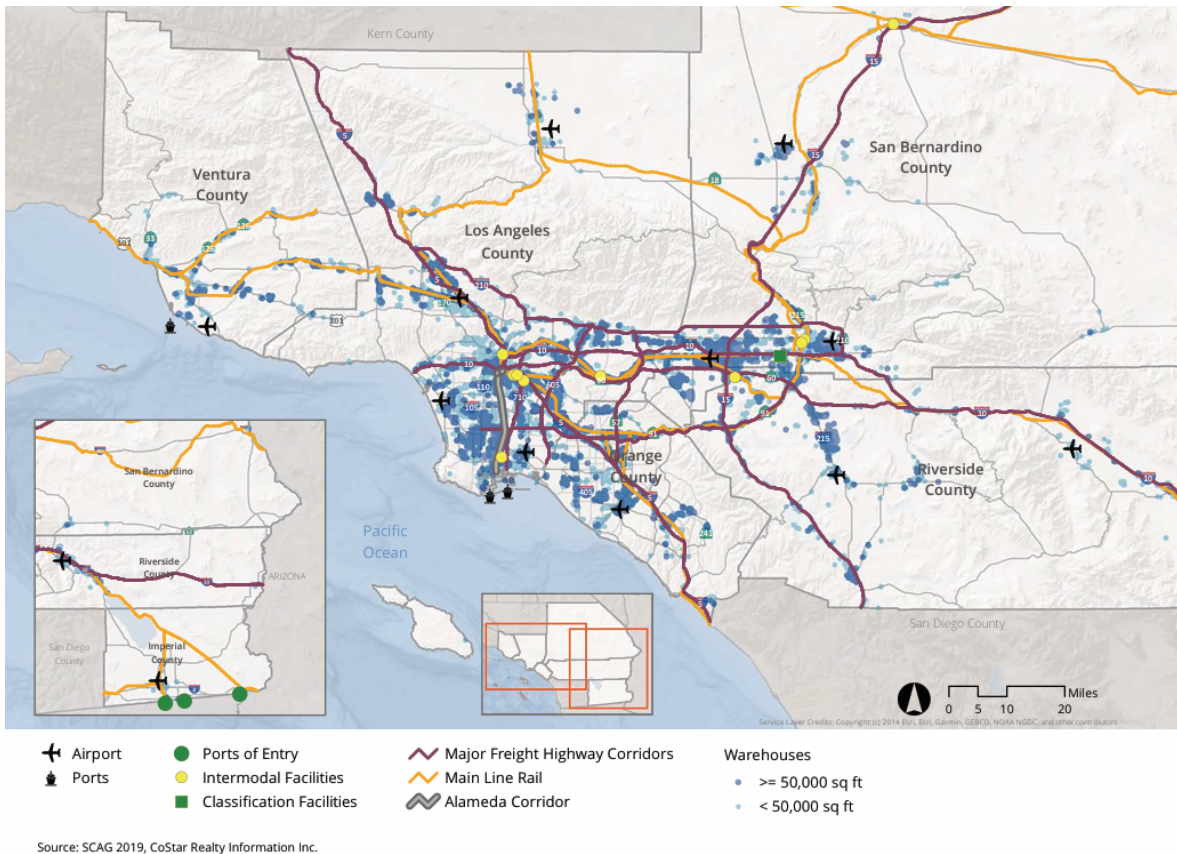
The region contains three ports: LA, San Pedro, and Hueneme ports. San Pedro Bay Ports remains a leader in the U.S. for containerized cargo activity for fulfilling local and national demand.²⁵⁷ There is competition from Eastern and Gulf ports due to increased industrial growth in those regions, leading to increased containerized cargo diversion.

The rail system is supported by six intermodal terminals and includes rails from BNSF and Union Pacific RR Company.²⁵⁸ Intermodal rail facilities have been moving inland as new infrastructure developments take place, such as the Barstow International Gateway and Union Pacific Inland Empire Intermodal Terminal.²⁵⁹

There are 1,634 miles of highways and interstates.²⁶⁰ Roads make up 56,276 miles, and there are 135,578 lane miles. Freight corridors and roads that support first- and last-mile deliveries remain vital, as 70% of freight tonnage (including 80% of local tonnage) enters, exits, and passes through the region.²⁶¹

Seven airports provide air-cargo services. LAX and ONT are the most significant airports, as they together managed about 97% of domestic and international goods in 2018. International land ports-of-entry support freight transport across borders between U.S. and Mexico. There are over 1.2 billion square-ft of space dedicated to supporting warehousing, distribution, and transloading facilities. In 2017, industries reliant on goods movement contributed \$348 billion (27.7%) to Gross Regional Product (GRP) in the region, which is representative of the market value of goods and services.

Figure 8. Goods Movement Transportation Network in the Greater Los Angeles Area



The region is home to over 150,000 businesses and 8.4 million employees. 2.3 million (about more than 1/4th) of those employees are in goods movement-related sectors, and employment has increased overtime in those sectors, with 8.5% growth between 2012 and 2017. Population and income are expected to increase over time and add extra demand for goods and stress on the freight transportation system.

Plan Details

The *Connect SoCal Transportation Goods Movement Technical Report* was adopted on September 3rd, 2020, by the Southern California Association of Governments (SCAG). The report provides an overview of goods movement activity in Southern California. The plan discusses regional strategies to improve the goods movement system and its alignment with their vision and 2045 goals. The report also discusses how the freight system impacts local industries and the economy, as well as air quality and the environment.

Multiple kinds of data supplement the plan. There are data related to truck freight and highway behaviors, including maps which show truck bottlenecks, truck speeds, daily truck volumes (both in 2016 and projected for 2045), locations of urban and rural freight corridors, parking, and truck

routes. There is also data about top commodities shipped from various modes (land, air, sea), such as machinery components, vehicles, furniture, apparel, etc., and levels of trade in terms of value, tonnage, imports, and exports. Economic data is provided, showing the number of establishments and employees which belong to manufacturing, retail, wholesale, transportation, and construction sectors in the region and compared to other states. An extensive project list includes descriptions of projects, estimated costs, timeframes by county, and maps which show the locations of these projects. Lastly, there are pie charts which discuss the percentage of nitrous oxide and particulate matter emissions from goods movement sources and various transit modes.

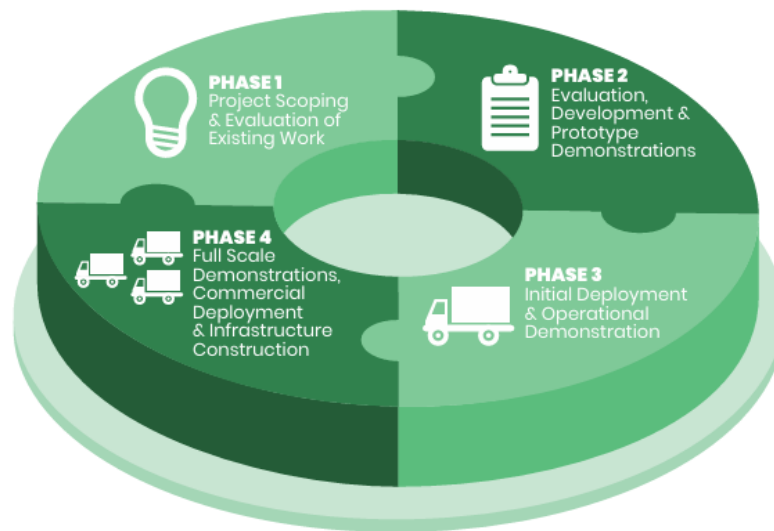
Various stakeholders helped provide input to support the report. For example, findings were discussed from a Last Mile Freight Study which was based on feedback from public and private stakeholders. The report also mentions other plans and connects them to freight planning efforts on a regional level, such as the San Pedro Bay Ports Clean Air Action Plan and the California Sustainable Freight Action Plan.

Freight Planning Strategies

Strategies in the SoCal plan involve multiple strategic infrastructure improvement projects to improve the efficiency of the freight system. Improvements at terminals include supporting on-dock rail to reduce truck dependency and emissions, dredging projects to support larger ships, and extending rail lines to support 10,000 ft long trains. Other rail improvements include altering infrastructure to support additional main railways and double or triple tracking. Some new land is being acquired to support new or expanded railyards and railcar storage. Advanced rail warning systems and signage are being used to direct drivers to alternate routes as needed.

The report has a section dedicated to the *Goods Movement Environmental Strategy and Technology Advancement Plan*, which seeks to achieve a zero-emissions goods movement system by 2035. This plan includes a circular economic framework which considers environmental impacts throughout the production process of zero-emission vehicles, along with action steps and commitments from regional partners. The Action Plan includes four phases which document the journey of new zero-emission technology being developed and distributed on a large scale, as shown in Figure 9.

Figure 9. Goods Movement Environmental Strategy and Technology Advancement Plan



Source: SCAG

Other emission reduction strategies strive to support zero-emission vehicles or enforce certain regulations. New infrastructure at the Port of Hueneme is being implemented to support zero-emission trucks, including clean energy charging stations, solar panels, and clean energy storage. The San Pedro Bay Ports is reducing emissions from drayage trucks by only registering trucks that are compliant with California Air Resources Board Drayage Truck Regulations.

Local jurisdictions could benefit from a series of freight handbooks which are being developed by the California Air Resources Board (CARB). CARB helps pass new vehicle emission regulations in the state. The first handbook was focused on warehouses and was supposed to be released in 2020. These freight handbooks aim to assist local jurisdictions with developing freight facilities and help environmental justice communities to be part of the decision-making process.

Road and highway improvements include redesigned intersections and the removal of grade-crossings, grade separations, and on-ramps to reduce passenger/rail conflicts and congestion. Fourteen grade-crossing projects have been completed and there are 48 in progress. Some roads and bridges are being replaced or widened by adding lanes, such as truck climbing lanes to support truck freight and alleviating traffic for automobiles in other lanes. These strategies help support trade across international borders. The addition of new air-cargo, intermodal, and cold-storage facilities also supports international trade. Some bridge projects include additions of bike facilities and pedestrian paths to support active transportation. Traffic signals are being altered or removed to reduce traffic conflicts. New critical urban and rural freight corridors are being submitted and designated to be part of the Primary Highway Freight System, as shown in Figure 10.

Lastly, strategies from a Last Mile Freight Study based in LA were highlighted in the report. Strategies include extending yellow curb designations, permitted parking, parking price options, and flexible parking spots. Permitted parking provides multiple benefits, including data collection, acting as a revenue stream and helping manage parking supply and demand.

Figure 10. Recent CUFC Submissions in the Greater Los Angeles Area



Challenges

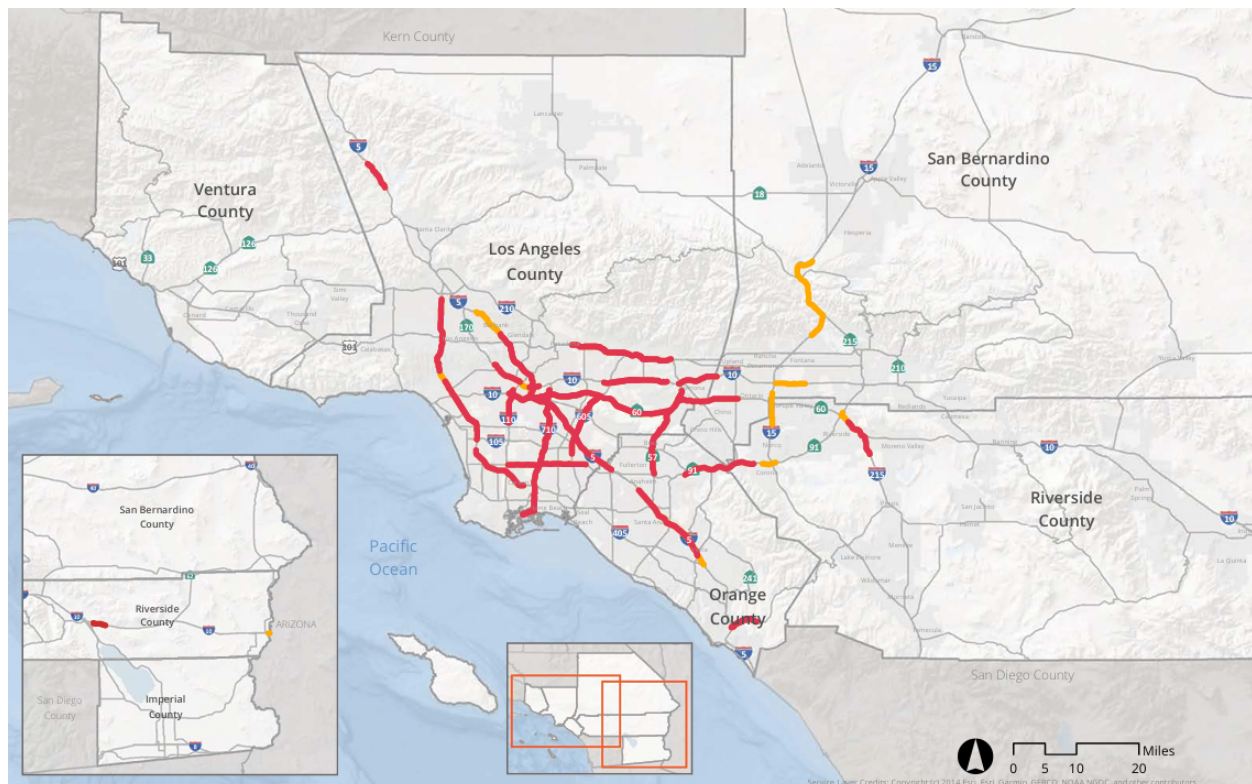
The SoCal Metro region is facing increasing domestic economic competition as other places in the U.S. improve their infrastructure and facilities to support trade and impact market share. On an international level, foreign trade policies can impact the level of trade that happens as agreements with other nations are made or broken, affecting freight transport activity.

Technology and e-commerce are bringing new challenges to goods movement. E-commerce is affecting distribution networks, influencing increased use of urban-distribution centers. There is uncertainty regarding how vehicle-miles-traveled (VMT) has and will be affected as e-commerce may lead to less driving but more online purchasing. The way new technology will impact employment and safety is uncertain. New technology could improve efficiency but also change

or eliminate certain jobs. Last-mile delivery is also a challenge, especially in dense, urban areas where there is competition for curb space.

The region struggles with several truck bottlenecks, as shown in Figure 11. These result in delays that contribute to greater greenhouse gas emissions. The region struggles with air pollution, as there are multiple pollutants which the freight system partially contributes to which impact human health and are produced at levels which do not satisfy National Ambient Air Quality Standards.

Figure 11. Truck Bottlenecks in the Greater Los Angeles Area



Annual Vehicle Hours of Delay (AVHD)

Orange line: 15,000 - 20,000
Red line: Above 20,000

Source: SCAG

Opportunities

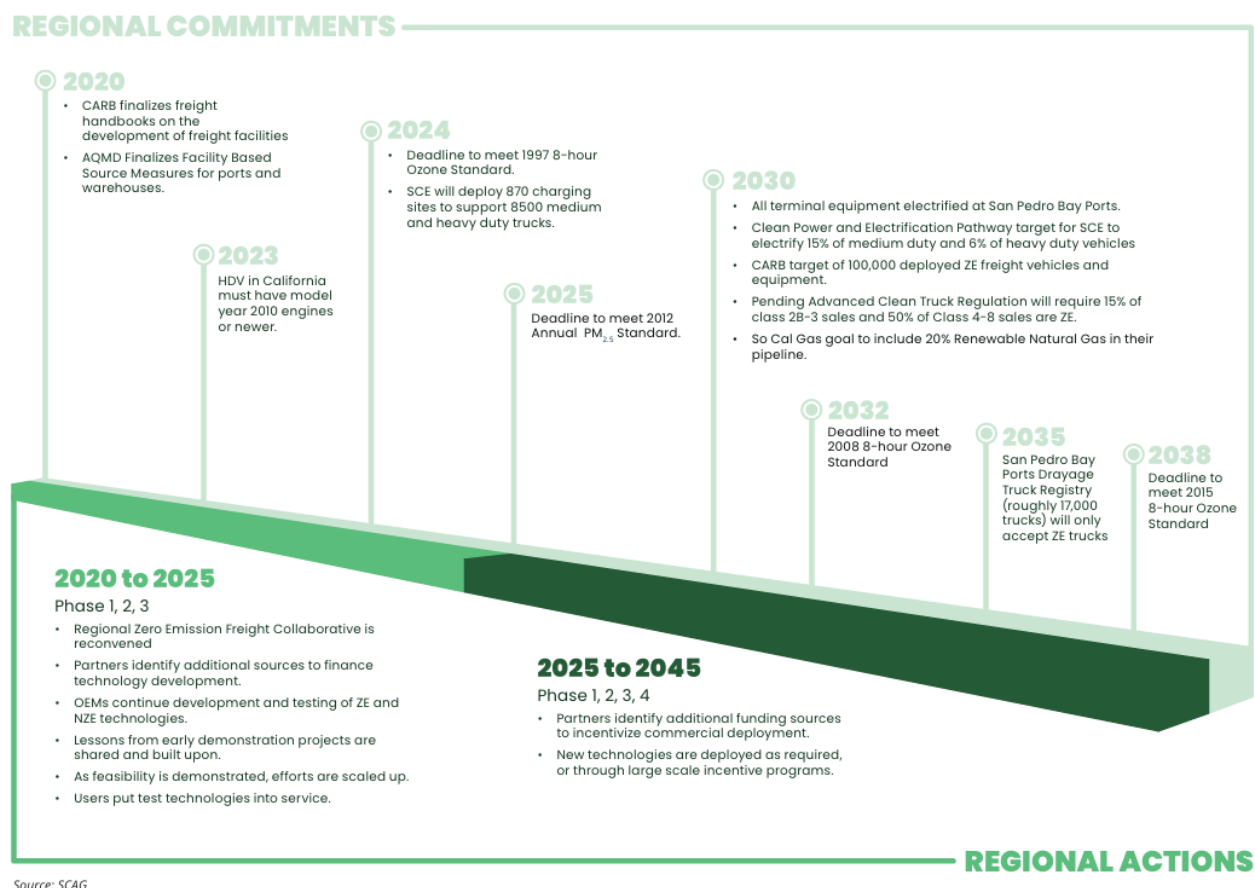
The report discusses opportunities for supporting zero-emission technologies in the near and distant future. Having these technologies flourish will require collaboration with other stakeholders, including private sector actors such as infrastructure providers, and manufacturers and developers of commercial technology. Both the development of the technology and the infrastructure to support that technology are necessary. Increasing producer responsibility for the life cycle of electric car batteries was also mentioned. Public agencies could take the lead in

creating mandates for producers to minimize the environmental impacts of depleted batteries, as has been done in other countries, such as China and the European Union. Coordinating land use and infrastructure planning is another potential strategy to reduce required vehicle-miles traveled (VMT) and lower emissions.

Implementation

The report has a section that discusses responsibility for various agencies and partners related to achieving environmental goals. Key partners outlined in this section include transportation commissions, the San Pedro Bay Ports, and South Coast Air Quality Management District (SCAQMD). Advocating for funding and new legislation that supports the facilitation of new technologies are seen as important steps. LA Zero Emissions Collaborative has been a partner which has successfully helped with advocating for funds and grant applications in the past. The report provides a graphic with multiple deadlines highlighting emission reduction goals as shown in Figure 12. This graphic includes specific action steps toward supporting clean technology.

Figure 12. SCAG Clean Technology Deployment Timeline



5.5 Southern California Region: *Connect SoCal Goods Movement Technical Report (2024)*

Introduction/Background

Section 2.5 provides an introduction/background of freight and goods movement activity in the Southern California region. Section 2.6 provides details about the 2024 plan, including plan details, freight planning strategies, challenges, opportunities and implementation.

Plan Details

The *Goods Movement Technical Report* was adopted on April 4th 2024 and is the most recent regional level freight plan in the Southern California region since the 2020 version.²⁶² The purpose of the 2024 technical report is to establish a vision and regional planning and policy framework with defined implementation strategies to address goods movement, while considering new trends, technologies and challenges. The Goods Movement Technical Report is a 199-page report that discusses strategies, laws and policies, challenges, opportunities, and implementation measures related to freight planning.

The technical report is guided by a vision with five main objectives. These objectives include 1) maintaining the long-term economic competitiveness of the region, 2) promoting local and regional job creation and retention, 3) increasing freight and passenger mobility, 4) improving the safety of goods movement activities, and 5) mitigating the impacts of goods movement operations.

Several types of data are included in the plan, including maps, tables and figures providing information related to freight and economic activity in the SCAG region. Some examples of data included in the report are retail and food service sales, retail locations, GDP of goods movement industries, maps discussing the freight network and its various modes, containerized trade value and volume, top commodities, imports and exports, and the Cass Freight Index. There are multiple types of data that pertain to truck behaviors, including highway speeds, bottlenecks, parking locations, volumes, and collisions.

Freight Planning Strategies

The technical report has five general policy strategies to support goods movement: rail investment, community and environmental justice, zero-emission and clean technology, comprehensive system-level planning, and advancement of intermodal freight. There are also specific strategies for seaport, rail, highway, and international Port of Entry (POE) included, helping to provide context-specific guidance to address freight challenges and improve freight mobility and efficiency depending on the mode of transport.

For rail investment, the goal is to focus investments on rail projects that benefit freight and commuter transport. For community and environmental justice, the goal is to prioritize the concerns and environmental needs of local communities by supporting workforce development, especially in relation to clean and zero-emission technologies, and disseminating information about freight, including holding workshops on goods movement in communities and the utilization of an ArcGIS StoryMap to serve as a communication tool about freight for communities. Exploring and advancing these technologies is another goal, as the plan includes supporting strategies such as supporting zero-emission delivery zones and microgrid-based electric charging for heavy duty trucks. For comprehensive system-level planning, the goal is to integrate the planning of inland ports and infrastructure for rail and roads with the planning of supply chains and corridors. The last policy of advancing intermodal freight has the goal of providing continuous investment in a transportation system that can support multiple modes, including rail and highways.

Challenges

The 2024 SCAG technical report has a section dedicated to goods movement challenges, with nine elements broken down: supply chain perspectives (including freight cycles, geopolitics, & resilience); the regulatory environment (including air quality and goods movement); highway and road congestion and delays; freight corridor bottleneck analysis; truck parking; freight rail service; community and environmental impacts; safety and security; and workforce sustainability.

Some challenges lie outside the region, including supply chain and global trade relationships. Freight supply chains are still facing constraints and instability. There have been elevated costs to move freight depending on the mode of transport and whether that work is contracted or spot market based. Enforcing state level regulations for zero emissions is also a challenge, especially for independent truck owner operators who may travel to locations outside the state or internationally to Mexico. Demand is expected to increase for both passenger travel and freight, impacting truck and rail transportation, both of which are experiencing their own challenges, such as a lack of infrastructure capacity for rail operations and parking accessibility for truck drivers. Truck parking remains limited for both public rest areas and commercial truck stops in the region, leading to illegal parking in places such as freeway shoulders, local communities, and commercial areas. Other challenges include roadway and highway congestion and workforce problems, all of which negatively impact the economy.

Some challenges are connected to efforts to increase public benefits, including economic and health benefits. Although air quality has improved overtime, it was found in 2022 in the South Coast Basin Area (which includes parts of Southern California) that National Ambient Air Quality

standards have not been met, with the highest ozone levels in the country. Polluting emissions contribute to community health impacts such as asthma. Policies and regulations that strive to address public health by increasing restrictions for reducing polluting emissions are putting pressure on the freight industry statewide. Supporting zero emission and net-zero emission vehicles remains a challenge, as costs for them remain high due to limited production, the need for research and development, and the requirement of certain materials and components. Moreover, there are logistical hurdles such as a lack of large-scale infrastructure to support these technologies.

Public safety continues to be a top public agency concern. There were 3,827 truck crashes in 2022 in the region which resulted in injury and 149 accidents which resulted in fatalities. Addressing local community impacts will require stakeholder engagement and building knowledge. For resilience, the plan explains it is important to invest in infrastructure and facilities that can make freight more efficient so that unexpected impacts can be absorbed from major disruptions such as the COVID-19 pandemic, which presented a huge challenge for the freight industry and altered shipping patterns. Movement of goods and security of supply chains are threatened by theft and hacking of systems.

Opportunities

The 2024 SCAG technical report provides a list of areas to monitor as part of their conversation about where freight planning is headed. The first item listed was the growth of e-commerce. The second item listed reshoring and near-shoring of production, both of which are expected to grow in the U.S. with rising geopolitical tensions and advancements in technology in the manufacturing and industrial sectors, the latter of which will increase foreign investment in the United States. The third listed item was the divide on technology advancement among state-level coalitions. The last couple of items are related to regulations: States with less regulations are expected to have easier economic development, while more regulations will lead to increases in business costs and unionized labor. Opportunities to reduce emissions from goods movement include integrating land use planning, improving efficiencies in freight system infrastructure, and pursuing clean technologies. Providing educational programs that are connected to supply chain industries, including programs to help transition employees, could help increase workforce sustainability.

Implementation

The 2024 SCAG technical report outlines implementation measures that are paired with the five general policy recommendations for achieving plan objectives. For rail investment, implementation will involve leading efforts for collaboration between multiple parties, including public agencies and private rail operators. For community and environmental justice, facilitating

community engagement throughout the SCAG region about freight will help improve freight knowledge and workforce participation. Zero-emission and clean technology will be furthered by managing the transition of medium- and heavy-duty vehicles and respective infrastructure to support these technologies. For comprehensive system-level planning, implementation will involve working on an update of the SCAG Comprehensive Goods Movement Plan with innovative strategies. Coordinating state and federal partners to access funding opportunities to support goods movement planning will be key for advancing intermodal freight investments.

5.6 Chicago Metro: The Freight System: Leading the Way (2017) & Regional Strategic Freight Direction (2018)

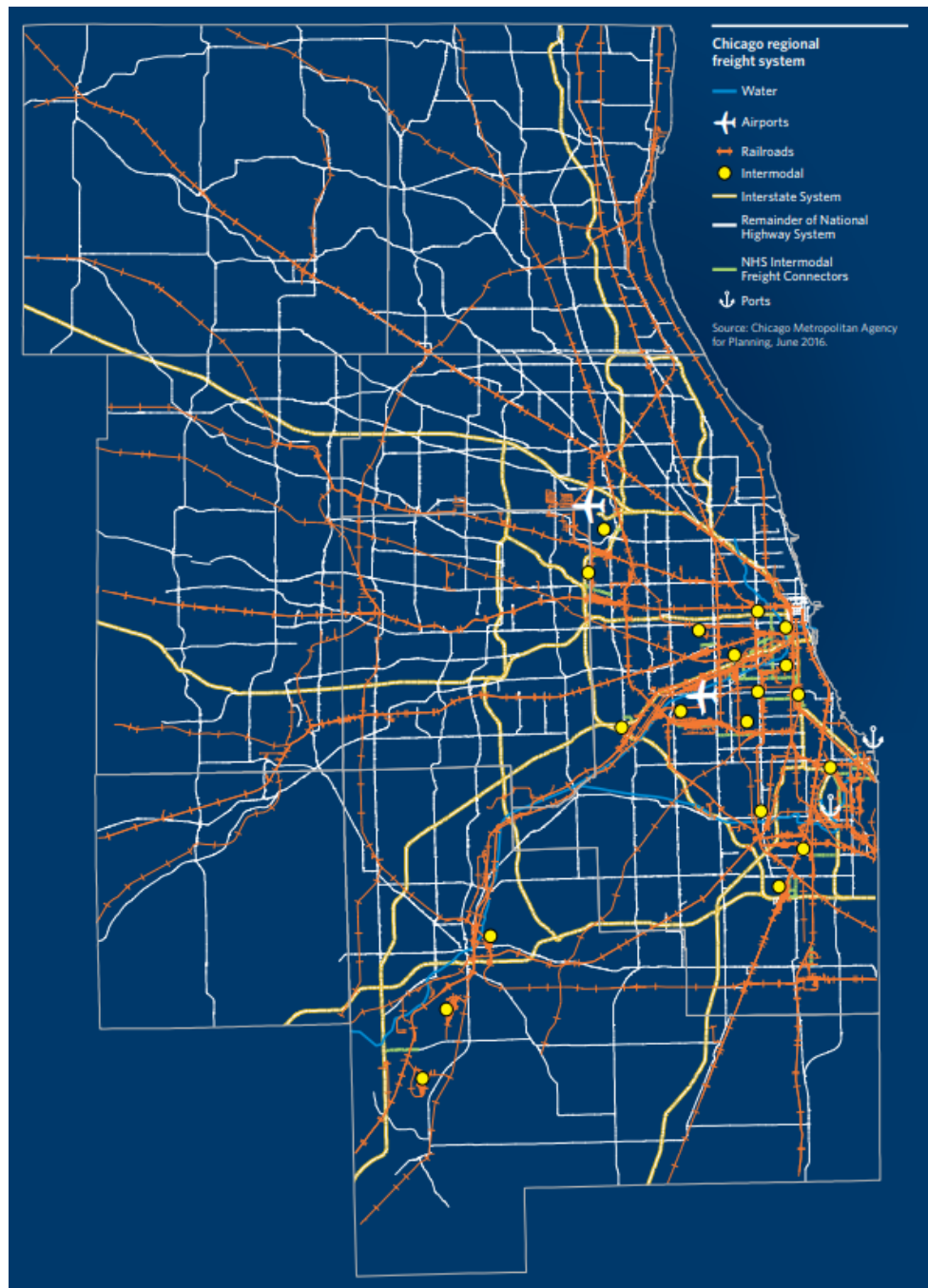
Introduction/Background

The Chicago Metro region is in the Northeastern part of the State of Illinois and by Lake Michigan, and it includes seven counties.²⁶³ The metro area had an estimated population of 9,262,825 in 2023, according to the U.S. Census Bureau.²⁶⁴ There are 30,000 miles of highways, 3,900 miles of rail, 100 miles of navigable waterways, and two major airports in the region.²⁶⁵

269 million tons of freight come in and out of the Chicago metro region annually, serving foreign, domestic, and in-region needs. The distribution of the freight system is shown in Figure 13. Trade mostly takes place with other metro areas and states. The Chicago Metro region is geographically significant because it serves as a major interchange point between railroads from the West and East coasts. The region also has the only direct maritime connection between the Mississippi River and the Great Lakes Basins.

Trucks are the most significant freight transport mode, as they help support intermodal connections and are generally more affordable, reliable, flexible, and expedient than other modes. Air freight is more expensive than other modes, so it is primarily used for lightweight or expensive goods, such as pharmaceuticals, electronics, and precision instruments. For lower-value and heavier goods, rail and water freight transport are effective.

Figure 13. Chicago Metro Freight System



Plan Details

The Chicago Metropolitan Planning Agency (CMAP) created two complimentary reports to support freight planning efforts in the region: *The Freight System: Leading the Way* (Snapshot Report), released in May 2017, and the *Regional Strategic Freight Direction*, released in February 2018. The Snapshot Report outlines major themes and issues of the freight system in the Chicago Metro region, discussing infrastructure needs, legal challenges, and impacts on the economy.²⁶⁶

The Snapshot Report is one of multiple snapshot reports which inform the region's comprehensive plan: "GO TO 2040." The *Direction* document discusses near-term freight policy strategies and recommendations and is influenced by previous planning efforts, including the Snapshot Report.²⁶⁷ The *Direction* document was created with the help of the Regional Freight Leadership Task Force and stakeholder engagement over several years. Outreach to support the plan was initiated by the CMAP work committees, and some stakeholders were engaged on an individual level.

The Snapshot report includes maps which show the distribution of bottlenecks, road conditions, reliability, and safety issues in the region.²⁶⁸ There are maps in the Snapshot report which include bottlenecks, supply chain trading partners on a national level, intermodal container traffic of Chicago Metro and how it compares to other major cities, origins of heavy truck trips, passenger and freight rail conflicts, and truck routing restriction changes.

The *Direction* document includes maps about economically disconnected areas in relation to freight clusters and truck bottlenecks, landed cargo weights for top U.S. airports, proposed truck route network, and highway-rail grade crossings to study.²⁶⁹ There is also a map for freight supportive land use clusters (see Appendix B), along with multiple tables describing land use in those clusters, specifying area in square miles dedicated to industrial, medium-utilized, vacant, and rentable building area. The number of truck routes and rail miles are also described in these clusters as well as the number of freight-manufacturing employment, and the number of truck, rail, and community issues, as shown in Table 4. Other data in the *Direction* document includes employment change among various counties in warehousing and storage and percentages on the types of occupations employed in those sectors.

Table 4. Number of Chicago Metro Communities in Freight Clusters and Respective Issues

	Included in analysis	Truck issues	Rail issues	Community impacts/quality of life
Greater O'Hare	28	10	3	3
Will County	15	7	6	7
Core/Midway	12	1	1	2
Fox River Valley	13	6	5	6
South Cook	9	4	2	0
North Chicagoland	3	1	1	0
TOTAL	80	29	18	18

Freight Planning Strategies

Strategies to support freight planning in the near-term are discussed in the Regional Strategic Freight Direction Report. An action plan was created with action items which are sorted under four categories: truck policy, rail policy, land use policy, and federal freight fund utilization.

For truck policy, strategies include executing recommendations from a regional truck-permitting study, which are sorted into short, medium, and long-term recommendations, as shown in Table 5. This study was initiated by county leaders in the region, included workshops and interviews with industry experts and permitting agencies, and was funded by multiple partners, including CMAP, the City of Chicago, seven counties, and the Illinois Department of Transportation (IDOT). Other truck policy strategies include being proactive and collaborative about truck restrictions and route designations and managing truck deliveries.

Table 5. Truck Permitting Study Recommendations

Short Term (six months)	Medium Term (18 months)	Long Term (36 months)
• Set baseline customer communications protocols. • Establish response time service levels for routine permits.	• Review and update permit-related ordinances. • Explore single permits spanning multiple jurisdictions. • Collect and publish jurisdictional maintenance agreements. • Invest in online permitting technology.	• Collect and publish road closure information. • Develop municipal infrastructure costs study. • Develop regional OS/OW commodity flow study.

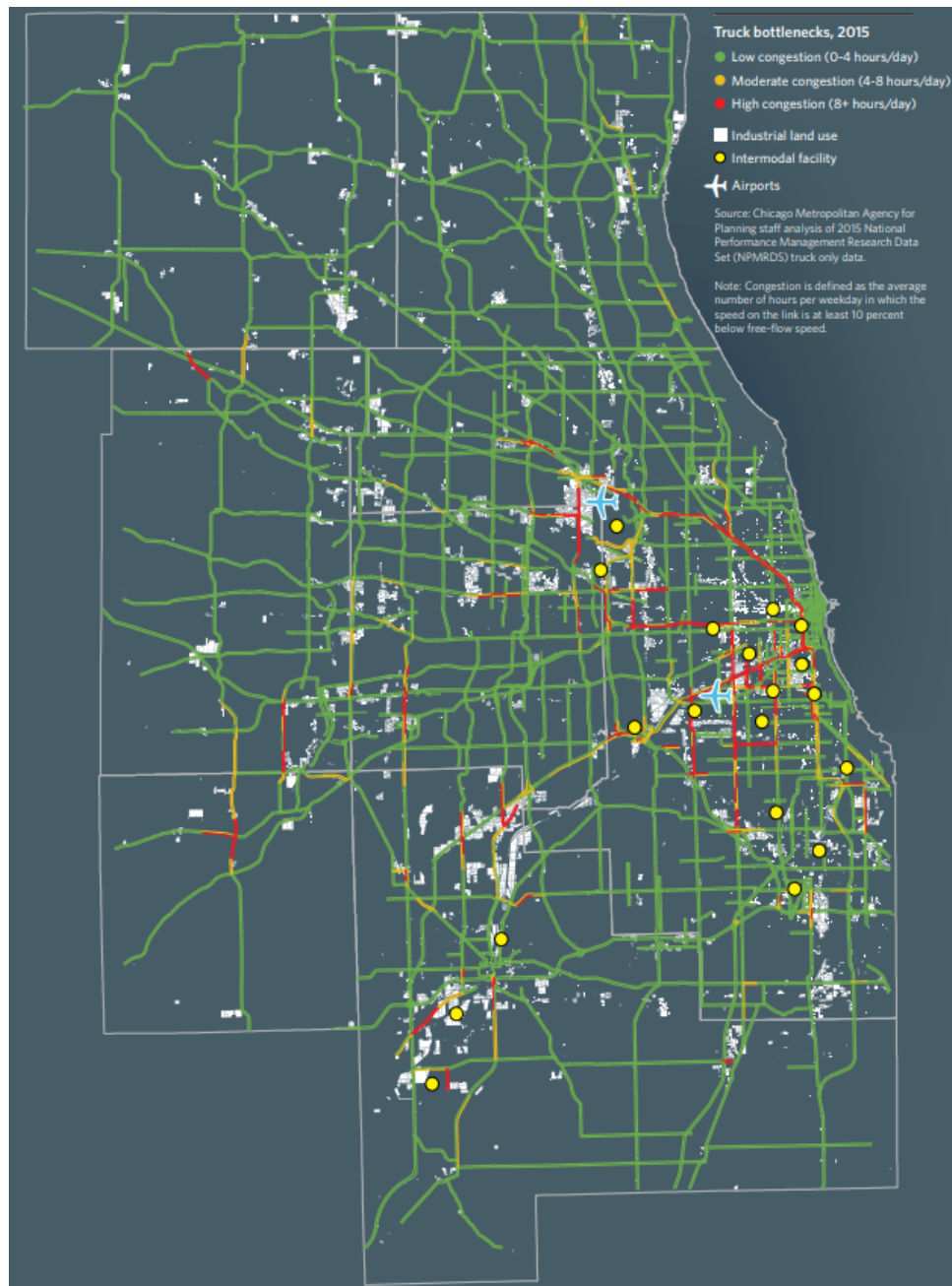
For rail policy, strategies include continued support of the Chicago Region Environmental and Transportation (CREATE) program, which was created in 2003 through a public-private partnership to improve rail capacity and connections between rail lines. There are 28 projects which have been completed as of 2017 through the CREATE program, and many other projects are in various design stages. Other strategies include performing a study on highway-rail grade crossings, analyzing major rail proposals, improving the operation of railroads, and promoting passenger rail in the central city.

The other two categories of the action plan are broader in scope and utilize outside resources. For land use policy, strategies include communication of best practices, assessing facility development, addressing environmental justice issues, prioritizing planning efforts in freight clusters identified in the report, and keeping local economic development in mind. Lastly, for federal freight fund utilization, strategies include providing a portion of National Highway Freight Program (NHFP) funds to MPOs, prioritizing those funds on truck bottlenecks and grade crossing improvements, and submitting regional projects for national competitive grant programs.

Challenges

The Snapshot Report explains that the region's core, as well as some major arterial highways, have the most infrastructural needs.²⁷⁰ Bottlenecks are an issue, particularly on the interstate network and on multiple arterial roads, including near O'Hare International Airport and in Will County, located in southwestern Chicago. Other issues which contribute to bottlenecks include lane reduction, timing of signals, passenger vehicle congestion, and geometric issues. A map of truck bottlenecks is shown in Figure 14.

Figure 14. Chicago Metro Truck Bottlenecks in 2015



Rail transport delays are common and can happen due to aging infrastructure, network density, conflicts between passenger and freight rail, and at-grade crossings. Although passengers obtain priority over freight, this results in lower speeds of freight on shared rail lines, which can also impact on-time performance for passenger rail. Besides delays and backups, the 1,500 highway-rail grade crossings in the metro area result in safety concerns. Between 2009 and 2014, 283 collisions occurred, resulting in injuries and fatalities. These grade crossings also have blocked emergency response vehicles from reaching their destinations quickly.

Truck routing and permitting were also highlighted as key challenges. The state allows local governments to determine truck routes. However, this has resulted in fragmented rules which have prioritized where trucks cannot go. These issues, combined with the lack of centralized, public accessibility of permitting requirements for drivers, results in some drivers simply not following the rules and driving in areas they are not supposed to, which increases damage on roads and bridges and increases risk of harm to pedestrians. Drivers may also choose to reroute around certain areas which adds time to their drive and contributes to increased carbon emissions.

Peripheral industrial development has led to unique challenges. Industrial development is expanding to undeveloped regions where there is more space but has led to concerns and conflicts about permissive zoning changes, loss of natural and agricultural resources, polluted aquifers, and adequate public infrastructure and utilities. There is little incentive for local jurisdictions to alter regulations to support freight-friendly land use due to the lower tax revenue they generate and the competition to use that land for other purposes, such as for residential purposes.

Lastly, environmental justice was discussed in the *Direction* document as a challenge that needs to be addressed, with a section dedicated to that topic.²⁷¹ There are higher percentages of low-income and people of color in freight concentrated areas, and there is a need to address social as well as economic concerns and impacts experienced in these areas, including job accessibility, training, nuisances such as noise and emissions, neighborhood connectivity, and safe road and rail crossings.

Opportunities

The *Direction* document discusses opportunities to improve delivery management. Recommendations include off-hour deliveries and better management of parking and loading. Municipalities can push to have stronger emission standards and acquire cleaner, less noisy trucks which could take advantage of night-time deliveries. New, unidentified technologies could be developed through pilot programs involving collaboration between public and private stakeholders to address concerns related to security and staffing for evening deliveries. At the University of Illinois' University Transportation Center, research is being conducted on case studies and best practices for off-peak delivery pilot programs. Other strategies include identifying loading zones for trucks and ensuring building codes include requirements for loading zones. These and other recommendations for delivery management are shown in Figure 15.

Figure 15. Delivery Management Recommendations



Urban Design

- 1 Require and maintain alleys or backage roads to separate freight activity from mainline traffic, walkers, and cyclists.
- 2 Loading docks should be adequate in number and size for the anticipated trucks, and deliveries should be limited by these accommodations.
- 3 Adapt existing streets for improved truck parking and drop-off/pick-up loading area management.
- 4 Where possible, separate trucks from walkers and cyclists to improve safety and make everyone more comfortable.

Truck Routing

- 5 Consider combined truck/bus lanes to speed freight, reduce emissions, and improve mobility.
- 6 Review truck route and permit ordinances to ensure they are up to date. Adopt Class II truck routes where combination vehicles with 53-foot trailers are expected. Coordinate these routes with neighboring communities, and submit revised ordinances for inclusion in IDOT's truck maps.

Delivery Management

- 7 Encourage overnight deliveries to reduce peak-period congestion. In congested places, require enclosed areas for unattended overnight deliveries. Consider requiring that overnight deliveries be quiet and clean, rather than banning them.
- 8 Encourage or require centralized shipping/receiving points to reduce the number of delivery vehicles.
- 9 Provide adequate loading zones, balancing between loading and customer parking needs. Meter loading zones to encourage turnover, and vary their use by time of day to enable other uses.
- 10 Introduce pedestrian- and bicycle-friendly means of delivery.
- 11 Consolidate home deliveries by encouraging alternative residential delivery sites.

Implementation

Each action item is discussed in detail in the *Direction* document with a list of key implementers listed for each action item. For example, lead implementers specified for implementing the recommendations from the Truck Permitting Study include entities from the government

(municipalities, counties, IDOT) and private industry. For improving railroad operations, private railroad entities Amtrak and Metra are listed as lead implementers. CMAP is listed as one of the parties responsible for sharing best practices, assessing development of facilities and significant rail proposals, and prioritizing planning in concentrated freight cluster areas. For environmental justice, government agencies (counties, municipalities), transportation agencies, as well as private industry are seen as lead implementers.

Federal transportation funding programs are described as a method to acquire funding to support environmental justice projects. For example, the Congestion Mitigation and Air Quality Improvement (CMAQ) Program gives 20 (out of 100) points to projects that address air quality impacts in sensitive populations. Being more explicit about how projects address environmental justice is a specified implementation strategy.

5.7 Atlanta Metro: Atlanta Regional Freight Mobility Plan (2016)

Introduction/Background (Incorporates 2016 & 2024 Plans)

The Atlanta Metro region is in the state of Georgia in the Southeastern United States. In 2023, the population for the Atlanta-Sandy Springs-Roswell metro area was approximately 6,307,261 according to the U.S. Census Bureau.²⁷² The region supports truck, rail, air, and intermodal freight, and it is well connected to the Port of Savannah.

Trucks are responsible for transporting about three-quarters of the freight in the region.²⁷³ The most truck counts occur along the interstate highways, three of which intersect the region. Inbound and outbound trucks support trade between states, while local trucks provide last-mile deliveries in the region.

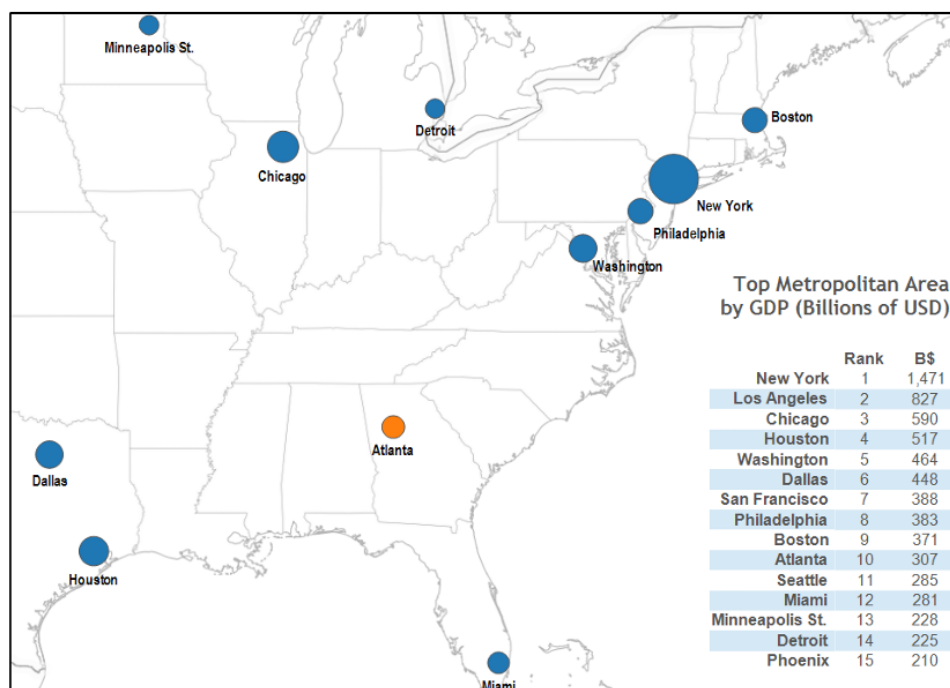
Rail is an important part of the region's economy and transports the second highest freight tonnage after trucks. There are two class I railroads. 85% of the rail infrastructure is commercially owned. There is intermodal, carload, and bulk transfer facilities which support the rail freight system.

The region has one primary international airport: Hartsfield-Jackson Atlanta airport. The air transportation industry is at least three times more concentrated in Metro Atlanta compared to the national average, making it significant for air cargo operations.²⁷⁴ The Port of Savannah is located on the eastern edge of Georgia, is a significant trading partner with the Metro Atlanta region, and is the 4th largest container port in the country.²⁷⁵

Economically, Atlanta metro was ranked 10th in the country for GDP in 2013, as shown in Figure 16. About a third of GDP in Metro Atlanta comes from freight dependent industries, which support over 31% of jobs, with retail trade and construction being the most notable, employing

9.6% and 6% of workers respectively.²⁷⁶ Freight dependent industries are estimated to grow faster compared to non-freight dependent industries, with employment projected to increase by 11% between 2020 and 2050. E-commerce has had a notable impact on the freight industry and respective economy, as it has grown from 5% of retail sales in 2011 to 15% in 2022. This growth resulted in an increase in distribution centers in the Atlanta region.

Figure 16. Top Metropolitan Areas by GDP



Source: 2013 Bureau of Economic Analysis, US Department of Commerce

Plan Details

The *Atlanta Regional Freight Mobility* plan was created in May 2016 by the Atlanta Regional Commission (ARC) with the purpose of performing a study about regional freight needs in the Atlanta Region through examining all freight transport modes and developing a framework to account for those needs.²⁷⁷ The plan's vision is to support the future of Metropolitan Atlanta by serving as a global hub for goods and services, sustaining industry trade and cultural vitality, as well as supporting goals from the Atlanta Region plan. These six goals include the construction of an economic hub of innovation and prosperity that is notable on a global level, workforce development that supports highly educated and skilled workers, a comprehensive transportation network that supports new technology, a secured long-term water supply, the development of vibrant urban centers that are walkable and support all ages and abilities, and the promotion of aspects that contribute to a high quality life, including health and arts.

The plan took eight months to complete and involved various kinds of stakeholder engagement. A freight advisory taskforce held biweekly meetings during the development of the plan. This taskforce was made up of stakeholders from industry, local governments, citizens, and community improvement districts (CIDs). Interviews with industry experts, briefing presentations to the ARC Transportation Coordinating Committee (TRC) and Transportation Air Quality Committee, and online questionnaires (by ARC TRC) were also engagement strategies which helped inform the plan.

The plan includes various kinds of data related to freight transport performance measures. The plan relies on data from the ASTRoMaP system, as shown in Figure 17, which includes data on truck volumes. Other data includes locations of freight clusters, speeds, freight value and ton-miles, job numbers, crash data, estimated emissions of nitrous oxide, particulate matter, and greenhouse gases. There is also data on the conditions and performance of intermodal connectors.

Figure 17. Truck Counts in Atlanta Metro Region



Source: Georgia Department of Transportation, Atlanta Regional Commission

Freight Planning Strategies

The plan has a section dedicated to strategies and initiatives. This section discusses strategies first, which mainly consist of studies to inform what specific projects to implement and where to implement them.

Some recommended studies are meant to supplement previous plans and efforts to assess freight issues in the region. For example, the Fulton Industrial Boulevard (FIB) Long-Term Capacity

Study is recommended to help determine long-term solutions for the FIB, the most significant freight cluster in the region. This study would continue the efforts started by the 2013 FIB Master Plan which identifies struggling intersections. This new study would collect data related to truck counts and land use growth patterns to determine future demand and then develop specific strategies to improve freight reliability and support economic productivity, like making lanes more truck friendly or changing the design of traffic signals.

Other recommended studies include an at-grade railroad crossings study on a metro level and creating freight plans on a more local level, like in counties and subareas of counties, to understand and organize truck traffic in freight clusters. These subarea studies would involve finding and naming where trucks begin and end their trips using data such as land use, economic, and employment data. New truck data would be compared to the existing ASTRoMaP system to uncover inconsistencies between the two. One example of a local study includes an ongoing 2016 study by the Georgia Department of Transportation (GDOT) about the Downtown Connector in Atlanta, home to one of the top bottlenecks in the country.

The plan then goes into initiatives, which, in contrast to the geographically focused strategic studies, are meant to address widespread problems which may have not been fully addressed or overlooked in past plans. Each initiative has a defined purpose, objective and factors. Examples of initiatives include a separate study about truck parking which includes the needs of short-haul and long-haul drivers, the addition of truck friendly lanes along busy roadways to reduce congestion, a pilot study testing automatic vehicle technology (examples shown in Figure 18), and technology that automates warehouses and factories to improve productivity.

Figure 18. Examples of Automatic Vehicle Technology Infrastructure

5.9 GHz DSRC
Roadside Units



Signal Controller/
Cabinet Upgrades



Backhaul
Communications
and Data
Management



Infrastructure-
Based Messaging



Other initiatives include topics about home deliveries, off-hour deliveries, the expansion of natural gas as an alternative fuel source to reduce emissions, and a planning assessment for resiliency to extreme weather, which considers supply chain vulnerabilities and consumption points, alternative routes, and best practices from other cities. Improving the performance of the long-haul corridor was also identified as an important goal, and the plan provides a list of projects to help achieve this goal.

Challenges

Local zoning laws have influenced the development of freight clusters in the region where freight facilities and infrastructure are disproportionately concentrated in certain areas. Planning of freight facilities has not been completely harmonious with other land uses and respective growth, resulting in large quantities of trucks sharing roads with other vehicles, increasing risk of safety and inefficiency. Road conditions are uneven throughout the region. Intermodal connectors have pavements in various conditions, with connectors to pipeline terminals being in the worst condition. Local roads that handle multiple modes also are in poorer condition. In general, compared to state roads, city and county roads are in inferior condition. Freight rail speed is considered poor and could be faster. There are multiple at-grade railroad crossings in the region which affect both passenger and truck vehicle traffic and increase safety risk.

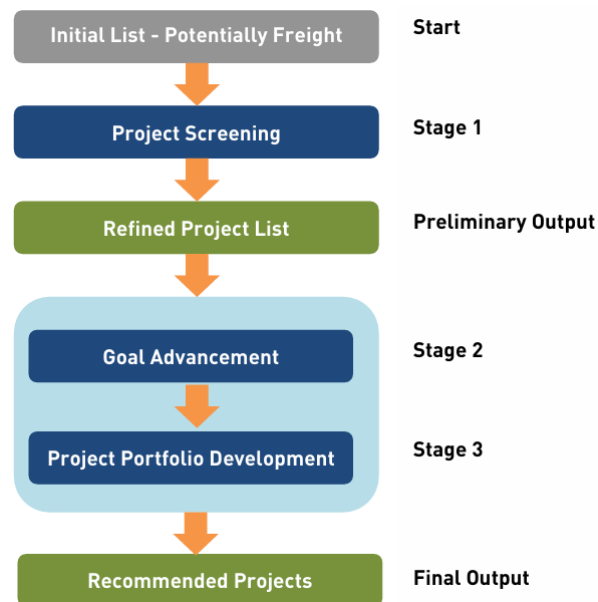
Opportunities

Changes in the global economy could add extra demand to the Atlanta region but also provide opportunities to support employment and overall economic competitiveness. New infrastructure at the Port of Savannah will be needed to increase the capacity and efficiency of the port. Redesigning intersections, roadway corridors, and interchanges will be necessary to address top congested roadways, which intersect with truck corridors.

Implementation

A project prioritization process was developed to support the plan, as shown in Figure 19. This process involved looking back at previous plans to find names of projects. The process involved the freight movement taskforce and ARC committee, which led to an initial project prioritization list. From there, projects were narrowed down based on their relevance to the freight or highway network, the amount of community support or opposition a project had, whether the project was financially feasible, and whether the project had not already been completed.

Figure 19. Project Prioritization Process in Atlanta Plan



Lastly, projects were scored based on their potential to meet various goals, as shown in Table 6. These goals include global hub, advanced network, skilled workforce, vibrant centers, and health and culture. Greater weight is given toward projects which fulfill global hub and advance network goals versus the other goals. Projects can receive one of three scores for each respective goal—1, 3, or 9—with projects generally receiving higher scores if they are within a freight cluster, are in more densely populated areas, or fulfill multiple criteria to support goals. Scores are given based on a mix of quantitative and qualitative criteria. For example, crash density is a quantitative criterion for the advanced network goal, which is fulfilled if a project addresses an area where there have been more than five freight-related crashes per mile. Examples of qualitative criteria include whether the project is in the region’s core and if it incorporates new technology.

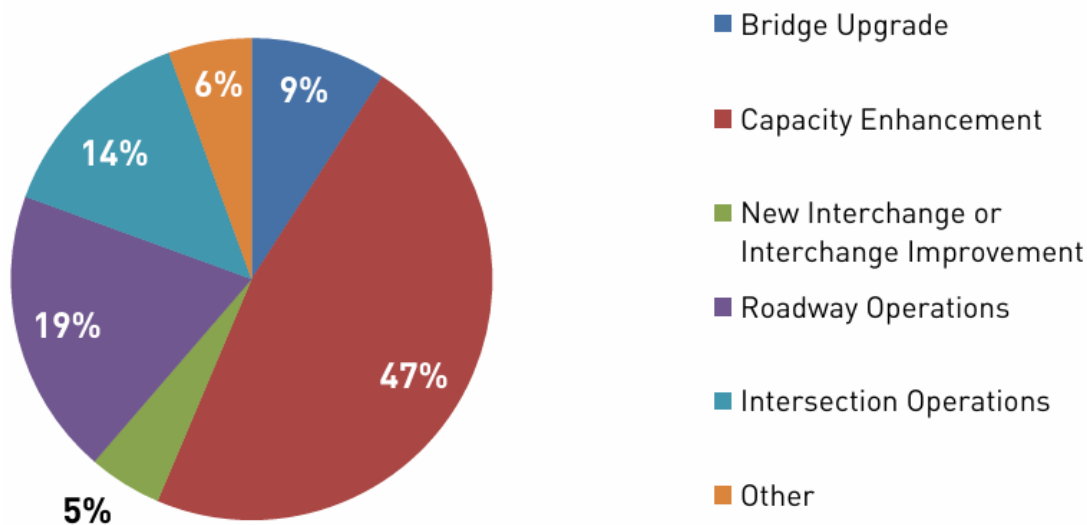
Table 6. Project Prioritization Performance Measures in Atlanta Plan

Goal	Weight	Performance Measure Correlation
Global Hub	30%	Projects supporting growth and market access for clusters: • 1 = Not in a cluster; • 3 = In a cluster, not a capacity project; or capacity project outside of clusters; • 9 = In a cluster and a capacity project or bridge replacement to address weight restriction
Skilled Workforce	15%	Projects supporting jobs in manufacturing and distribution clusters. Scoring criteria used is described below: • 1 = Minimal support/not in or adjacent to a freight cluster; • 3 = Adjacent to a freight cluster; • 9 = Within a freight cluster.
Advanced Network	30%	GIS analysis of performance on interstate highways and the ASTRoMaP non-interstate network • Speed less than 25 mph on non-interstate ASTRoMaP or less than 45 mph on interstate highways • Reliability – buffer factor of 0.6 or higher • Crashes – Crash density of more than 5 freight related crashes per mile Scores: 1 = one criteria met; 3 = two criteria met; 9 = three criteria met
Vibrant Centers	15%	Land use composition of project's surroundings was considered as a factor impacting efficacy of a project in improving freight movement in the region. Scores were assigned to projects by their location within the land use categories from the ARC Unified Growth Policy Map (UGPM) as described below. • 0 = Rural, Developing Rural, Regional Important Resources • 1 = Developing Suburbs, Industrial / Logistics Area • 3 = Town Centers, Established Suburbs, Regional Employment Corridors, Maturing Neighborhoods, Community Activity Centers, Recreation Districts, University Districts, Wellness Districts, Redevelopment Corridors, Crossroad Village, Airport Investment Area, Regional Town Centers, Village Centers • 9 = Station Communities (1-mile buffer), Region Core, Regional Centers, Major Retail, LCI areas
Health and Culture	10%	Projects reducing NOx, PM2.5, and/or GHG. Following scoring criteria was used in this process: • Capacity projects = 1; • Operations and Interchange projects = 3; • Alternate mode and new technology = 9.

The scoring of projects resulted in a final recommendation of projects to pursue, which was presented via maps, tables, and a pie chart, the latter of which is shown in Figure 20. There are six categories of projects presented: bridge upgrade, capacity enhancement, new interchange or interchange improvement, roadway operations, intersection operations, and other projects. Projects which included capacity enhancements were the most frequently recommended project type in the final project prioritization list, followed by projects which included roadway operations. Overall, the plan includes a thorough project prioritization process that keeps track

of the number of approved projects and the type of projects that are approved, helping to explain what the most significant issues are in the region and guiding planners to not only respond, but plan ahead for these issues.

Figure 20. Types of Projects Included in Final Project Prioritization List in Atlanta Plan



A section in the plan is dedicated to funding sources to support freight strategies which could be used in combination. The FAST Act was mentioned as a federal source which could be leveraged to support new critical urban freight corridors and other projects. The Georgia Transportation Funding Act of 2015 (partly funded by state fuel taxes) is expected to provide \$750 million–\$1 billion in funds every year to support transportation projects across the state of Georgia. Community Improvement District (CID) assessments are seen as another funding strategy. CIDs are a recent planning strategy implemented in Metro Atlanta which can generate funds for projects through taxing non-residential property based on its assessed value. Public-private partnerships can also be utilized to more widely distribute project risk. Collaborations with the private sector can also bolster FAST Act project applications to increase likelihood of approval.

5.8 Atlanta Regional Freight Mobility Plan Report (2024)

Introduction/Background

Section 2.8 provides the introduction/background of freight and goods movement activity in the Atlanta region. Section 2.9 provides information from the most recent regional freight plan released in 2024, including plan details, freight planning strategies, challenges, opportunities, and implementation.

Plan Details

The 2024 *Atlanta Regional Freight Mobility Plan Report* has four main purposes: 1) to assess the 2016 plan with current conditions and forecasts; 2) to update the plan with policies at the regional state and federal levels; 3) to include requirements from the Infrastructure Investment and Jobs Act (IIJA); and 4) to identify significant freight projects at the regional, state, and federal levels.²⁷⁸ Six goals are outlined in the 2024 plan: safety, operations, economy, sustainability and resiliency, quality of life, and integrated planning.

Many types of data are used to provide context to the plan. There are tables and figures included which discuss bottlenecks, employment in the freight industry, e-commerce sales, truck parking supply and availability, recommended projects, and freight clusters. Multiple other plans and studies from the local, regional and state level also informed the creation of the 2024 plan, with a section dedicated reviewing these plans and studies.

Freight Planning Strategies

General objectives were specified for each of the six plan goals:

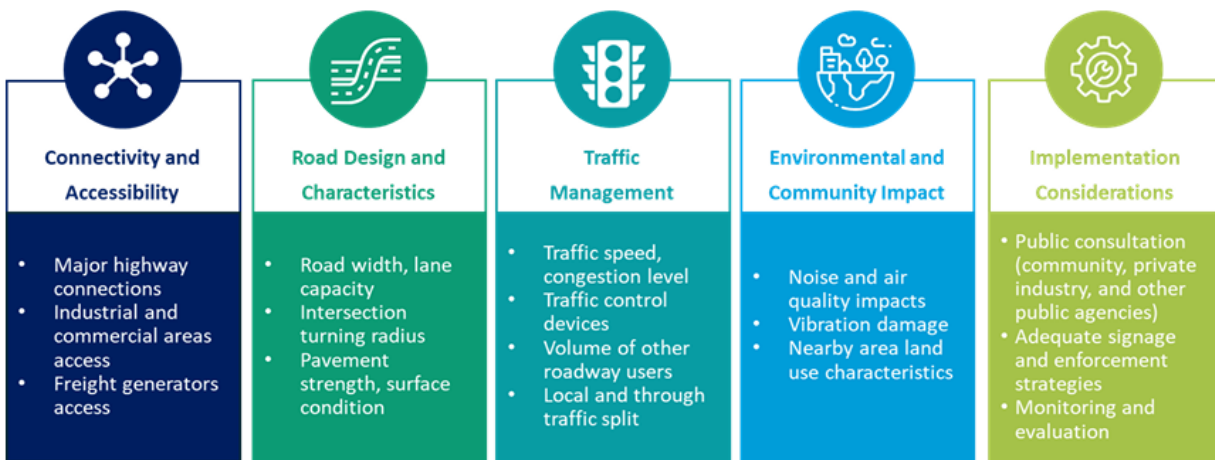
- Safety: improving safety for all users of the freight network, including freight operators and other road users.
- Operations: improving travel efficiency, intermodal connectors, and utilizing metrics to keep track of performance.
- Economy: strengthening regional freight industry capacity and increasing the understanding of freight among the general public and decision makers.
- Sustainability and Resiliency: investments in freight infrastructure to strengthen resilience and utilizing technology to improve system efficiency and environmental sustainability.
- Quality of Life: equitable employment accessibility, following best practices for future siting of industrial facilities, supporting efficient and smooth good delivery.
- Integrated Planning: considering wider-scale freight and industrial impacts, policies to support housing located within a reasonable commute time for workers in industrial employment areas, encouraging public-private collaborations, and creating local tools and guidance to support freight considerations for the local planning process.

Several freight planning strategies are provided in the plan. These strategies include guidelines for freight design and the designation of truck routes and prohibition corridors, a truck parking

model ordinance, development partnerships, designation of critical urban freight corridors, and county freight factsheets.

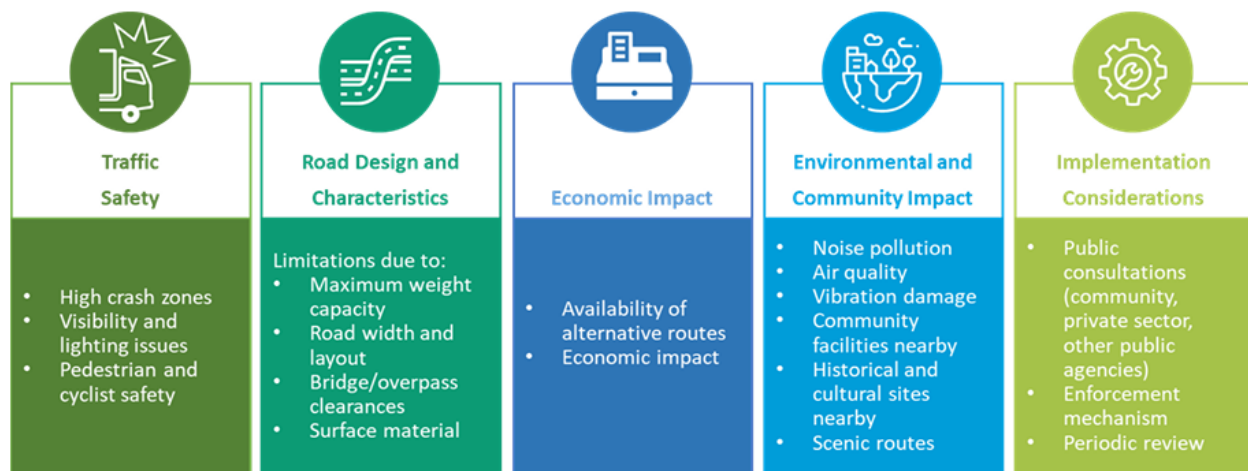
There are freight design guidelines that explain how to plan and design for freight in public spaces and for private development. These guidelines have specific considerations for industrial land use, major activity centers, and small regional centers and downtown areas. There was also guidance that was developed for municipalities and counties to designate truck routes and prohibition corridors. For truck routes, considerations include connectivity and accessibility, road design and characteristics, constraints of infrastructure, traffic management, environmental and community impact, and implementation. Figure 21 provides more details on truck route considerations.

Figure 21. Truck Route Designation Considerations from Atlanta Regional Freight Mobility Plan (2024)



For truck prohibition corridors, considerations include road design and characteristics, traffic safety, environmental and community impact, economic impact, and implementation considerations. Figure 22, in contrast to Figure 21, provides more details on the truck prohibition corridor considerations. Together, these figures demonstrate the multi-dimensional aspects that go into planning for truck freight. Environmental and community impacts are great examples as they have to be considered in not only choosing where truck routes should go but where they should be prohibited. There are several negative externalities that accompany freight such as noise, toxic emissions, and threat to safety. Thus, when planning truck routes, planners have to make difficult decisions on where to distribute community benefits and costs.

Figure 22. Truck Prohibition Corridor Considerations from Atlanta Regional Freight Mobility Plan (2024)



The Truck Parking Model Ordinance is a document that was created as part of the 2024 plan. This document has two sections for addressing truck parking, particularly for semi-trailer trucks, influenced by the Federal Highway Administration’s Truck Parking Development Handbook. The first section discusses truck parking zoning recommendations for supporting long-term truck parking and storage as well as temporary truck staging. The second section is a Model Short-Term Truck Parking Ordinance for counties and municipalities, providing guidance to communities for providing more opportunities for short-term truck parking access. Both sections provide minimum recommendations as well as more ideal and comprehensive recommendations for addressing truck parking.

Development partnerships were recommended for addressing the lack of freight parking facilities in the private sector, which could be due to land costs, public concerns, and local regulations. In the plan, they provide some examples of entities to work with, such as a development authority, and a list of activities that could be pursued to support a public–private partnership, including tax abatement, regulatory agreements which could include streamlined, low- to no-cost-permitting, low-cost leasing, or other agreements for land use.

There have been efforts to designate critical urban freight corridors (CUFCs), a first for the state of Georgia. This allows the state and the Atlanta region to have more roads be part of the National Highway Freight Network and be qualified for assistance under the FAST Act. Coming up with a list of CUFCs involved looking through project lists from previous planning documents, categorizing projects into road segments, evaluating those road segments based on various criteria (traffic levels, connections, higher priority projects) and coordination with state and other stakeholders. A map was created as result of this process and corridors that fell under Tier I was submitted to the FHWA for approval.

Factsheets have been created for all 20 counties that are part of the Atlanta Metro region. These fact sheets are brief, two-page summaries include county-relevant information about types of freight dependent jobs, freight flow direction, an overview of freight networks, an overview of trading partners, and an overview of top commodities transported.

A freight resilience study was also listed as a potential strategy. If pursued, it would identify vulnerable freight infrastructure based on a risk-management lens which would calculate potential impacts and likelihood of scenarios from human and natural disruptions. This study would also coordinate with other efforts being completed as part of the PROTECT plan, a U.S. Department of Transportation funded plan to improve resilience of transportation infrastructure to extreme weather and climate change.

Challenges

Some of the main challenges addressed in the 2024 report include freight bottlenecks, at-grade rail crossings, resiliency, pursuing alternative fuels and electric vehicles, and truck parking.

The demand for freight transportation has risen faster than the capacity for rail and highways to handle that freight over decades in the region, resulting in bottlenecks. There are many at-grade rail crossings that can cause delay and injury. The plan outlines the most problematic crossings. In terms of resiliency, bridges that are structurally deficient are particularly vulnerable to extreme weather events. Extreme weather can result in these bridges being closed, which can disrupt the flow of freight, resulting in detours and greater costs. Bridges with low vertical clearance also result in detours.

Many challenges and concerns were outlined that limit widespread adoption of alternative fuels and electric vehicles. There were a lot of concerns in terms of range and reliability of electric vehicles and vehicles utilizing alternative fuels, as there is a lack of charging or alternative refueling infrastructure. Additionally, charging vehicles takes longer than traditional refueling. There is a concern for high upfront costs, as it involves costs for site upgrades, charger installing upgrades, as well as the vehicles themselves. Larger companies have a stronger ability to adapt, afford, and train employees to participate in using and maintaining electric vehicles compared to smaller companies, which may be limited in their resources.

Demand for truck parking continues to exceed supply in the Atlanta metro region. There are differences between counties within the region, but a majority have truck parking deficits.

Opportunities

Multiple opportunities were outlined to help support alternative fuels and electric vehicles, including expanding infrastructure, improving battery technology to support longer ranges,

lowering upfront costs, providing incentives, pursuing workforce development to support these alternative fuels and electric vehicles, helping smaller fleets with the capacity to transition, upgrading the electrical grid, communicating with utility companies, forming partnerships, and advocating for increased funds.

Implementation

The 2024 plan has a project prioritization process. There are three stages that contributed to a list of project recommendations. The first stage involved reviewing previous plans and completing a needs assessment for the 2024 plan. Identified needs from this assessment included safety, bottlenecks, system resiliency, truck parking, grade separation, deficient bridges, at-grade rail crossings, integrating ITS or other technologies, adoption of alternative fuels or electric vehicles, improving accessibility to freight clusters, curbside management, operational improvements and system gaps. The second stage included project screening, where projects were analyzed based on their relevancy to freight, regional significance and feasibility. The last stage included putting together a refined project list. Table 7 provides details of this process, including an objective scoring system, five project criteria, and each criterion's respective weight toward a project's final score. Project criteria include satisfy goal, satisfy need, freight cluster, freight network, and crash hotspot. Compared to other criteria, freight cluster has the highest weight in the project prioritization methodology. Each criterion is given a score from 0 to 2.

Table 7. Project Prioritization Methodology from Atlanta Plan

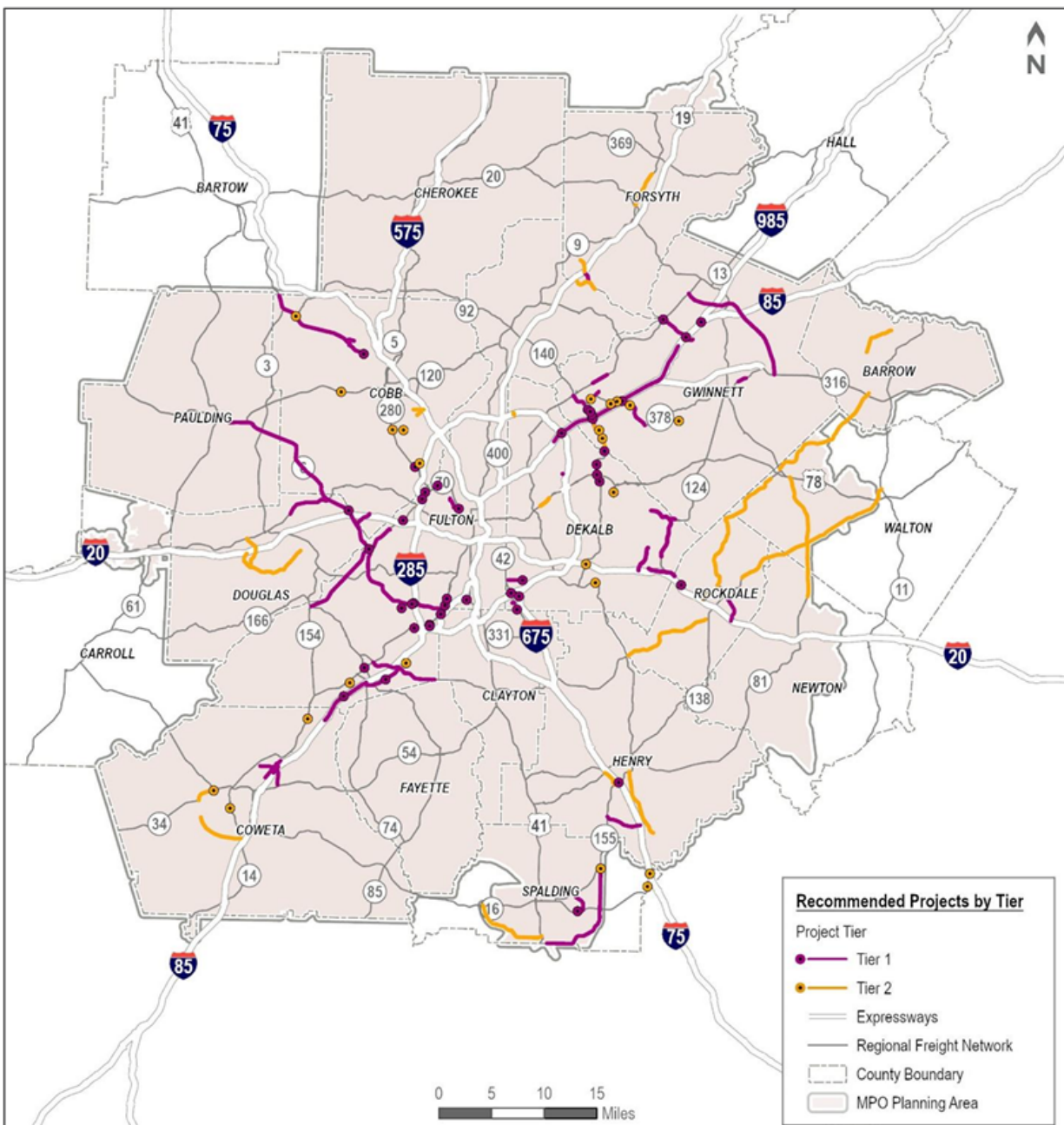
Criteria	Weight	Score		
		High (2)	Low (1)	Zero (0)
Satisfy Goal	15%	Satisfies two or more goals	Satisfies one goal	Doesn't satisfy any goals
Satisfy Need	15%	Satisfies three or more needs	Satisfies one or two needs	Doesn't satisfy any needs**
Freight Cluster*	30%	In a freight cluster	Connected to a freight cluster	Not in a freight cluster
Freight Network*	20%	On more than one freight network (current NHFN, ASTRoMaP, and proposed CUFCs)	On one freight network (current NHFN, ASTRoMaP, and proposed CUFCs)	Not on any freight network
Crash Hotspot*	20%	The project is in proximity to a truck or rail crossing fatal crash hotspot	The project is in proximity to a truck or rail crossing serious injury crash hotspot	The project is not near a known crash hotspot
Total	100%			

*Criterion was evaluated by performing spatial analysis of projects

**All projects satisfied at least one 2024 ARFMP goal and met at least one regional need.

This project prioritization process helped narrow down an initial list of 900 projects to 147. Figure 23 shows these projects in a map, which are further distinguished into two categories: Tier 1 and Tier 2. A table is included in the plan that lists all 147 projects rated by tier. The map is a strong tool for visualizing priority projects in the region and how they spatially relate to each other. This relationship is important to keep in mind when pursuing freight transportation planning, as it may not always be clear how projects in a certain part of the freight network will affect other adjacent areas.

Figure 23. Recommended Projects by Tier from 2024 Atlanta Plan



5.9 Seattle, WA: The City of Seattle Freight Master Plan (2016)

Introduction/Background (Incorporates 2016 and 2024 Plans)

Seattle is the largest city in Washington State and is located on the West Coast. The city lies within the Seattle-Tacoma-Bellevue Metro Area, which in 2023 had a population of approximately 4,044,837 according to the U.S. Census Bureau.²⁷⁹ Seattle was the fastest growing big city in the United States in 2022 and is expected to increase in population by 1 million over the next 20 years.²⁸⁰

The freight industry serves an important role for both Seattle and Washington State. 40% of jobs in the state come from the freight industry.²⁸¹ By 2050, the movement of freight is expected to grow by 42% and will result in increased residential delivery trips overtime.²⁸² About 15% of jobs in the city (116,000 individuals) come from the manufacturing, transportation, and maritime sectors.

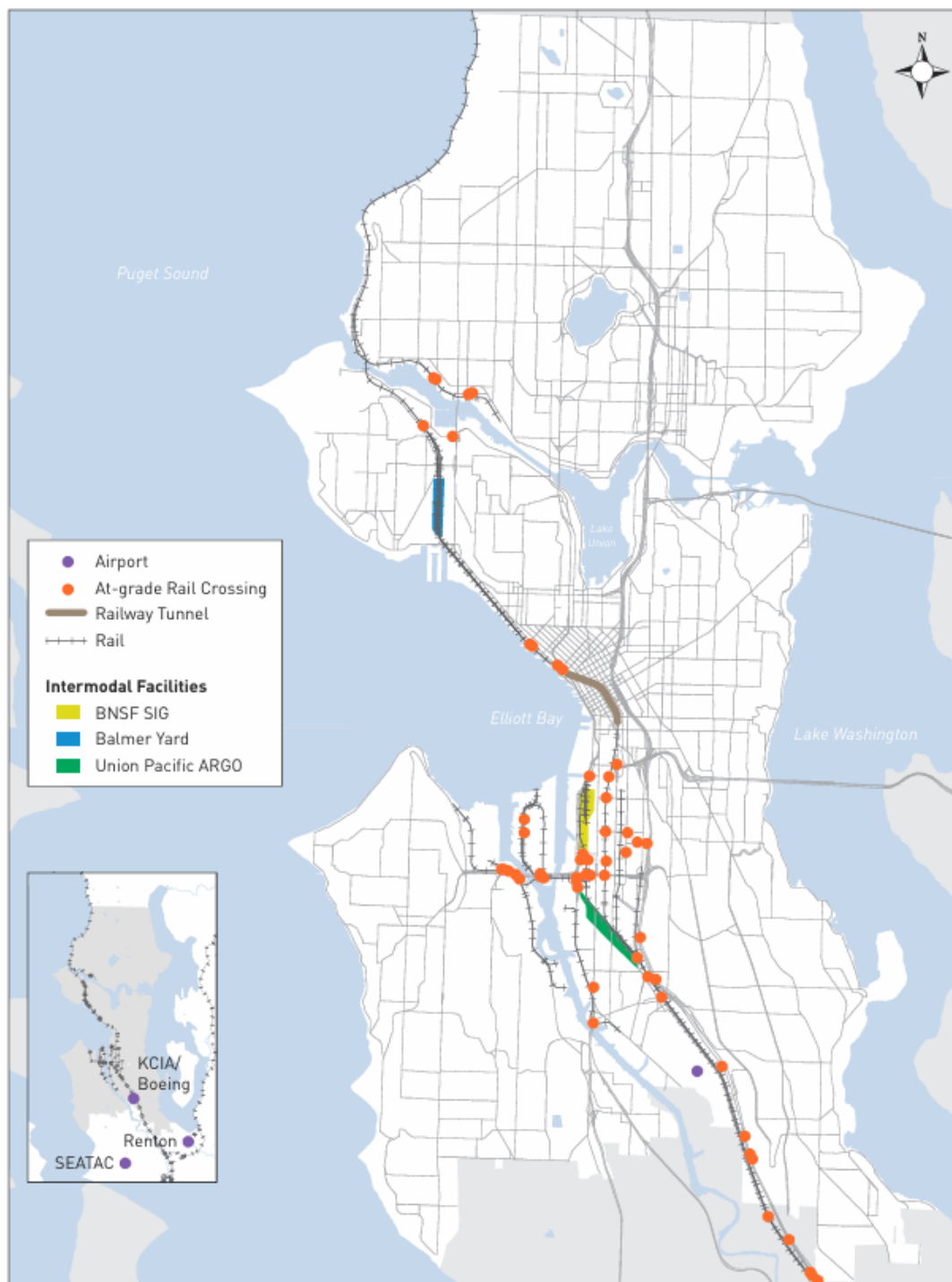
Truck transport is responsible for the largest proportion of freight in the region and utilizes almost all roadways in the region.²⁸³ In terms of freight tonnage, 68.5% of freight in Washington State was transported by truck in 2011. Trucks are key for supporting intermodal freight transport. About 80% of truck trips in the metropolitan area are a result of delivery of goods and services.²⁸⁴

The Port of Seattle is one of the busiest ports on the West Coast, with deepwater ports to support maritime freight and international trade, especially with Asian countries.²⁸⁵ The port also helps support the state's manufacturing and agricultural businesses, trade with Alaska, and intermodal freight. The Port of Seattle is part of the Northwest Seaport Alliance, which works with the Port of Tacoma to bolster marine freight transport in the region. About half of the freight that is exported from Seattle ports comes from Washington State. Truck and rail are the primary modes that deliver goods to ports to be exported, shipping 44.2% and 41.6% of goods respectively. The remaining 14.2% of goods delivered to ports are mainly representative of crude petroleum activity and are delivered by ships, barges, or pipelines. The maritime industry remains significant to the economy despite a city shift to supporting large tech companies.²⁸⁶ Altogether, 46,800 jobs resulting in \$6.2 billion in wages were provided by Maritime, Manufacturing and Transportation and Warehousing Industries.

Rail and intermodal facilities help support freight transport over long distances, such as from the mid-west for agricultural goods. There are two class I railroads owned by BNSF and Union Pacific, some of which branch off into class III rail spurs for smaller distance shipments. BSNF has 1,332 miles of track in the state.²⁸⁷ BSNF has rail connections from Seattle that extend far north, south, and east, with connections to British Columbia, San Diego and Minneapolis. In 2016, 502,000 car loadings left the state and 890,000 terminated in the state.

The region features King County International Airport, and nearby, the Seattle-Tacoma International Airport and Renton Municipal Airport support air cargo services.²⁸⁸ Air cargo can be a faster mode of transport and useful for high value and time sensitive shipments. The location of the rail network, as well as air and intermodal facilities, is shown in Figure 24.

Figure 24. Location of Air and Intermodal Facilities and Rail Network in Seattle



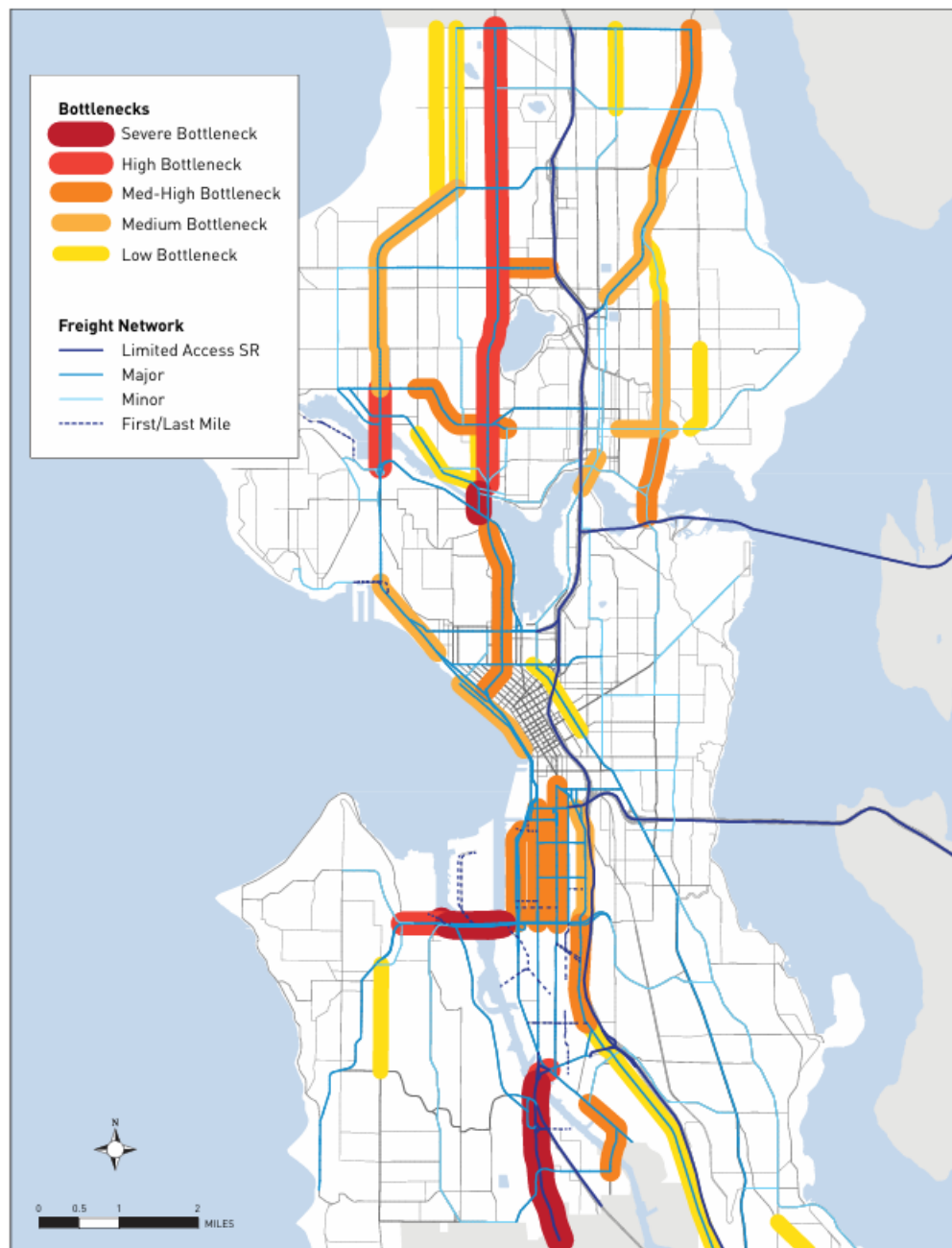
Plan Details

The Seattle Freight Master Plan (FMP) is a city-based freight plan created in 2016 that will serve as a guide for freight planning over the next twenty years, with a primary focus on urban truck movement.²⁸⁹ The plan strives to address freight issues to guide investments and improvements in the freight network and infrastructure to make it more efficient, to support economic growth, trade at the local, national, and international levels, improve safety, and reduce environmental impacts.

The plan was informed by multiple kinds of stakeholder engagement. The FMP advisory committee is made up of internal and external stakeholders. Public input was collected through public events, briefings, councils, involving coordination with various agencies and city officials. The public engagement process involved three stages. The first stage involved individual and group interviews as well as online questionnaires to collect information about current conditions and concerns of the freight network. The second and third phases involved public input on the proposed network and first draft of the Freight Master Plan. Public input was facilitated through open houses, modal advisory boards, and city commission meetings. Existing plans and conditions related to the freight network were also reviewed to help influence the plan, such as the City's 2013 Climate Action Plan, with considerations about potential future conditions and impacts.

The plan contains many types of data to put freight planning issues into context. There are maps that visualize the legal freight network, locations of manufacturing/industrial centers (MICs), mobility constraints, and bottlenecks (shown in Figure 25). There is also data about truck types and volumes, truck collisions (including serious, fatal, between bikes and pedestrians, etc.), and existing projects being currently pursued.

Figure 25. Freight Bottlenecks in Seattle

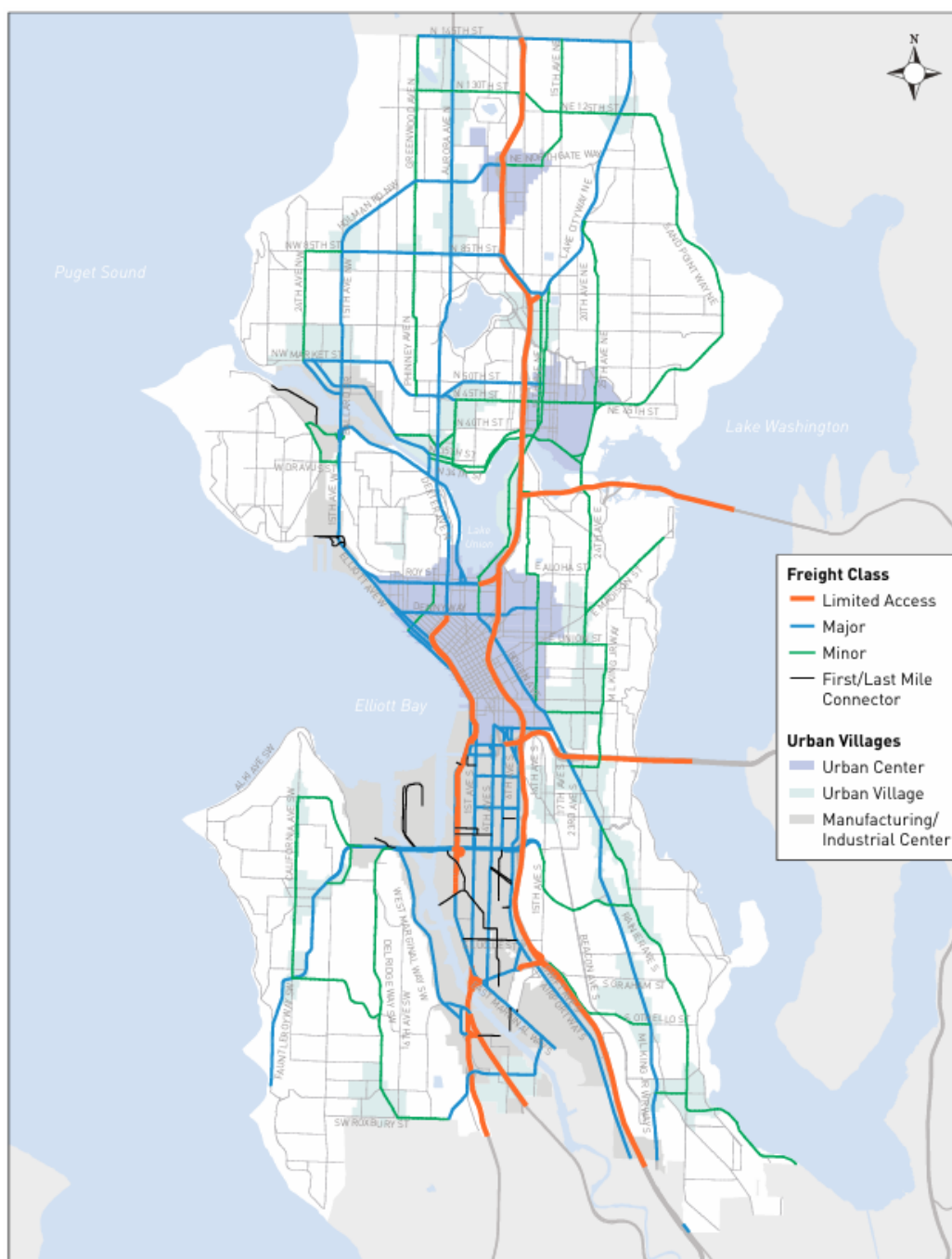


Freight Planning Strategies

The plan has a section discussing the development of a comprehensive freight network informed by stakeholder response and planning best practices. In this network there are four designations, as shown in Figure 26. These designations include major truck streets detailing connections between industrial land uses, minor truck streets which connect neighborhoods and are secondary, first- and last-mile connectors to support short truck trips, and limited access facilities for long-distance drivers who are passing through the region. The plan provides a list of methods

to figure out how and where to create these designations. Some strategies to inform designation decision-making include truck volume analysis (current and future), the types of land use a respective road helps serve, including how it supports other modal types, reviewing the classification of roadways (interstate, state, principal or minor arterial, etc.), assessing where there are alternative routing options, and including public input.

Figure 26. Proposed Freight Network in Seattle



Another section of the plan is described as a freight toolbox, discussing more freight planning strategies. The plan provides seven general strategies or tools to address each of the six goals identified in the plan, as shown in Table 8. These general strategies include maintenance and preservation, intelligent transportation system (ITS) applications, wayfinding, geometric improvements, freight operations management, capital investments, and freight mitigation. Multiple examples of geometric improvements were provided as strategies, such as editing the design of curbs for easier turning, repositioning utility poles, making lanes wider, and creating lanes dedicated for truck travel only. Other potential capital investments include replacing and retrofitting bridges, building ramps that provide more direct access to freeways, and separating grades.

Overall, the freight toolbox establishes explicit strategies with specific action items that connect well to established plan goals. Table 8 demonstrates that certain tools may address more goals than others. For example, tools pertaining to maintenance and preservation touch on all six of the plan's goals, while tools pertaining to geometric improvements address only the safety and mobility goals. That is not to say that geometric improvements cannot address the other goals in the plan, such as equity and the environment. Geometric improvements can improve freight mobility can also contribute to improved efficiency of goods movement, which may provide equity and environmental benefits by minimizing output of negative freight externalities. However, the toolbox is still effective in identifying major tools and the goals they primarily address.

Table 8. Freight Toolbox in Seattle Freight Master Plan (FMP)

List of Tools	Goals Addressed					
	Safety	Economy	Mobility	State of Good Repair	Equity	Environment
Maintenance and Preservation	x	x	x	x	x	x
Intelligent Transportation System (ITS) Applications	x	x	x			x
Wayfinding	x	x	x			x
Geometric Improvements	x		x			
Freight Operations Management	x		x		x	x
Capital Investments	x	x	x	x		x
Freight Mitigation	x			x	x	x

There are several other strategies which have been implemented which aim to improve the safety and efficiency of goods movement. Vision Zero is a Seattle city initiative that aims to eliminate deaths and injuries due to traffic by 2030. The city aims to achieve this by using collision data to support decisions about where to implement safer and smarter street designs, as well as

increasing enforcement and education. Certain routes have been designed to support oversized vehicles which require permits to utilize. State legislation has resulted in heavy truck safety inspections on a semi-annual basis. Legislation has also helped increase funding and provide a framework to support repairing roadways. Other strategies include city weight regulations and a downtown traffic control zone that enforces time-of-day restrictions for permitted and non-permitted drivers.

Challenges

Challenges discussed focused on truck transport primarily. Although there are permitted roads designed for truck travel, truck drivers utilize almost all roads in the region regardless of whether they are meant to handle truck freight. Truck collisions are also an issue, especially with bikes and pedestrians. Some challenges are related to restricted mobility, such as limited quantity of loading zones and facilities, height and weight regulations, traffic control zones, and flawed geometric design. Bottlenecks were also listed as an issue.

Opportunities

The plan has a section dedicated to future trends which discusses various opportunities and potential changes to the freight system. E-commerce and home deliveries are expected to continue rising which may stimulate a diverse fleet of transport modes, including smaller trucks, rideshare and automatic vehicles and bicycle fleets. Smaller distribution centers might also emerge which target smaller, local areas and shipments. For air cargo, increasing the efficiency of fuel will help lower operational costs, as fuel costs are expected to increase over time. The efficiency of rail transport could be improved so that it is more of a possible alternative for long-distance shipments.

Reducing emissions will be key for combatting climate change as truck volumes are expected to increase by 22% between 2014 and 2035 in the region. Increasing climate change impacts could also lead to more severe weather events which impact freight travel, highlighting the importance of preparing for emergency response and disaster relief management.

Implementation

The plan has specific action items listed under each general strategy to accomplish plan goals. A diverse range of action items are included in the plan, which often mention working with various stakeholders, including other city agencies and state partners. Some actions involve pursuing new programs or policies, increasing support for existing efforts, identifying funding opportunities, and exploring new technologies. For example, one general strategy to support their environmental goal is to reduce greenhouse gas emissions, as shown in Table 9. Some action items to achieve this goal include supporting anti-idle policies, bike deliveries, a program to

support lower inspection costs for new trucks, and funding alternative fuels in the city's fleet of vehicles.

Table 9. Strategies and Actions to Achieve Environmental Goals in Seattle FMP

Environment – Improve freight operations in Seattle and the region by making goods movement more efficient and reducing its environmental footprint.	
Strategies	Actions
6.1 Advance freight-supportive technology improvements	6.1.1 Support the use of alternative fuel trucks
	6.1.2 Participate in the development of guidelines for alternative fuel stations throughout the city that provide access for freight vehicles
	6.1.3 Work with partners to identify funding to advance alternative fuel technologies
	6.1.4 Prepare for the advent of freight applications of connected automated vehicle (C/AV) technology; define potential test locations and design of initial pilots
6.2 Reduce greenhouse gas (GHG) emissions produced by freight	6.2.1 Support the proposed “anti-idle” policy for City-owned and operated fleet vehicles and equipment used for transport, construction or landscaping, and train staff after adoption
	6.2.2 Work with the State Department of Licensing to explore and pilot an emissions signature program in which newer trucks pay less for emissions inspections
	6.2.3 Review best practices to consider testing and implementing renewable diesel on City-owned vehicles
	6.2.4 Support efforts to increase bicycle and electric vehicle freight deliveries
	6.2.5 Work with Port on “no idle” zones where trucks queue before entering Port facilities
	6.2.6 Work with the State on truck fleet program grants to offer incentives for cleaner running trucks
	6.2.7 Work with other City agencies to identify funding for exploration and testing of alternative fuels and energy components in City fleet

There is a chapter in the plan dedicated to implementation, which includes a prioritization framework based on quantitative and qualitative data. The type of quantitative data to support implementation is explained for each respective plan goal, as shown in Table 10, explains what kinds of data will help assess accomplishing that goal, what specific kinds of data should be prioritized, as well as recommended sources to acquire that data. Quantitative data examples include truck collision history, average daily truck volumes, and bottleneck analysis.

Table 10. Quantitative Data Criteria and Sources for Freight Planning Goals

Goal	Criteria Description	Data Source
Safety	Prioritize locations that directly contribute to reducing truck collisions in high-collision locations and that contribute to the city's Vision Zero efforts. Safety criteria will focus on truck-related collisions and locations that have a higher potential for interactions between people driving trucks and people walking, bicycling, or taking transit.	• Truck collision history • Transit, bicycle and pedestrian master plan priorities that overlap with the freight network
Mobility	To create an efficient connected freight network, mobility criteria will prioritize locations on the Washington State Critical Urban Freight Corridors (CUFC) and Freight and Goods Transportation System (FGTS) and within manufacturing/industrial centers, urban centers, and urban villages. It will also prioritize areas with high forecasted truck volumes, and locations on the freight network.	• WSDOT CUFC network • WSDOT FGTS network • MIC, urban center, urban village boundaries • Average daily truck volumes • Freight network
Economy	Prioritize areas that have high concentrations of freight-related jobs and that provide direct and reliable freight connections to land uses that rely on the movement of goods.	• PSRC covered jobs data • MIC, urban center boundaries
State of Good Repair	Prioritize investments based on pavement condition and location on the regulatory networks.	• Pavement condition index • Heavy Haul network • Over-legal network
Equity	Prioritize investments in areas with high concentrations of low-income or minority populations to ensure appropriate measures can be taken to mitigate the impacts from freight.	• US Census Bureau
Environment	Prioritize projects that eliminate FMP bottleneck locations and/or reduce congestion on the freight network, thereby reducing idling and greenhouse gas emissions.	• FMP bottleneck analysis

Qualitative data criteria are also described in the plan, with four qualitative criteria highlighted which influence project prioritization. These criteria include 1) if a project includes the presence of community interest; 2) if the project helps balance investments geographically across the region; 3) if the project is connected to a city policy initiative; and 4) if there is potential for the project to utilize multiple funding resources.

Funding opportunities are also discussed in the implementation chapter and are organized by local, state, and federal level opportunities. Local sources include local agencies such as the Port of Seattle. Move Seattle is a local levy which provides funds to help maintain the conditions of streets and bridges and improves safety of travelers in the city. On the state level, sources identified include the Transportation Improvement Board and Freight Mobility Strategic Investment Board. On the federal level, the FAST Act was mentioned. Public-private partnerships

were also mentioned as a potential strategy, listing the partnership between the Port of Seattle and private railroads as an example.

Lastly, performance measures were described in the implementation chapter. Five performance measures were identified in the plan to address the accountability of the plan achieving its desired goals. Each measure had an explanation for a desired outcome, where to find the data associated with each performance measure, and which goals it helps measure accountability for. Performance measures include travel time, collision, volume counts, and quantity of major truck streets in solid condition, as shown in Table 11. These measures support plan implementation by establishing specific criteria which can track plan progress and to what extent plan goals are being met. Some metrics or data sources appear to track progress of certain goals better than others. For example, pavement condition, according to this table, addresses all six goals, while truck collision numbers address equity, safety, and economy goals but not so much mobility, state of good repair, and environmental goals.

Table 11. Seattle Freight Master Plan Performance Measures

Measure	FMP Performance Measure	Desired Trend	Data Source	Baseline measure	FMP Goal addressed					
					Economy	Safety	Mobility	State of Good Repair	Equity	Environment
1	Travel time on select FMP network corridors	Improve reliability rate	SDOT city-wide speed and reliability program	2016 travel times on identified FMP network corridors	X		X			X
2	Number of collisions involving trucks	Decreasing number	SDOT collision database, sourced from traffic collision reports	2015 truck collisions	X	X			X	
3	Number of fatal and serious injury collisions involving trucks	Fatal and serious injury collisions involving trucks reach zero by 2030	SDOT collision database, sourced from traffic collision reports	2015 fatal and serious truck collisions	X	X			X	
4	Percent of FMP network segments with annual volume counts	Increase the number of FMP network segments with annual counts	SDOT city-wide count program	2016 FMP network segments with annual count locations	X	X	X			
5	FMP network miles of major truck streets in fair or better pavement condition	Maintain and/or improve pavement condition on major truck streets	SDOT pavement condition index	2015 pavement condition on major truck streets	X	X	X	X	X	X

5.10 Seattle: Freight and Goods Movement Element (2024)

Introduction/Background

Section 2.10 discusses the introduction/background of freight and goods movement activity in the city of Seattle and State of Washington. Section 2.11 discusses the most recent city-level freight plan for Seattle, the Freight and Goods Movement Element, summarizing the plan details, freight planning strategies, challenges, opportunities and implementation strategies.

Plan Details

The Freight and Goods Movement Element is a report created in 2024 that builds upon the 2016 Freight Master Plan and is part of Seattle's Transportation Plan, the latter of which is a 20-year plan targeting the city's transportation goals.²⁹⁰ Public outreach was pursued in 2022 and 2023 to help develop the Seattle Transportation Plan.

The freight element provides details about freight related planning, design, construction, operation, and maintenance of the transportation network. The freight element discusses rail, air, and maritime transport modes but focuses on truck transport. The freight element outlines a framework to guide investment strategies to improve safety and equitable access to resources, programs, and secure infrastructure for those who work in the freight industry. The freight element also addresses various adverse impacts and is aligned with citywide goals to eliminate historical socio-economic and racial disparities in and near industry.

Data included to support the plan are figures that discuss the supply chain, freight network, including locations of airport, intermodal and rail facilities. There are also tables that discuss the level of port activity by twenty-foot equivalent units (TEU) and an appendix which features a list of freight projects.

Freight Planning Strategies

The freight plan provides strategies to achieve STP goals by defining key moves to support goals. These six goals include the following:

- Safety
- Equity
- Sustainability
- Mobility and Economic Vitality
- Livability
- Maintenance and Modernization

This plan helps meet STP goals by prioritizing safety so there is no serious injury or fatality, co-creating with the community to implement restorative practices that address inequities, addressing climate change with innovation and justice in mind, ensuring there are affordable and reliable options to move people and goods, making streets inviting places to linger and play, and improving city infrastructure.

For safety, key moves include concentrating on safety investments in the most high-risk areas and making all journeys safer for people not traveling in a motorized vehicle. For equity, key moves include making communities of color and underrepresented groups be the center of planning and decision-making processes and prioritizing investments in the transportation system that address inequities in impacted communities. For sustainability, key moves include promoting clean, sustainable travel options and pursuing green infrastructure. Projects should strive to improve community health and support neighborhood vitality and support the electric vehicle transition. For mobility and economic vitality, key moves include curb management, supporting job access, freight movement, and residential deliveries. For livability, key moves include reallocating street space to be more enjoyable places while supporting goods mobility and delivery. Lastly, for maintenance and modernization, key moves include maintaining streets, bridges, and sidewalks and incorporating safety improvements. Other key moves include reducing disparities in the quality of streets, bridges and sidewalks among different neighborhoods. Streets should be prepared to handle new technologies and travel trends.

Besides these key moves, there is a freight toolbox which discusses general freight strategies which are similar to the 2016 plan, including maintenance and preservation, intelligent transportation system (ITS) applications, wayfinding, geometric improvements, freight operations management such as time-of-day variations, capital investments, mitigation of freight impacts, and conflicts among various modes such as grade separations.

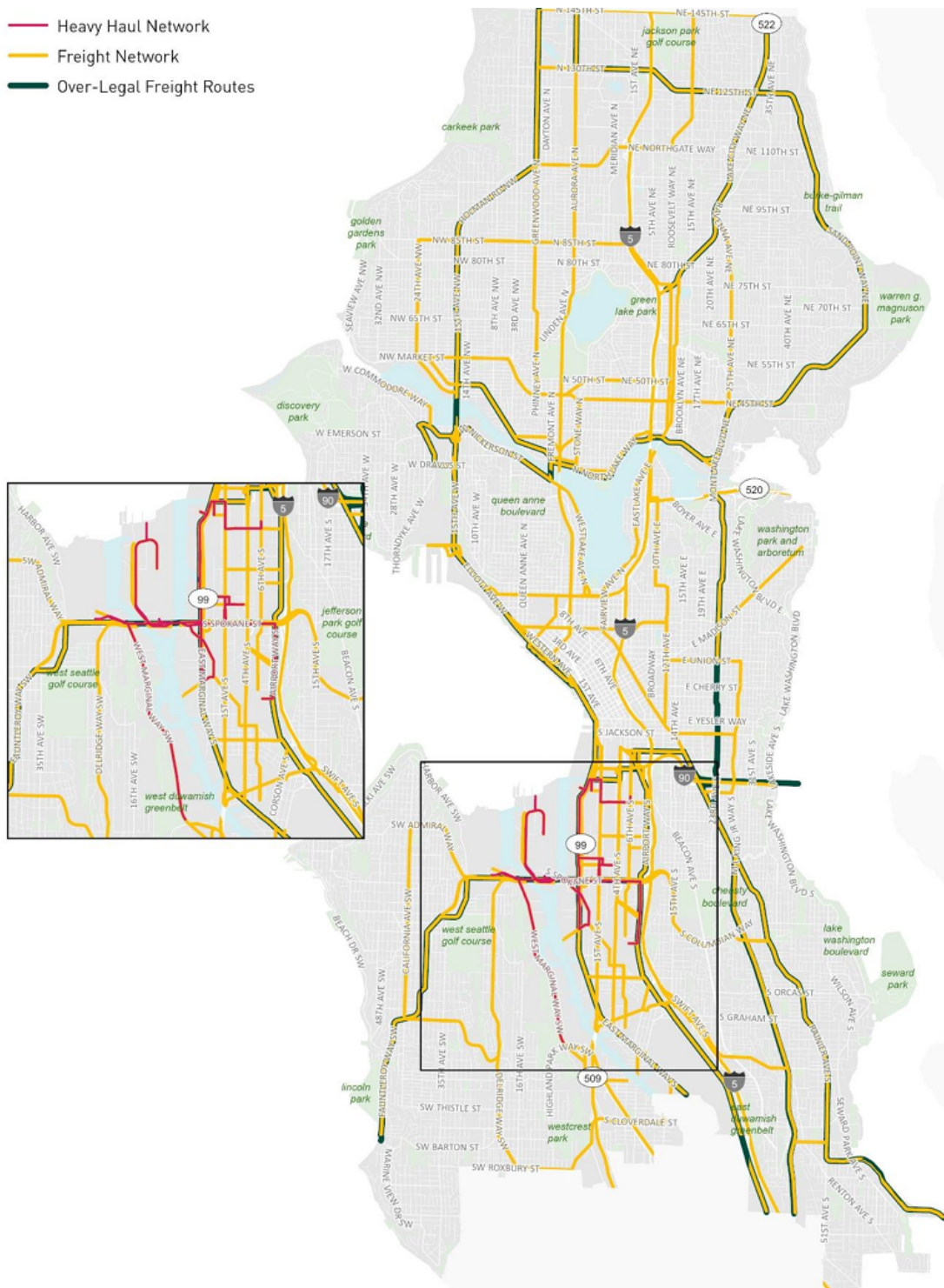
A freight network has also been officially established, outlining major and minor truck streets, limited access, and first and last mile connectors. Table 12 discusses spatial and operating considerations for freight depending on what type of street it is. This table helps compare and contrast different street types among various categories, not only by looking at the road itself, but considering respective land uses, time of day, curbside and delivery needs, and safety concerns. It also helps identify which of these categories certain agencies may have greater jurisdiction and responsibility to address, increasing accountability and critical thinking of freight network planning.

Table 12. Freight Network Spatial and Network Guidance by Street Type

		Factors				
		Land Use Context	Curbside Loading Needs & Parking Design	Time-of-Day Delivery Feasibility	Physical Roadway Design	Safety Treatments
Description		Business type and commercial activity	Parking and loading designs	Times when businesses can send/receive deliveries	Roadway design features	Types/application of road safety, traffic calming, or at-grade crossing improvements
Roadway Network Factors		Land use determines truck activity levels	Truck size and loading requirement affects space needs; service vehicle parking considerations	Impacts commercial loading or truck access hours	Appropriate lane widths, turn radii, driveway aprons	Truck streets require special consideration for safety measures
Roles & Responsibility		City of Seattle property owners	SDOT, private owners	Private entities, Port of Seattle	SDOT, WSDOT, FHWA	SDOT, WSDOT, FHWA, BNSF, UPRR, BDTL, FRA
Major Truck Streets	Through Connector	Primary connectors to and from MICs, intermodal facilities, regional freeways	Requires special considerations to accommodate truck loading given higher traffic, transit, and other activity on these corridors	N/A	Maintain standard travel lanes and turn radii. Consider Freight-only lanes and Freight-and-bus (FAB) lanes in key network segments	Provide truck-compatible traffic calming features
	Servicing Destinations	High-activity commercial generators, limited residential	Requires high number of commercial loading spaces that can accommodate large trucks	N/A	Provide standard turn radii	Minimize use of median barriers
Minor Truck Streets	Through Connector	Connecting to/from major truck streets, urban commercial districts	Requires assessment to determine appropriate parking	N/A	Maintain standard travel lanes and turn radii	Coordinate traffic calming and safety treatments on streets with higher truck volumes
	Servicing Destinations	Low-activity commercial generators, some residential neighborhoods	Requires minimum of commercial loading spaces that can accommodate smaller single-unit delivery vehicles	N/A	Provide designs that accommodate smaller trucks	Apply safety treatments that can accommodate smaller single-unit delivery
Limited Access	Industrial Trips	MICs	N/A	N/A	Maintain standard lane widths and highway design standards	Prioritize truck safety treatments
	Regional Trips	N/A	N/A	N/A	Maintain standard lane widths and highway design standards	Prioritize freeway truck safety treatments

Figure 27 shows an overlay to the freight network which has been created since the 2016 plan, which defines the heavy haul network and over-legal freight routes in the city of Seattle. The heavy haul network helps to support freight mobility on a local level near the port by defining key routes for commercial trucks which make short trips nearby. The over-legal freight routes accommodate larger freight loads and require permits.

Figure 27. Heavy Haul and Over-Legal Freight Routes Overlay



Challenges

Several challenges were listed in the 2024 Seattle Freight Element. The COVID-19 pandemic affected the location and process of supplying goods, making micro-distribution hubs more relevant and high-density hubs less relevant. The supply chain in general has become more unstable due to shortages in the workforce, delivery pattern changes, and disruptions in trade. Maintenance, whether it is delayed or in process, can alter the network of where freight can travel. Truck parking was listed as an issue. There is a lack of parking opportunities for drayage trucks overnight.

There are also environmentally related challenges. A lot of industry in the city is located on wetlands, making it vulnerable to climate change impacts. Pursuing alternative fuels and drones has also been a challenge, as they can be limited by a lack of updated electrical distribution infrastructure, alternative fueling stations, and legislative requirements. Thus, air quality impacts from freight persist.

Opportunities

The 2024 Seattle Freight Element has a section dedicated to opportunities and emerging trends for the freight industry. In general, a large growth in freight flow and demand is expected overtime as the population increases. Although the COVID-19 pandemic resulted in a shift in shopping trends toward e-commerce, workers in the freight industry remained resilient, as they could not work from home. There has been a growth in interest and testing of hubs for last mile deliveries which incorporate cargo bikes. Warehousing has densified because of increased demand, resulting in multi-level warehouses in space-restricted areas. Mitigating climate impacts of the freight industry is another opportunity mentioned.

Implementation

The 2024 plan specifies performance measures to keep track of progress toward plan goals. Table 13 specifies four desired outcomes and provides relevant details for each, including specific metrics and which goals they related to. Desired outcomes include eliminating traffic injuries and deaths, improving freight corridor reliability, decreasing carbon emissions, and continuing road maintenance. Performance measures include number of crashes, percentage of network that is operating reliably, percentage of zero-emission vehicles in truck fleet, and percentage of major streets in fair or better condition. With each outcome there is a description of what a desired trend or progress looks like, such as 30% zero-emission vehicles by 2030 corresponding to the goal of sustainability. Ultimately, the 2024 plan follows in the footsteps of the 2016 plan, ensuring there are specific datapoints which can be used to track progress of achieving plan goals.

Table 13. Seattle Performance Measures for Freight and Goods Movement

Desired Outcome	Performance Measure (source)	Baseline (year)	Target or Desired Trend	Track measure by RSEI and/or race	Related STP Goal
End traffic deaths and serious injuries on city streets	Number of fatal and serious injury crashes involving trucks or rail (SPD collision report data)	4 (2022)	Zero fatalities or serious injuries by 2030	Yes	Safety Equity Sustainability Livability
Improve reliability of freight corridors	Percent of Major Truck Street network operating reliably (TBD) ¹⁴	TBD	Increase percent of network operating at a TTI of 1.5 or better [“Travel Time Index” (TTI) – ratio of congested to free-flow travel time on a segment]	Yes	Mobility & Economic Vitality Maintenance & Modernization
Decrease the carbon footprint of in-City package delivery	Percentage of fleet vehicles that are zero emissions (TBD) ¹⁴	TBD	30% of goods delivery fleet is zero emissions by 2030	No	Sustainability Mobility & Economic Vitality Livability Maintenance & Modernization
Support a well-maintained freight network	Percentage of Major Truck Streets with fair or better pavement condition (SDOT)	58% (2023)	Achieve and maintain a higher percent of Truck Street segments with fair or better pavement conditions than streets as a whole	Yes	Safety Mobility & Economic Vitality Maintenance & Modernization

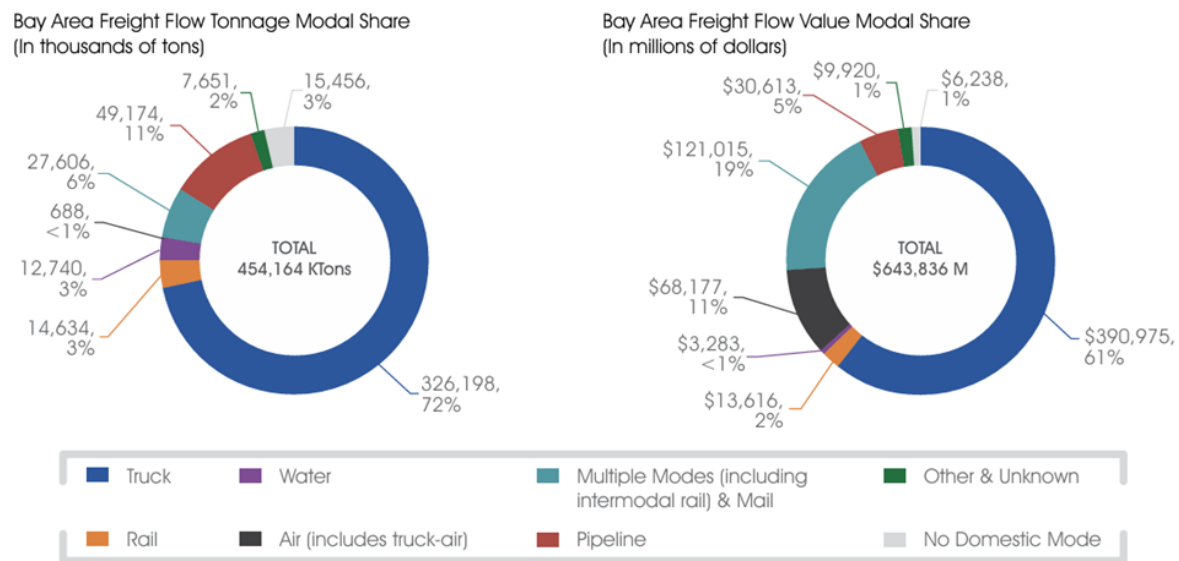
5.11 San Francisco Bay Area: The San Francisco Bay Area Goods Movement Plan (2016)

Introduction/Background

The San Francisco Bay area is in Northern California and is adjacent to the Pacific Ocean. According to the U.S. Census Bureau, the San Francisco-Oakland-Fremont Metro Area had a population of approximately 4,566,961 in 2023.²⁹¹ The region supports truck, maritime, rail, air, and multimodal modes of transportation.²⁹² Figure 28 shows the percentages of various freight modes from 2012, highlighting the fact that trucks are the most dominant freight mode. The

region features the Port of Oakland, along with other minor ports. There are highways and rail lines that help connect the region to other parts of the state and support global gateways. It is estimated that the highways in the region carry anywhere between 5,000 and 15,000 trucks on an average day. BNSF and Union Pacific have Class I rail lines in the region. At the local level, city streets provide last mile connections, as well as support interregional and intraregional connections.

Figure 28. Freight Flows by Mode in the SF Bay Area in 2012



Source: Freight Analysis Framework Data; Analysis by Cambridge Systematics, Inc.

Plan Details

The purpose of the San Francisco Bay Area Goods Movement Plan is described with several objectives, including 1) to create a vision to support sustainable freight and goods movement that contributes to a diverse, thriving regional economy that is competitive on a global scale, 2) identify strategies to address issues and discover opportunities, including changes in policy or programs and investments in infrastructure, 3) prioritize strategies using performance measures, 4) focus key opportunities based on the region's unique characteristics, and 5) create recommendations for how to collaborate with partners on the state and federal level to advocate for funding, policies, and help advance the plan in the short-term and long-term.²⁹³

In the plan, they outline a vision. They want to provide more opportunities for middle-wage workers in the freight industry, increase the efficiency of the industry through land use strategies, smart operations, and technology, and utilize investments to reduce congestion while increasing reliability and safety along primary travel corridors and international gateways. Five goals are outlined: 1) building healthy communities by reducing negative environmental goods movement impacts, 2) ensuring goods movement facilities are efficient, safe and reliable, 3) supporting

innovative technologies, 4) preserving and improving the multimodal network while considering freight accessibility and mobility, and 5) economic prosperity.

Development of the plan was influenced by stakeholder input. There was outreach performed to a variety of groups as the plan was developed. There was an executive team, a regional technical advisory committee, interest groups, and public roundtables. The plan is also supported by figures with various kinds of data, including employment levels in goods movement industries, freight flows by mode and commodity, truck volumes, the freight rail network, and congested corridors.

Freight Planning Strategies and Opportunities

The plan outlines three general opportunities for the region, and later in the document, it provides “opportunity packages,” which discuss specific freight planning strategies to address these opportunities. The three opportunity packages are sustainable global competitiveness, smart operations and deliveries, and modernized infrastructure. A table is included for each opportunity package which provides a list of projects, their descriptions and what level of impact (positive or negative) the projects have toward goal areas. Table 14 shows an example of some of the projects included in the sustainable global competitiveness package.

Table 14. SF Bay Sustainable Global Competitiveness Strategies

Project Name	Project Description	Performance across Goal Areas				
		Interconnected/ Multimodal	Safe and Reliable	Innovative	Economic Prosperity	Improved Quality of Life
A Program of Rail Crossing Improvements	This includes the following projects: - Berkeley Rail Road Crossing Improvements; - Grade Separation over Decoto; - High St/Davis St/Hesperian Blvd Grade Separation; and - Tennyson Road grade separation.					
A Program of Track Additions, Sidings and New Connections	This program includes the following projects:					
Hayward Double Track (Elmhurst to Industrial Parkway 2 nd Track)	This project involves adding a second track on Niles Subdivision between Elmhurst and Industrial Parkway.	○				⊙ ^b
Niles Junction Bypass	This involves building a new rail bridge over Alameda Creek in Niles Junction to allow movement from Oakland Subdivision at mouth of Niles Canyon to Niles Subdivision.	◐				⊙ ^c
Improvement on the Oakland Subdivision East of Niles Junction	This program involves improvements on the Oakland Subdivision pending approval of ACEforward projects.	Unknown				

Key: ● High Positive Impact ◐ Medium Positive Impact ○ Low Positive Impact ⊙ Negative Impact

^a This project was included in the OAB 2002 EIR and the 2012 EIR Addendum and mitigation measures were identified for air quality and traffic-related impacts on neighboring communities. These mitigations measures currently are being implemented by the Port of Oakland and the City of Oakland's developer. In some cases, mitigation measures are only necessary when construction activities or port/logistics activities grow to certain levels, and the measures will be implemented as necessary in the future.

^b This project would not be subject to a California Environmental Quality Act (CEQA) environmental review because federal law exempts private railroad projects from environmental reviews if they are conducted entirely within the railroad's existing ROW. Impacts associated with increased rail traffic on this line will be reduced through the adoption of the rail crossing improvement and rail quiet zone programs included in this package.

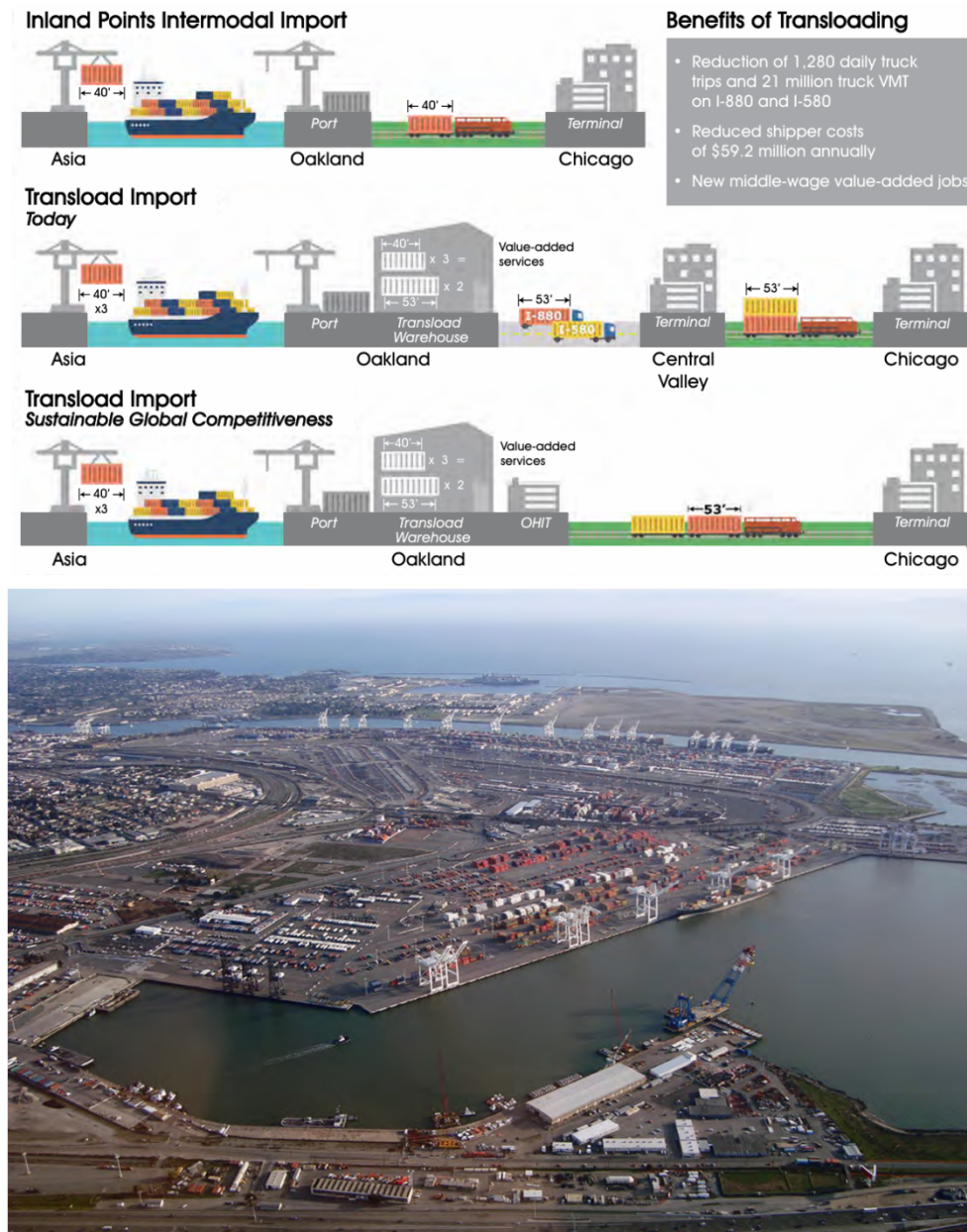
^c This project will require an EIR because it is a new bridge over Alameda Creek outside existing ROW to address potential impacts on the creek. During this review, any necessary measures needed to mitigate impacts on surrounding communities will be identified.

A summary of each package along with their respective strategies is provided below:

1) Sustainable global competitiveness package: Supporting the local economy, creating local jobs, and improving rail access are seen as key opportunities, along with supporting the Port of Oakland as a world-class logistics hub. A rail strategy is discussed that will increase intermodal terminal capacity at the Port of Oakland through redeveloping the Oakland Army Base to provide more warehouse and logistics space. By taking advantage of public and private investments, the Port of Oakland could increase its capacity to better handle foreign transloading activity and take advantage of underutilized rail lines so that less truck trips are taken to intermodal terminals in the Central Valley. A visualization of this rail strategy is shown in Figure 29. Some of the other strategies mentioned under this package include grade separations, bridge reconstruction, a dike

to reduce flooding and protect the shoreline near an airport, a program to identify market incentives to support zero-emission trucks, and workforce training in logistics and transloading.

Figure 29. Rail Strategy for SF Bay Area



2) Smart deliveries and operations package: The existing roadway could be better utilized through technologies like ITS and connected vehicles. Technological innovation should be supported to further technologies which improve overall goods movement and safety and reduce congestion. Some of the strategies mentioned include a program to support off-peak deliveries, developing freight guidelines for complete streets initiative, developing a program to identify ITS

projects that focus on truck corridors on arterial streets, and improving night and weekend operations at ports through adding additional shifts and automating terminal operations.

3) Modernizing infrastructure package: The road network could be modernized to better support last-mile truck movements, connections to rail, and improving the overall safety of industrial corridors and facilities. Modernization projects provide opportunities to support job diversity, while improving infrastructure to reduce conflicts and safety risk. Some strategies listed under this package include the following: guidelines and incentives for land use in cities which coordinate with regional and state actions; highway improvements like adding auxiliary lanes and interchange improvements in high priority freight routes; addressing speed and safety problems on truck routes in rural areas; updating a truck parking study to inform implementation of new parking in industrial areas; a regionwide freight signage program to advertise truck route options; and modifying industrial spurs to support increased rail usage to support industry and agriculture.

Challenges

Multiple challenges were discussed in the report. There is an expected continual shift of the goods movement economy from traditional manufacturing to high-tech and bio-tech industries, which can support middle wage as well as high-wage engineering jobs. However, the region is suffering from a housing crisis which is making it harder for middle-wage workers to live nearby, and the shift to a more knowledge-based economy is resulting in increased educational requirements to acquire jobs. This shift in the economy is also increasing the demand for higher-cost shipping methods such as air cargo to deliver higher-value materials.

Communities that live near goods movement facilities and connecting infrastructure experience the greatest levels of pollution, which not only contributes to respiratory issues like asthma and heart disease, but also noise and light pollution. Although lifetime cancer risk levels have reduced tremendously between 1990 and 2012, the area has yet to fulfill all state and national standards for air pollution, especially for particulate matter.

There are issues which are connected to road safety. There are particularly high levels of traffic experienced at interregional and intraregional highway corridors in the Alameda County, which resides in the region. These corridors are used by a diverse mix of vehicles which, when they interact with mergers and interchanges, experience a higher risk of collision. There are also inconsistencies with the road network in some spots, such as size and weight restrictions, poor signal coordination, time of day controls, and outdated, obsolete infrastructure.

E-commerce has had an impact on the goods movement industry in the region, worsening last-mile delivery issues like limited parking spaces for deliveries in urban areas. Initiatives, like complete streets to develop denser residential and commercial areas and support non-active

modes of transportation, can conflict with industrial users who may prefer streets to be designed for greater maneuverability for trucks.

Implementation Measures

The report provides a list of assigned roles for key partners to fulfill goals described in the plan. Eight categories of key partners are specified: congestion management agencies (CMA), the Port of Oakland, the Metropolitan Transportation Commission (MTC), private sector and business organizations, cities, state agencies, the Bay Area Air Quality Management District (BAAQMD), and federal agencies. Table 15 shows the roles described for each of these key partners, which can differ considerably from each other, as various stakeholders have jurisdiction over certain areas and different levels of influence or ability to pursue certain policies, projects, or actions. Regardless of the differences in responsibility, stakeholder collaboration remains key and is noted in multiple actions in the table below.

Table 15. Key Partner Roles for SF Bay Strategy Implementation

CMAs	Port of Oakland
• Plan, program and fund projects identified in the Plan • Participate in detailed rail planning study for Port of Oakland and also detailed managed lane study • Work with business organizations to identify workforce development needs • Prepare program guidelines for programs, such as off-peak delivery programs • Work with MTC, BAAQMD and state agencies to develop planning and land use guidelines	• Submit in response to call for projects, project delivery (projects on port property) • Make TIGER applications if funds are available • Conduct detailed rail plan for Port of Oakland • Plan and apply for grants to implement low-emission intermodal terminal technologies at Outer Harbor Intermodal Terminal (OHIT)
MTC	Private Sector and Business Organizations
• Convene regional and megaregional stakeholders to develop policy commitment and investment strategy for Plan priorities • Plan, program and fund high-priority projects identified in the Plan and PBA 2040 • Participate in detailed rail planning study for Port of Oakland • Conduct a detailed managed lanes study • Work with CMAs to develop program guidelines for programs such as off-peak delivery program • Work with CMAs, BAAQMD and state agencies to develop planning and land use guidelines	• Railroads to participate in detailed rail planning study for Port of Oakland, identify capacity needs and fund their share of improvements and adopt Tier 4 locomotives • East Bay EDA and East Bay Transportation and Logistics Partnership work with building owners logistics businesses to participate in off-peak delivery hours programs, and workforce development programs • Identify cost-effective ZE applications and apply for purchase assistance programs
Cities	State Agencies
• Submit in response to call for projects • Deliver local roadway improvement projects • Manage implementation of off-peak delivery programs • Modify local regulations (e.g., noise ordinances), as needed • Adopt land use changes, Complete Streets guidelines and truck route guidance	• Provide funding through Cap and Trade, new Trade Corridors and Investment Fund (TCIF) program and grade-crossing programs • CalSTA and Governor coordinate negotiations with railroads, regional and local agencies for passenger (transit and intercity) and goods movement rail projects • ARB/CalSTA to negotiate agreements with railroads to bring Tier 4 locomotives to Bay Area • Deliver identified projects on state highway system • Participate in detailed managed lane study
BAAQMD	Federal Agencies
• Identify potential fuel efficiency and emissions reduction potential to establish eligibility for Cap and Trade funds • Provide local funding and coordinate applications and implementation for Cap and Trade funds • Work with CMAs, MTC and state agencies to develop planning and land use guidelines	• Include in NHS intermodal connector designations and provide funding for expanded intermodal connector program • Provide funding for goods movement in federal surface transportation bill and TIGER • Continue program funding for FRATIS, grade crossing, off-peak delivery program and support new programs such as truck parking • Support national negotiations with railroads to increase pace of adoption of Tier 4 and low-emission rail technologies

Source: Cambridge Systematics, Inc.

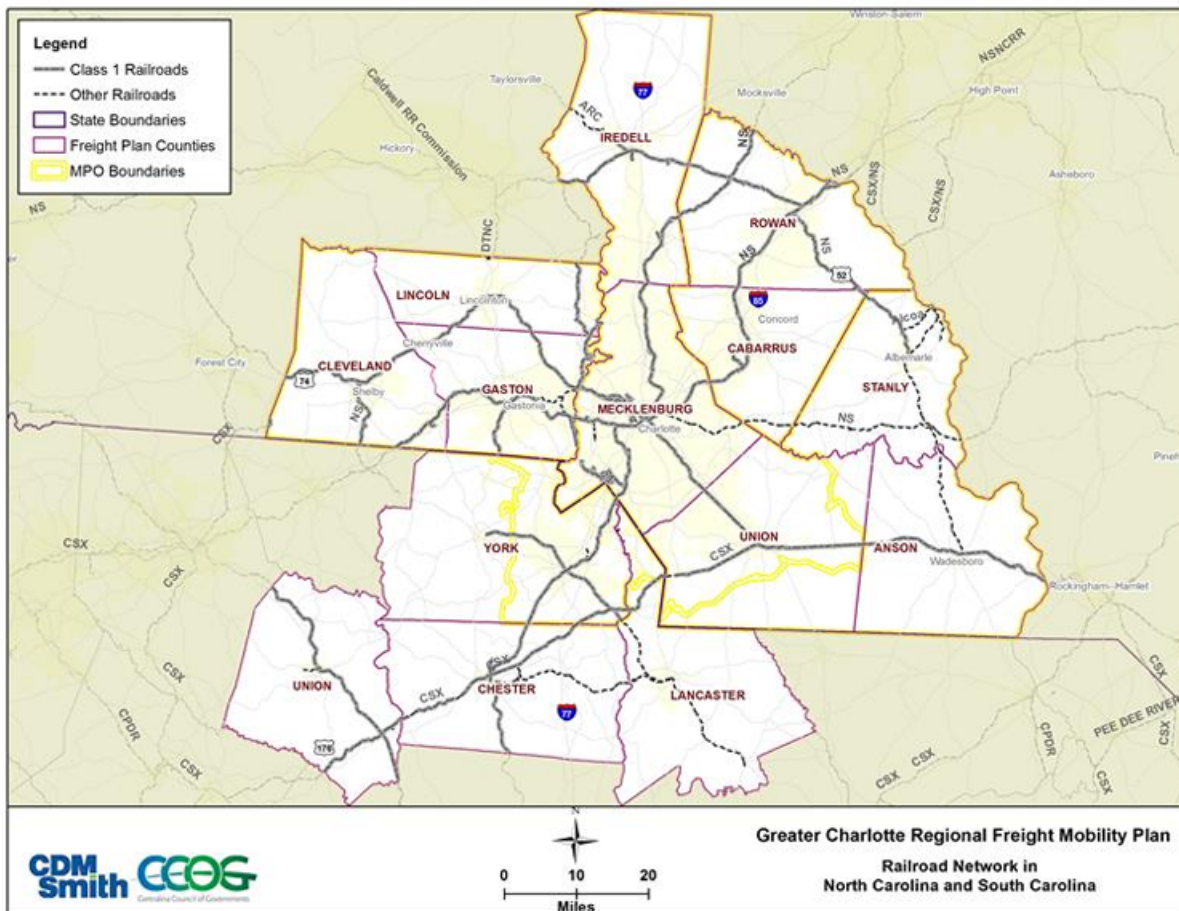
The plan also discusses existing and potential future funding sources to support strategies for improving goods movement. A list of funding sources is provided, where each revenue source is described, as well as the value of the funding source and how it relates to goods movement. Freight specific sources include the National Highway Freight Program (NHFP) and the Nationally Significant Freight and Highway Projects program. Other potential sources which are not specific to freight include a voter approved sales tax to support transportation investments, funds via grants from MTC and CMAQ, a multi-year capital improvement program known as the State Transportation Improvement Program (STIP), cap and trade funds, and the Mobile Source Incentive fund, which is administered by the BAAQMD and provides grants for projects that reduce toxic emissions. Anticipated or future funding sources include the Trade Corridor Improvement Fund (TCIF), bridge tolls, and the Carl Moyer Memorial Program. Table 16 provides details on these anticipated or future funding sources. Regardless of whether a funding source is current or upcoming, certain or uncertain, it is a strong implementation strategy to investigate and pursue multiple kinds of funding, as it increases capacity to support freight projects in the long-term and the ability to adapt to unexpected planning obstacles.

Table 16. Anticipated and Future Funding Sources for SF Bay Area

Revenue Source	Description	Total Value (Millions) ^a	Eligible Uses Relevant to Goods Movement
Trade Corridor Improvement Fund (TCIF)	Proposition 1B, approved by voters in 2006, and provided \$2.5 billion for infrastructure improvements along Federally designated "Trade Corridors of National Significance" or along other corridors within California that have a high volume of freight movement. Of the total funding statewide, Bay Area projects received \$481.5 million.	\$200-300 ^b	Freight projects with statewide significance
Bridge Tolls	The last regional bridge toll increase (Regional Measure 2) was passed in 2004 and has funded various transportation projects determined to reduce congestion or to make improvements to travel in the toll bridge corridors. The draft revenue forecast for Plan Bay Area 2040 assumes a \$2 increase in FY 2019-20.	\$560 ^c	TBD, but this is not a freight-specific source. However, the amount listed is our assumption for how much funds would go towards freight-specific projects.
Carl Moyer Memorial Program	ARB funding source with regional funds administered by the BAAQMD. The Carl Moyer Program provides grants to upgrade or replace heavy-duty diesel vehicles and equipment, including on- and off-road vehicles and equipment, school buses, agricultural equipment, marine vessels, and locomotives. This program aims to reduce air pollution from these diesel engines operated in California by public and private entities.	\$7 – \$10 million per year has been allocated to the Bay Area ^d	While all heavy-duty diesel sources are eligible, this program is primarily used for goods movement. This is an incentive program so cannot be used to demonstrate technology (it must demonstrate lasting emission reductions) and therefore is unlikely to be used for zero emission trucks in the near-term. It could be used to address some of the needs identified for the Rail and Terminal Emission Reduction Program.
U.S. DOT TIGER funds	Discretionary Federal grants awarded to fund capital investments in surface transportation infrastructure that will have a significant impact on the Nation, a region, or a metropolitan area. Funds have been appropriated for a 2016 TIGER program, but the program is not renewed in the FAST Act.	\$500 million awarded in October 2015. Of this, \$220 million went to freight projects. ^e	Port, rail, and highway projects benefiting freight transportation. (Other non-freight-specific projects also eligible under this source.)

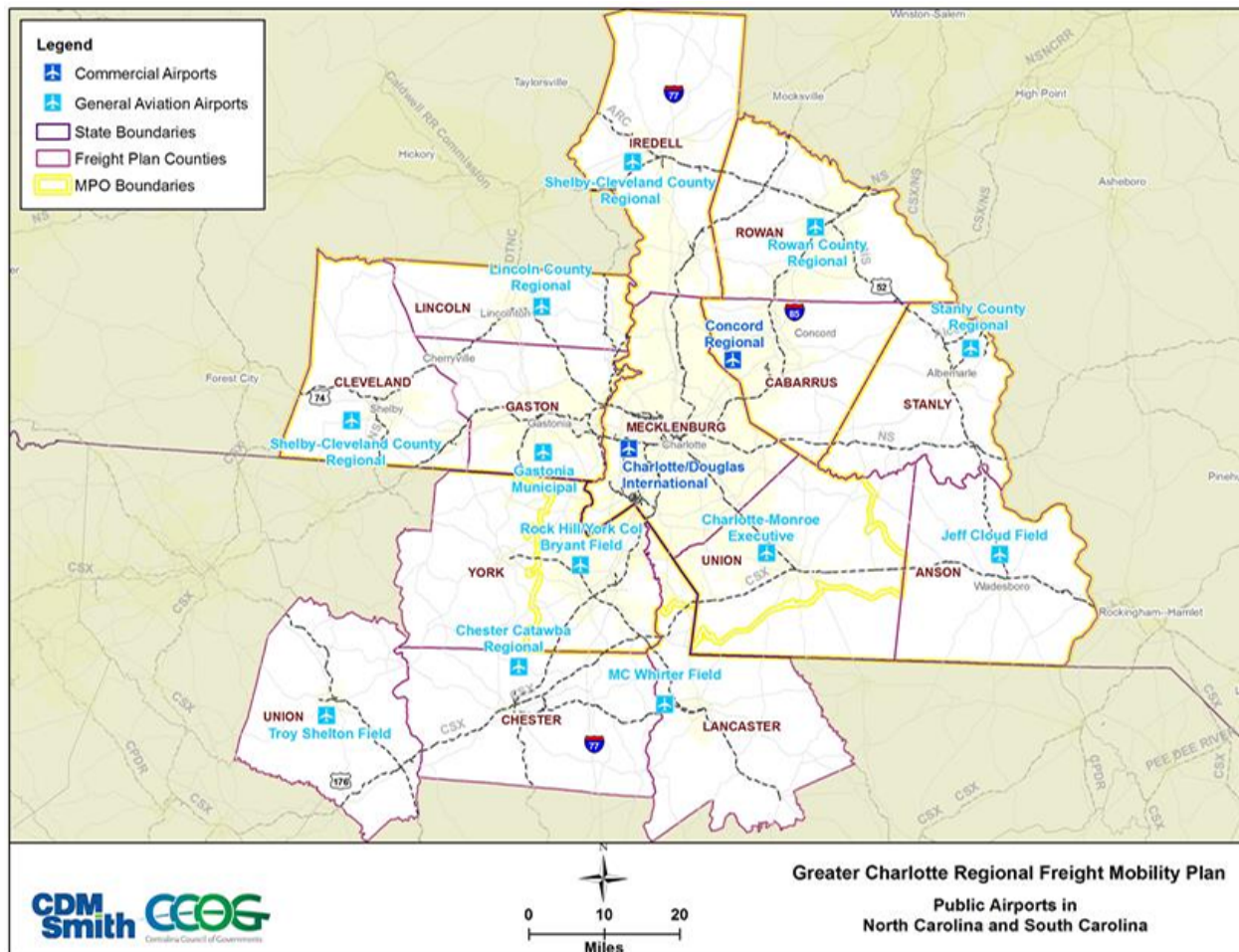
6. Appendix B: Additional Supporting Figures from Freight Plans

Figure 30. Map of Rail Network in Charlotte Metro Region



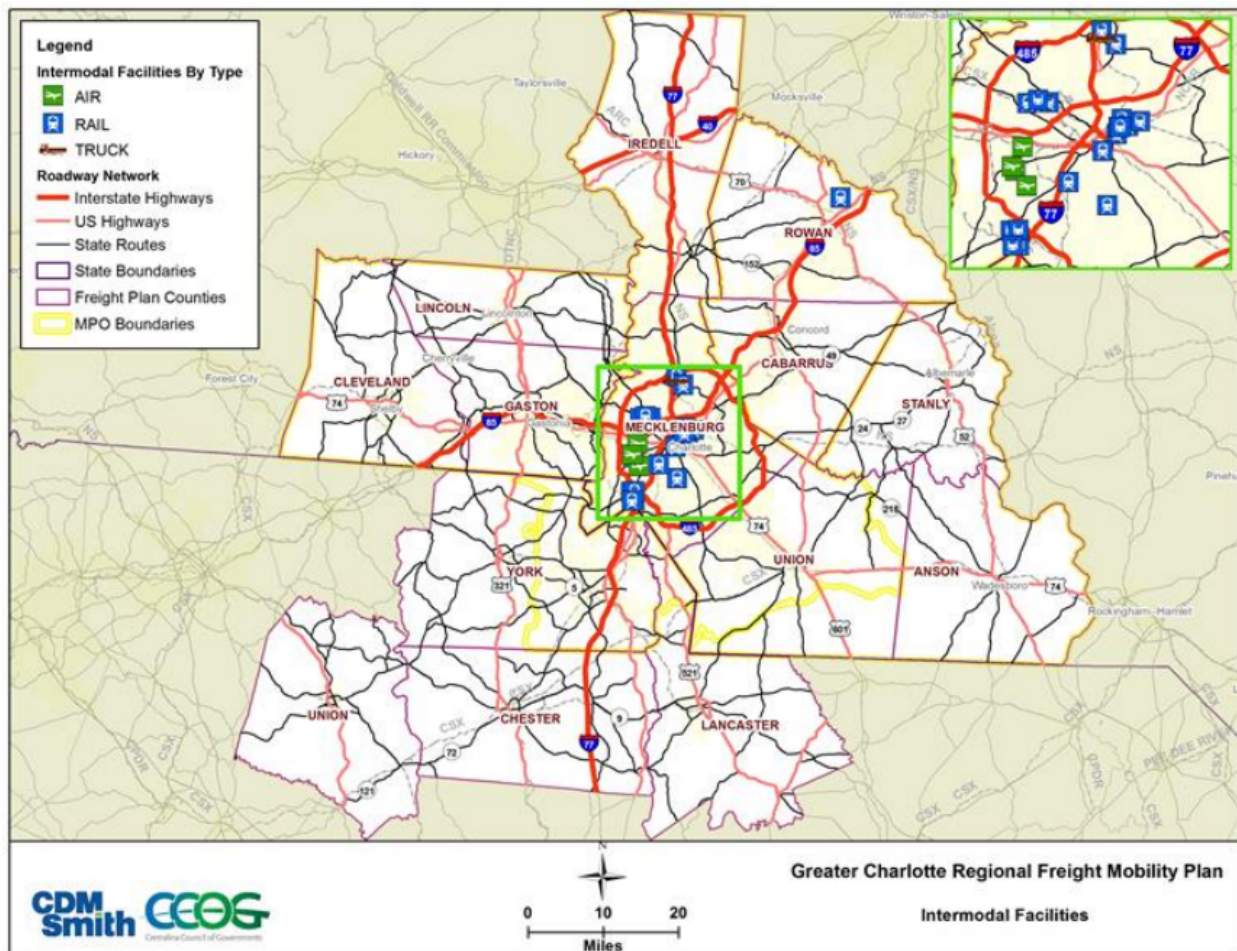
Source: National Transportation Atlas Database, 2015

Figure 31. Map of Airports in Charlotte Metro Region



Source: Federal Aviation Administration

Figure 32. Map of Intermodal Facilities in Greater Charlotte Region



Source: National Transportation Atlas Database, 2015

Figure 33. Highway Condition, Mobility, and Reliability Deficiency in Chicago Metro Area

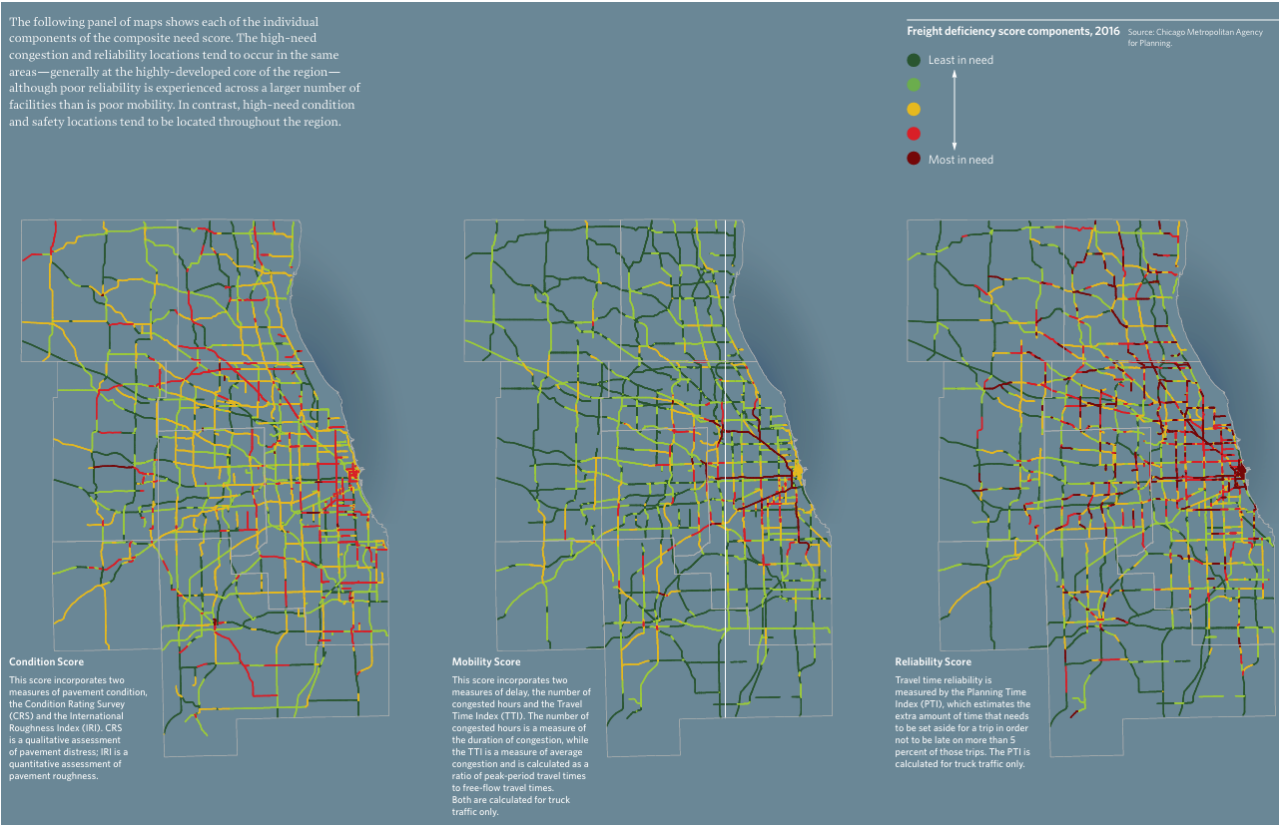


Figure 34. Composite Score of Infrastructure Need
(Congestion, Condition, Mobility, Reliability) in Chicago Metro Area

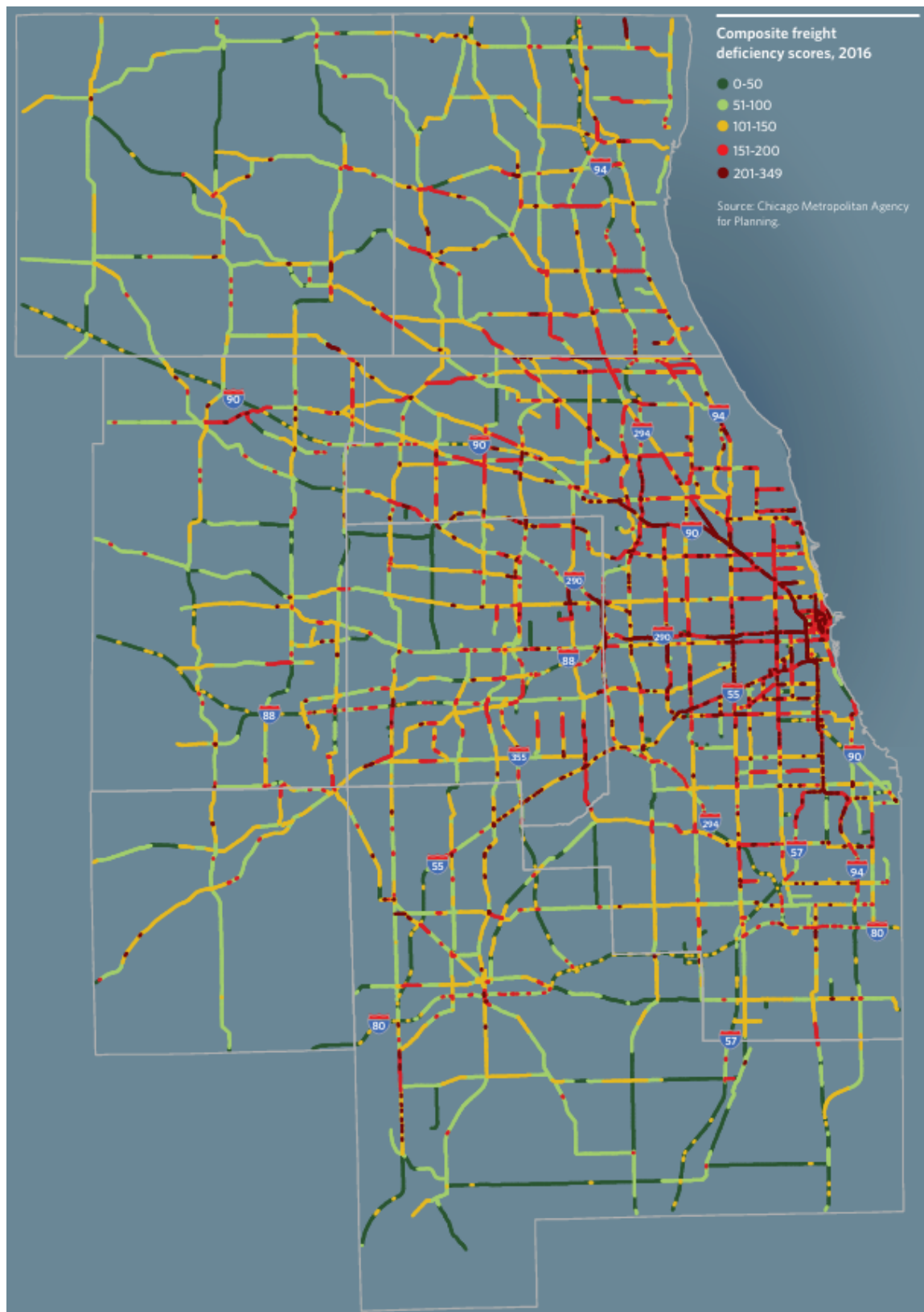
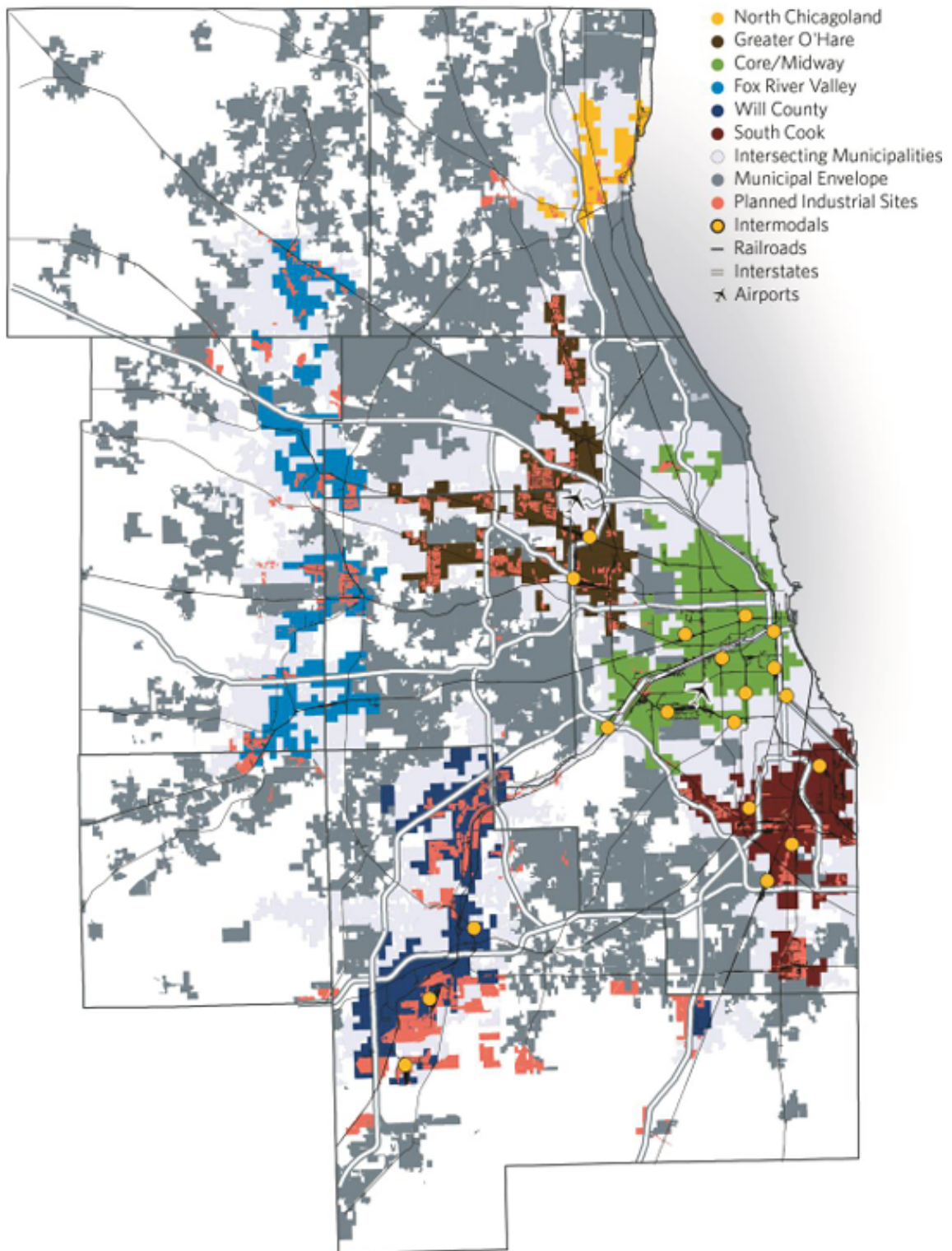
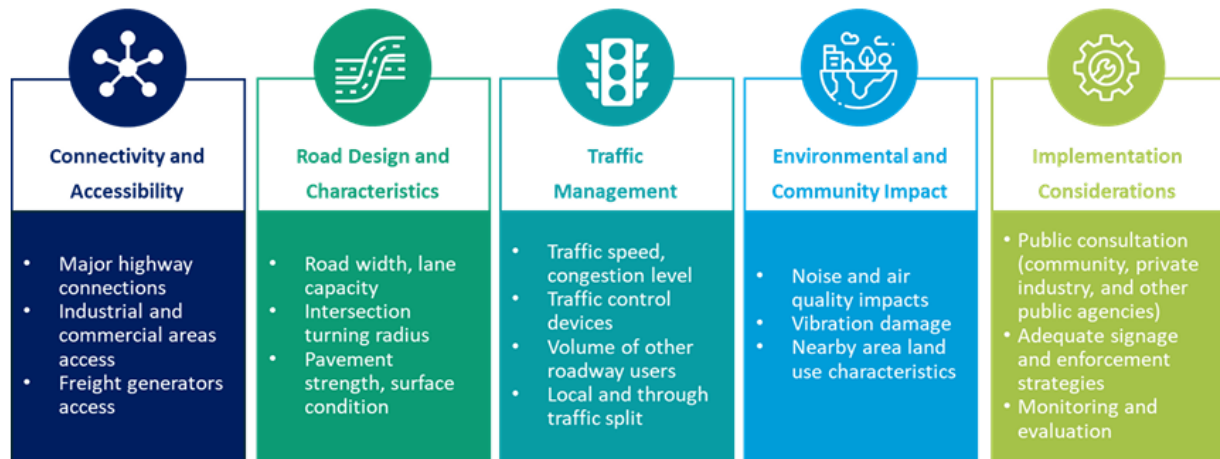


Figure 35. Freight Clusters and Industrial Land Uses in Chicago Metro Area



Source: Chicago Metropolitan Agency for Planning.

Figure 36. Truck Route Designation Considerations from Atlanta
Regional Freight Mobility Report (2024)



7. Appendix C: List of Interviewees

Organization	Position	Name
SCAG	Manager, Mobility Planning & Goods Movement	Philip Law
SCAG	Planning Supervisor, Mobility Planning & Goods Movement	Scott Strelecki
Boston MPO	Freight Planning Program Manager/Senior Planner	Shravanthi Gopalan Narayanan
Centralina	Director, Centralina Regional Planning Department	Jason Wager
Centralina	Regional Mobility Program Manager	Andy Grzymiski
BaltoMetro	Senior Transportation Engineer	Keith Kucharek
CMAP	Senior Planner	Tom Murtha
MassDOT	Chief Possibility Officer	Kristopher Carter
Metropolitan Transportation Commission	Principal Planner/Analyst	Adam Noelting
SODO Business Improvement Area	Transportation Planner	Tyler Blackwell
Seattle Department of Transportation	Senior Civil Engineer, Transportation Operations – Freight at Seattle Department of Transportation	Christopher Eaves
Seattle Department of Transportation	Strategic Advisor at Seattle Department of Transportation	Brian Hamlin
Atlanta Regional Commission	Principal Planner, Transportation Planning Department	Peter Ngolton
Atlanta Regional Commission	Planning Administrator, Transportation Planning Department	Daniel Studdard

8. Appendix D: Interview Questions and Guide

1. Please tell us briefly about your experience with freight planning.
2. What are some of the biggest challenges facing the freight industry?
3. What are the main benefits of developing a freight-specific plan?
 - a. Are regional freight plans more appropriate?
 - b. State-level plans?
4. What are the current key performance indicators you are using in Seattle to assess performance of the freight network?
 - a. Environmental?
5. What are some of the key strategies employed by [planning area] to address negative impacts from freight?
6. What are some of the key strategies employed by [planning area] to increase resiliency of [planning area]'s freight network?
 - a. Ask about measures/use of resilience indices?
7. How is [planning area] balancing demands of freight mobility with multimodal transportation goals?
 - a. Given the shift toward planning for active and mass transportation modes, how can planners balance demand between allocating space to multimodal transportation improvements and freight?
8. How does the federal infrastructure bill impact funding for both maintenance and investment in new projects? Do you anticipate changes during the current administration?
 - a. E.g., balancing competing priorities of new projects and the need to maintain/repair/upgrade existing infrastructure.
9. Is [planning area] taking any steps to shift freight volume to alternative modes of rail, maritime, or cargo bikes?
 - a. E.g., development of inland ports for rail, cargo bikes for last mile, perhaps even drones?
 - b. Can ask why or why not.

10. What kinds of emerging technology, if any, is [planning area] working with to improve freight mobility and address freight externalities?
 - a. How to use resilience indices/measure progress towards it.
11. Has [planning area] taken any steps to set up cross-jurisdictional collaboration/partnerships with nearby regions to improve freight mobility?
12. What are the criteria for prioritizing and selecting freight projects for implementation? What are the steps taken during the implementation process?
13. What are the opportunities to improve freight mobility, sustainability, and resilience in the future?
 - a. What future freight trends do you anticipate?
14. Can you recommend anyone else we should interview for this project?

Endnotes

- ¹ McLeod and Curtis, “Understanding and Planning for Freight Movement in Cities.”
- ² Potter et al., “Regional Resilience for Rail Freight Transport.”
- ³ CDM Smith, *GREATER CHARLOTTE REGIONAL FREIGHT MOBILITY PLAN*.
- ⁴ BRTB, *Resilience 2050 - Adapting to the Challenges of Tomorrow*.
- ⁵ ARC, *2024 Atlanta Regional Freight Mobility Plan*.
- ⁶ Southern California Association of Governments, *Connect SoCal Transportation Goods Movement Technical Report* (2020); Southern California Association of Governments, *Goods Movement Technical Report*.
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Avante Grady

Avante Grady is the Assistant Director of Planning and Community Development in the Town of Milton, MA. He has prior work experience in sustainable freight planning research, clean energy workforce development, and assisting in the sampling of PFAS chemicals for the state of Vermont. Avante graduated from Northeastern University with a M.S. in Urban Planning and Policy with a focus in Sustainability and Resilience. He also holds a B.S in Geography from the University of Oregon with a focus in Environmental Systems.

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