

**A FRAMEWORK FOR INTEGRATING FREIGHT INTO MPO
TRANSPORTATION PLANNING**

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**A FRAMEWORK FOR INTEGRATING FREIGHT INTO MPO
TRANSPORTATION PLANNING**

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To my loved ones.

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LIST OF SYMBOLS AND ABBREVIATIONS

MPO	Metropolitan Planning Organization
DOT	Department of Transportation
FHWA	Federal Highway Administration
ARC	Atlanta Regional Commission
BMC	Baltimore Metropolitan council
CMAP	Chicago Metropolitan Agency for Planning
NCTCOG	North Central Texas Council of Governments
SEMCOG	Southeastern Michigan Council of Governments
H-GAC	Houston-Galveston Area Council
NYMTC	New York Metropolitan Transportation Council
SCAG	Southern California Association of Governments
DVRPC	Delaware Valley Regional Planning Commission
SACOG	Sacramento Council of Governments
MTC	Metropolitan Transportation Commission
PSRC	Puget Sound Regional Council
ISTEA	Intermodal Surface Transportation Efficiency Act
TEA-21	Transportation Equity Act for the 21 st Century
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act- A Legacy for Users

SUMMARY

Given the regional nature of freight movement, the metropolitan planning organization (MPO) is one of the most appropriate agencies to deal directly with this challenge. However, most metropolitan planning organizations (MPOs) have little experience planning for freight. There is a need for a planning framework that MPOs can use to incorporate freight considerations into the planning process. The purpose of this research is to analyze the freight planning efforts of a number of MPOs and provide a conceptual framework for integrating freight into transportation planning.

The methodology used to conduct this research was the case study approach. Information regarding the freight planning activities of several large MPOs were obtained both through collection of available on-line documents and, when appropriate, through direct contact with MPO representatives. Subsequently, this was reviewed and summarized into case studies that noted the nature of the freight planning activities, the process by which MPOs conducted studies, and the components of those studies. Finally, a conceptual framework for incorporating freight into transportation planning was developed based on the data collected and the case studies.

As a result of these studies, it was concluded that MPOs are beginning to address freight movement concerns, but there are still deficiencies in their planning processes that the conceptual framework could highlight. These deficiencies are primarily in the areas of performance measure development, the implementation of freight programs, and the appearance of only nominal freight planning efforts. In addition to these deficiencies, there are certain obstacles that must be addressed and overcome. These include a lack of data, the level of sophistication found in freight modeling, the participation of freight stakeholders in the planning process, and the lack of freight-specific dollars for transportation investment.

CHAPTER 1

INTRODUCTION

Freight plays an important role in our everyday lives. The food that we eat, the clothes in our closet, and the goods purchased for our homes most likely were grown, or manufactured some distance from where they were bought. Freight is the invisible seam that holds the economy together and helps make possible the quality of life we enjoy. For many years this topic was largely ignored by transportation planners, being perceived as a private sector issue. This has changed. With an aging and increasingly congested infrastructure, goods movement is facing obstacles that the private sector alone cannot solve. Bottlenecks in nationally significant transportation hubs stifle the growth and productivity of the economy. This translates to more expensive goods, regional loss of jobs, and a country that loses one of its competitive advantages in the global economy.

In order to put this problem into perspective, one must first understand the economic implications of freight and the nature of the logistics industry. “Freight transportation increases the value of goods by moving them to locations where they are worth more and encourages competition and production by extending the spatial boundaries of commodity and labor markets,” according to the Federal Highway Administration [1]. The percentage of GDP related to the final demand of transportation goods and services totaled approximately 10% in 2005, and for-hire carriers accounted for approximately 3% [2]. In addition to for-hire carriers, in-house transportation services are vital to some of the nation’s largest businesses. Besides its contribution to the economy through transportation goods and services, freight also provides jobs for millions of Americans. Estimates from the Bureau of Labor Statistics (May 2006) estimate that more than 9.4 million people are employed in the transportation sector [3].

The U.S. logistics industry has had to deal with significant changes in the nation's economic and political environment. The primary change to the political environment was deregulation, which greatly increased competition and allowed businesses to have greater control over their market. The economic change was a shift from a manufacturing to a service economy, which was facilitated by the increased dominance of a global market structure. Supply chains no longer emphasize bulk movement, but focus on high-value, low-weight goods. Inventory management has shifted from *push* systems, in which goods are manufactured to supply, to *pull* systems, in which goods are manufactured to order. Pull logistics require timely, efficient, and perhaps most importantly, reliable transportation systems. This shift in logistics and inventory operations, along with a growing global economy, has placed greater demand on freight transportation, and the need for collaborative solving of transportation problems between public agencies and the freight transportation industry.

Obstacles faced by the freight system can be overcome with creativity and cooperation. The freight challenge is unique in that most of the operations carried out by private industry require large public investments in transportation. That is why the freight problem requires greater cooperation between public agencies and private industry. From a national perspective, it is easy to see the importance of freight to the economy and international standing. However, it is not so easy from a local perspective, where many of the benefits of freight are not realized, but many of the burdens are, which leads to the focus area of this research.

Metropolitan areas are the economic engines of America. They contain the majority of its residents and are both producers and consumers in the global supply chain [4]. Metropolitan areas are also the places where freight capacity and operational improvements must be made in order to enhance the national economy and increase competitiveness in the global marketplace. As stated earlier, the benefits of an improved freight system are often realized outside the area where negative externalities often occur.

However, efficient freight movement does offer benefits to metropolitan areas through the prices paid in the marketplace. In broader terms, such movement can impact business location decisions, reduce profitability for existing companies, and stymie regional economic vitality [5].

1.1 Study Need

Given the regional nature of freight movement, the metropolitan planning organization (MPO) is one of the most appropriate agencies to deal directly with this challenge. MPOs are an important actor in improving our nation's freight system since freight movement is regional in nature, national in significance, and highly affected by decisions made at the local level.

However, most metropolitan planning organizations (MPOs) have little experience planning for freight. It is true that some MPOs have long histories and a wealth of experience in freight planning, but this is certainly not the norm. Before ISTEA, freight was simply not addressed by the vast majority of MPOs. In addition, MPOs face added challenges due to the need to compete for limited resources with personal transportation concerns, which often have more public and, subsequently, political interest. There is a need for a planning framework that MPOs can use to incorporate freight considerations into the planning process. The planning process must be both responsive and flexible enough to accommodate the needs and expectations of different stakeholders [6].

Previous work in this area has focused on integrating freight into the greater discussion of transportation planning. Guidelines and strategies have been aimed at increasing stakeholder participation, improving organizational structure to facilitate freight, and bringing freight into the planning, but none have provided a framework within which this could happen. This research addresses this issue.

1.2 Study Objective

The purpose of this research is to analyze the freight planning efforts of a number of MPOs and provide a conceptual framework for integrating freight into transportation planning. It is understood that there is no one-size fits all model for freight planning. Metropolitan areas across the United States vary in many aspects and have unique characteristics that must be dealt with accordingly by each MPO, but it is possible to develop a basic framework by which they may be guided.

1.3 Study Overview

The primary method of analysis for this study was the case study approach. The websites of major MPOs were visited in order to determine whether significant freight planning activity was present at that organization. Whenever possible, freight planning documents available via the website were downloaded and reviewed. Since the purpose of this study is to develop a conceptual framework by which freight planning may take place, it was duly noted whenever such a framework was found.

1.3.1 Literature Review

The literature review focuses on previous studies of freight planning. Most of these studies offered strategies, guidelines, and principles to adhere to, but none proffered a conceptual framework within which to conduct freight planning. Also, there was often no explanation of the interaction of various components of a freight study.

1.3.2 Data Collection and Case Study Development

Data was collected by visiting the websites of large MPOs with significant freight planning activities and downloading documents. When appropriate, agency representatives were contacted and information requested. Once received, all this information was reviewed and summarized into case studies that note the nature of the

freight planning activities, the process by which MPOs conducted studies, and the components of those studies.

1.3.3 Conceptual Framework

A conceptual framework for incorporating freight into transportation planning was developed based on the data collected. The conceptual framework is discussed in Chapter 3 and the interactions among its various components that make it effective are explored.

1.3.4 Case Study Analysis

Chapter 4 is the heart of the thesis in which selected case studies are analyzed in light of the conceptual framework. It is observed that MPOs with significant freight planning activity incorporate many aspects of the model and that it provides an effective framework by which freight planning can be undertaken.

1.3.5 Conclusions and Recommendations

The thesis ends with conclusions and recommendations drawn from the research performed. It includes a brief examination of MPO freight planning deficiencies, opportunities for more efficient planning, and possible areas of future research.

CHAPTER 2

LITERATURE REVIEW

Since deregulation of the transportation industry, freight carriers have made great strides toward efficiency through mergers, network restructuring, and greater efficiencies in the use of labor and equipment. These efforts have yielded more multimodal freight systems with greater productivity and cheaper prices. However, freight now faces challenges that improved logistics alone cannot overcome and government agencies can aid in forming solutions.

A literature review has shown that the federal government is paying attention. Recent transportation legislation- ISTEA, TEA-21, and SAFETEA-LU- all contain provisions for freight. This has spurred transportation agencies to include freight in their planning efforts. Although literature has been written on the importance of freight and techniques for its incorporation into specific components of transportation planning, there is little evidence of an overall framework within which to do it. The following paragraphs summarize the findings of a number of recent freight planning research.

2.1.1 The U.S. Department of Transportation- A Review of Freight Transportation Legislation

Freight transportation is an issue that has grown in importance in recent years and transportation legislation has reflected this. The three most recent major legislative actions in regard to transportation include the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), the Transportation Equity Act for the 21st Century (TEA-21), passed in 1998, and finally the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), which was passed in

2005. To varying degrees, all have some mention or provision for freight, but it is the most recent legislation that contains the strongest language on the matter.

ISTEA was the first transportation legislation passed in the post-interstate era and the hallmark of its existence was the setting forth of a vision for transportation in the future. Freight was not at the center of this vision but it was included. ISTEA established the Office of Intermodalism and the National Commission on Intermodal Transportation which was responsible for, among other things, documenting intermodal freight transfers [7].

TEA-21 continued many of the endeavors undertaken by ISTEA and sought to improve others, especially in the face of increasing congestion. But TEA-21 is unique in its efforts to promote equity in the transportation system for communities and the environment. Freight is mainly addressed in providing funds for projects benefiting freight railroads and publicly owned intermodal transfer facilities [8].

The latest transportation legislation passed in 2005 is SAFETEA-LU. It is the largest transportation investment to date, \$244.1 billion, and builds upon the foundation laid by ISTEA and TEA-21. It sought to increase efficiency by focusing the federal government on transportation issues of national significance and allowing state and local governments the flexibility to solve their own problems as they see fit. SAFETEA-LU is the first transportation legislation to specifically address freight, particularly in the areas of mobility and productivity [9].

SAFETEA-LU addresses freight through its Corridors, Borders, and Ports Initiative which provides funds to expedite the movement of freight across international borders with Canada and Mexico; provides grants to facilitate intermodal freight transportation initiatives at the state and local level to relieve congestion and provides capital funding to address infrastructure and freight distribution needs at inland ports; and provides funding for projects in corridors deemed to be nationally significant. Lastly, SAFETEA-LU also established the National Cooperative Freight Transportation

Research Program to coordinate freight research and the Freight Planning Capacity Building program to enhance freight planning in the United States.

2.1.2 “Freight Transportation Planning for Urban Areas,” Chatterjee, 2004.

Although the Transportation Equity Act for the 21st Century (TEA-21) specifically lists freight as one of the seven primary planning factors for transportation, few urban areas thoroughly plan for freight. Most planners and engineers are not trained in freight planning and there exists a lack of information on the subject. However, freight planning has received greater attention from the FHWA in recent years due to an increasing awareness of the effects freight has on congestion and economic competitiveness in the global economy.

Freight planning can be approached from two different perspectives: an economic and business logistics approach, or a traditional engineering physical infrastructure approach [10]. Both approaches are valid and should be done simultaneously; however, the economic development and business approach is more appropriate at the state level, whereas the physical infrastructure approach can be done at all levels, particularly at the MPO level. The economic approach focuses on the identification of policies and physical improvements related to goods movement that would benefit existing industries and help attract new ones. These projects tend to involve multiple modes and large projects. This type of planning is more appropriate for the state level because planners and engineers have greater access to decision-makers who can implement such policies. The physical infrastructure approach can be conducted at all levels of planning, but are most appropriate for the MPO. These projects include at-grade rail crossings, road improvements, and land use decisions. Data needs for economic and infrastructure freight planning includes information such as commodity flows and vehicle movements, respectively. This article focuses primarily upon MPOs and the traditional engineering approach.

In order to plan properly for freight, MPOs should recognize the three different types of freight movements: external-internal, through, and internal. External-Internal movements are those that originate outside the study area but terminate in it. These are primarily inter-city, or inter-metropolitan, movements. External-internal freight movements relate to the economic base of an area and involve several transportation modes and terminals for those modes. These movements are critical to the economic development approach to freight planning and require knowledge of commodity flow data. MPOs must work closely with other agencies for studies involving these types of movements.

Through movements are those that begin and end outside of the study area. Although they are not directly related to a study area's economic activity, they can still cause problems such as congestion and poor air quality due to heavy truck volumes, large delays at rail-highway grade crossings, as well as safety issues associated with both modes. The traditional engineering approach is usually invoked to deal with issues of heavy freight traffic. Common solutions include the removal of at-grade crossings and the construction of by-pass facilities.

Internal movements begin and end in the study area and almost always occur by trucks. These movements are usually for pick-up and delivery (PUD), but also include the movement of freight between terminals by large combination trucks. There exists a hierarchy to these movements and all must be dealt with accordingly [10]:

- PUD movements between major activity centers;
- PUD movements of containers between rail terminals (rubber-tired interchanges);
- PUD movements originating at warehouses and distribution centers and terminating at retail stores and offices;
- PUD movements between break-bulk truck terminals and stores and offices.

MPOs should conduct focused studies on freight, as is already done with issues such as air quality, and take advantage of short range planning opportunities. Long-range planning usually has a time horizon of 20 years and requires accurate forecasting. Forecasting models are essential to this process and normally fall into two categories: land use and travel forecasting models. Both are useful, but if a travel demand model is to be used it is important to conduct a truck travel survey.

2.1.3 “Short-Range Planning for Urban Goods Movement,” Chatterjee, 1979.

This article presents an overview of urban goods movement (UGM) problems and opportunities and focuses on short-range, low-cost opportunities for improving the UGM system [11]. A strategy for identifying short-range opportunities and their implementation is discussed, primarily applicable to small and medium-sized urban areas of less than 750,000 people. Six urban areas – Knoxville, TN; Modesto, CA; Rochester, NY; Saginaw, MI; Stockton, CA; and Richmond, VA were used as case studies for strategies developed in this paper.

Most problems and opportunities were in the area of transportation systems management and include, but are not limited to: inadequate off-street loading/ unloading facilities; poor access to shipping/ receiving points; and policies of public agencies (more specifically, lack of enforcement of loading-zone restrictions and poor land use planning and control). Strategies for improving these deficiencies include surveys, stakeholder interviews, quantifying problems and opportunities, and forming an advisory panel.

2.1.4 “MPOs and Freight Planning,” Dowell et al, 2006.

This article is a summary of presentations given at the MPOs and Freight Planning breakout session of the conference, “Metropolitan Planning Organization, Present and Future.” Paula Dowell of Wilbur Smith Associates, Caroline Marshall of the Atlanta Regional Commission, and Ted Dahlburg of the Delaware Valley Regional

Planning Commission were presenters. Freight presents considerable problems to MPOs in the areas of air quality, congestion, and the preservation of freight activity centers. All these issues were discussed in the dialogue that took place [12].

Paula Dowell's presentation entitled the 'Role of MPOs in Freight Planning' discussed some of the key factors driving MPO involvement in freight planning. These include urban congestion, land use linkage, air quality concerns, and environmental justice issues. Trucks contribute to traffic in metropolitan areas, and it is in metropolitan areas that the majority of forecasted truck traffic growth will take place. This has the potential to worsen already formidable air quality and congestion issues. There is also an important link between freight and land use. New residential developments in many areas are beginning to encroach upon industrially zoned areas, raising issues associated with noise, safety, and property values among others. These can lead to constraints on expansion, operating hours, and efforts to increase efficiency.

Caroline Marshall's presentation entitled 'Enhancing Planning by MPOs for Freight Mobility in 2020' discussed the state of the practice with freight planning at MPOs, identified elements enabling effective freight planning, and outlined critical success factors for enhancing freight planning. MPOs are mandated by federal legislation to conduct freight planning, but this can be challenging given the organizational structure of MPOs. Freight cuts across several areas of expertise, but MPOs tend to have a silo structure. Board members of MPOs do not fully understand freight issues and there are not many educational outreach opportunities. Six key elements were identified for effective freight planning: organization and staff resources, freight goals and objectives, data and analytical tools, freight mobility studies, institutional and agency coordination, and private stakeholder participation.

Ted Dahlburg's presentation entitled 'Critical Factors for Freight Planning at the Future MPO' also identified factors for successful freight planning. These critical factors include continued federal transportation legislation, support for freight planning from key

top personnel, designated agency staff with expertise in freight planning, MPO freight advisory committees, increased technical analysis, customer focus, and a context for coordination and cooperation. There is great variation among MPOs in the United States. Larger MPOs with more staff and resources should take the lead in developing freight data and analysis techniques, and incorporating freight into metropolitan transportation planning.

2.1.5 “The Freight Story,” Sedor et al, 2002.

The efficient, safe, and secure movement of freight is critical to America’s economic strength. Although there have been successful efforts to improve freight transportation efficiency, there are new challenges that, unless addressed, will jeopardize its reliability. These challenges include: congestion & capacity; operations; planning; financing; safety; national security; environment; and professional capacity building. This paper explores these challenges and identifies strategies for overcoming them and improving productivity [1].

The Freight Story makes an argument for freight primarily by explaining its economic importance (e.g. contributions to GDP and employment), which is probably due to the national perspective of the authors. Effective freight planning is necessary because without it, our economy and global standing are jeopardized. Also, it puts the problem in perspective by explaining the effects of deregulation, globalization, population increase (and the subsequent increase in VMT), and a growing service economy based on pull logistics on the freight system.

Strategies to improve the freight system are also national in perspective, but do recognize the need importance of MPOs and state DOTs. They include the creation of an institutional environment that identifies and advances freight concerns within the transportation development process and the establishment of comprehensive and sustainable funding. More specifically, strategies involve international freight gateways,

more state and local transportation programs that prioritize freight (although no guidelines are given), multi-state trade areas and corridors, and national initiatives for freight productivity and security.

2.1.6 “Freight Planning at Small MPOs: Current Challenges and Practices,” Blonn, 2007.

This paper investigates the current state of planning activities among MPOs in the midwest region with populations between 50,000 and 200,000 [13]. A sample of 19 MPOs is included. The authors of the study used surveys to determine (1) if freight is addressed in planning activities, (2) which freight-related issues are of most interest, (3) which methods are utilized for outreach, data collection, modeling, and analysis, and (4) similarities and differences in freight planning among MPOs. Attention is given to selected freight issues, including safety, congestion, air quality, impacts on low-income and minority populations, outreach activities, and integrating modes of freight.

This study does not offer a freight planning strategy, but instead determines the amount and level of activity. It is limited in that it only studies midwestern MPOs. The study concludes that the majority of survey respondents address freight planning activities, but the scope of freight planning is limited and varies by MPO.

2.1.7 “NCHRP Report 570: Guidebook for Freight Policy, Planning and Programming in Small and Medium-Sized Metropolitan Areas,” Cambridge Systematics, 2007.

Freight has grown in national significance as evidenced by legislation passed by Congress including ISTEA, TEA-21, and SAFETEA-LU. Freight planning has many obstacles such as its highly intermodal nature and its reliance on the private sector, which has a very different time cycle than that of the public sector. These challenges can be particularly daunting to small and medium-sized MPOs. However, these challenges can

and have been overcome by many states and MPOs. Through better understanding of freight needs and issues, a comprehensive and efficient freight planning process can be developed and integrated into traditional transportation planning practices.

This document was created in order to provide small and medium-sized MPOs a basic guidebook outlining how to implement a successful freight transportation planning program [14]. The guidebook defines a small MPO as one with a population of less than 200,000 and a medium-sized MPO as one with a population of at least 200,000 and no more than 1 million. The document is broken up into five different modules, which are (1) Using the Guidebook, (2) Getting Started, (3) Integrating Freight into MPO Activities, (4) Putting it all Together, and (5) Identifying Freight Resources. The approach used to develop the guidebook focused on several fundamental characteristics including [14]:

- **Provide flexibility** to allow many MPOs with various needs and capabilities to make use of the guidebook.
- **Rely on integration.** Reallocating staff and funding is the best way to ensure that freight becomes an active component of transportation planning.
- **Use best practices effectively.** Best practices have not been developed for all aspects of freight planning since it is relatively new to MPOs.

The Guidebook also includes case studies of successful freight planning practices at small, medium, and large MPOs.

2.1.8 “NCHRP Report 594: Guidebook for Integrating Freight into Transportation Planning and Processes,” Cambridge Systematics, 2007.

The inability of many agencies to incorporate freight into existing planning processes makes it difficult to give freight equal consideration in the funding and project prioritization process. There is little specific guidance on how to convert freight discussions in long-range plans and stand-alone freight studies into actual projects and

programs that can be funded and implemented. The purpose of this document is to provide states and MPOs with techniques to more fully incorporate freight throughout the entire transportation planning and programming process and more effectively plan, develop, program, and implement freight improvement projects [15].

The approach used to develop the guidebook focused on fundamental characteristics including: integrating freight issues into established planning and programming processes; building on and support the existing body of freight planning guidance; provide flexibility; effectively use best practices; and providing dynamic guidelines. A few of these characteristics warrant further explanation. Flexibility is needed because every state DOT and MPO has a unique set of needs and issues that a guidebook must be able to address. Every MPO should be able to use it regardless of size and budget. Dynamic guidelines are ones that can grow and evolve with the freight planning community over time, and across political boundaries. Today's issues are not necessarily tomorrow's and a freight planning guideline should be robust enough to handle that.

The guidebook identifies seven key elements of freight planning and programming integration [15]:

1. Freight point-of-contact/ technical lead;
2. Understanding the statewide or regional freight system;
3. Link between freight planning activities and the transportation planning and programming process;
4. Freight data needs assessment and collection;
5. Effective outreach;
6. Taking advantage of training and education opportunities; and
7. Advocacy.

These seven elements were identified from interviews with freight planners and best practices case studies. The freight point-of-contact supplies reliability to the process

by providing a technical lead on freight projects and issues and is often found in states or metropolitan areas with recognized, or important, freight issues. Freight cannot be effectively integrated into transportation planning if it is not fully understood.

Understanding the freight system allows planners and engineers to better identify and consider improvement projects. It also allows them to identify, and understand the relationship between, key elements of the freight system. There is a tendency to conduct freight planning along with ‘normal’ transportation planning activities, but those organizations that most effectively plan for freight have done so by mainstreaming freight into the transportation planning process. Obtaining good freight data can be difficult. Often public data is aggregated at a level of detail insufficient for state, or MPO planning and private data is expensive. Organizations must begin to collect their own data and match their efforts to their needs and deficiencies. Transportation planning agencies must conduct outreach activities to the private sector, other government organizations, and the public. Since freight is relatively new and not often part of a traditional transportation education, organizations must seek out and take advantage of training and educational activities. Lastly, transportation agencies must identify and develop strong advocates for freight.

A strength of the guidebook is the number of case studies included in the study. It examines both MPOs and state DOTs of various sizes that have effectively planned for freight and uses them to identify best practices. The case studies aided in the development of basic guidelines and techniques for integrating freight into the transportation planning and programming process. In addition to strategies and resources, the guidebook identifies where freight planning resources can be found including data and training.

2.1.9 “Freight Transportation Planning Best Practices and Benchmarking Survey,” Schank et al, 2008.

Freight has become an increasingly important issue in transportation planning and many MPOs have taken notice of this. However, many have little or no experience in freight planning and there is little literature to guide MPOs on freight planning in their own region. In order to help with this problem, this paper provides a best practices survey of existing MPO freight planning processes. The survey and resulting analysis provides guidelines, ideas, and strategies for MPOs wishing to set up or improve their freight transportation planning practices [16].

This survey was done on behalf of the Chattanooga MPO and had two phases: preparation and execution. The preparation phase consisted of identifying MPOs to interview and survey questions to include. Two types of MPOs were selected: MPOs representing small to mid-sized regions, and those representing large regions with significant freight planning activities. The former was chosen because MPOs of this type are similar to Chattanooga, whereas the latter was selected to see how a large MPO might best plan for freight.

There are some important lessons to be learned from this research for MPOs wishing to start, or enhance their freight planning activities. MPOs with substantial freight planning activities have permanent freight stakeholder committees that meet regularly regardless of current, or lack thereof, freight studies being conducted. An MPO does not have to be large to have an effective freight committee or overall freight planning process. A major challenge in freight planning is dealing with the private sector and their perspective.

2.1.10 “Mainstreaming Intermodal Freight into the Metropolitan Transportation Planning Process,” Zavattono et al, 1998.

In response to ISTEA’s charge to emphasize intermodal planning and improve the mobility of people and goods, the Chicago Area Transportation Study (CATS) developed an approach to integrate intermodal freight transportation into regional plans and programs. This process began with the establishment of the Intermodal Advisory Task Force (IATF). Task Force membership includes both public and private sector representatives and organized itself around four working groups [17]:

1. Operation GreenLight Working Group – This working group addressed freight bottlenecks in the Chicago region.
2. Intermodal Improvement Needs Working Group – This working group was established to provide continuing outreach to the industry.
3. RTP Working Group – The RTP working group was formed to develop and coordinate the intermodal component of the RTP.
4. Transit Working Group – The Transit Working Group was established to address the issue of access to regional intermodal facilities since some intermodal connectors serve public transportation stations as well.

In addition to forming the working groups, IATF developed ten major tasks to outline the scope of their work. These tasks centered on identifying constraints to the intermodal system; facilitating improvements to that system; developing projects and policies that support intermodal facilities; and providing input into the preparation of the intermodal section of the 2020 RTP.

Ultimately, the IATF developed six policy statements that were incorporated as system-level intermodal recommendations in the RTP. The formation of the IATF was an effort to ensure that comprehensive, coordinated, and continuing regional freight planning were given equal and fair consideration in the planning and resource allocation

process. This process effectively “mainstreamed” freight into transportation plans and programs in the Chicago area.

2.1.11 “Urban Goods Movement: A Guide to Policy and Planning,” Ogden, 1992.

The movement of freight is critical to the health and development of urban areas. Urban areas rely on freight movement to gain access to sources of food, raw materials for industry, and also to transport manufactured goods to market [18]. Urban areas should maintain an adequate infrastructure that makes possible the efficient movement of goods. The consideration of freight movement in urban transportation planning has the possibility to contribute to the achievement of both urban transportation issues and planning and policy issues as well. There are some problems and issues associated with goods movement in urban areas. As opposed to urban passenger movement, urban freight movement is very complex and heterogeneous. There does not exist many commonalities between the many actors in urban goods movement. Often there is an adversarial relationship between urban passengers (i.e. motorists, mass transit passengers, and pedestrians) and goods movement operators (i.e. truck drivers, railroad engineers, etc.). This relationship extends into planning and politics with the two sides often pitted against one another.

Ogden categorizes urban freight issues into three main areas: economic development, transport efficiency, and the minimization of adverse impacts. Economic development refers to the contribution which goods movement can make to the prosperity of an urban area. Ogden cites studies that show that the national cost of urban goods movement is comparable to that of urban passenger movement. The efficiency of freight movement is the next issue with concerns such as adequate off-street loading docks, transfer facilities, and the allocation of land for freight terminals, among others. Lastly is the minimization of possible adverse impacts of urban goods movement, which may include poorer air quality, noise, and truck-involved incidents. Many of these measures

are already in practice but there may not have been any assessment or analysis of the cost to industry or the effectiveness of policies.

Ogden organizes his book into three sections: Part A is dedicated to policy, and analyzes the issues and objectives of urban goods movement; Part B focuses on planning and reviews the various improvement strategies for urban goods movement; lastly, Part C discusses the implementation of urban goods movement planning and policy. Part B will serve as the main topic of discussion since it most relates to the research conducted in this thesis. Ogden recognizes several planning strategies aimed toward improving freight movement for urban areas. These strategies include traffic management, location and zoning of land use, infrastructure, licensing and regulations, pricing, terminals and modal interchange, and operational strategies. Also, this section discusses the role of models in freight planning. Each strategy has a dedicated chapter containing in-depth discussions on how these strategies can improve the efficiency of freight movement.

CHAPTER 3

CONCEPTUAL FRAMEWORK

A conceptual framework is a simplification of a very complex process [19]. In reality, the process may contain many smaller steps that are lumped into the larger ones presented in the framework, and probably do not follow such an orderly process. Also, many steps in a conceptual framework may have already occurred and be irrelevant to a specific problem at a specific time. However, simplification imparts upon the framework ease of use and, if designed properly, effectiveness.

The framework presented in this research is an evolved version of earlier forms presented in Meyer and Miller's text, *Urban Transportation Planning: A Decision-Oriented Approach* [20], *NCHRP Report 480: A Guide to Best Practices for Achieving Context-Sensitive Solutions* [21], and *NCHRP Report 541: Consideration of Environmental Factors in Transportation Systems Planning* [19]. Now, we will explore each section of the framework and discuss its contributions to the total process.

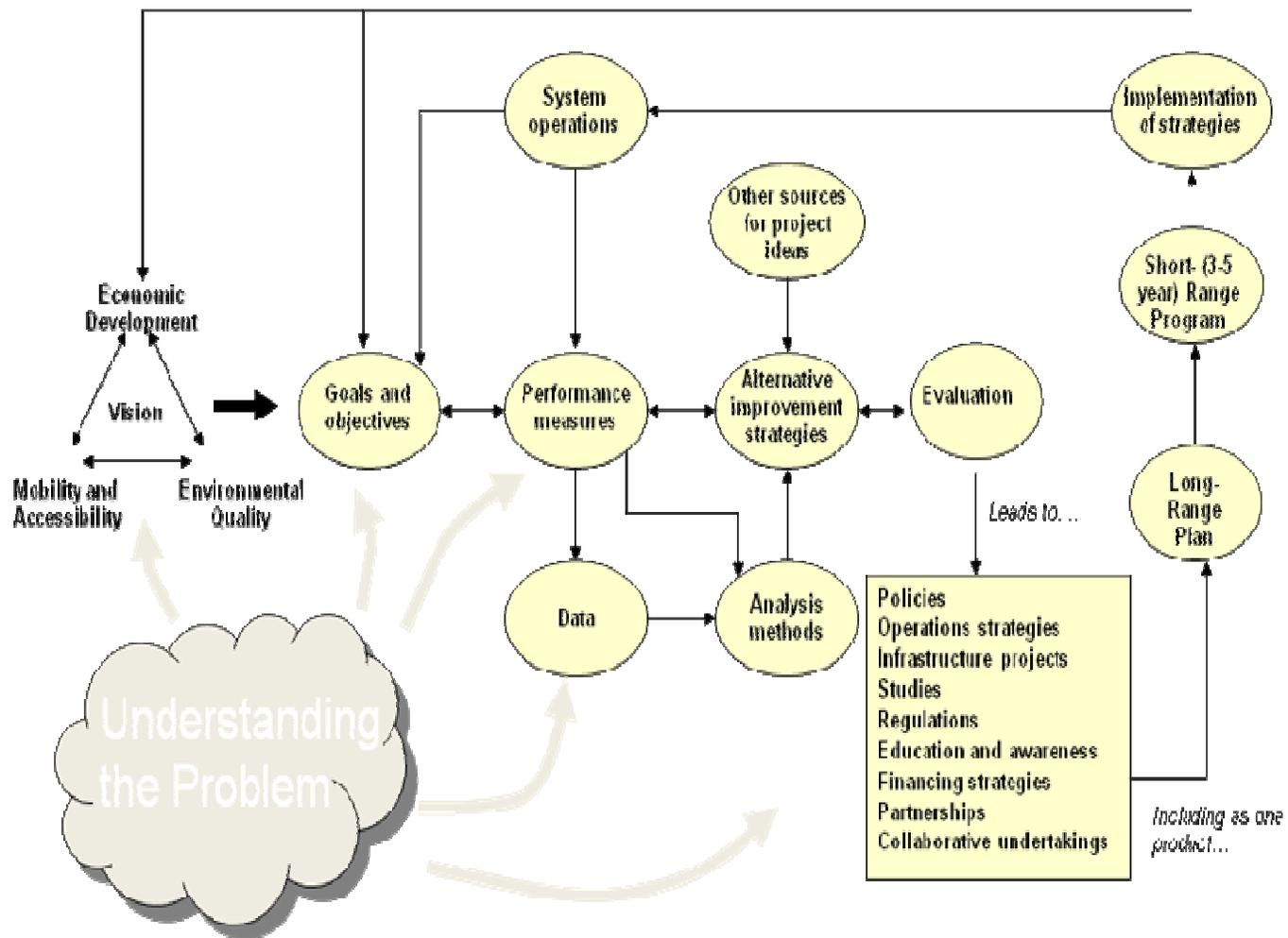


Figure 1.1 The conceptual framework for integrating freight into transportation planning [19], [20], [21].

Understanding the problem is the initial and perhaps most important step in any planning process. For many years, freight was not understood to be a problem and the transportation system and economy continue to pay the price for it. Many public agencies now recognize this and are starting to act accordingly. However, how can one effectively plan for freight if the problems associated with it are not fully understood? The answer is simple, you cannot.

This is a two-part problem, the first of which has already been taken care of by legislative action. Freight must be understood to be an issue of regional and national importance. Transportation legislation passed by Congress requiring MPOs to plan for freight has ensured that it is considered in the planning process. The extent to which it is integrated into the overall process so it is planned for on a continual basis is up to the MPO. This thesis seeks to help in this process. The second part to “Understanding the Problem” is “Problem Identification” and “Needs Assessment”. Unlike the first part, this is region-specific.

The three key factors to sustainable development in transportation are: mobility and accessibility, environmental quality, and economic development. These factors are embodied by the next step in this framework, which is **vision**. Vision reflects the interaction between desired states of prosperity, environmental quality, and social equity. Vision statements can be both general and very specific.

The importance of **goals and objectives** in transportation planning almost goes without saying. Without specific information on desired outcomes and performance measures to guide the overall process, very little will actually be accomplished.

Goals and objectives can also help in the identification of **performance measures** [19]. Performance measures gauge how well a system is functioning and guide the **data** collection process. Their primary purpose is to give decision-makers the information important to their region and necessary for making informed decisions.

Once data has been collected, the next key step is **analysis** [19]. Analysis is important to understanding how the transportation system works and how changes to that system alter its performance. It includes the identification of **alternative strategies** and projects that meet the objectives of the study, as well as **ideas from other sources**. Analysis also relates the transportation system to non-transportation entities that may be affected by it, such as social equity and environmental quality. There are a range of analysis tools that will be at public agencies' disposal.

Evaluation is synthesizing information on the benefits, costs, and effects generated by analysis so that decisions can be made in regards to the relative merits of alternative actions [19]. Evaluation criteria should be defined to ensure the results of evaluation reflect the needs of decision-makers. From these results the next step, the development of a **plan**, can be undertaken. This includes both a long- and short-range plan for incorporation into the Regional Transportation Plan (RTP) and Transportation Improvement Plan (TIP), respectively; which is encompassed in the broader concept of **programming** – the matching of the most desirable action with available funds.

Once a plan has been developed and the most attractive projects and strategies programmed into long- and short-range planning documents, the next step is the **implementation of strategies** [19]. Not only has funding been secured, but strategies to bring projects and plans to fruition have been developed and set into action. This includes the awarding of contracts to engineers and contractors by the MPO.

The very last step in this conceptual framework is **system operations**. System operations provide a feedback loop to goals and objectives and performance measures to monitor the health of the system. This is important because it alerts engineers and planners to problems in the freight system, which can be identified and dealt with. There may be underlying problems that require the re-definition of goals and objectives and performance measures.

The strength of this conceptual framework lies in its holistic approach to freight planning. Key concepts worth mentioning again include performance measures, the analysis approach, and system operations. Performance measures are key because they provide the means by which the effectiveness of strategies and projects can be evaluated, which goes hand-in-hand with system operations. It is not sufficient to implement a plan, or project, and have no idea how well it is performing or if it achieved the specified objective at all. These two steps allow that evaluation to take place and for the refinement and, if necessary, the re-direction of strategy. The analysis approach helps provide for stakeholder and community involvement, which is important in any transportation endeavor and especially so for freight projects. Local communities often have strong opinions in regard to freight. If they are not included in the process, projects may not have any local support and the risk of delayed and halted projects becomes more imminent.

CHAPTER 4

APPLYING THE CONCEPTUAL FRAMEWORK TO SELECTED CASE STUDIES

Case studies of selected MPOs were conducted in order to ascertain which regions have incorporated, or are in the process of incorporating, freight into their transportation planning activities. These case studies were selected on the basis of evidence indicating that significant freight planning activities had taken place. Evidence was gathered through a search of transportation databases and by exploring the websites of the most populous metropolitan areas'. It was assumed that larger MPOs would have more resources to dedicate to freight planning, therefore providing more comprehensive and evolved plans for evaluation.

4.1 Vision

Vision reflects the desired end-state of transportation planning efforts. Vision can be articulated both generally and specifically, but it is the latter that truly affects planning efforts and subsequent results. Vision statements that are too general and simply contain ambiguous, agreeable principles may not sufficiently guide the planning process. It is important that the vision be action-oriented and serves as a guide to the process. Many MPOs include a vision within mission statements that embodies the principles and guides the approach of the agency to its endeavors. Within the context of this research, a vision statement articulates concerns about freight movement, influences subsequent planning activities, and leads to decisions aimed at improving existing conditions and future functioning.

None of the MPOs observed have specific vision statements regarding freight. Instead, freight is incorporated into the vision of larger, all-encompassing transportation plans, usually the RTP.

4.2 Goals/Objectives and Performance Measures

Goals and objectives reflect the philosophy of the vision, but are more specific as to the desired outcomes of the planning process. In regard to freight, the goal is the overall outcome one wants to achieve, such as enhanced freight movement in the region. Of course this is broad and may encompass many things that can help enhance freight movement in the region. In order to remedy this, objectives are formed to provide more concrete answers in response to what is hoped to be achieved in the operational capacity of a regions freight system. Several case studies provide examples of MPOs developing goals and objectives for their freight system

Performance measures provide two major benefits to transportation engineers and planners: (1) they monitor how well a system is functioning; and (2) they allow for informed decisions to be made on a continual basis. Too often this aspect of transportation planning is left out. Decisions made without knowledge of how they affected the system once implemented does not allow for effective planning practices. Performance measures must reflect recognized deficiencies in the freight system that MPOs want to improve; and in order to be effective, they must be incorporated into and guide the freight planning process.

4.2.1 Atlanta, GA

Atlanta is truly multimodal in its freight transportation options. Two major rail lines and three interstate highways intersect the region as its strategic location provides the nation access to the Southeast, and vice versa. Atlanta is home to the world's busiest

airport. Also, the Port of Savannah is only approximately 248 miles away. Savannah is one of the fastest growing container ports in the U.S. as well as one of the largest on the east coast. Much of the transportation infrastructure in Atlanta allows the Port of Savannah, along with other ports in Georgia, South Carolina, and north Florida, to serve their markets [22].

The movement of goods has always played a significant role in the region and the ARC recognizes that continuing to move goods through the Atlanta region is critical to the region's, and the nation's, economic health. A considerable challenge faced by Atlanta is accomplishing this in the face of unprecedented growth.

The Atlanta Regional Commission (ARC) defines as its goal in its 2008 freight mobility plan the following:

“To enhance regional economic competitiveness by providing efficient, reliable and safe freight transportation while maintaining the quality of life in the region's communities” [22].

The objectives of the plan are to:

- Facilitate an understanding of the importance of freight mobility to the region's economy and quality of life;
- Develop a dialogue between public decision-makers and private sector freight stakeholders regarding freight needs and strategies;
- Integrate freight considerations in the public planning process at all levels;
- Identify a regional freight transportation subsystem that is recognized to being essential to continued regional economic growth; and
- Develop a goods movement action plan that is data driven and stakeholder informed.

The ARC freight plan proposes performance measures in a number of key areas that include system productivity, reliability, connectivity, mode split, safety, and

environmental impacts. Each area has key performance associated with it that allows one to critically examine the system. Performance measures are as follows [23]:

System Productivity

- Congested lane-miles on strategic freight road network
- Congested lane-miles on designated truck routes
- Average travel speed on selected origin-destination trip pairs
- Percent of top 25 congestion bottlenecks that are being improved

Reliability

- Crash clearance times
- Number of crashes on strategic freight subsystem
- Number of lane closures on strategic freight subsystems
- Number of work zones on primary freight subsystem

Connectivity

- Percent of bridges on freight strategic road network with load limitations
- Percent of freight-critical locations (e.g., intermodal yards, distribution centers, air cargo facilities, etc.) that have LOS C or better

An important value of the goals/objectives created by the ARC is that they are actionable. This leads to strategies for improvement clearly linked to the goals and objectives and provides greater cohesiveness among all subsequent components of the freight plan. Another valuable aspect is that sources of data needed for performance measures are identified prior to implementation. Also, whether the performance measure is qualitative or quantitative is specified. This way, other agencies that may be responsible for data not collected by the ARC can be brought into the process early [23].

4.2.2 New York, NY

New York is the financial center of the United States and as such has an urgent need for effective freight planning. The region has an active multimodal freight system

characterized by highway, rail, air, and maritime freight. In addition to New York being the nation's financial center, it is also the most populous city in the United States [24], and therefore, one of the largest consumer markets as well. The freight issues affecting the New York region, which are typical of many major metropolitan areas, were defined as: the lack of an overall view, instead of modal, of the transportation system, an overwhelming dependence on highway infrastructure, and the need for a more modally balanced freight infrastructure [13].

New York Metropolitan Transportation Council (NYMTC), the MPO for the New York region, has no explicitly stated freight goal in its freight transportation planning documents, but rather chooses to reflect the freight transportation goals in its 1999 RTP, *Mobility for the Millennium*, which emphasizes improved reliability and minimized cost by following actions in the community's interest, such as [25]:

- Improve the transportation of freight by removing burdensome government regulations and restrictions;
- Improve the physical infrastructure of the transportation system for freight-related transport between shipping and receiving points;
- Improve the reliability and overall movement of freight in the region by encouraging expedient and cooperative multimodal shipment of freight;
- Improve the reliability and overall movement of freight in the region by also expanding alternatives for trucks and other commercial vehicles; and
- Improve the freight system's strategic redundancy.

The objectives of the NYMTC Regional Freight Plan are as follows [25]:

- Timely descriptive narratives of the current freight delivery system;
- Recommendations for capital and operating projects, policies and programs;
- Suggestions for further freight transportation planning; and

- Public education of freight transportation characteristics and issues from the point of view of shippers, carriers and other affected stakeholders.

Also, goals found in NYMTC's planning documents reflect the goals of other stakeholders in the process, such as the New York State Business Council, the New York Economic Development Corporation, and the Long Island Association. The incorporation of other stakeholder goals is an important aspect of the NYMTC Regional Freight Plan. Freight affects many aspects of community life, including economic development, which must be taken into account. By acknowledging and including the goals of other agencies, a crucial bond of community solidarity has been formed that will prove to be very important come time for implementation. Instead of just one, a chorus of voices working towards and pushing an agenda of freight improvements can more efficiently build the consensus that is necessary for its success. This aspect will be explored in more depth during the analysis section.

Performance measures in the NYMTC Freight Plan are organized according to mode – highway, rail, air, and maritime – and economic development. It offers both qualitative and quantitative performance measures. Highway performance measures are split into two categories: operating and physical. Figure 4.1 [25] displays a summary of highway performance measures, deficiencies, and possible solutions.

Task 4		Task 5
Performance Measures	Current/Anticipated Deficiencies	Possible Solutions/Alternatives
<p>Operating Measures:</p> <ul style="list-style-type: none"> • Truck volumes (with respect to total traffic volumes) • Levels of service (LOS) for major truck routes • Average speed • Toll costs • Curbside space management (loading/unloading zones, parking enforcement, etc.) • Accident and incident rates <p>Physical Measures:</p> <ul style="list-style-type: none"> • Height clearances • Turning radii • Access width • Weight limitations • Truck delays at railroad/highway grade crossings • Usable shoulders • Highway design standards, acceleration/deceleration lanes, truck climbing lanes, etc. • Signage; and • Curbside capacity (for truck operations) 	<p>Operating Limitations:</p> <ul style="list-style-type: none"> • Chronic congestion on many regional roadways • Poor signage along surface truck routes • Bridge and tunnel crossings act as “choke points” for regional traffic <p>Limitations on Truck Access:</p> <ul style="list-style-type: none"> • “Gaps” in regional freight network caused by truck-excluded roadway segments (ex., Grand Central Parkway) • Legally and illegally parked vehicles on already narrow and difficult to navigate surface streets <p>Limited Truck Routes:</p> <ul style="list-style-type: none"> • Trucks with 53-foot trailers are prohibited from serving destinations within New York City • Only one truck route within the NYMTC region for interstate-standard 53-foot trailer vehicles serving Nassau and Suffolk Counties (New England Thruway, Throgs Neck Bridge, Clearview Expressway, Long Island Expressway) No limited-access, high-speed truck corridors in Manhattan (except the one-mile Trans-Manhattan Expressway) • Gowanus Expressway/Brooklyn Queens Expressway/Long Island Expressway is the only east-west truck route between Southern Brooklyn and Queens/Long Island • Long Island Expressway is the only east-west highway open to trucks serving Nassau and Suffolk Counties • Cross-Bronx Expressway is the only east-west arterial for the Bronx 	<p>Infrastructure Improvements:</p> <ul style="list-style-type: none"> • Eliminate vertical clearance limitations on highways that cause truck diversion to local streets (e.g., on BQE at Brooklyn Bridge) • Improved signage • Create new roadway links to access major truck trip generators (e.g., direct Hunts Point connection to the Bruckner Expressway) • Reconstruct bottleneck interchanges to improve flow (e.g., Highbridge Interchange) • Develop new east-west connector serving South Brooklyn and JFK Airport, on either new right-of-way or modification of existing routes to permit trucks • Develop continuous service roads along major highways to provide alternate truck routing in case of incidents • Increase capacity and lane widths at the Goethals Bridges • Improve capacity on the Tappan Zee crossing • Improve Sheridan-Bruckner Interchange and access to Hunts Point Market. <p>Policy Improvements:</p> <ul style="list-style-type: none"> • Investigate the use of key parkway segments by smaller trucks and vans to eliminate gaps in the truck network (e.g., one-mile pilot study of the Grand Central Parkway between the Triboro Bridge and BQE) • Allow smaller commercial vehicles to use parkways during nighttime hours (9:00 or 10:00 p.m. to 6:00 a.m.)

Figure 4.1 a Summary of NYMTC’s highway performance measures, deficiencies, and possible solutions.

Task 4		Task 5
Performance Measures	Current/Anticipated Deficiencies	Possible Solutions/Alternatives
	<p>Geometric Constraints:</p> <ul style="list-style-type: none"> • Low clearances in Hudson River tunnels, and at highway overpasses • Substandard turning radii, lane widths, and grades at key points of regional network • No shoulders • Short acceleration and deceleration lanes <p>Poor Connections to Regional Freight Facilities:</p> <ul style="list-style-type: none"> • Only one limited access route to JFK Airport (Van Wyck Expressway) • Trucks must use local streets extensively to access regional rail and port terminals (e.g., limited and difficult connections between Brooklyn waterfront freight terminals and the Gowanus Expressway truck route) 	<p>Policy Improvements (continued):</p> <ul style="list-style-type: none"> • Coordinate toll pricing management plan to influence truck route and timing choice (this management plan should address all vehicles, not just trucks) • Strictly enforce current truck routes and restrictions • Allow trucks to use regional high-occupancy vehicle (HOV) lanes during nighttime hours • Encourage off-peak deliveries in the central business district (CBD) through a combination of incentives and curbside regulations • Review/update current truck route network to maximize commercial accessibility and minimize community impacts • Review truck length and weight restrictions for U.S. compatibility <p>Better manage commercial curbside space</p> <p>Operating/Technology Improvements:</p> <ul style="list-style-type: none"> • Accelerate expansion of Intelligent Transportation Systems (ITS) • Target roadway geometry improvements at the most critical locations • Improve signage for truckers • Improve coordination between private logistics and public ITS systems

Figure 4.1 continued.

Rail performance measures shown in Figure 4.2 [25] below are categorized based on rail traffic levels, levels of service, market share, competition, and terminal access. Although NYMTC cannot influence many of the operational performance measures due to proprietary information and the fact that the railroad industry is private, it can, however, affect access. This is where NYMTC focuses much of its effort.

Performance Measures ¹	Task 4	Task 5
	Current/Anticipated Deficiencies ¹	Possible Solutions/Alternatives
Rail Freight Traffic Levels: <ul style="list-style-type: none"> Rail carloads exchanged with East-of-Hudson origins/destinations Container or trailer groundings in the East-of-Hudson region Rail Freight Levels of Service: <ul style="list-style-type: none"> (Proprietary information, may be difficult to acquire) Rail Freight Market Share: <ul style="list-style-type: none"> Rail as a percentage of total regional freight traffic Rail Freight Competition: <ul style="list-style-type: none"> Number of competing carriers (preserving service options through future mergers) Rail Terminal Access: <ul style="list-style-type: none"> Number of access modes (truck, barge/ferry) Number of alternative access truck routes Connection time/distance to nearest limited-access highway or mainline rail head Average cost of dray operations 	Congestion Issues that Limit Potential Traffic Levels: <ul style="list-style-type: none"> Scheduling conflicts with passenger rail service in East-of-Hudson market Emerging rail congestion on West-of-Hudson rail network Operating Restrictions that Limit Levels of Service: <ul style="list-style-type: none"> Clearance restrictions on East-of-Hudson rail network Weight restrictions on East-of-Hudson rail network Limited freight operating windows between passenger service Capacity/Infrastructure Deficiencies that Limit Market Share: <ul style="list-style-type: none"> Yard and terminal capacity limits growth Lack of an efficient cross-Hudson rail link Heavy taxation on railroad property in New York State limits railroad investments in rights-of-way² Limited Rail Terminal Access: <ul style="list-style-type: none"> Hunts Point, Harlem River, Fresh Pond, and 65th Street rail yards have poor highway access that requires trucks to travel extensively on local roads Trucks serving proposed Pilgrim intermodal terminal will need direct access to LIE to avoid use of local streets 	Infrastructure Improvements: <ul style="list-style-type: none"> 17'-6" TOFC vertical clearance program:³ <ul style="list-style-type: none"> Metro North Hudson Line (underway) To Fresh Pond yard and Long Island Bay Ridge Line in Brooklyn To Pilgrim State Hospital site 20'-6" East-of-Hudson double-stack vertical clearance program on all major rail lines Create sufficient lateral clearances in keeping with AAR envelopes, paying extra attention to electrified third rails and station platforms on LIRR and MNR lines Increase weight limits on select railroad lines (ongoing) Improve West-of-Hudson rail line and terminal capacity (ongoing) Increase East-of-Hudson terminal capacity (ongoing) Develop new intermodal rail terminal at Maspeth, Queens (Phelps-Dodge) and Pilgrim State Hospital (Long Island) Construct a permanent Cross-Hudson freight rail connection Provide direct truck access from proposed Pilgrim intermodal terminal to the LIE Policy Improvements: <ul style="list-style-type: none"> Support the East-of-Hudson Rail Freight Operation Task Force (EOHRFOTF) Monitor impacts of toll pricing on river crossings and rail mode share to shift discretionary traffic away from the most congested periods Eliminate or reduce railroad taxation to spur railroad investment in infrastructure improvements Operating/Technology Improvements: <ul style="list-style-type: none"> Continue coordination between passenger and freight rail operations, particularly on the Hudson Line and LIRR Revitalize cross harbor car floats as a near-term solution to improved cross-Hudson connectivity Restore freight service to Staten Island Support Amtrak's mail and express delivery initiative

¹ Performance Measures and Deficiencies identified here cover all aspects of the rail transportation system. However, in keeping with the scope of the Regional Freight Plan, the focus of subsequent project tasks was on deficiencies related to groundside access.

² Issue has subsequently been resolved.

³ Canadian Pacific equipment requires 18-foot clearance.

Figure 4.2 a Summary of NYMTC's rail performance measures, deficiencies, and possible solutions.

Port performance measures are categorized as capacity, operations, or access performance measures. Although included for thoroughness, NYMTC has no control over performance measures concerning operations and capacity. On-terminal port planning is controlled by other agencies such as the Port Authority of New York and New Jersey and the New York City Economic Development Corporation. However,

NYMTC can affect port access. Figure 4.3 [25] shows a summary of NYMTC’s maritime port performance measures, deficiencies, and possible solutions.

Task 4		Task 5
Performance Measures ¹	Current/Anticipated Deficiencies ¹	Possible Solutions/Alternatives
<p>Capacity:</p> <ul style="list-style-type: none"> Actual throughput (total and per acre) Actual throughput as a percentage of theoretical “maximum practical capacity” by functional component of each terminal (wharf and crane operations, storage, gate) <p>Operations:</p> <ul style="list-style-type: none"> Average cargo dwell time Hours of terminal operation Utilization of storage (high-versus low-density) <p>Port Terminal Access:</p> <ul style="list-style-type: none"> Number of access modes (truck, rail, barge/ferry) Rail barge mode share Number of alternative access truck routes LOS on major truck access routes Access to on-dock rail Connection time/distance to nearest limited-access highway or mainline rail head Average cost of dray operations 	<p>Capacity Shortfalls:</p> <ul style="list-style-type: none"> Forecasted shortfall of container terminal capacity by 2005 Forecasted shortfall of auto terminal capacity by 2005 Insufficient marine terminal land area for forecasted demand <p>Operations:</p> <ul style="list-style-type: none"> Currently satisfactory, but the following operational criteria could be improved to meet increased demand: Reduced cargo dwell time More efficient cargo storage and yard management Increased use of non-truck modes (rail and barge/ferry) More efficient truck gates and information systems <p>Poor Connections to NYMTC Port Terminals:</p> <ul style="list-style-type: none"> Limited truck infrastructure constrains truck access options Regional toll infrastructure (particularly at Howland Hook) impacts access decisions and dray operations Brooklyn port connections use narrow, winding, and congested local streets, which creates a bottleneck to efficient freight movement No access to on-dock rail at any port terminal in NYMTC region (although access is planned for Howland Hook) Poor rail connections to national rail infrastructure limit attractiveness of efficient rail/port exchange 	<p>Infrastructure Improvements:</p> <ul style="list-style-type: none"> Increase availability of “ExpressRail” style on-dock rail and expand West-of-Hudson intermodal rail yard capacity Develop Port Ivory Site as an on dock rail facility for Howland Hook Consider on dock rail at South Brooklyn Marine Terminal Improve NYMTC port terminal connections to regional rail network Reactivate Staten Island’s North Shore Line and Arlington Yard to provide rail service to Howland Hook terminal via the Chemical Coast Line Use revitalized First Avenue rail line to connect South Brooklyn Marine Terminal to the Bay Ridge Line Construct cross-harbor rail tunnel Improve truck circulation and port access Construct New Port Newark exit on the New Jersey Turnpike Construct “Portway” in northern New Jersey Improve the Goethals Bridge crossing Add direct port access ramps or truck lane as part of a Gowanus expressway reconstruction <p>Policy Improvements:</p> <ul style="list-style-type: none"> Combat “freight sprawl” by adopting land use policies that encourage warehouse and distribution center development in the existing metropolitan area <p>Operating/Technology Improvements:</p> <ul style="list-style-type: none"> Use dedicated “inland distribution networks” to move port commodities through limited terminal space rapidly and efficiently Use information systems to manage terminal resources: <ul style="list-style-type: none"> Coordinate empty container supply to avoid excessive stacking of empties Schedule container pickups or use incentive pricing to manage gate traffic and box-moving resources Fully implement PANYNJ’s FIRST program

¹ Performance Measures and Deficiencies identified here cover all aspects of the marine transportation system. However, in keeping with the scope of the Regional Freight Plan, only the deficiencies related to groundside access were developed through subsequent project tasks.

Figure 4.3 a Summary of NYMTC’s maritime port performance measures, deficiencies, and possible solutions.

Airport performance measures are similar to maritime port performance measures in that they share the same categories and the realm of NYMTC influence is limited to

access performance measures. Figure 4.4 [25] shows these performance measures along with other pertinent information.

Task 4		Task 5
Performance Measures ¹	Current/Anticipated Deficiencies ¹	Possible Solutions/Alternatives
<p>Capacity:</p> <ul style="list-style-type: none"> • Aircraft parking • Airfield capacity • Warehouse capacity <p>Operations:</p> <ul style="list-style-type: none"> • Availability/ efficiency of Federal Inspection Services (FIS) • Tug distance to aircraft parking ramp <p>Airport Access:</p> <ul style="list-style-type: none"> • Number of alternative access truck routes • Connection time/ distance to nearest limited-access highway or CBD • Average cost of dray operations 	<p>Limited Capacity:</p> <ul style="list-style-type: none"> • Heavy airfield congestion at JFK Airport, one of 15 major national airports cited by the FAA for significant delays; significant congestion also exists at LaGuardia • Aircraft parking and warehouse capacity are in high-demand, but not yet identified as significant capacity limitation <p>Constrained Landside Access:</p> <ul style="list-style-type: none"> • Constrained surface access to JFK currently is the most significant air freight deficiency • Heavily congested Van Wyck Expressway is the only major truck access route (Nassau Expressway also provides limited access) • No regional truck routes provide for goods delivery to LaGuardia Airport • Limited Hudson River capacity constrains truck traffic connecting Newark Liberty International Airport and Manhattan 	<p>Infrastructure Improvements:</p> <ul style="list-style-type: none"> • Investigate the construction of a new facility or upgrade existing arterials to create an east-west truck route from the South Brooklyn area to JFK • Improve key Hudson River crossings to facilitate access to Newark Liberty International Airport • Increase capacity or improve congestion management on the Van Wyck Expressway • Investigate development of a truck ferry service connecting Manhattan to JFK to provide an alternative access route for truck serving downtown locations <p>Policy Improvements:</p> <ul style="list-style-type: none"> • Permit trucks to use sections of parkways or other truck-excluded routes to access regional airports. For example: <ul style="list-style-type: none"> - Grand Central Parkway between the Triboro Bridge and the BQE • Permit small trucks and vans in HOV lanes <p>Operating/Technology Improvements:</p> <ul style="list-style-type: none"> • Develop a regional airport access plan that will be responsible for defining and addressing key airport access issues for each airport • Tailor land side access to complement the operating niche of local airport resources, including JFK, LaGuardia, Islip, Newark, and White Plains airports. • Improve operations of loading and unloading zones in Manhattan to facilitate efficient delivery of air dependent courier packages

¹ Performance Measures and Deficiencies identified here cover all aspects of the air transportation system. However, in keeping with the scope of the Regional Freight Plan, only the deficiencies related to groundside access were developed through subsequent project tasks.

Figure 4.4 a Summary of NYMTC’s airport performance measures, deficiencies, and possible solutions.

New York is unique in that it has performance measures for economic development. These performance measures can be difficult to obtain, due to proprietary information, and also to quantify, since the relationship between freight and the economy is complex. Overall, the best freight performance measure for economic development is the strength, or weakness, of the economy itself. Figure 4.5 [5] shows the performance measures NYMTC uses for economic development.

Performance Measures	Current/Anticipated Deficiencies
<p>Cost:</p> <ul style="list-style-type: none"> • Average freight transportation cost per ton-mile as a percentage of the value of goods being moved • Overall cost of freight transportation compared to regional GDP • Regional freight costs per ton-mile compared to national averages • Appropriate use of most efficient freight modes (i.e., Bulk commodities move predominantly by rail/marine modes, etc.) <p>Efficiency:</p> <ul style="list-style-type: none"> • Energy consumption per ton/dollar shipped <p>Reliability:</p> <ul style="list-style-type: none"> • Percent of freight moving by time-definite modes/carriers • Carrier on-time performance records <p>Land Use:</p> <ul style="list-style-type: none"> • Facility productivity per acre (throughput of tons/containers) • Sufficient land devoted to terminal, warehousing, distribution, or other freight supportive use • Efficient location of support facilities (logistics flows do not result in unnecessary travel) • Use of lands that would otherwise not be reused (i.e., brownfields) <p>Secondary Development/Employment:</p> <ul style="list-style-type: none"> • New employment/businesses development near major transportation facilities <p>International Trade:</p> <ul style="list-style-type: none"> • Volume of international trade • Number of direct trading partners • Number of carriers serving international destinations from NYMTC region <p>Disposal of Municipal Solid Waste (MSW):</p> <ul style="list-style-type: none"> • Percent of MSW sent to landfills (as opposed to being recycled or reclaimed) • Percent of MSW shipped to out-of-state facilities • Remaining capacity/agreed tonnage at receiving landfills • Per-ton cost of MSW disposal 	<p>Trucking Overdependence:</p> <ul style="list-style-type: none"> • Less than 1% of domestic freight moves by rail • 73% of domestic freight moves by truck • Trucking contributes to congestion on regional roadways (particularly at river crossing choke points) • Lack of modal choices reduces efficiency and cost competition <p>High Costs:</p> <ul style="list-style-type: none"> • The NYMTC region has some of the highest freight shipment costs in the nation. • Direct costs – tolls, labor, real estate, energy costs, and delivery surcharges • Indirect costs – congestion, accidents, and environmental impacts • Lack of truck friendly infrastructure <p>Transportation Land Shortfalls:</p> <ul style="list-style-type: none"> • High land prices in the NYMTC region make it difficult to maintain sufficient acreage for lower-revenue transportation uses • Warehousing and distribution facilities concentrated more in northern New Jersey, due to land availability and better access to transportation corridors, which results in: <ul style="list-style-type: none"> – More Hudson crossing truck trips for deliveries to East-of-Hudson markets – Reduced diversity of employment and economic output in the NYMTC region <p>Municipal Solid Waste Export:</p> <ul style="list-style-type: none"> • Controversial nature of MSW prevents waste from travelling efficiently by direct rail connection from East-of-Hudson transfer stations

Figure 4.5 a Summary of NYMTC’s economic performance measures and deficiencies.

4.3 Analysis

Analysis is the process by which you interpret information and formulate solutions to the problems you wish to solve. Within the context of this framework, given the data gathered and performance measures developed, how must the stated goals and objectives be achieved? More specifically, freight analysis should answer important

questions with regard to the region being studied. They include: ‘What are the existing conditions in this region? How does freight affect other area issues? What do we reasonably expect to happen in the future?’ A proper method of analysis is essential to answering these questions among others.

The collection of data, which feeds directly into analysis in the conceptual framework, allows the most basic question, ‘What are the existing conditions in this region?’, to be answered. Establishing a baseline condition is important before any problem-solving can take place. Data collection serves as a bridge between performance measures and analysis. What it is hoped to achieve and how success is measured dictate the type and amount of data necessary.

An important aspect of analysis is the ability to expand the scope of the problem definition. In other words, it relates the transportation system to non-transportation entities that may be affected by it, such as social equity, environmental quality, and the economy. This is particularly true for freight considering that until recently, it was largely considered a private sector problem [1]. The conceptual framework achieves this by the incorporation of alternative improvement strategies and ideas from other sources. Underlying these components is the basic, but important, understanding that there are stakeholders who may not formally be included in institutional decision-making but have great insight into freight related problems and subsequently their solutions as well. This includes not only freight and logistics companies, but private citizens and local governments as well.

A specific call to answer the last question, ‘What do we reasonably expect to happen in the future?’ is not explicitly stated in the framework but is understood to be a part of the analysis method. Transportation planning is primarily concerned with what will be the case tomorrow, not simply today. Therefore, inherent in the analysis method must be the ability to forecast.

4.3.1 Atlanta, GA

The combination of unprecedented growth and a large number of local governments comprising what is considered to be the metropolitan Atlanta area presents significant obstacles and complicates analysis. The *Atlanta Regional Freight Mobility Plan: Freight Mobility Needs Assessment* is a separate document from the final report in which much of the primary analysis takes place [25]. A modal and commodity flow profile is established for the region, its primary trading partners identified, and future forecasts predicted. Other important characteristics include identification of the freight transportation system, safety data, and economic implications.

In order to obtain a big-picture view of freight in the Atlanta region, the ARC gathered data on commodity flows, the market share according to mode, and the regions with which it does the most trade. Data is aggregated at the city and county level primarily since the organization desiring this information is an MPO. Much of this information can be obtained from national and state databases. This data, along with truck survey data, allowed the ARC to establish and categorize existing freight flows within the region into internal-external, internal, and through trips, an important aspect of freight planning identified by Chatterjee [11]. It is important to note that data gathered reflects the goals and performance measures established earlier in the planning process. As has been stressed it is desirable to have a freight plan that is action-oriented. Gathering data that reflects goals and performance measures helps achieve this.

Particular attention is paid to highway and rail modes since they are the dominant modes of transport in the Atlanta region. Within the study, both the highway freight system and subsystem are identified along with safety data within those systems. This highlights an aspect of analysis that expands the scope of the problem. Of course, any freight plan seeks to improve efficiency and cut down on travel time, but safety affects both of these things and is very important to decision-makers and constituents alike, in addition to being the primary concern of the engineer. In addition to the human toll taken,

poor safety increases operating costs for carriers and hurts the regional economy. The ARC identified high incident locations along the primary freight system and subsystem and put forth efforts at solving the problems.

4.3.2 New York, NY

The analysis process used by NYMTC speaks to the heart of the proposed conceptual framework. It is important to recognize that there are many factors that may affect freight; the formulation of alternative improvement strategies is key to identifying different routes that lead to the same destination. This is important in all metropolitan areas, but especially those with an existing dense, highly built infrastructure, where practical limitations on physical improvements exist. NYMTC did just this by forming alternative improvement packages and conducting analyses on these in order to determine which would offer the greatest benefits. The alternative packages are [26]:

1. Policy, Operational, and Low-Cost Capital Actions (“Policy” package);
2. Highway System Improvements; and
3. Railroad System Improvements.

The NYMTC used a two-tier analysis approach, displayed in Figure 4.6 [26], to their alternative packages. Each alternative package was compared to a base case and analyzed according to the performance measures. The baseline package includes all projects that have committed funding, widespread support, and are included in either the TIP or STIP. Results were then used to create a hybrid improvement package incorporating the most important characteristics of each alternative package.

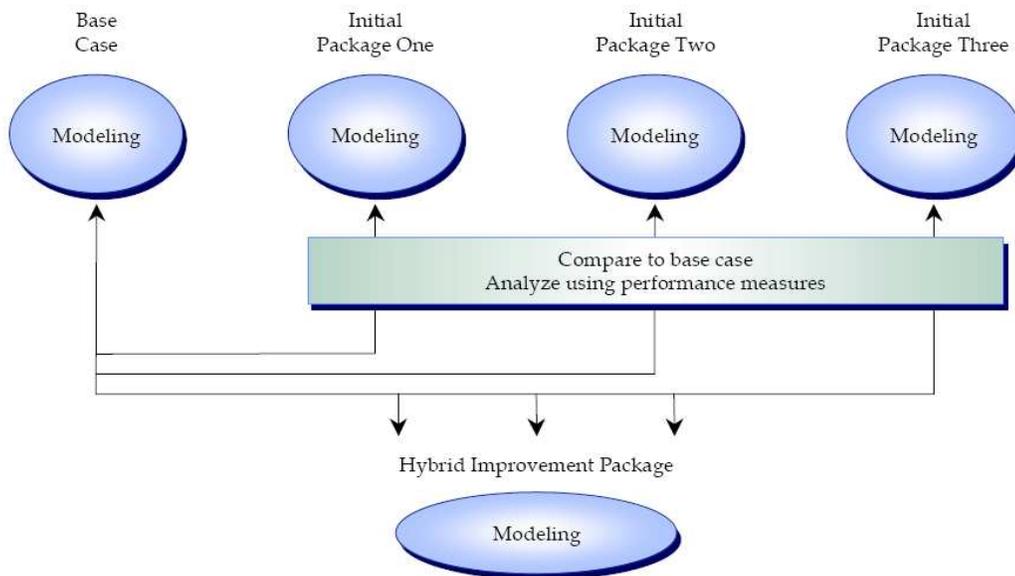


Figure 4.6 Two-Tiered Analysis Approach used by NYMTC in evaluating alternative improvement packages.

4.3.3 Tampa, FL

The Tampa Bay Regional Goods Movement Study is an analysis of freight activity in the Tampa Bay region, and a forecast of what is expected in the future [27]. This document very much answers the questions posed earlier in the Analysis section, but it does a particularly good job of expanding the scope of the problem which will be discussed in greater detail later in this section. First, we will start off with the basic questions: ‘What are the existing conditions in this region?’ and ‘What do we reasonably expect to happen in the future?’

Most planning agencies answer these questions by conducting a modal assessment and forecast of commodities and carrier activity in the area; Tampa is no different. All major modes are covered: Rail, Truck, Maritime, and Air, and commodities likewise. Important information covered in this section include modal splits of total freight volumes, the identification of valuable trading partners, forecasted growth, and modal preferences of goods being shipped, among others. The primary purpose of this section is to provide a baseline understanding of freight in the region and how it is going to change

in the future. This fits nicely into the framework and allows for subsequent steps in the planning process to take place. But before that happens, it also makes possible another important aspect of Analysis that any freight plan should not ignore, expanding the scope of the problem.

Freight affects many things that are not solely transportation related. It has important implications for economic prosperity, global competitiveness, and quality of life. Improvements to the freight transportation system lowers costs for businesses and can provide a comparative advantage for economic development. The Tampa Bay Regional Goods Movement Study recognizes and highlights these things throughout the document.

Another aspect of expanding the scope of the problem in regards to freight planning is quality of life. Two closely related areas affected by freight are congestion and land use. Large levels of freight activity although economically desirable, can also contribute to congestion and all the issues associated with it: environmental degradation, increased travel times, and risks to safety. But this can actually be an opportunity in disguise as Tampa has hinted in its freight study. Tampa has identified freight activity centers, areas of high goods movement activity, and the possibilities of freight villages. Zoning can be used as a tool for protecting and concentrating freight activity into specific areas, 'freight villages', in order to increase efficiency and decrease congestion. This may help to reduce traffic impacts on residential neighborhoods and help improve the overall quality of life.

4.4 Evaluation

By this step in the process, an MPO would have already established goals and performance measures, collected the necessary data, and developed improvement strategies through the analysis process. The next step in the process is evaluation. The purpose of evaluation is to gauge the merits of each alternative relative to one another and develop strategies or a plan by which the most promising alternatives may be implemented. In other words, it seeks to answer two important questions, ‘Which alternatives are the best?’ and ‘How will we actually accomplish all these things?’ This involves identifying policies, operations strategies, financing strategies, and increasing education and awareness about a project. Most likely there will also be a need to establish partners and collaborative undertakings.

Developing criteria by which alternatives may be judged allows the best choices to be selected out of many. Criteria should be reflect the vision of the community, be supportive of the overall goal of the freight plan, and seek to achieve the specific objectives of each alternative. Also, evaluation criteria must be mindful of the needs and concerns of decision-makers and the type and quality of data available. It is important for engineers and planners to understand the environment within which freight transportation decisions are made and provide the information that allows the decision-maker to most efficiently and accurately act within that environment.

The identification of strategies is truly paramount in the evaluation process. If freight transportation is evaluated from a systems perspective, there exists the freight system itself as well as an outside environment with which it must interact. Many aspects of the freight system are not under the control of the MPO, such as the shipper’s choice of mode or size of shipment. However, MPOs can greatly influence the outside environment and the linkages between the two, such as improvements to the arterial system in order to relieve interstate congestion, or the elimination of at-grade crossings.

Effective strategies to negotiate these relationships between the freight system and its environment are a necessity.

4.4.1 Atlanta, GA

Regional strategies for freight improvements in metropolitan Atlanta are multifaceted and address institutional, operational, and infrastructure approaches to meeting the region's needs. There must be continuous and simultaneous implementation across institutional, operational, and infrastructure strategies. This translates into the development of a coordinated plan that selects and prioritizes strategies in a manner that selects and prioritizes strategies in a manner that allows the region to capitalize on short term, easily implemented solutions while planning for long-term investments [28].

The key categories of needs as defined by the ARC include [28]:

- Operational Enhancements
- Mitigation of Land Use Conflicts
- Safety Enhancements
- Expansion of Education/ Public Awareness
- Adoption of Regional Approaches
- Mitigation of Community and Environmental Impacts
- Expansion of System Capacity

These will be important in developing strategies for improvement and criteria by which to evaluate them.

The process for developing and screening strategies focused on assessing their potential effectiveness for meeting the needs outlined above. Tying evaluation criteria back to the region's desired needs is an important aspect of the ARC Freight Plan. In the conceptual model, the goals and objectives along with the vision, ensures that transportation planning is grounded in the community and forms the foundation for subsequent actions.

Developing strategies was done both qualitatively and quantitatively and emphasized stakeholder input. Also, it identified general themes and categories of strategies that were supported by the region's needs. The step-by-step process went as follows [28]:

1. Initial List – The initial list of strategies and interim deliverables was developed and presented to stakeholders for input and feedback. It focused on specific modes and areas of goods movement and the categories of defined needs. From this a matrix of projects was developed.
2. Expanded List – The initial list was expanded with input from other agencies and private stakeholders to include specific projects and strategies. The expanded list disregarded financial, engineering and political feasibility.
3. Refined List – The refined list was developed using the following qualitative screening criteria:
 - a. Does the project or strategy enhance regional goods movement?
 - b. Does the project or strategy mitigate negative impacts associated with freight movement?
 - c. Does the project or strategy enhance regional economic competitiveness?

The result of this process was a list of possible strategies that address institutional, policy, operational, and infrastructure issues. The strategies were organized into 13 categories [28]:

1. Mitigation of Interchange Bottlenecks
2. Maintain and Enhance Intermodal Connectors
3. Addition of Mainline Rail Capacity
4. Rail Grade Separations
5. ITS Technologies
6. Management and Operational Strategies
7. Preserve Lands for Freight Uses

8. Implement Institutional Changes to Improve Feasibility of Freight Projects of Regional Significance
9. Enhance Freight Network Safety
10. Improve Data and Analytical Methods
11. Promote Regional Approaches and Leadership
12. Enhance Public Awareness of Freight Transportation
13. Expand Highway Infrastructure

Strategies for improvement were evaluated using criteria based on identified needs. They include [28]:

Table 4.1 ARC Improvement Criteria

Truck Diversion	How much is freight shifted from freight to rail and through truck traffic removed from the highway system?
Highway Congestion/ Delay	How much will highway congestion and delay be reduced for both passenger and freight movement?
Rail Congestion/ Delay	How much will rail congestion and delay be reduced for freight movement?
Travel Time/ Reliability	How much will the project or strategy improve travel time and reliability for both passenger and freight movement?
Freight Trip Times	How much will the project or strategy improve trip time for freight movement?
Truck Traffic Peak/ Off-Peak Shares	How much will the project or strategy shift the share of truck traffic from peak to off-peak times?
Freight Vehicle Miles of Travel	How much will the project or strategy reduce regional truck vehicle miles of travel?
Freight Vehicle Hours of Travel	How much will the project or strategy reduce regional truck vehicle hours of travel?

Safety	How much does the project or strategy reduce truck crashes and improve pedestrian safety along corridors?
Truck Emissions	How much will the project or strategy reduce truck emissions
Community Impacts	How much will the project or strategy reduce community impacts associated with goods movement along transport corridors and freight intensive areas, including those in dense areas?
Land Use Impacts – Transport Corridors	How much will the project or strategy reduce land use impacts associated with goods movement along transport corridors?
Land Use Impacts – Intermodal/ Warehouse/ Distribution Facilities	How much will the project or strategy reduce land use impacts associated with goods movement between intermodal yards, warehouse and distribution facilities?
Regional Economic Output/ Competitiveness	How much will the project or strategy improve the economic output and competitiveness of the region?
Jobs/ Economic Opportunity	How much will the project or strategy increase the number of jobs and economic opportunity associated with goods movement in the region, including those immediately in proximity to freight businesses?
Cost	What is the overall cost of the project or strategy?

The evaluation procedure conducted by the ARC incorporates many aspects of the evaluation section of the conceptual framework. It contains both operations and financing strategies for projects, as well as education and awareness initiatives that help build community support. An important aspect of the strategies outlined by the ARC, and of any good evaluation process, is that they be action-oriented. By this point in the

transportation planning process, plans are refined, ambiguities removed, and ideas translated into projects and strategies that can be enacted.

Another notable characteristic is the Enhance Public Awareness and Education strategy proposed by the ARC. This coincides with the ‘Education and awareness’ aspect of evaluation listed in the conceptual model. Freight often times must compete with other land uses, particularly residential. This is especially true in urban areas experiencing back-to-downtown movements. Citizens have adverse reactions to the thought of large, noisy trucks operating in their neighborhoods. The best remedy for this is land use planning that protects areas zoned for industrial purposes from the encroachment of residential activity, but education plays an important role as well. Residents must be made aware of how freight is important in their everyday lives and reminded how it adds to the regional economy and overall quality of life.

4.4.2 New York, NY

In order to develop strategies for improvements, NYMTC took the following actions [25]:

- A public forum was held to solicit ideas in addition to those provided by NYMTC’s Freight Transportation Working Group (FTWG);
- NYMTC member agencies generated a working list of possible freight strategies; and
- Actions were separated into short-term solutions of one to three years; mid-term solutions of three to ten years; and long-term solutions of more than ten years.

NYMTC organized actions according to goals and strategies in which they also identified responsible agencies, the timeframe, and possible impacts. The method of evaluation employed by NYMTC truly captures the essence of the evaluation process in the conceptual framework. It includes aspects such as policies, studies, partnerships, collaborative undertakings, and financing and operating strategies. NYMTC includes

many of these things in its strategy development. Also, another aspect of the conceptual framework incorporated into strategy development was the need to develop long-term and short-term plans.

Figure 4.7 [25] below outlines a highly formalized method of evaluating potential alternatives relative to the overall NYMTC goal. This constant linking of various parts of the freight plan back to each other improves the chances of success and makes for a better overall system once implemented. Within this framework, NYMTC identifies the goal to be accomplished; the strategy to achieve that goal; the actions that must take place; where they will take place; the parties responsible for carrying out the action; the timeframe within which those actions will happen; and the next steps in the process. It entails all of the steps the conceptual framework described in Chapter 3 seeks to accomplish within the evaluation procedure and fully answers the two questions posed earlier in the section.

Goal	Strategy	Action	Benefits	Corridor	Agency	Timeframe	Next Steps	Cost
1. Improve transportation of freight by removing burdensome government regulations and restrictions	A. Improve management of truck routes	Complete NYCDOT Truck Route Management Study	Improved regional connectivity and reduced community impacts	Citywide	NYCDOT	Short	Complete "Citywide Truck Route Management and Community Impact Study"	N/A
		Assess alternatives for providing greater access to national standard 53' long, 102-inch wide tractor trailers	Improved regional connectivity	Northern Southern Eastern (I-278) Eastern (I-678)	NYSDOT NYMTC NYCDOT PANYNJ	Short	Conduct regional feasibility study	N/A
	B. Improve the management of commercial vehicle loading and unloading zones	Expand the commercial parking program in Manhattan and further assess impacts	75 percent of trucks finish delivery within first hour – suggests VMT/VHT reduction	Manhattan	NYCDOT	Short	Expand program boundaries; continue to assess impacts	Revenue will cover capital cost
		C. Expand the application of ITS to commercial vehicle operations	Automate commercial vehicle permitting, credentialing and enforcement	Enhanced truck movements and safety leading to reduced costs and travel time	All	NYSDOT NYSTA	Short	Implement program under development and assess impacts
		Expand Integrated Incident Management System in NYC area	Accelerated incident response time to reduce non-recurring congestion and improve public safety	All	NYSDOT NYCDOT MTA NYPD NYCOEM	Short	Proceed with multi-agency expansion as planned	\$2.5 M for the SIE
		Provide real time traveler information to commercial vehicle operators	Enhanced truck movements leading to reduced costs and travel time	Northern Southern I-95 NE Thruway I-87 NYS Thruway Western	NYSDOT NYCDOT PANYNJ	Short	Coordinate program development with I-95 Corridor Coalition	N/A

Figure 4.7 The NYMTC project evaluation method.

Goal	Strategy	Action	Benefits	Corridor	Agency	Timeframe	Next Steps	Cost
		Continue experimentation with value pricing of toll facilities	Reduced peak period congestion	All	NYSTA PANYNJ MTA NYSDOT	Short	Continue experimentation and analysis Complete Off-Peak Delivery Study	Costs to be recovered from tolls
2. Improve the physical infrastructure of the transportation system for freight related transport between shipping and receiving points	A. Use marine connections to enhance access to key distribution points	PIDN - Transport port containers by barge and rail to out-of-region transshipment facilities	1,256,356 TEUs moved by rail/barge instead of truck	Northern Southern I-95 NE Thruway I-87 NYS Thruway Western	PANYNJ	Short to mid	Assess impact of early deployments (Albany) and expand as planned	\$490 M
		Assess feasibility of regional truck ferries	Reduced truck traffic on roads	TBD	NYMTC NYSDOT PANYNJ NJTPA NJDOT	Short	Conduct regional Feasibility Study	N/A
	B. Use rail connections to enhance access to key distribution points	Restore service on Staten Island railroad	Travis Branch - 16,000 carloads/year Howland Hook on-dock rail - 20,000 rail cars/year	Southern	PANYNJ NYCEDC	Short	Implement existing plans	\$363 M
		Improve First Avenue rail tracks in South Brooklyn waterfront	Support bi-level auto carrier port - 81,000 tons	Southern	NYCEDC	Short	Implement as planned	\$17 M

Figure 4.7 continued.

Goal	Strategy	Action	Benefits	Corridor	Agency	Timeframe	Next Steps	Cost
3. Improve the reliability of overall movement of freight in the region by encouraging multimodal shipment	A. Reduce barriers to EoH rail service	Provide a minimum of 17-foot six-inches TOFC clearance; eliminate weight and clearance restrictions on plate F cars and tri-level auto carriers; expand eventually to 23-foot double-stack clearance	300,000 to 700,000 tons annually to Pilgrim; 69,000 tons on Hudson Line	Western Long Island Expressway I-87 NYS Thruway I-95 NE Thruway	NYSDOT MTA PANYNJ NYCEDC	Short to mid	Complete "Hudson Line Railroad Corridor Transportation Plan" Complete "East of Hudson Rail Freight Study" Conduct Pilgrim ES Complete Cross Harbor ES	\$0.75 M for Westchester Avenue Clearance (Harlem River Yard to Oak Point)
		Reduce operational conflicts between passenger and freight service on region's railroads	69,000 tons on Hudson Line; others TBD	Western Long Island Expressway I-87 NYS Thruway I-95 NE Thruway	NYSDOT MTA PANYNJ	Short to mid	Complete "Hudson Line Railroad Corridor Transportation Plan" Complete "East of Hudson Rail Freight Study"	N/A
	B. Evaluate the further expansion of freight yards and warehouses (freight villages)	Assess potential to develop Harlem River as intermodal yard	TBD	Western I-684 I-87 NYS Thruway I-95 NE Thruway	NYSDOT MTA	Short to mid	Complete "Hudson Line Railroad Corridor Transportation Plan"	N/A
		Assess potential to develop Pilgrim State Hospital in Deer Park as a bulk and/or intermodal facility	300,000 to 700,000 tons	Long Island Expressway	NYSDOT	Mid to long	Conduct Pilgrim ES	\$87 M

Figure 4.7 continued.

Goal	Strategy	Action	Benefits	Corridor	Agency	Timeframe	Next Steps	Cost
		Assess potential to develop Phelps Dodge site and adjacent areas in Maspeth, Queens into a bulk or intermodal facility	2.9 to 7.3 million tons of intermodal	Northern Southern	NYCEDC	Mid to long	Complete Cross Harbor EIS	Funds included under Cross Harbor tunnel
		Assess potential to further develop existing yard at 65th Street, Brooklyn for bulk, intermodal, and/or port-related traffic	TBD	Northern Southern	NYCEDC	Mid to long	Complete Cross Harbor EIS Advance Port Revitalization plans	N/A
		Conduct regional Feasibility Study to identify additional sites	TBD	All	NYMTC	Short	Conduct Feasibility Study	N/A
	C. Improve Cross-Hudson Rail Service	Improve existing float bridges at Greenville, NJ	TBD	Southern	TBD	Short	Implement plans as designed	\$8-10M
		Assess cross-harbor rail freight tunnel	9.4 to 14.9 million tons	Northern Southern	NYCEDC	Long	Complete Cross Harbor EIS.	Single tunnel \$4.46 Double tunnel \$7.3 B
4. Improve the reliability and overall movement of freight in the region by expanding alternatives for trucks	A. Improve Northern Corridor Crossing	Assess improvements to the Highbridge Interchange	Improved traffic flow on I-95	Northern	NYS DOT	Long	Complete EIS	N/A
		Assess completing a continuous service road system on the CBE	Improved traffic flow, reduced traffic diverted to local roadways	Northern	NYS DOT	Long	Complete "Bronx Arterial Needs Study"	N/A
		Improve Sheridan-Bruckner Interchange	Improve access to Hunts Point Market	Northern	NYS DOT	Long	Complete EIS	\$200 M

Figure 4.7 continued.

Goal	Strategy	Action	Benefits	Corridor	Agency	Timeframe	Next Steps	Cost
	B. Improve Southern Corridor Crossing	Assess upgrading crossing at Goethals Bridge	Improved traffic flow and reduced accidents	Southern	PANYNJ NYMTC	Long	Conduct EIS Conduct corridor study	\$450-650 M
		Assess completing a continuous bus/ HOV system on the SIE and related improvements	Increased capacity and volume	Southern	NYS DOT NYMTC NYCDOT	Long	Conduct EIS Conduct corridor study	\$500 M
	C. Improve Eastern Corridor (I-278)	Assess removing clearance restriction on the BQE	Reduced traffic diverted from local roadways	Eastern (I-278)	NYS DOT NYMTC	Long	Conduct Feasibility Study Conduct corridor study	N/A
		Assess feasibility of off-peak truck use of Gowanus HOV lane	Improved traffic flow on mainline	Eastern (I-278)	NYS DOT NYMTC	Short to long	Conduct demonstration project, analyze, and apply to Gowanus Reconstruction EIS; conduct corridor study	N/A
	D. Improve JFK Airport/Industrial Access Corridor	Assess options for improvements to the major routes in the corridor	Improved access to JFK and adjacent areas	Eastern (I-678) South Brooklyn/ Queens	NYS DOT NYMTC NYCDOT PANYNJ	Long	Conduct Corridor Study Complete S. Brooklyn TIS	N/A

Figure 4.7 continued.

Moving on to the evaluation criteria, use of the packaging approach allowed NYMTC to evaluate the greatest number of projects within a big picture perspective of regional freight planning. Packages were assessed using both quantitative and qualitative measures. Each alternative was analyzed according to the following impact criteria [26]:

- Transportation;
- Environmental;
- Connectivity;
- Economic Development;
- Technology;
- Physical Feasibility; and
- Institutional Feasibility.

Evaluation of direct transportation impacts relied on three basic analysis processes: roadway volume impacts, railroad diversion impacts, and qualitative impacts. Roadway modeling allowed planners and engineers to predict the effects of roadway improvements on traffic in the area; railroad diversion modeling estimated the additional traffic that can be attracted to rail; and qualitative analysis was applied to aspects that could not be modeled, such as freight villages and curb space management programs.

Evaluation with the other criteria was done at the planning level, primarily qualitatively, due to the early stage of development for many of the projects. Environmental analysis covered basic criteria and relied heavily upon existing documentation, such as corridor studies and Environmental Impact Statements (EIS). Connectivity was viewed from an economic development perspective since the two are closely related. Improvements in connectivity reduce the cost of goods movement and allow businesses to be more competitive and generate adjacent economic activity as well. Physical analysis addressed the challenges of constructing proposed projects. Institutional analysis assessed issues such as stakeholder support, funding sources, and agency cooperation.

4.4.3 Los Angeles, CA

The identification of strategies is of great importance in the evaluation process. Strategies must not only address operational issues, but financial and public awareness issues as well. Freight systems do not exist in an isolated environment, they must interact with the outside world and many factors, beyond engineering and planning affect them. The Los Angeles region, represented by the Southern California Association of Governments (SCAG), recognized this and responded accordingly. SCAG identifies principles and strategies for goods movement in the region as well as its benefits.

The first three principles address the linkages between freight movement and the outside environment. Of particular interest is an issue common to freight movement: that improvements to the freight system often induce benefits realized nationally, but negative externalities often incurred locally because of those improvements. These include traffic congestion, air pollution, and freight-related safety incidents, which leads to the first principle [29]:

1. *Environmental and community impact mitigation must be integral to the goods movement program.*

The strategy to address this issue is to increase federal involvement in freight movement at the local level, encouraging community involvement, and establishing an environmental review process for freight.

The next principle addresses the possible negative effects freight system improvements may have on other aspects of the transportation system. Goods movement projects must often compete for funds with other transportation projects. If all are drawing from the same pool of funds, ultimately the entire transportation system loses since investments and improvements are needed across the board. The second principle states [29]:

2. *Improvements to the goods movement system should not come at the expense of other transportation system improvements.*

The primary strategy to alleviate this issue is to diversify funding options for freight movement projects.

The third principle focuses on the positive linkages between freight movement at the local and statewide level. Freight improvements at the local level cause benefits felt statewide in the areas of performance, environmental, and economic benefits. The third principle states [29]:

3. *Investments in the regional goods movement system should be made to realize regional benefits that have statewide implications.*

Strategies related to this include educating decision-makers and the general public about the wide-ranging benefits of freight improvements. In order for freight planning to be effective, strategies must address its effects on the outside environment.

The final two principles focus on foresight and leadership in freight transportation planning. Issues related to freight movement are not insurmountable. They can be solved but require timely investments and leadership on behalf of the transportation community and decision-makers. The final principles are [29]:

4. *Funding of these investments must begin now because many key projects will take years to deliver. Without action, congestion will worsen.*
5. *Without leadership and collective action at the state and national level, we will not be able to realize these benefits.*

Strategies supporting these principles include identifying advocates for freight within the community, encouraging government leadership, and the implementation of policies and procedures that encourage freight system investment and improvements.

Although this evaluation process is not highly specific, it provides a guideline for more detailed evaluation efforts. It contains many of the aspects of the evaluation process outlined in the conceptual framework, namely operational strategies, financing strategies, and policies. Perhaps the most notable aspect of SCAG's evaluation is that it recognizes that freight exists within a larger environment and responds accordingly.

4.5 Implementation of Strategies

Implementing strategies means bringing to fruition all the labor of the previous steps. It involves the funding, designing, and construction of projects, as well as changing inefficient and enacting new policies and regulations. In transportation, the implementation process is often referred to as programming and consists of the scheduling of projects for implementation with associated funding levels. In the case of MPOs, the decision to fund projects is in part decided by other organizations (state DOTs, local governments, federal agencies, etc.), which can be problematic.

Implementation involves overcoming three primary obstacles: physical, institutional, and political. In particular, it is implementation's political nature that can make it one of the most frustrating parts of the conceptual framework. Physical obstacles have usually been vetted during the development of alternatives, or in evaluation [26]. So at this point in the process they are not so much of an issue.

Institutional barriers present another challenge that may not be as easy to overcome. Often times the implementation of transportation plans of any sort may require the enacting of new and the changing of inefficient policies and regulations. The degree of ease with which this takes place is in large part directly related to the involvement of agencies responsible for those policies and regulations in the freight planning process. Freight cuts across boundaries of all types: political, geographical, jurisdictional, and modal among others. Because of this great diversity of stakeholders, any plan without meaningful input from all actors is likely to fail.

Political obstacles represent another challenge with which to be dealt. These manifest themselves in the form of funding, political turnover, and cross-jurisdictional disputes. Like all other transportation initiatives, freight is subject to the scrutiny and priorities of decision-makers. Decision-makers who disapprove of projects for whatever reason present significant hurdles in achieving the overall goal. And just as devastating as a political opponent can be, - is a lost advocate. A decision-maker is not guaranteed his/

her seat beyond the length of the term; because of this, turnover is a fact of life in politics that can greatly hinder transportation projects. For example, the Chicago metropolitan area has an ambitious plan for improving freight movement which has suffered setbacks relating to this very issue. Chicago only received a tiny portion of funds from the federal government needed to implement their plan, which happened to coincide with the loss of a key legislator and advocate.

The last political obstacle is the cross-jurisdictional nature of freight movement. In order to participate in the marketplace, freight must be transported from the area of production to the area of consumption, which often does not lie in the same political region. Because of this cross-jurisdictional nature, improvements to transportation infrastructure and facilities to accommodate freight require the cooperation of decision-makers across the improvement area (and sometimes those outside the area as may be the case with projects requiring federal funds or approval). This presents significant funding and governing challenges, but as Anker and Meyer illustrated, such obstacles have been overcome in the past citing the U.S. interstate highway system as an example [30]. Regional funding mechanisms (e.g. sales taxes), federal and state guidance, and geographically larger regional governing structures could help overcome these obstacles.

Another obstacle that can present itself during implementation is environmental compliance. The National Environmental Policy Act (NEPA) process can be a long and arduous one, with many projects potentially meeting their end here, if not through the legislation itself, then quite possibly through the courts. Public and stakeholder involvement early in the process can be an effective way of combating this, but may not prove to be sufficient on its own. An environmental compliance process closely tied to the planning and implementation process could at least alleviate, if not fully solve, this potential problem.

Funding can be an obstacle because transportation must compete for funds with other important areas such as healthcare and education. Governments of any scale and

size only have limited monies that will be available to transportation planners and engineers. The competition for these funds grows even stronger once in the hands of transportation agencies because freight must compete with passenger related projects which often receive more attention from the public, thereby giving them greater priority in the eyes of elected officials. Because of these things transportation professionals must convey to decision-makers the importance of freight, while at the same time, developing increasingly creative funding mechanisms that overcome insufficient funding due to political obstacles. One such mechanism is the public/ private partnership.

4.5.1 Chicago, IL

The Chicago Region Environmental and Transportation Efficiency Program (CREATE) is a public/ private partnership of the American Association of Railroads (AAR) – representing the various railroad companies operating in the Chicago area-, Metra (the regional transit authority), the Illinois Department of Transportation (IDOT), and the Chicago Department of Transportation (CDOT). This multimodal endeavor seeks to vastly improve freight transportation in the Chicago region [31].

The highlight of the CREATE program is the Systematic, Project Expediting, Environmental, Decision-making (SPEED) strategy shown in Figure 4.8 [31]. The SPEED strategy supports systematic decision-making, provides an expeditious method of moving low risk component projects forward, and assesses potential impacts in a proportional, graduated way [31]. SPEED was developed by the Illinois Division of the FHWA, IDOT, and CDOT because traditional NEPA compliance methods, Tiered or Programmatic Environmental Impact Statements (EIS), were deemed unwieldy and inefficient for an undertaking of this nature. A Tiered EIS would be considered overkill for smaller projects and would unduly delay their start. On the other hand, a programmatic EIS would be vulnerable to legal challenges related to segmentation. If a case is brought forward, whatever speed and efficiency initially anticipated would

deteriorate and projects could be severely delayed, costing large sums of money and quite possibly leading to their failure.

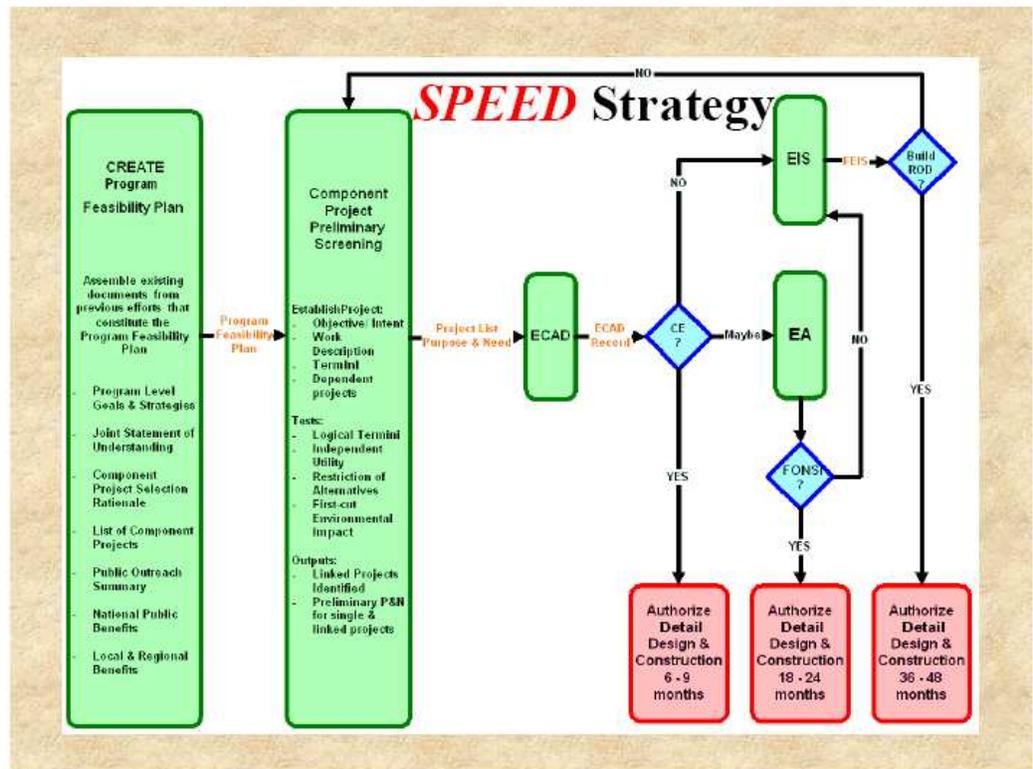


Figure 4.8 The SPEED strategy used in the Chicago metropolitan area.

With this strategy, implementation is not simply a step in the freight planning process, but an ongoing process itself starting with the generation of alternatives. It addresses all the obstacles outlined in the conceptual framework. Institutional barriers are overcome by requiring the support and cooperation of all stakeholders. An agency is not likely to neglect the policy issues that may hinder projects if they helped devise the freight plan from which it was created. Elected officials are less likely to stand in the way if proper public support has been solicited and the freight plan has the support of both the transportation and business communities. Lastly, because the CREATE program is a public/ private partnership, it creates the possibility of diverse funding for projects by making available private sector money.

4.5.2 Seattle, WA

The Puget Sound Regional Council (PSCR) addresses issues of freight in their region through the Freight Action Strategy (FAST) for the Everett-Seattle-Tacoma Corridor. FAST is a public-private partnership consisting of 26 local cities, counties, ports, federal, state, and regional transportation agencies, and railroads and trucking interests [32]. It was established to move needed goods and support port operations on the highways and rail lines that sustain the maritime international trade corridor through the Puget Sound region. In this program the region's ports, Tacoma, Seattle, and Everett, act as the anchors and highway and rail facilitates the movement of goods into and out of the region.

The FAST program addresses in particular funding and political obstacles to the implementation of freight projects. Because FAST is a public/ private partnership, new funding sources become available for projects that might not have otherwise been built due to limited public resources. Within this program, stakeholders also have the ability to shift funds from project to project if one becomes hindered by delays.

FAST consists of a broad range of participants all committed to improving freight in the region. Because of this spirit of cooperation between public and private sectors, political inertia to moving projects and programs forward is alleviated. The more stakeholders that buy in to a plan, spreads the risk and has a greater chance at actual implementation. In order to strengthen this quality of the public/ private partnership in freight, PSCR makes considerable effort at identifying beneficiaries of the FAST Corridor; not just simply the logistics, railroad, and trucking industries, but small businesses and citizens, as well.

4.6 Systems Operations

System operation is the final step in the conceptual framework and it entails a continual monitoring of system performance in order to reevaluate goals and performance

measures. It can be thought of as a feedback loop to planners and engineers that would alert them as to the health of the system. The purpose of this step is to stress the importance of planning on a continual basis. Transportation in general and freight in particular, can be dynamic in nature. As an open system freight is constantly influenced by its environment, and policies and procedures that are effective today, may not be tomorrow. Also, actions on behalf of stakeholders may be in good faith, but do not always achieve the desired positive effects. For these reasons, it is important to constantly monitor the health of the freight transportation system and periodically reevaluate the situation.

Notice how the conceptual framework directly ties system operations into goals and objectives, and performance measures. These may often need to be refined, or redefined, according to a possibly changing environment or situation. The continual monitoring of a freight system can be accomplished best in terms of the performance measures used to gauge its effectiveness at inception. The same factors that were important before implementation are still important after implementation, especially if they have the ability to regress, unless data says otherwise. This is why the initial setting of goals and performance measures is so important, because they help ensure that an efficient system can be maintained for posterity.

The monitoring of system operations can be achieved through an ongoing freight task force. Emphasis is placed on ongoing because a task force formed simply to initiate a few projects and subsequently dissolved will not achieve the desired goal of monitoring the system and planning on a continual basis. A permanent freight task force could solidify the relationships formed between the public and private sector for initial planning. A preserved spirit of cooperation makes unnecessary the possible rebuilding of this relationship for future endeavors. Also, a permanent freight task force will over time amass institutional knowledge that would be lost otherwise. Of course permanent organizations are still subject to this with the changing of personnel, but it can be

accounted for with the proper training and development of younger professionals within the organization who are expected to take over these positions some day. Lastly, a permanent freight task force could help make available the performance measure data necessary for assessing the system.

4.6.1 New York, NY

Of all the MPOs observed, only a few had the organization necessary to conduct the monitoring of system operations as defined here. A number of them had either no staff dedicated to freight, or a dedicated staff but what appeared to be no formal and permanent task force to address freight issues. New York had both these things along with the performance measures critical to system operations. The NYMTC Freight Transportation Working Group consists of dedicated freight staff, freight providers and receivers, other transportation agencies, businesses, civic groups, and representatives of elected officials [33]. It was established to expand and enhance the freight planning process and meets the needs of the general public and freight stakeholders. It seeks to accomplish this by:

1. Informing the general public and local decision makers about the importance of freight transportation;
2. Establishing and overseeing an coordinated, cooperative, and continuing freight planning process;
3. Initiating a coordinated data collection effort which meets the needs of the Council and the needs of the region's shippers, producers, and general public.

As one can see from above, the NYMTC Freight Transportation Working Group has all the characteristics necessary for an organization tasked with monitoring system operations: permanence, inclusiveness, and data-oriented. The dedicated freight planning staff speaks to freight's permanence in the transportation planning process and implies

that it will go beyond ‘special’ projects. The Freight Working Group consists of more than just the aforementioned staff and includes stakeholders, decision-makers, and members of the community. This quality covers the inclusiveness that is necessary not only in the monitoring of operations step, but freight planning in general. Lastly, the language in number 2 above, ‘continuing freight planning process’, implies that they understand the dynamic nature of freight and that it must be planned for not just for today, but for tomorrow as well.

4.6.2 Atlanta, GA

Atlanta has responded similarly to New York in its formation of a Freight Advisory Task Force for monitoring systems operations. The Freight Advisory Task Force is comprised of freight providers, chambers of commerce, community groups, and dedicated staff and provides a forum for discussion of freight issues in the Atlanta region. Key tasks of the Freight Advisory Task Force include the identification of freight needs in the region; and ensuring that freight is addressed in the region’s planning, investment, and operation of the transportation system on a continual basis.

The presence of this task force helps ensure that freight will be planned on a continual basis. For that to happen, there has to be some monitoring of systems operations, which can be best accomplished through the performance measures set forth earlier in the planning process. The ARC developed performance measures in the areas of system productivity, reliability, connectivity, mode split, safety, and environmental impacts. In addition to setting these performance measures, the ARC also identified where and how easily this data can be attained, as well as developing a performance measure framework.

The performance measure framework developed by the ARC achieves several different functions within a regional planning process [22]. This framework includes a regional indicator, goals, objectives, key performance measures, and project evaluation

criteria/ measures of effectiveness. A regional indicator is a characteristic of a region's transportation system that provides a glance of what is happening over time. This can be some measure of economic contribution of freight to the region's economy, such as freight-related jobs. Project evaluation criteria help decision-makers to decide which alternatives are best. All other aspects of the framework are explained earlier in the thesis. A framework such as this could be a key tool in monitoring system operations.

Figure 4.9 [22] shows the performance measure framework.

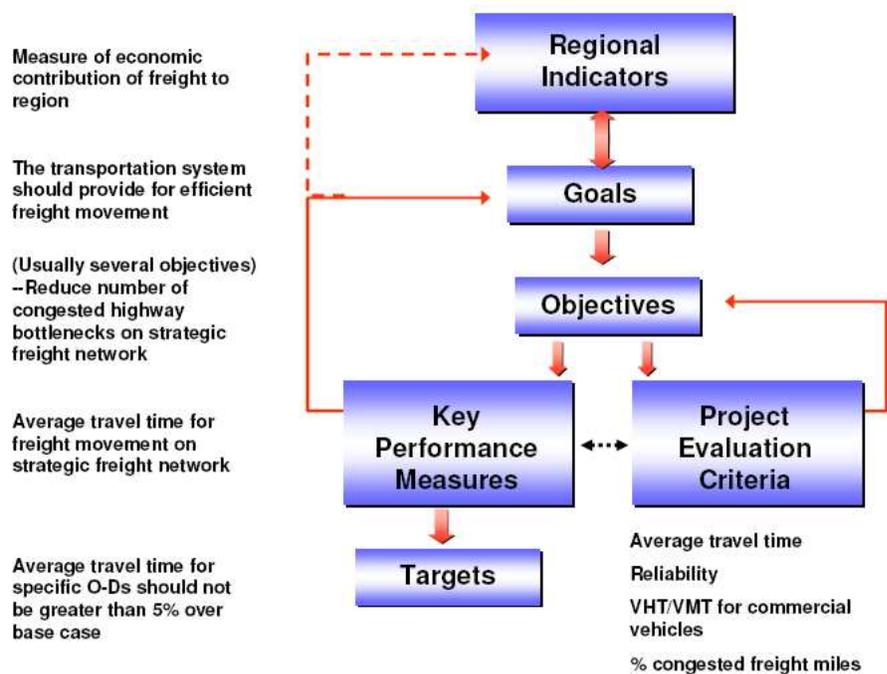


Figure 4.9 The performance measure framework developed by the ARC.

The combination of the Freight Advisory Task Force and the establishing of a performance measure framework make possible the monitoring of system operations that needs to take place to ensure continual planning and efficient operations.

CHAPTER 5

CONCLUSIONS & RECOMMENDATIONS

Due to trends in transportation legislation and an increasing awareness of the importance of goods movement, freight movement is receiving a greater amount of attention in transportation planning. Metropolitan areas are the engines of the economy and as such, account for much of the production and consumption of goods moved. It is fitting that the MPO be the subject of discussion on how freight issues can be incorporated into the transportation planning process. Although MPOs are starting to address freight movement, the extent to which they do so varies by metropolitan area. Also varying is where they are in the process. Some issues have not been addressed simply because MPOs are not yet at that point in their planning efforts. The following paragraphs will discuss where the MPO planning process appears to be lacking with respect to freight considerations.

Performance measures are an important feedback loop into the planning process in that they gauge how well the strategies and actions that were implemented are actually behaving. Without performance measures, it is not possible for the cyclic nature of the planning process to take place, which is a great strength of any planning effort. Many of the MPOs examined as part of this study do not have formal performance measures in place. For some, this is because they are not quite at this point in their planning efforts. Still others seem to miss this critical step and plan for freight movement based either on a priori knowledge of freight movement issues in the region (this may be especially true for metropolitan areas that have had long-standing freight planning efforts in the region), or an assumption that freight issues will be identified as part of the analysis process.

Another component of a freight-oriented planning process that seems to be lacking is the actual implementation of strategies. After planning has occurred, MPOs

must figure out exactly how the recommended projects will be implemented. There are many obstacles that can prevent this from happening; primary among them are funding and environmental concerns. Chicago and Seattle notably tied their freight planning efforts to the NEPA process (in Seattle's case because of state law and in Chicago's case because of the desire for federal funds). Perhaps one of the greatest obstacles for freight-oriented projects is the limitations set on the use of public funds. In many cases, federal and state funds cannot be used to benefit a specific company or corporation. So, although there are some instances in the United States where states have established state grant programs for supporting freight facilities (for example, in Florida and Virginia), such flexibility does not exist in many other states. Public/ private partnerships have the potential to make available more resources having more flexibility in the funding process. However, it was not apparent in this research that many MPOs are prepared or able to participate in negotiating public/ private partnerships.

The MPOs observed in this thesis had both similarities and differences in their approach to freight planning. This appeared to be affected by many different factors such as local and state laws, participation in public/ private partnerships, potential funding sources, and the maturity of their freight planning efforts. Table 5.2 shows where MPOs agreed and disagreed about the appropriate course of action for their respective freight plans.

Table 5.1 Comparison of Freight Movement Planning Across Metropolitan Areas

	Vision	Goals/ Objectives & Performance Measures	Analysis	Evaluation	Implementation of Strategies	Systems Operations
Atlanta	No clear vision statement.	Atlanta clearly defined goals/ objectives & performance measures for freight movement planning in the metropolitan area.	Atlanta provided a comprehensive view of freight movement including commodity flows, modal data, economic data, and needs and deficiencies.	Atlanta evaluated projects via a vetting procedure with members of the Freight Task Force and transportation professionals. The procedure assessed how well each projects met specific criteria based off of identified needs.	Implementation follows a traditional strategy of prioritizing projects, including them in the TIP, and seeking federal, state, and local funds.	Atlanta monitors system operations through an ongoing freight movement task force who identified system performance indicators, and developed a framework that assesses how well the freight system is performing.
New York	No clear vision statement.	New York clearly defined goals/ objectives and performance measures for freight movement planning in the metropolitan area.	New York provided a comprehensive view of freight movement including commodity flows, modal data, economic data, and needs and deficiencies.	New York developed a formal evaluation procedure that grouped projects into packages- infrastructure, policy, and operational- and evaluated them based off of specific criteria.	Implementation follows a traditional strategy of prioritizing projects, including them in the TIP, and seeking federal, state, and local funds.	New York monitors system operations through an ongoing freight movement task force consisting of transportation professionals, industry, and community leaders.
Tampa	No clear vision statement.	Tampa clearly defined goals/ objectives for this initial freight study, which was intended to provide a baseline analysis, not to plan comprehensively for freight.	Tampa provided a comprehensive view of freight movement including commodity flows, modal data, economic data, and national and state policy.	Not yet at this stage.	Not yet at this stage	Not yet at this stage
Los Angeles	No clear vision statement.	Los Angeles defined a goals statement that reflects a philosophical approach to freight planning.	Analysis in the Los Angeles region takes place through a number of small studies as opposed to a comprehensive study. This may be due to its long history of freight planning.	Los Angeles evaluated projects using a set of principles based off environmental and community impacts and benefits.	Implementation follows a hierarchy of actions: preserving and improving operational performance, environmental mitigations/ enhancements, and physical enhancements.	Los Angeles monitors system operations through an ongoing freight movement task force.
Chicago	No clear vision statement.	Chicago clearly defined specific goals for freight movement planning in the region.	Analysis is based off of a number of smaller previous freight movement studies conducted in the Chicago region.	Projects were evaluated based off how well they attributed to the achievement of listed goals.	Chicago implemented projects through a public/ private partnership, traditional measures (federal, state, and local funds), as well as connecting its strategy to the environmental compliance process.	Chicago monitors system operations through an ongoing freight movement task force.
Seattle	No clear vision statement.	Seattle clearly defined specific goals for freight movement planning in the region.	Analysis is based off a number of smaller previous studies.	Projects were evaluated based off how well they met the stated goals of the plan, combined modes, and added port access.	Seattle implemented projects through a public/ private partnership, traditional measures, as well as tying its strategy to the environmental compliance process.	Seattle monitors system operations through an ongoing freight movement task force.

Although it may not be within the scope of MPO freight planning efforts, it is important to mention the ability of the freight and the logistics industry to support local economic development. Many freight planning studies have documented the logistics industry's contribution to the regional economy, especially in terms of jobs. [34] However, it is not often mentioned that many of these jobs are seen by planning, policy, and community development professionals as an opportunity to replenish many of the high-paying blue-collar jobs lost during deindustrialization [35]. These jobs helped many Americans achieve a middle-class lifestyle. Establishing the connection between freight and community development helps to build a strong base of support for freight initiatives and would only serve to make MPOs more successful in goods movement efforts.

By far, the most alarming issue with respect to freight planning is the paucity of activity that seems to be present in many MPOs. There are many MPOs where either only a nominal amount of freight planning is taking place or where efforts are in their infancy. This is significant because goods movement issues will only worsen with time. Inadequate infrastructure that does not support the efficient movement of goods will potentially impact the costs of goods for American consumers and erode a competitive advantage in the global economy. Addressing freight movement more formally in the transportation planning process is important not only for dealing with today's bottlenecks, but for also preparing the transportation system for tomorrow's freight demands.

In addition to the shortcomings described above, there are several obstacles to effective freight planning in MPOs. Among these is a lack of data, the level of sophistication found in freight modeling as applied in practice, the participation of freight stakeholders in the planning process, and the lack of freight-specific dollars for

transportation investment. Limited availability of adequate data is a significant hurdle for any planning process, not just freight planning. This limitation is evident during public policy efforts aimed at improving some aspect of freight planning and operations. Information and data needed from a large number of private companies runs into the issue of proprietary data. Companies not surprisingly do not want to put data on market conditions and service characteristics into the public domain. One response to this is to massage the data to remove any information that might be disadvantageous to a particular company. However, one of the consequences of this strategy is that data can be organized in numerous ways with different naming conventions further confounding data sets [36]. Because of such issues, some researchers have called for a national freight data framework to collect and disseminate such information [37].

Limited data also contributes to the issue of the level of sophistication found in freight analysis and modeling. There are many different types of freight models and analysis techniques whose use depends upon the data available, information needed, and the geographic context. Primary among these are time-series forecasts and a number of aggregate and disaggregate flow models (trip and commodity-based, traditional four-step approach, utility-maximizing logit models, discrete choice, etc.). Each of these approaches has limitations that affect the accuracy of planning efforts. For instance, a time-series analysis of a historic trend is effective when the geographic area is implicit, such as a seaport [38]. But this does not reveal information on freight flows. Aggregate traffic zone based flow models work well for planning studies since many of the datasets they use can be either broken down or aggregated to a level of geographic detail appropriate for regional studies. However, a weakness of aggregate models is that they are limited in the number of potentially important causal factors that they can recognize [38]. Disaggregate models make up for this weakness with the ability to capture such causal factors through the data collected from shipper and carrier surveys. Surveys, however, require the participation of knowledgeable representatives from the freight

logistics industry, as well as high levels of response to fiscally constrained, limited size data samples, both of which may be difficult to obtain [38].

An issue that appears to be common to many MPO's freight planning efforts is the difficulty in engaging freight stakeholders in the planning process. Often this is due to public agencies and private organizations operating on different timetables and different priorities. The development of permanent freight committees with private sector participation (such as found in Philadelphia and Atlanta) could help alleviate this. Also, private entities tend to plan for and implement projects on much shorter timeframes than public agencies, which could cause frustration in both parties. In order to keep the private sector sufficiently engaged MPOs should make efforts to provide short-range projects that will maintain their interest [16].

As noted earlier, perhaps the greatest challenge (and thus need) is the limited amount of funding that is available to invest in freight-specific facilities. Although investment in a region's road network also benefits freight carriers, much of the discussion and debate surrounding these decisions usually focus on community issues or on other public benefits from investments. In many instances, freight is starting to receive the attention it deserves, but it still must compete with passenger travel for critical investment funds. Since freight does not represent as large a constituency, as passenger travel, decision-makers are less prone to devote attention to its needs and possibilities. It would seem that continued federal interest, guidance and perhaps planning regulation will be necessary to continue the evolution toward a more inclusive role for freight issues in the planning process. In addition, a freight-specific funding program would go a long way at garnering the attention of state and local officials. This has been happening with recently passed transportation legislation, but more is required. Figure 4.10 provides a graphic of how shortcomings and obstacles can be addressed within the conceptual framework for the transportation planning process.

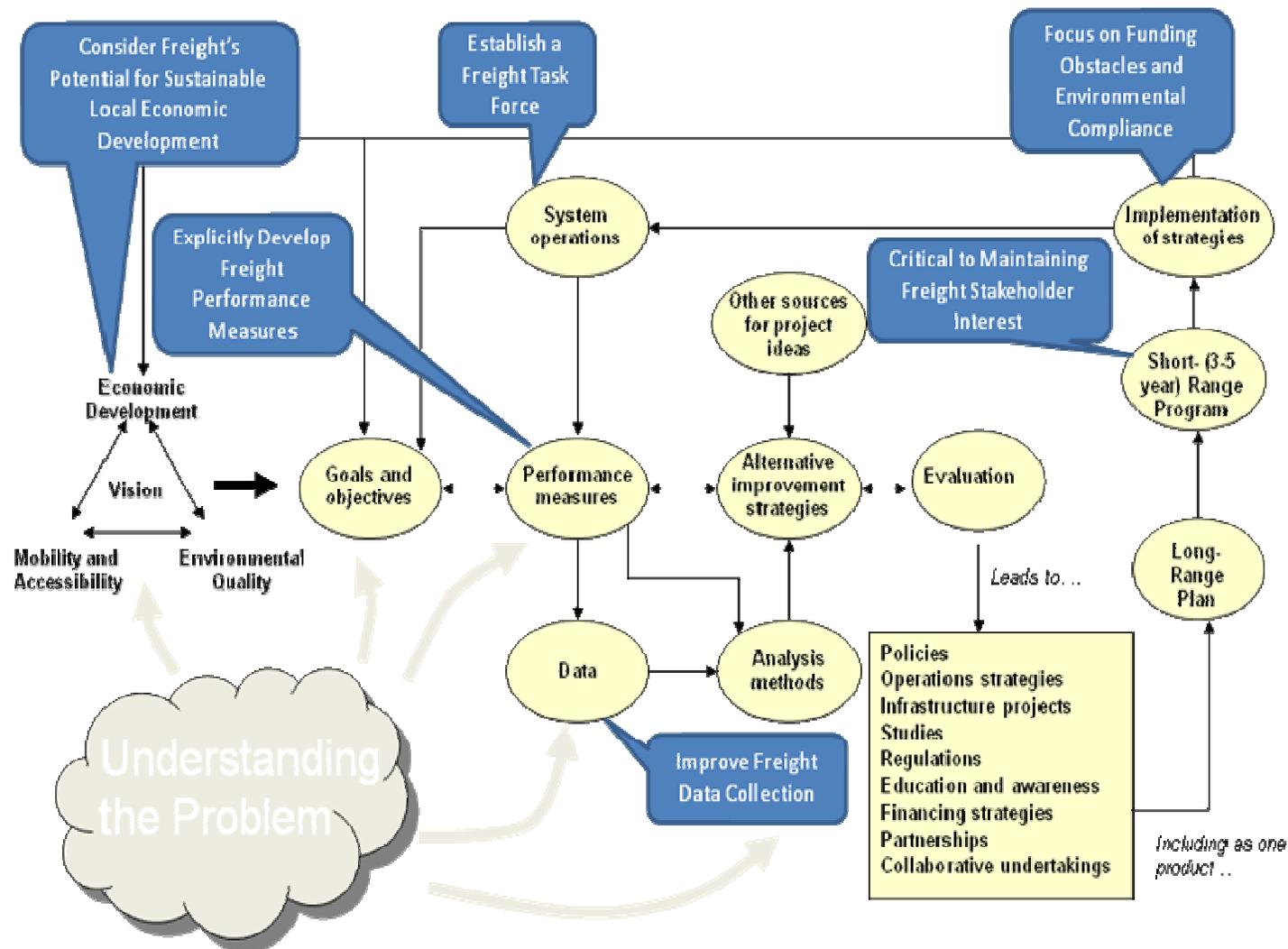


Figure 4.10 The incorporation of recommendations into the conceptual framework for freight planning.

Recommendations for future research primarily focus on freight data collection and system monitoring and operations. A need exists for databases and collection techniques focused at the regional level. The limited availability and quality of data aggregated at an appropriate level for use is a continuing challenge in freight-related planning. Regional databases could track goods movement from metropolitan area to metropolitan area using tools such as GPS tracking. Also, data collection and naming conventions should be uniform across the country, improving the quality and usefulness of information.

It was suggested earlier in this thesis that the establishment of a freight task force could provide for sufficient system monitoring and operations. Although this is true, improvements in technology and the need for more information warrant other options as well. Freight transportation researchers and practitioners should work toward the establishment of regional freight intelligent transportation centers. These centers could provide real-time information on goods movement in the region much in the same manner that ITS does for passenger travel. This would aid freight carriers in the transportation decisions they make, as well as help freight planners obtain the information they need for planning purposes.

The case studies approach taken here illustrates how the conceptual framework shown in Figure 4.10 can be applied to freight movement planning. Every freight-oriented activity of an MPO's planning efforts could be attributed to an aspect of the conceptual framework. When viewed as a sum of its parts, the case study analysis provides a comprehensive view of freight planning from beginning to end. The framework is robust in that it can be applied to MPOs regardless of size and geographic location, as well as many different types of studies, such as regional, corridor or site-specific. Also, it is comprehensive and provides for freight planning on a continual basis, ensuring that progress is not slowed or halted.

APPENDIX A

CASE STUDIES

A.1 Atlanta, GA

MPO Overview

The Atlanta Regional Commission (ARC) is the MPO for the Atlanta metropolitan area. Formed in 1947, it was originally known as the Metropolitan Planning Commission and served only Fulton and DeKalb Counties and the City of Atlanta. As metro Atlanta has grown, so has membership to now include 8 additional counties – Cherokee, Clayton, Cobb, Douglass, Fayette, Henry, and Rockdale.

Metro Atlanta has been characterized as a region of high growth and increasing economic significance. It is considered a major inland port and transportation hub due its strategic position in the Southeast, as well as the major volumes experienced by Hartsfield-Jackson Atlanta International Airport. Because of these factors, Atlanta has experienced large freight volumes moving through, into, and within the region. ARC has responded to this challenge by conducting a special study of freight in the region and incorporating it into its long-range plan.

Freight Study

ARC undertook their freight study using the three-tier system listed below.

- Tier 1
 - Data Collection, Inventory, and Assessment
 - Needs Assessment and Analysis
 - Goals and Objectives
- Tier 2
 - Economic Development Analysis

- Land Use Assessment
- Environment/ Community Impact
- Tier 3
 - Interim Recommendations
 - Final Recommendations

Tier 1

Data Collection, Inventory, and Assessment

The Atlanta Regional Commission conducted this portion of the study using two major components:

- A set of local and commercial data resources, and
- A four part collection of primary information conducted in the field.
 - a. Roadside surveys
 - b. Stakeholder surveys (carriers, shippers, receivers, logistics providers)
 - c. Stakeholder interviews
 - d. Land use data

Needs Assessment and Analysis

The purpose of this subtask was to create a baseline picture of freight movement in the region and to guide succeeding tasks. The data was to be aimed towards applications in planning, policy analysis, and strategic development. Part of this task was to establish current and future freight flows, develop performance measures, compile modal freight profiles, and identify freight bottlenecks. Freight modal profiles included taking inventory of freight facilities and identifying subsystems that are critical to that region's needs.

Goals and Objectives

The purpose of this task was to develop goals and objectives based on the previous tasks. In turn, they were used to develop strategies, recommendations, and

freight projects for regional planning. The overall goal for the transportation planning process was:

“To enhance regional economic competitiveness by providing for efficient, reliable, and safe freight transportation while maintaining the quality of life in the region’s communities.”

Tier 2

Economic Development Analysis

Freight plays an important role in determining a region’s economic competitiveness. This task quantified the important role of freight and logistics to the regional economy and demonstrates the potential economic benefits associated with facilitating efficient freight mobility.

The economic contribution of freight to a region can also be an indicator when something in the system has gone wrong. A continuing decline could be due to a problem in the transportation system.

Land Use Assessment

The purpose of this task was to provide information and tools for coordinating land use and freight plans for the region and to support an overall regional freight strategy. Such guidance was to help reduce the sprawl of freight activities by establishing distribution facilities within existing transportation corridors and zones. This was to help with the balance between moving people and freight across the region. A detailed analysis and assessment included:

- The impacts of local land use plans, policies, and decision-making on freight goods movement in the region
- The impacts of freight movement on existing land uses
- The role of local and regional planning processes with regard to freight planning

Environment/ Community Impact

The location of freight facilities and the infrastructure needed to ensure efficient operations are usually controlled by the cost of available land. Historically, land has been cheapest in minority and low-income neighborhoods. With that in mind, it is important that environmental justice and equity planning be a part of the process. Therefore, efforts must be made to account for these communities proximity to current and future freight districts and corridors and mitigate or eliminate any negative impacts they may incur.

Tier 3

Interim Recommendations

These recommendations were meant to recognize quick-start projects that could be helpful, as well as allow all the stakeholders a voice in the final decisions made.

Final Recommendations

This last portion of the process narrowed down likely alternatives that were to be included in the final document. At this point, the extent to which freight movement would add additional pressures to the transportation system would be defined, as well as the economic, environmental, community costs and benefits of this. Initially, all alternatives are to be considered regardless of their merit. A clear and efficient process of screening alternatives was critical to ensure that the ones that offer the greatest merit and/or opportunity were identified and supported.

Performance Measures

Once different alternatives are evaluated, selected, and implemented there must be a way of determining how well this system operates. This can be accomplished by instituting performance measures. The ARC freight plan proposed performance measures in a number of key areas that included: system productivity, reliability, connectivity, mode split, safety, and environmental impacts. The key performance measures included:

System Productivity

- Congested lane-miles on strategic freight road network

- Congested lane-miles on designated truck routes
- Average travel speed on selected origin-destination trip pairs
- Percent of top 25 congestion bottlenecks that are being improved

These performance measures can be determined using existing models. They are important to the land use assessment portion of the freight study. Congestion, travel speed, and ill-performing intersections can be results of poorly zoned areas. These areas can be rezoned to better facilitate freight traffic, or the traffic redirected to areas where rezoning would be less of a community impact. There are many options that can be explored in land use to increase system productivity.

Reliability

Until models that measure reliability are ready for use, other measures can be used, including:

- Crash clearance times
- Number of crashes on strategic freight subsystem
- Number of lane closures on strategic freight subsystems
- Number of work zones on primary freight subsystem

The increasing number of crashes along a freight corridor is an important performance measure with respect to community impacts, as well as how well the overall system is performing. Also, decreasing the amount of crashes should be a safety goal of any freight plan.

Connectivity

- Percent of bridges on freight strategic road network with load limitations
- Percent of freight-critical locations (e.g., intermodal yards, distribution centers, air cargo facilities, etc.) that have LOS C or better

Current models can produce much of this information. Coordination with GDOT is important to establish bridge rehabilitation priorities and to secure funding. This

performance measure was an important part of the Needs Assessment portion of the study and was a simple way of improving overall performance.

Mode Split

- Percent freight movement through region by mode

Current modeling tools can be used to predict mode split. This performance measure is important in determining infrastructure investments as well as proper land use for various areas.

Safety

- Percent of top truck-car crash locations being improved
- Percent of at-grade rail crossings being eliminated/improved

The Georgia Department of Transportation (GDOT) is able to identify these areas and whether projects are already under way. It is assumed that addressing either of the above two issues will increase safety, an important goal of the freight study.

Environmental Impacts

- Freight-related air emissions
- Freight-related fuel consumption

VMT can be used to estimate these performance measures and would require the cooperation of freight stakeholders.

A.2 Baltimore, MD

MPO Overview

The Baltimore Metropolitan Council (BMC) is the MPO for the Baltimore, MD metropolitan area. Local governments represented by the BMC include the City of Baltimore, Anne Arundel, Baltimore, Carroll, Harford, and Howard counties.

Metropolitan Baltimore has over 2.5 million residents and sits in the heart of the Mid-Atlantic region. The BMC was chartered in 1992 and is the successor of the Regional Planning Council and the Baltimore Council of Governments.

Metropolitan Baltimore has a long history of planning for freight due to the high number of Class I railroads in the region, heavy use of the interstate system by trucks, and the existence of the Port of Baltimore. A number of studies have been conducted by BMC including a comprehensive freight planning, truck parking, and truck modeling studies.

Freight Study

BMC formed a Freight Task Force for freight planning in the region. This task force consists of industry professionals, professional from BMC, Maryland Department of Transportation, Federal Highway Administration, Maryland Department of Business & Economic Development, Greater Baltimore Alliance, Morgan State University, and Johns Hopkins University. The Freight Mobility Study, conducted in 1997, is organized by mode, but has a focus on intermodal facilities [40]. It concludes with recommendations and proposals for future actions.

Purpose

The purpose of the BMC Freight Mobility Study was to provide an overview of the freight movement system within the Baltimore region, with an emphasis on

intermodal facilities, identify key long-range issues, and proposes investments and actions.

Roadway Freight System

Baltimore sits at the mid-point of Interstate-95 that runs the length of the eastern seaboard. The area has approximately 11,243 miles of public roads. The majority of freight moved within and through the Baltimore region uses this road system.

The BMC Freight Task Force used a survey to identify for-hire motor carriers major travel routes, impediments in freight flows, time-of-day travel, freight origins and destinations, and intermodal freight activities. Analysis of this information yielded the following primary concerns [40]:

- Congestion
- Truck restrictions – Restrictions due to weight limits, height clearances, and certain goods impede carriers from reaching intermodal facilities and distribution centers.
- Intelligent transportation systems – The implementation of ITS and electronic tolls and clearances would greatly improve efficiency.
- Truck rest areas – A lack of truck rest areas forces truck drivers to park illegally causing safety and congestion issues.

Rail Freight System

Railroads are critical to the freight system in metropolitan Baltimore. The region is served by Class I railroads, one local railroad, and two switching and terminal rail companies. Coal is the primary commodity handled by the rail industry.

From analyses and discussion with rail industry professionals, the following rail issues and concerns were raised [40]:

- Double stacking – Clearances for tunnels do not allow for double stacking, which decreases capacity.

- Grade crossings – The elimination of at-grade crossings can reduce incidents and truck traffic congestion.

Air Freight System

The major air freight facility in the Baltimore region is the Baltimore-Washington International Airport (BWI) located in Anne Arundel County. Owned and operated by the Maryland Aviation Administration (MAA), BWI handles both international and domestic goods specializing in high-value, time-sensitive freight. Two local airports in the area, Carroll County Airport and Martin State Airport have very limited air cargo service.

Issues and concerns identified through analyses and discussions with BMC Freight Task Force members included [40]:

- Air cargo capacity – BWI is operating near capacity and more capacity is needed to handle future growth.
- Truck services – Air cargo trucking services linking airports with regional shippers is a major factor in determining market range and penetration for airports.

Maritime Freight System

The Port of Baltimore is the region's major maritime facility located on the Patapsco River near the northern end of the Chesapeake Bay and is accessible from the Atlantic Ocean. The port is located 150 miles inland and primarily serves mid-Atlantic and Midwestern markets.

Issues and concerns identified include [40]:

- Harbor dredging – The shallowness of the Chesapeake & Delaware Canal and connecting harbor channels prevents the Port of Baltimore from servicing carriers specializing in containerized cargo.
- Rail access – The two major rail lines operating in the region, CSXT and Conrail, allow limited reciprocal switching-allowing each other's carloads to be placed on

their tracks for access to terminals they do not serve. Also, the inability to provide double stacking hinders rail activity.

Intermodal Facilities

The Freight Task Force identified ‘regionally significant’ intermodal facilities as those which use two or more transportation modes and which function as transfer points for seamless and continuous door-to-door freight movement. The efficiency of the freight system does not depend solely upon the efficiency of each individual mode, but also upon the efficiency with which intermodal facilities connect one mode to another.

BMC uses the FHWA intermodal facility criteria as a guideline for determining which facilities are regionally significant. These are used as a baseline for comparison and potential project prioritization. Criteria for “regionally significant” designation [40]:

- Freight at commercial aviation airports – 200 trucks per day, or 100,000 tons per year
- Freight at port terminals – 50,000 TEUs per year or other units that convert to 200 trucks per day; bulk commodity terminals that handle 500,000 tons per year or 200 trucks per day
- Freight at truck or rail terminals – 50,000 TEUs per year or 200 trucks per day
- Other factors – Intermodal facilities that handle more than 20% of the freight volumes by mode within the State or region, facilities targeted for major investments to address existing deficiencies or anticipated expansions of traffic
- Expert advice, as reasonable, to include facilities that do not meet the quantitative guidelines.

Issues and concerns identified in analyses and discussion with Freight Task Force members included [40]:

- Double stacking
- Harbor dredging

- Truck impediments

Findings & Recommendations

The Freight Mobility Study established goals and strategies on which to base continuous freight mobility system planning, implementation, and evaluation activities. These are summarized in Figure A.1 [40] below.

Goal	Policy	Strategies
Accessibility	Maintain and enhance access to freight movement facilities and market areas through the B RTP	<ul style="list-style-type: none"> • Establish freight movement performance measures and continuously assess the state of the regional freight movement system • Encourage investments and actions that enhance the efficiency of freight movement both within the region and between regions • Apply technological strategies designed to facilitate the efficient movement of freight
Economic Development	Support B RTP projects that can expand the regional market for labor and goods	<ul style="list-style-type: none"> • Improve access to business and employment opportunities in the region through cooperative public-private efforts • Encourage projects that support community revitalization efforts and help retain and expand businesses in these locations
Economic Development	Strengthen the contribution of the freight movement system to the regional economy in the B RTP	<ul style="list-style-type: none"> • Plan for efficient access to port, air, rail, and intermodal facilities • Coordinate planning among oversight authorities responsible for freight movement in the region • Maintain and support a Freight Movement Task Force to help identify options for addressing impediments to efficient freight movement

Figure A.1 Summary table of goals, policies, and strategies found on pg. 47 in the 1997 Freight Mobility Study conducted by the Baltimore Metropolitan Council.

Analysis from the Freight Mobility Study allowed the BMC to recommend and prioritize capital projects and programmatic actions.

Future actions on behalf of the BMC Freight Mobility Task Force mainly involve staying active in freight planning for the Baltimore region and keeping freight a primary issue in transportation planning. In particular,

- The Task Force will remain informed on the status of capital projects identified for consideration and work with other agencies and private businesses to help implement these projects.
- The Task Force will direct attention to the programmatic actions and studies that can bring additional freight-related information to the forefront and lead to other improvements and recommendations.
- The Task Force will maintain strong relationships with other agencies and help bring freight movement community together to discuss and share information.

A.3 Chicago, IL

MPO Overview

The Chicago Metropolitan Agency for Planning is the MPO for the Chicago area. CMAP was formed as a combination of the Chicago Area Transportation Study, the original MPO formed in 1955, and the Northeastern Illinois Planning Commission in order to better integrate land-use and transportation in overall planning. The CMAP region has a population just over 8 million. In addition to being an economic and cultural center of the United States, the Chicago region is also a major transportation hub with many of the nation's railroads connecting there.

Freight planning has been well integrated into the transportation planning process of CMAP. Freight has always been an issue of concern in the Chicago region due to its history with railroads. Chicago is also a good example of involving private industry into the planning process as evidenced by the freight program CREATE.

Freight Study

The Chicago Regional Environmental and Transportation Efficiency Project (CREATE) is a unique freight study that is a public/private partnership among all stakeholders including the Illinois Department of Transportation, major rail freight carriers, and the Commuter Rail Division of the Regional Transportation Authority to name a few[31]. Most municipalities conducting freight studies involve major freight carriers, but in Chicago they are not only involved, but accountable. CREATE's public/private partnerships financially invests private sector partners in proposed projects as well as makes them complicit in legal and environmental issues. Chicago's freight plan particularly focuses on rail and reducing interference between passengers and freight.

Another unique aspect of Chicago's freight study is the Systematic, Project Expediting, Environmental Decision-making (SPEED) Strategy. SPEED is a new

strategy to attain NEPA compliance by tying together the study, project implementation, and NEPA processes. SPEED supports systematic decision-making, expeditiously moves low-risk project components forward, and assesses potential environmental impacts in a proportional, graduated way. Figure A.2 [31] illustrates the SPEED process.

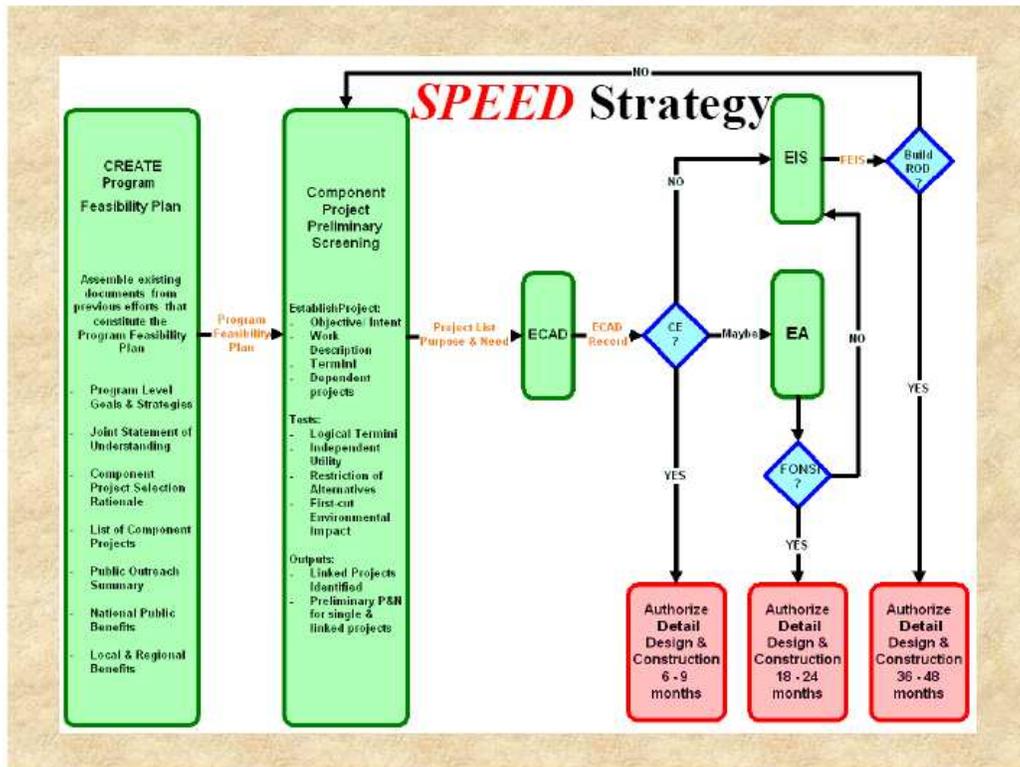


Figure A.2 Outline of the SPEED Strategy for achieving NEPA compliance.

Chicago divides its projects up into three categories, and they are as follows [31]:

1. Railroad components- Railroad improvements that exclude the grade separation of intersecting rail lines
2. Metra components- Rail-to-rail separations of passenger and freight rail lines
3. Public components- These include rail-to-highway separations and the Viaduct Improvement/ Grade Crossing Safety Program

Each stakeholder is responsible for projects that fall within their realm of control.

Listed in the CREATE study are detailed responsibilities related to projects for each

stakeholder. All parties agreed to a Joint Statement of Understanding with respect to their responsibilities.

Needs Assessment and Analysis

A number of early freight studies were done by various organizations. The Chicago Area Transportation Study (CATS), the previous MPO for the Chicago area, conducted the study entitled *Freight Movements and Urban Congestion in the Chicago Area* which sought to solicit participation from the freight industry professionals and to incorporate freight oriented measures into the comprehensive program [31]. It projected future growth and identified as primary concerns grade crossings, viaduct clearance limitations, and truck congestion on highways. These previous studies serve as the basis for what the Chicago area now addresses as freight concerns in the CREATE study, as well as their RTP.

Goals and Strategies

The purpose of this task was to develop goals and objectives based on the previous tasks. In turn, they were to be used to develop strategies, recommendations, and freight projects for regional planning. In addition to stating the goals of the CREATE plan, CMAP also identified strategies for achieving these goals. The goals and strategies were [31]:

Goal 1: Improve the efficiency and reliability of local and national passenger freight rail service in and through the Chicago region

Strategies:

- Provide rail system that meets future needs
- Reduce passenger rail to freight rail conflict points
- Provide rail traffic operations upgrades
- Increase passenger rail capacity
- Improve intermodal operations

Goal 2: Reduce motorist, passenger rail and freight rail delays to travel in and through the Chicago region

Strategies:

- Encourage passenger rail ridership
- Reduce rail to highway conflict points
- Reduce passenger rail to freight rail conflict points
- Provide rail traffic operations upgrades

Goal 3: Reduce highway and rail traffic congestion in the Chicago region

Strategies:

- Reduce rail to highway conflict points
- Reduce passenger rail to freight rail conflict points
- Provide rail traffic operations upgrades
- Encourage passenger rail ridership

Goal 4: Improve rail-grade highway safety in the Chicago Region

Strategies:

- Reduce rail to highway conflict points
- Encourage passenger rail ridership

Goal 5: Provide national, regional, and local economic benefits

Strategies:

- Contingent upon achievement of goals 1 through 4. Benefits include:
 - Time savings for all associated parties
 - Reduced investment in new highway construction
 - Reduced accidents and associated costs

- Commercial and residential development which leads to increased tax revenue
- Prevention of the possible future loss of jobs and the creation of new ones due to increased construction

Goal 6: Provide environmental (air quality) benefits for the Chicago region

Strategies:

- Achievement of goals 1 through 3. Benefits include:
 - Reduced train emissions due to reduction in idling times cause by delays
 - Reduced motor vehicle emissions due to reduction in idling times caused by delays

Goal 7: Provide national, regional, and local energy benefits

Strategies:

- Achievement of goals 1 through 3. Benefits include:
 - Reduced energy consumption from trains and motor vehicles due to a reduction in idling times caused by delays

These goals and strategies were then used to identify transportation improvement projects that could achieve the stated goals.

Economic Development

Economic development in the CREATE plan was examined from the national, state, and local levels. From a national perspective, Chicago is an important freight corridor and is a vital part of the U.S. economy. It provides many freight-related jobs and efficient shipping helps to lower the prices of consumer goods. The impact felt on the state level is much higher as the Chicago region is responsible for much of Illinois' economy. At the local level, the direct effect includes the goods and materials purchased in the region for construction, the indirect and secondary effect of labor and materials

needed to provide such activity, and the induced effects from workers spending money in the region. Also important is the amount of land no longer beneficial to the freight system that will be opened up for development, increasing housing, retail, and mixed-use opportunities, as well as additional tax revenue.

Environment/ Community Impact

The location of freight facilities and the infrastructure needed to ensure efficient operations are usually controlled by the cost of available land. Historically, land has been cheapest in minority and low-income neighborhoods. With that in mind, it is important that environmental justice and equity planning be a part of the process. Therefore, efforts must be made to account for these communities' proximity to current and future freight districts and corridors and mitigate or eliminate any negative impacts they may incur. CREATE addressed these issues in the NEPA process as a part of their SPEED strategy.

Project Implementation

The last step CREATE took was the securing of funding and project implementation. Alternatives have already been evaluated as part of the NEPA process.

A.4 Dallas-Ft. Worth, TX

MPO Overview

The Dallas-Fort Worth area is a major logistics center due to its position as a north-south/ east-west crossroads for the south central United States. It is considered an inland port with no navigable waters leading to it. The North Central Texas Council of Governments (NCTCOG) is the metropolitan planning organization for the Dallas-Fort Worth area. Counties included in the planning region are Wise, Denton, Collin Hunt, Palo Pinto, Parker, Tarrant, Dallas, Rockwall, Kaufman, Erath, Hood, Somervell, Johnson, Ellis, and Navano Counties. The Dallas-Ft. Worth metropolitan area has just over 6 million residents.

NCTCOG's Goods Movement program is composed of a variety of studies aimed at making freight movement more efficient in the area. These endeavors include truck lane restrictions [41], the Trans-Texas Corridor [42], diesel freight idle reduction program [42], rail reliever study [43], and the South Dallas Logistics Project [44].

Freight Study

The goals of NCTCOG's Goods Movement program included [45]:

- Promote NAFTA safety and mobility issues
- Promote safety at highway/ rail crossings
- Improve air quality by implementing the Diesel Freight Vehicle Idle Reduction program
- Establish new processes for intermodal freight community input
- Monitor goods movement traffic throughout the region
- Evaluate accessibility of intermodal freight centers
- Ensure safety of hazardous material truck routes
- Continue MPO involvement with freight and NAFTA groups

- Review intermodal factors in project selection for major rail studies and other major investment studies

Truck Lane Demonstration Project

As the number of large freight trucks on the road has increased, so has the amount of interaction with passenger vehicles, resulting in crashes and worsened safety conditions. This has led the State of Texas to implement lane restrictions that do not allow trucks within certain lanes [41]. Although many states have implemented such measures there have been no studies to gauge their effectiveness.

Participating members of NCTCOG have requested that the Texas Department of Transportation (TxDOT) bar left lane of I-30 from the eastern side of Dallas the western side of Forth Worth from use by trucks. NCTCOG led the study examining two different facilities in four phases. The two facilities were I-20 (from I-45 to Cedar Ridge Road in Dallas County) and I-30 (from Collins Street to Hulen Street in Tarrant County). The study design consisted of the four following phases [41]:

Phase 1: Base conditions

Phase 2: Increased enforcement

Phase 3: Truck lane restrictions and increased enforcement

Phase 4: Truck lane restrictions

Phase 1 represents baseline conditions of the operating system. Phase 2 involved law enforcement agencies of participating municipalities to increase traffic patrol levels and commercial truck inspection units. During Phase 3, TxDOT installed “No Trucks Left Lane” signs throughout the two corridors. Also during this phase citizens and stakeholders were informed of the changes via media outreach efforts. Phase 4 allowed the system to freely operate with the absence of heightened enforcement and media campaigns.

In order to gauge how well the new system performed, data on various characteristics of the program had to be collected. These included compliance, travel

speeds, access and egress, safety, public acceptance, enforcement, and air quality. This information was gathered from a variety of sources including police and sheriff crash records, on-site ITS monitoring devices, mobile video cameras, automated traffic count recording devices, in-cab freight truck video collection, and public surveys. NCTCOG hoped to answer the following questions [41]):

- Do truck drivers comply with the “No Trucks Left Lane” signage?
- Do truck lane restrictions have a positive effect on travel speeds?
- Do truck lane restrictions allow normal entering and exiting of freeways?
- Did the rate of crashes decrease?
- Is the general public accepting of the truck lane restrictions?
- Are truck lane restrictions effective without added enforcement?
- Do truck lane restrictions have a positive air quality impact?

Each question provides necessary guidance for decision-making and is analyzed in five parts: purpose, available data sources, key data for each study phase, comparison of phases, and conclusions. Lastly, the study provides conclusions and recommendations [41].

Compliance

- Purpose - This forms the basis for all other performance measures. If drivers do not comply with standard levels of enforcement, then it would be impossible to draw meaningful conclusions from the study. The purpose of this issue is to understand the type, magnitude, and direction of change in truck drivers’ use of the far left lane.
- Data Sources
 - These include ITS data collection, video data collection, and public surveys. Video data collection shows traffic conditions, whereas ITS allows for statistical insight, and public surveys are anecdotal.

- Key Data
 - Truck and automobile volume per lane.
- Comparison of Phases
 - Comparison allows the generation of compliance rates.
- Conclusions

Travel Speeds

- Purpose - Knowing whether restrictions improved travel speeds is an important operational issue. Also, improvement in travel speed justifies a broader implementation of this program.
- Data Sources
 - ITS data collection.
- Key Data
 - Average speed by lane during Phase 1 and Phase 4 of the study.
- Comparison of Phases
 - Comparison Phases 1 and 4 to note differences.
- Conclusions

Access and Egress

- Purpose - The purpose of this is to find out if operational improvements gained in the far left lane have adverse effects on center and right lane operations, particularly entering and exiting the freeway.
- Data Sources
 - Video cameras placed near ramp junctions.
- Key Data
 - Frequency of incidents of the type caused by the absence of trucks in the left lane (wall of trucks, queues on entrance and exit ramps, near collisions, cars and trucks in outside lane blocking entrance/ exit ramps).

Analysis was conducted to find if there was any correlation between the volume to capacity ratio on the ramps, percentage of trucks in the right freeway lane, and the occurrence of unusual driver behavior.

- Comparison of Phases
- Conclusions

Safety

- Purpose - If there is no safety benefit, then there is little reason to place an additional burden on freight carriers.
- Data Sources
 - Traffic data from the ITS system and accident data from law enforcement agencies.
- Key Data
 - Accidents per day in phases 1 and 4.
- Comparison of Phases
- Conclusions

Public Acceptance

- Purpose - It is difficult and possibly counterproductive to continue with a policy the public is not in favor of.
- Data Sources
 - Surveys mailed to residents, given out at public meetings, distributed to elected officials, placed at truck stops, and made available on NCTCOG's website.
- Key Data
 - Survey results.
- Comparison of Phases
 - N/A.

- Conclusions

Enforcement

- Purpose - The purpose of this task was to determine if truck lane restrictions were effective without added enforcement.
- Data Sources
 - Traffic data from the ITS system and accident data from law enforcement agencies.
- Key Data
 - Vehicle counts of trucks in the left lane and total accidents both truck and auto.
- Comparison of Phases
 - Comparisons are made between Phases 1 and 2, which added enforcement only, and Phases 3 and 4, which added the lane restrictions and then removed additional enforcement.
- Conclusions
 - Truck lane restrictions are effective without additional enforcement.

Air Quality

- Purpose – The purpose of this is to determine whether or not truck lane restrictions have a positive effect on air quality in the NCTCOG region.
- Data Sources
 - Change is measured by Phase 4 emissions minus Phase 1 emissions. Relevant air quality statistics include nitrogen oxides (Nox), volatile organic compounds (VOC), and particulate matter (PM).
- Key Data
 - Key data include auto VMT, average roadway speed, truck VMT, left lane speed, left lane truck portion, middle lane(s) speed, middle lane truck

portion, right lane speed, and right lane truck portion. All data is measured for both Phase 1 and 4.

- Comparison of Phases
 - Subtract Phase 1 from 4 and note the difference.
- Conclusions
 - NOx emissions decreased and all others remained the same.

Conclusions

The evaluation study concluded that truck lane restrictions had a positive effect on safety, mobility, and air quality. It is recommended that lane restrictions should be implemented on a larger scale.

Diesel Freight Idle Reduction Program

The Diesel Freight Idle Reduction Program is aimed at reducing emissions from diesel vehicles by limiting the amount of time they are allowed to idle. There are two phases to the program [42]:

Phase 1: Establish and accomplish the planning, policy, and monitoring programs necessary to reduce diesel freight vehicle idling.

Phase 2: Implement capital improvements necessary to reduce diesel freight vehicle idling.

Figure A.3 [42] displays NCTCOG's implementation plan for the Diesel Freight Vehicle Idle Reduction Program.

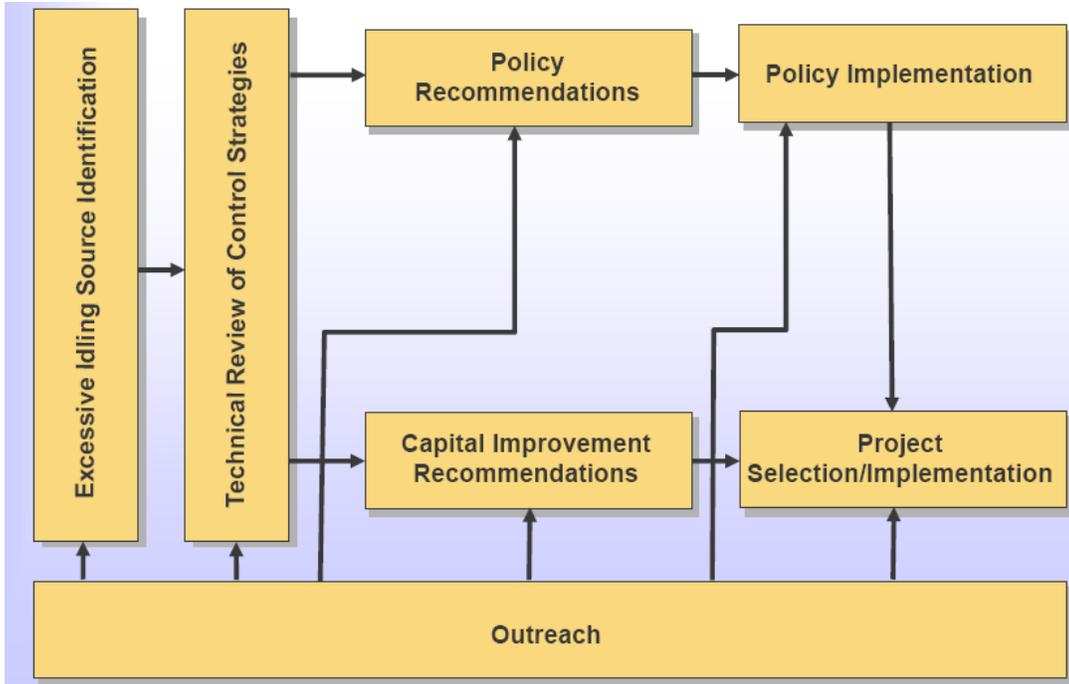


Figure A.3 NCTCOG's implementation structure of the Diesel Freight Idle Reduction Program. Tower 55 Rail Reliever Study

Tower 55 is a rail hub in the NCTCOG region that experiences significant delays. Since future growth in rail freight is expected, addressing this problem is very important. This will be improved through grade improvements, bypasses, and capacity expansion [42].

South Dallas Logistics Project

The South Dallas Logistics Project is an effort at implementing freight-oriented development. NCTCOG enacted land use policies to funnel intermodal and logistics facilities into the southern portion of Dallas. Facilities include warehouses, assembly, and distribution centers. The goals are to make freight more efficient, provide jobs, and provide a long-term tax base [44].

Trans-Texas Corridor

The Trans-Texas Corridor is another project that has significance in freight movement for the NCTCOG region. The proposed 1,600-mile national highway

connecting Mexico, the United States, and Canada will incorporate existing and new highways, railways and utility right-of-ways. Each route will include [42]:

- Separate lanes for passenger vehicles and large trucks
- Freight railways
- High-speed commuter railways
- Infrastructure for utilities including water lines, oil and gas pipelines, and transmission lines for electricity, broadband, and other telecommunications services.

A.5 Detroit, MI

MPO Overview

The Southeastern Michigan Council of Governments (SEMCOG) is the MPO for the Detroit metropolitan area. It consists of the counties of St. Clair, Livingston, Oakland, Macomb, Washtenaw, Wayne, and Monroe. SEMCOG addresses the transportation interests of nearly 5 million residents. The Detroit metropolitan area is best known for the strong presence of the auto industry, which has experienced difficulties the past few years. Regardless of this, the SEMCOG area is still a major transportation hub acting as an international gateway as providing access to Canada [46].

SEMCOG formed a Regional Freight Task Force to address freight issues; a number of studies have been completed, while others are ongoing. These studies have been incorporated into the long-range transportation plan for the Detroit area.

Freight Study

SEMCOG organized its freight study by using the following strategies [46]:

- Develop and maintain databases and analysis tools for decision-making.
- Interact with freight stakeholders to better understand the freight system, identify common issues, and build consensus.
- Incorporate freight into the regional planning process.

The freight analysis included in SEMCOG's RTP describes problems associated with the movement of freight commodities into, out of, within, and through the Southeast Michigan region and strategies for addressing those problems. The study includes a qualitative analysis of truck network deficiencies based on safety, bridge, congestion, pavement, and border crossing data, and a qualitative analysis of truck, aviation, marine, and rail system networks based on input from industry representatives and experts.

Truck Network Analysis

Trucks move the majority of freight throughout the SEMCOG region making them a critical component of the freight system. General issues associated with truck movements in the region include [46]:

- Poor condition of freeways and major roadways;
- Lack of designated truck-only lanes in appropriate areas;
- Lack of coordination between counties regarding designation of truck routes;
- Michigan's truck-weight limits; and
- The potential impact of the Federal Motor Carrier Safety Administration's (FMCSA) revised hours of service regulations.

The study took inventory of various conditions within the network such as the number and severity of truck crashes, the number and functional health of bridges, the current and forecasted amount of congestion on recognized truck routes, and the condition of pavement along truck routes.

Border Crossing Analysis

Canada is the United States' largest trading partner and a large percentage of this trade is funneled through the Southwest Ontario/ Southeast Michigan region. The two areas work together to better facilitate cross-border trading through coordinated planning and project implementation. Findings of this analysis included [46]:

- Commercial vehicles – This analysis included identifying primary commercial vehicle crossings in the region (the Ambassador Bridge, the Blue Water Bridge, and the Detroit-Windsor Tunnel) and estimating the percentage increase of traffic along these routes in the future.
- A passenger vehicle – This analysis identified primary crossings (Ambassador Bridge and Detroit-Windsor Tunnel) and estimates the percentage increase of traffic along these routes in the future.

- Physical capacity – Access-road capacity is the major issue in regards to freight. Current and future capacity needs must be met while maintaining and enhancing security.
- Border processing – Delay and security issues at border crossings are a major problem. Programs have been implemented to address this such as the Fast and Secure Trade (FAST) Program, which helps to enhance security and the efficient flow of commodities, and NEXUS, which helps speed the process for frequent travelers.

Aviation System Analysis

Although airports only account for a small percentage of freight in SEMCOG's region, the value of air cargo is particularly high. Important air freight issues include access, ownership and management changes, funding, land use, air traffic and capacity, and air space [46]. Traffic congestion on roads leading to airports increases travel time and could potentially affect airport operations. Funding continues to be a problem, especially for small, privately owned airports unless they can be designated as reliever airports. Transitioning ownership of smaller airports from private to public can help keep them operating and prevent competing land use interests; these are primarily residential. Air space and capacity are continuing problems as airports reach capacity and air space is saturated with competing uses.

Marine Facility Analysis

Freight carried by ship represents a significant part of the intermodal freight system. There are six ports in the region and they are connected to the world market via the Great Lakes/ St. Lawrence Seaway. Deficiencies of the marine freight system in Southeast Michigan include [46]:

- Immediate and long-term infrastructure needs;
- Uniform data for commercial flows;
- Cargo security needs at management level for shippers and carriers;

- Land-use conflicts;
- Operations of marine facilities;
- Environmental concerns;
- Pavement conditions;
- Access to upper and lower Rouge River ports; and
- Accessibility for trucks (e.g., tight turning movements and poor pavement conditions).

The locks of the St. Lawrence Seaway that provide access to the Great Lakes are old and must be replaced since they cannot provide access to larger ships. This may be costly and may also introduce unwanted aquatic species.

Rail Network Analysis

Rail is the second largest carrier of freight in the SEMCOG region and is important for moving heavy, bulk materials such as ore, chemicals, and manufacturing equipment. One primary issue with rail is grade-separated crossings, which reduce conflicts with passenger vehicles. 81% of rail crossings in Southeast Michigan are at-grade. Other deficiencies identified included [46]:

- Operating and retaining active rail is extremely costly and requires heavy private capital investment.
- The lack of understanding on the part of government agencies toward private railroads and their proprietary rights.
- Existing freight intermodal terminals lack sufficient land for expansion and growth to handle both current and future demands.
- There is a lack of rail for intra-regional travel.
- At-grade crossings can pose a safety problem and create delays.

Proposed Solutions for Improved Freight Movements

Opportunities to improve freight movements in Southeast Michigan were grouped into three categories: financial, institutional/ process, and infrastructure [46].

- Financial
 - Having a unified stance on appropriate issues;
 - Identifying alternative funding sources; and
 - Supporting long-term strategies to fund improvements;
- Institutional
 - Improved service at local level (e.g., freight loading/ unloading areas in central business districts);
 - Raising the profile of freight in the public eye;
 - Coordinating land use, transportation, and economic development plans to ensure appropriate balance;
 - Improving understanding of freight through continued data collection, development of analysis tools, and coordination with partners;
 - Sharing data between public and private sectors; and
 - Continuing the development of ITS technologies to enhance freight movements;
- Infrastructure
 - Shared intermodal facilities with direct highway access;
 - Improved design standards that facilitate freight movements;
 - Railroad grade crossing improvement program;
 - Addressing pavement and bridge deficiencies;
 - Addressing congestion issues on truck routes;
 - Correcting identified border crossing issues;
 - Addressing, identifying, and avoiding accessibility problems and land-use conflicts at airports, marine terminals, and rail facilities.

A.6 Houston, TX

MPO Overview

The Houston-Galveston Area Council (H-GAC) is the MPO for the Houston region. It consists of 13 counties and 133 local governments along the Gulf Coast. H-GAC's service area is 12,500 square miles and contains nearly 5.4 million people. H-GAC addresses issues of freight in their regional transportation plan and examines its freight system by taking inventory of issues that affect each mode and at the end, makes policy recommendations to address these problems.

Freight movement in the Houston-Galveston metropolitan area is greatly influenced by the petroleum industry [47]. Not only does the region produce a large share of domestic petroleum, it also refines most of what comes in internationally. These facilities are strategically placed near ports to facilitate the import of petroleum and it, along with products derived from petroleum, are shipped throughout the U.S. via trucking, rail, pipeline or by ship.

Freight Study

Trucking

This section primarily focuses I-69/Trans-Texas Corridor, the proposed 1,600-mile national highway connecting Mexico, the United States, and Canada. It will incorporate existing and new highways, railways and utility right-of-ways. Each route will include [47]:

- Separate lanes for passenger vehicles and large trucks
- Freight railways
- High-speed commuter railways

- Infrastructure for utilities including water lines, oil and gas pipelines, and transmission lines for electricity, broadband, and other telecommunications services.

Also identified in this region were major commodity flows and vehicle-miles-traveled. The top five freight commodities for the region are petroleum and coal, chemicals and allied materials, nonmetallic minerals, secondary traffic, and clay, concrete, and glass. Light duty trucks account for the majority of VMT.

In order to improve safety, ordinances have been passed to restrict truck traffic to certain lanes to segments of a number of highways. These restrictions are in place Monday through Friday from 6 AM to 8 PM. Although the results were favorable, implementation on a larger scale may not be feasible due to operational obstacles. Cars entering or exiting a freeway in lanes occupied by trucks may pose safety issues. Restricting trucks to the inner most lane might not be useful unless physically separated by a barrier.

Rail

The Houston-Galveston area is a major rail hub for the region and has five freight rail yards. There are intermodal facilities at the Port of Houston and Hobby Airport. Primary rail commodities include chemicals/allied products, coal, nonmetallic minerals, farm products, and petroleum/coal products. Also identified is the tonnage of commodity flows originating, terminating, traveling through, and traveling locally in the Houston region.

At grade rail crossings are a major concern for the region. Priority grade crossings for the area are identified along with methods for improving the situation. Also listed are at grade crossings ranked by vehicle minutes of delay per day and crossings with a history of accidents.

In a separate study, the TxDOT identified deficiencies in the region's freight network, possible improvements, and alternatives to improve rail capacity. Improvements were categorized as [47]:

- Grade Separations (bridges to separate the railroad from the streets)
- Grade crossing closures (closing to rerouting the street at the intersection with the railroad)
- Improvements to existing railroad infrastructure (improving capacity and connectivity on existing rail lines)
- New railroad corridors.

Marine Freight

The Port of Houston, the Port of Texas City, and two smaller ports at Freeport and Galveston serve the Houston-Galveston region. Crude oil and chemicals are handled in large quantities at these ports. Each port and its respective tonnage of foreign imports, foreign exports, and domestic trade are listed. The Gulf Intracoastal Waterway (GIWW) is a 423-mile long manmade canal linking ports along the gulf coast. This waterway is very old and in need of rehabilitation due to its inability to handle larger ships. Bridge clearances along the canal are often too small. Also, truck access to the ports needs to be improved.

Air Freight

Major area airports (George Bush Intercontinental, William P. Hobby Airport, and Ellington Field) and the amount of freight handled are identified in this section of the report.

Policy Recommendations

A variety of policy recommendations are offered, including [47]:

- Engage freight stakeholders in the planning process.
- Consider intermodal and multimodal options in the planning process.
- Expand and continuing freight data collection and analysis.

- Examine and analyze options for more efficient truck use of toll facilities.
- Identify simple problems and solutions that offer relatively high benefits.
- Better engage issues of freight into land use planning for municipalities and counties.
- Educate the public and policy makers on the importance of freight and its relationship to everyday life.

Encourage innovative financing options for implementation of projects that incorporate private sector investment, such as [47]:

Private Activity Bonds- These are used to attract private investment for projects that have a distinct public benefit.

Transportation Infrastructure Finance and Innovation Act (TIFIA) - provides federal credit assistance to nationally or regionally significant surface transportation projects, including highway, transit, and rail.

A.7 Los Angeles, CA

MPO Overview

The Southern California Association of Governments (SCAG) is the MPO for the Los Angeles region. It is the largest MPO in the United States representing six counties – Los Angeles, Orange, San Bernardino, Riverside, Ventura, and Imperial- and over 18 million people. SCAG is responsible for a 38,000 square mile planning region. SCAG has a long history and has a number of freight studies dating back years. Much of this planning has centered on the Alameda Corridor and the Ports of Long Beach and Los Angeles. The Los Angeles region has experienced considerable freight growth due to its strategic position on the West Coast nearest Asia; burgeoning Asian economies and manufacturing capabilities have caused steady increases in imports from those countries, particularly China.

Freight Study

Problem

As manufacturing productivity in Asian countries improves, along with their booming economies, the State of California, in particular the Ports of Long Beach and Los Angeles, have served as the gateway to U.S. markets. The San Pedro Bay ports handle 43% of containers entering the United States, resulting in high levels of congestion and poor air quality [35]. Infrastructure projects, environmental policies, and funding mechanisms must be identified and implemented to alleviate these problems, as well as capitalize on the economic benefits attainable through California's competitive advantage.

Goal

The Southern California Association of Governments' (SCAG) Goods Movement Program sought to optimize the region's transportation system through increases in

economic efficiency, congestion mitigation, safety and air quality improvements, and enhancements to system security [35]. In doing so, all modes of freight were evaluated, ultimately resulting in a series of new recommendations and policies regarding infrastructure.

Principles

The following five principles, which all stakeholders and decision-makers have adopted, guide the effort to improve the regional goods movement system [29]:

1. Environmental and community impact mitigation must be integral to the goods movement program.
2. Improvements to the goods movement system should not come at the expense of other transportation system investments.
3. Investments in the regional goods movement system should be made to realize regional benefits that have statewide implications: Performance Benefits, Environmental Benefits, and Economic Benefits.
4. Funding for these investments must begin now because many key projects will take years to deliver. Without action, congestion will worsen.
5. Without leadership and collective action at the state and national levels, we will not be able to realize these benefits.

Existing Goods Movement System

SCAG takes inventory of its existing goods movement system in order to assess deficiencies.

Benefits

If the SCAG region can maintain its competitive advantage by solving the issues of congestion, diesel emissions, and community impacts, significant benefits will occur to the SCAG region's labor force and logistics firms [35].

- Economic Benefits

- The logistics industry offers the possibility for employing unskilled and marginally educated workers in high-wage jobs, promoting and increasing social equity.
- Performance Benefits
 - Logistics firms speed and reliability would be increased resulting in more efficient operations.
 - Metrics to measure potential improvements in speed and reliability:
 - Speed – SCAG assumes it costs \$73 per hour to move a container load of freight in the region.
 - Reliability – Congestion costs can increase that amount by 50% to 250% depending on time of day.
 - Time Chart – Model of SCAG’s freeway system to estimate travel speeds for typical highway trips.
 - Reliability Chart – A factor for unexpected traffic or accidents to be included resulting in a “buffer time” for trip planning.
- Environmental Benefits
 - Policies must be implemented to ensure that, at worst, no adverse health effects occur, and, at best, current health and environmental problems are alleviated.
 - “Cold ironing” of ships at the docks (power to come from electrical grid)
 - Lower speed limits for ships in order to decrease emissions.
 - Off-peak port operating hours (PierPass), etc.

Solutions

SCAG has developed an unprioritized list of projects, already contained in the TIP, that if implemented could increase the speed and efficiency of the freight system.

However, increased capacity and operational improvements can sometimes have adverse

environmental effects. Additional studies have investigated the extent of these effects and techniques by which they can be mitigated. Additional solutions that will be included in the subsequent study, the Multi-County Goods Movement Action Plan, fall into three categories that mirror the state's hierarchy of transportation system actions: from preserving and improving the performance of the existing system, through the use of technology to improve operations and reduce impacts, to the last resort of capital expenditure on the system expansion. The categories are as follows [35]:

- Operating enhancements
- Environmental mitigations/ enhancements, and
- System/ physical enhancements.

Also, financing these improvements is an issue. SCAG has explored various funding mechanisms and sources and has concluded that sufficient resources can be raised to cover capital and pre-engineering costs. These mechanisms and sources are as follows:

- Transportation Infrastructure Finance and Innovation Act of 1998 (TIFIA)
- Tax-exempt private activity bonds for goods movement facilities
- Tax-credit bonds for goods movement facilities
- Tax Credit Equity
- User/ Beneficiary Fees
- Innovative Procurement Arrangements/ Project Delivery Systems
- U.S. Customs Duties

A.8 New York, NY

MPO Overview

The New York Metropolitan Transportation Council (NYMTC) is the MPO for the New York City metropolitan area. It includes New York City, Long Island, and the lower Hudson Valley. The NYMTC planning regions has a population of 11.3 million and encompasses an area of 2,440 square miles.

New York serves as the economic center of the United States and is one of the largest consumer markets in the country. Freight is imperative to the success of the region; inefficiency could cripple the area and hinder its ability to thrive. NYMTC understands this and has done much work in the area of freight planning including a comprehensive regional freight plan and, in addition to that, a number of smaller, more focused freight studies.

Freight Study

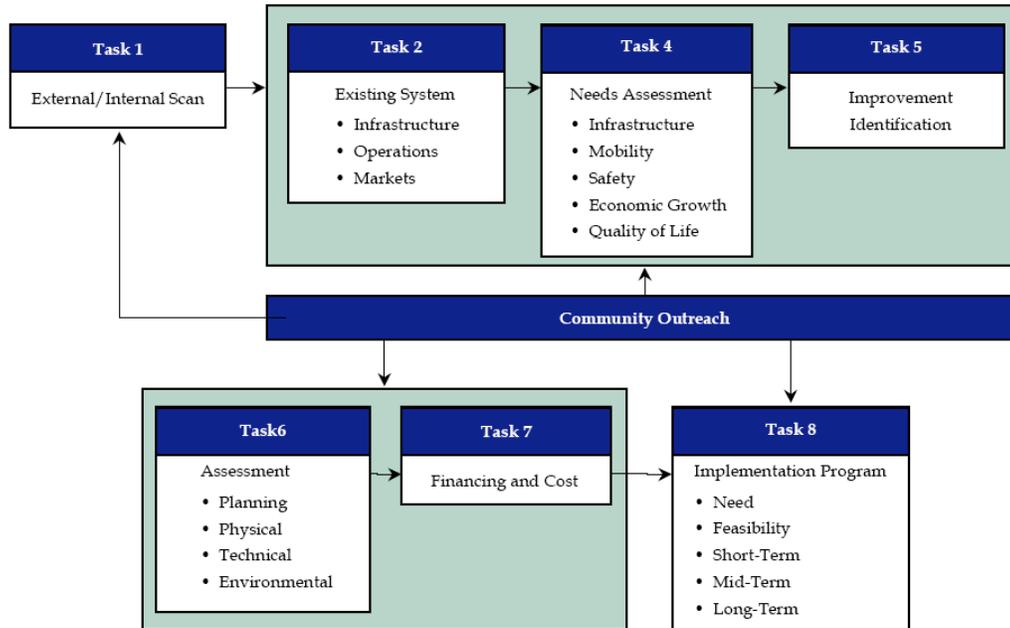


Figure A.4 Project approach NYMTC used in conducting its freight study [26].

- Task 1- External & Internal Scan
- Task 2- Description of Freight Transportation System in the Region
- Task 3- Community Outreach
- Task 4- Definition & Assessment of Needs
- Task 5- Preliminary Identification of Improvements & Solutions
- Task 6- Evaluation of Alternatives
- Task 7- Financing & Cost
- Task 8- Implementation Program
- Task 9- Assess Changes since 9/11

Data Collection, Inventory, and Assessment

Task 1- External & Internal Scan

The New York Metropolitan Transportation Council (NYMTC) conducted an assessment of all planning activities, construction projects, and freight related programs

that would affect, or contribute to, the development of a comprehensive regional freight plan including [49]:

- An internal scan of all ongoing or recently completed freight initiatives,
- The development of a GIS containing freight infrastructure characteristics,
- An external scan of best practices for freight transportation practices
- Collection of primary information.
 - a. Stakeholder surveys (carriers, shippers, receivers, logistics providers)
 - b. Stakeholder interviews
 - c. Land use data
 - d. Literature review

Task 2- Description of Freight Transportation System in the Region

The purpose of this task was twofold. First, it documented the current conditions of each of the primary freight modes- highway and trucks, railroads, intermodal facilities, ports, and airports. Secondly, it presented an overview of freight markets in the NYMTC region which involves [50],

1. a quantitative description of commodity flows in the region,
2. a description of waste movement in the region (is not included in commodity flows),
3. a qualitative description of freight logistics in the region using case studies,
4. and, the potential application of this study to a truck-to-rail diversion model.

Task 3- Community Outreach

Report not yet available.

Task 4- Definition & Assessment of Needs

The purpose of this task was twofold [51]:

1. Develop performance measures to identify how effectively the NYMTC's freight system moves goods; and

2. Identify current deficiencies within the freight system based on these performance measures that restrict the flow of goods, increase costs to regional shippers/ receivers, or adversely impact the regional economy/ environment.

These deficiencies served as a baseline for developing alternatives.

- Performance Measures

NYMTC organized its performance measures primarily by mode- highway, rail, port, and airport, but also by economics [51]. These were again split into operating, physical, capacity, and access measures.

- Highway [51]

- Operating

- Truck volumes with respect to total volumes
 - LOS for major truck routes
 - Average speed
 - Toll costs
 - Curbside space management (loading/ unloading zones, parking enforcement, etc.)
 - Accident and incident rates

- Physical [51]

- Height clearances
 - Turning radii
 - Access width
 - Weight limitations
 - Truck delays at railroad/ highway grade crossings
 - Usable shoulders
 - Highway design standards, acceleration/ deceleration lanes, truck climbing lanes, etc.
 - Signage

- Curbside capacity (for truck operations)
- Rail- Capacity constraints come from freight conflicts with passenger traffic, insufficient overhead or lateral clearances for modern rail equipment, lower than usual weight limits on regional tracks, and limited serving yard capacity. The lack of rail connections translates into unreasonable diversions to reach their destinations, or a switch to a different mode [51].
 - Operating
 - Rail traffic levels
 - LOS for rail (*Proprietary information may be difficult to obtain*)
 - Rail as a percentage of total regional freight traffic
 - Number of competing carriers (preserving service options through future mergers)
 - Number of access modes (truck, barge/ ferry)
 - Number of alternative access truck routes
 - Connection time/ distance to nearest limited-access highway or mainline rail head
 - Average cost of dray operations
 - Physical
- Port [51]
 - Capacity
 - Actual throughput (total and per acre)
 - Actual throughput as a percentage of theoretical “maximum practical capacity” by functional component of each terminal (wharf and crane operations, storage, gate)
 - Operating
 - Average cargo dwell time
 - Hours of terminal operation

- Utilization of storage (high versus low density)
 - Access
 - Number of access modes (truck, barge/ ferry)
 - Number of alternative access truck routes
 - Access to on-dock rail
 - Connection time/ distance to nearest limited-access highway or mainline rail head
 - Average cost of dray operations
- Airport [51]
 - Capacity
 - Airfield capacity
 - Aircraft capacity
 - Warehouse capacity
 - Operations
 - Availability/ efficiency of Federal Inspection Services (FIS)
 - Tug distance to aircraft parking ramp
 - Access
 - Number of alternative access truck routes
 - Connection time/ distance to nearest limited-access highway or Central Business District (CBD)
 - Average cost of dray operations

Economic Development Analysis

Economic development and freight are intrinsically linked and one is often an indicator of another. This part of the study examined the implications of freight on economics from a national and regional perspective, developed performance measures, and assessed the economic performance of the regional freight system to identify deficiencies, limitations, and requirements for each mode. The economy is shifting from

mass manufacturing and distribution to high value-added customized manufacturing and overnight delivery. Consequently, freight is lighter, moved longer distances, and of higher value.

Economic Performance Measures

- Economic [51]
 - Cost
 - Average freight transportation cost per ton-mile as a percentage of the value of goods being moved
 - Overall cost of freight transportation compared to regional GDP
 - Regional freight costs per ton-mile compared to national averages
 - Appropriate use of most efficient freight modes (i.e., Bulk commodities move predominately by rail/ marine modes, etc.)
 - Efficiency
 - Energy consumption per ton/ dollar shipped
 - Reliability
 - Percent of freight moving by time-definite modes/ carriers
 - Carrier on-time performance records
 - Land use
 - Facility productivity per acre (throughput of tons/ containers)
 - Sufficient land devoted to terminal, warehousing, distribution, or other freight supportive use
 - Efficient location of support facilities (logistics flows do not result in unnecessary travel)
 - Use of lands that would not otherwise be reused (i.e., brownfields)
 - Secondary Development/ Employment
 - New employment/ business development near major transportation facilities

- International Trade
 - Volume of international trade
 - Number of direct trading partners
 - Number of carriers serving international destinations from NYMTC region
- Disposal of Municipal Solid Waste (MSW)
 - Percent of MSW sent to landfills (as opposed to being recycled or reclaimed)
 - Percent of MSW shipped to out-of-state facilities
 - Remaining capacity/ agreed tonnage at receiving landfills
 - Per-ton cost of MSW disposal

Environment/ Community Impact

Freight is a huge driver of the economy, but it can also have detrimental effects on the environment, communities, residents, and overall quality of life. Freight has the most direct impact on air quality and noise since trucks, trains, and marine vessels are large concentrated sources of noise and pollution. Also, in keeping with Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations,” low-income and minority populations were examined to determine what adverse effects, if any, projects implemented and policy enacted will have upon them. Issues to be addressed are as follows [51]:

- Land use/ open space
- Air quality
- Noise
- Cultural resources
- Wetlands, floodplains, coastal zones
- Demographics
- Visual resources

- Hazardous materials

Goals and Objectives

The purpose of this task was to develop goals and objectives based on the previous tasks. In turn, they will be used to develop strategies, recommendations, and freight projects for regional planning.

The goals of NYMTC Freight Plan were as follows [51]:

- Improve the transportation of freight by removing burdensome government regulations and restrictions.
- Improve the physical infrastructure of the transportation system for freight-related transport among shipping and receiving points, and major terminals and ports.
- Improve the reliability and overall movement of freight in the region by encouraging expedient and cooperative multimodal shipment of freight.
- Improve the reliability and overall movement of freight in the region by expanding alternatives for trucks and other commercial vehicles.
- Improve the freight system's strategic redundancy.

Land Use Assessment

The purpose of this task was to provide information and tools for coordinating land use and freight plans for the region and to support an overall regional freight strategy. Such guidance can help reduce the sprawl of freight activities by establishing distribution facilities within existing transportation corridors and zones. This can also help with the balance between moving people and freight across the region. Included was a detailed analysis and assessment of:

- The impacts of local land use plans, policies, and decision-making on freight goods movement in the region
- The impacts of freight movement on existing land uses
- The role of local and regional planning processes with regard to freight planning

Task 5- Preliminary Identification of Improvements & Solutions

This was an initial list of improvements and solutions to address specific deficiencies outlined in the Needs Assessment section. These alternatives will be screened further in an evaluation of alternatives and a cost-benefit analysis to yield a preferred set of solutions and improvements. Preferred solutions will then be suggested as part of the overall freight plan. Solutions can be put into three categories [52]:

- **Infrastructure projects** expand or physically enhance the transportation infrastructure.
- **Policy strategies** optimize governmental regulations and incentives to better manage freight and passenger traffic on existing infrastructure.
- **Operational improvements/ technology** use new paradigms in fleet management, low capital network improvements, and emerging transportation technology to maximize the capacity and level of service provided by the region's transportation network.

Task 6- Evaluation of Alternatives

The purpose of this task was to eliminate alternatives that are not feasible or do not truly meet the needs of the region. Alternative packages that include several projects were evaluated including [26]:

1. Policy, operational, and low-cost capital actions (“Policy” package)
2. Highway system improvements
3. Railroad system improvements

Each alternative package was evaluated according to the following impact criteria [26]:

- Transportation
- Environmental
- Connectivity
- Economic development

- Technology
- Physical feasibility
- Institutional feasibility

Specific impacts associated with each criterion include [26]:

- Diversion of tons from truck to rail
- Roadway operations on major facilities
- Regional truck VMT and VHT
- Benefits to users of the roadway system and society as a whole

Each package was compared to a 2025 Baseline condition that included all existing facilities plus a limited number of committed projects. Ongoing projects included in the baseline are already under construction or are included in the TIP. The analysis was centered on three vehicular definitions: commodity trucks, all trucks, and all vehicles, defined as follows[26]:

- Commodity trucks are those involved in intercity freight and whose behavior can be described by commodity flows.
- All trucks include commodity and non-commodity trucks such as garbage trucks, utility service trucks, etc.
- All vehicles include all rubber-tired vehicles using the roadway system.

The transportation analysis methodology that served as the basis for the analysis of most other criteria is shown in Figure A.5 [26].

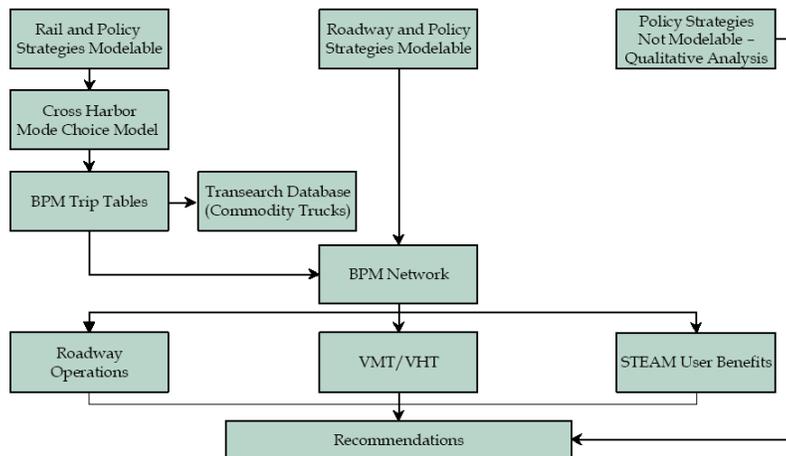
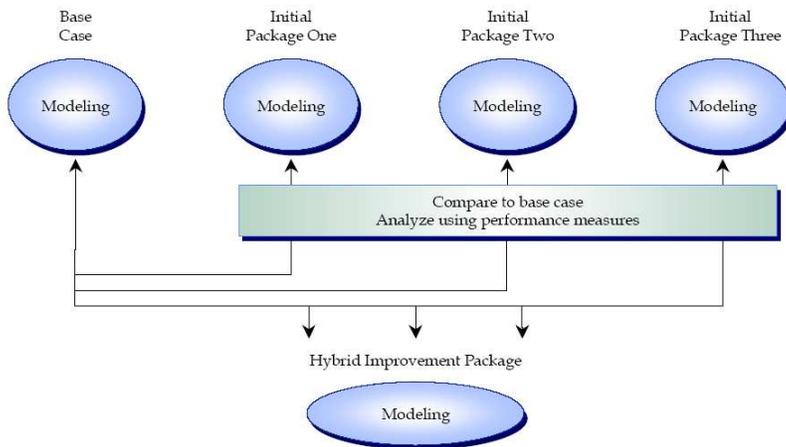


Figure A.5 Transportation analysis methodology used by NYMTC in conducting its freight study for the region.

The environmental impact analysis was conducted qualitatively and used the following criteria [26]:

- Land use and open space
- Air Quality
- Noise
- Cultural/ Historic Resources
- Wetlands, floodplains, and coastal zones
- Demographics
- Vital resources
- Hazardous materials

A two-tier analysis approach was used in comparing alternatives. First they were grouped into “initial packages,” and then assessed using a combination of qualitative and quantitative techniques. Figure A.6 [26] displays this approach.



**Figure A.6 Two-tiered analysis approach used to evaluate alternative packages by the NYMTC.
Task 7- Financing & Cost**

Report not yet available.

Task 8- Implementation Program

This section of the NYMTC Freight Plan identifies strategies that could be used in the implementation of freight-related projects. These strategies are multimodal and represent short- (1 to 3 years), mid- (3 to 10 years), and long-term (more than 10 years) goals [25]. Strategies for implementation focused on benefits, corridor impacts, responsible agencies, timeframes, next steps, and capital costs. These strategies are organized in Figure A.7 [25].

Goal	Strategy	Action	Benefits	Corridor	Agency	Timeframe	Next Steps	Cost
1. Improve transportation of freight by removing burdensome government regulations and restrictions	A. Improve management of truck routes	Complete NYCDOT Truck Route Management Study	Improved regional connectivity and reduced community impacts	Citywide	NYCDOT	Short	Complete "Citywide Truck Route Management and Community Impact Study"	N/A
		Assess alternatives for providing greater access to national standard 53' long, 102-inch wide tractor trailers	Improved regional connectivity	Northern Southern Eastern (I-278) Eastern (I-678)	NYSDOT NYMTC NYCDOT PANYNJ	Short	Conduct regional feasibility study	N/A
	B. Improve the management of commercial vehicle loading and unloading zones	Expand the commercial parking program in Manhattan and further assess impacts	75 percent of trucks finish delivery within first hour – suggests VMT/VHT reduction	Manhattan	NYCDOT	Short	Expand program boundaries; continue to assess impacts	Revenue will cover capital cost
		C. Expand the application of ITS to commercial vehicle operations	Automate commercial vehicle permitting, credentialing and enforcement	Enhanced truck movements and safety leading to reduced costs and travel time	All	NYSDOT NYSTA	Short	Implement program under development and assess impacts
	Expand Integrated Incident Management System in NYC area	Accelerated incident response time to reduce non-recurring congestion and improve public safety	All	NYSDOT NYCDOT MTA NYPD NYCOEM	Short	Proceed with multi-agency expansion as planned	\$2.5 M for the SIE	
Provide real time traveler information to commercial vehicle operators	Enhanced truck movements leading to reduced costs and travel time	Northern Southern I-95 NE Thruway I-87 NYS Thruway Western	NYSDOT NYCDOT PANYNJ	Short	Coordinate program development with I-95 Corridor Coalition	N/A		

Figure A.7 NYMTC project evaluation method.

Goal	Strategy	Action	Benefits	Corridor	Agency	Timeframe	Next Steps	Cost
		Continue experimentation with value pricing of toll facilities	Reduced peak period congestion	All	NYSTA PANYNJ MTA NYSDOT	Short	Continue experimentation and analysis Complete Off-Peak Delivery Study	Costs to be recovered from tolls
2. Improve the physical infrastructure of the transportation system for freight related transport between shipping and receiving points	A. Use marine connections to enhance access to key distribution points	PIDN – Transport port containers by barge and rail to out-of-region transshipment facilities	1,256,356 TEUs moved by rail/barge instead of truck	Northern Southern I-95 NE Thruway I-87 NYS Thruway Western	PANYNJ	Short to mid	Assess impact of early deployments (Albany) and expand as planned	\$490 M
		Assess feasibility of regional truck ferries	Reduced truck traffic on roads	TBD	NYMTC NYSDOT PANYNJ NJTPA NJDOT	Short	Conduct regional Feasibility Study	N/A
	B. Use rail connections to enhance access to key distribution points	Restore service on Staten Island railroad	Travis Branch – 16,000 carloads/year Howland Hook on-dock rail – 20,000 rail cars/year	Southern	PANYNJ NYCEDC	Short	Implement existing plans	\$363 M
		Improve First Avenue rail tracks in South Brooklyn waterfront	Support bi-level auto carrier port – 81,000 tons	Southern	NYCEDC	Short	Implement as planned	\$17 M

Figure A.7 continued.

Goal	Strategy	Action	Benefits	Corridor	Agency	Timeframe	Next Steps	Cost
3. Improve the reliability of overall movement of freight in the region by encouraging multimodal shipment	A. Reduce barriers to EoH rail service	Provide a minimum of 17-foot six-inches TOFC clearance; eliminate weight and clearance restrictions on plate F cars and tri-level auto carriers; expand eventually to 23-foot double-stack clearance	300,000 to 700,000 tons annually to Pilgrim; 69,000 tons on Hudson Line	Western Long Island Expressway I-87 NYS Thruway I-95 NE Thruway	NYSDOT MTA PANYNJ NYCEDC	Short to mid	Complete "Hudson Line Railroad Corridor Transportation Plan" Complete "East of Hudson Rail Freight Study" Conduct Pilgrim ES Complete Cross Harbor ES	\$0.75 M for Westchester Avenue Clearance (Harlem River Yard to Oak Point)
		Reduce operational conflicts between passenger and freight service on region's railroads	69,000 tons on Hudson Line; others TBD	Western Long Island Expressway I-87 NYS Thruway I-95 NE Thruway	NYSDOT MTA PANYNJ	Short to mid	Complete "Hudson Line Railroad Corridor Transportation Plan" Complete "East of Hudson Rail Freight Study"	N/A
	B. Evaluate the further expansion of freight yards and warehouses (freight villages)	Assess potential to develop Harlem River as intermodal yard	TBD	Western I-684 I-87 NYS Thruway I-95 NE Thruway	NYSDOT MTA	Short to mid	Complete "Hudson Line Railroad Corridor Transportation Plan"	N/A
		Assess potential to develop Pilgrim State Hospital in Deer Park as a bulk and/or intermodal facility	300,000 to 700,000 tons	Long Island Expressway	NYSDOT	Mid to long	Conduct Pilgrim ES	\$87 M

Figure A.7 continued.

Goal	Strategy	Action	Benefits	Corridor	Agency	Timeframe	Next Steps	Cost
		Assess potential to develop Phelps Dodge site and adjacent areas in Maspeth, Queens into a bulk or intermodal facility	29 to 73 million tons of intermodal	Northern Southern	NYCEDC	Mid to long	Complete Cross Harbor ES	Funds included under Cross Harbor tunnel
		Assess potential to further develop existing yard at 67 th Street, Brooklyn for bulk, intermodal, and/or port-related traffic	TBD	Northern Southern	NYCEDC	Mid to long	Complete Cross Harbor ES Advance Port Revitalization plans	N/A
		Conduct regional Feasibility Study to identify additional sites	TBD	All	NYMTC	Short	Conduct Feasibility Study	N/A
	C. Improve Cross-Hudson Rail Service	Improve existing float bridges at Greenville, NJ	TBD	Southern	TBD	Short	Implement plans as designed	\$8-10 M
		Assess cross-harbor rail freight tunnel	94 to 14.9 million tons	Northern Southern	NYCEDC	Long	Complete Cross Harbor ES.	Single tunnel \$4.46 Double tunnel \$7.3 B
4. Improve the reliability and overall movement of freight in the region by expanding alternatives for trucks	A. Improve Northern Corridor Crossing	Assess improvements to the Highbridge Interchange	Improved traffic flow on I-95	Northern	NYSDOT	Long	Complete ES	N/A
		Assess completing a continuous service road system on the CBE	Improved traffic flow, reduced traffic diverted to local roadways	Northern	NYSDOT	Long	Complete "Bronx Arterial Needs Study"	N/A
		Improve Sheridan-Bruckner Interchange	Improve access to Hunts Point Market	Northern	NYSDOT	Long	Complete ES	\$200 M

Figure A.7 continued.

Goal	Strategy	Action	Benefits	Corridor	Agency	Timeframe	Next Steps	Cost
	B. Improve Southern Corridor Crossing	Assess upgrading crossing at Goethals Bridge	Improved traffic flow and reduced accidents	Southern	PANYNJ NYMTC	Long	Conduct EIS Conduct corridor study	\$450-650 M
		Assess completing a continuous bus/HOV system on the SIE and related improvements	Increased capacity and volume	Southern	NYS NYMTC NYCDOT	Long	Conduct EIS Conduct corridor study	\$500 M
	C. Improve Eastern Corridor (I-278)	Assess removing clearance restriction on the BQE	Reduced traffic diverted from local roadways	Eastern (I-278)	NYS NYMTC	Long	Conduct Feasibility Study Conduct corridor study	N/A
		Assess feasibility of off-peak truck use of Gowanus HOV lane	Improved traffic flow on mainline	Eastern (I-278)	NYS NYMTC	Short to long	Conduct demonstration project, analyze, and apply to Gowanus Reconstruction EIS; conduct corridor study	N/A
	D. Improve JFK Airport/Industrial Access Corridor	Assess options for improvements to the major routes in the corridor	Improved access to JFK and adjacent areas	Eastern (I-678) South Brooklyn/ Queens	NYS NYMTC NYCDOT PANYNJ	Long	Conduct Corridor Study Complete S. Brooklyn TIS	N/A

Figure A.7 continued.

A.9 Philadelphia, PA

MPO Overview

The Delaware Valley Regional Planning Commission (DVRPC) is the MPO for the Philadelphia metropolitan area, which extends into southern New Jersey. DVRPC represents the transportation interests of just over 5 million residents. The principal local governments that form the DVRPC include Bucks, Chester, Delaware, and Montgomery counties, as well as the City of Philadelphia, in Pennsylvania; and Burlington, Camden, Gloucester and Mercer counties in New Jersey.

There are no seminal, or comprehensive, studies in regards to freight planning, but there has been much work done in this area. DVRPC has conducted freight planning continuously and comprehensively since the early 1990's. Studies include the *Delaware County Highway-Railroad Grade Crossing Study* [53] and the *National Highway System Connectors to Freight Facilities in the Delaware Valley Region* [54]. The RTP, *Destination 2030* [55], which will serve as the guiding document as it sets DVRPC's vision and goals for its freight system and goods movement in the region. Various studies conducted collect the necessary data, incorporates stakeholders, and set priorities.

Freight Study

Vision

The focus of DVRPC's freight efforts is primarily the advancement of economic development through freight transportation infrastructure, investment and policies [55]. DVRPC recognizes the importance of freight to the regional economy.

Goals and Strategies

The goal of DVRPC's freight efforts are to identify strategies and improvements that maximize air, rail, ship, and truck modal contributions to the flow of goods; including connections between the modes and support facilities [55].

- Elevate considerations of projects that promote efficient freight movement and economic development.
- Integrate freight facilities and operations with community goals.

National Highway System Connectors to Freight Facilities in the Delaware Valley Region

Introduction

- This purpose of this study was to determine the operational deficiencies along the connector roadways.
- This section introduces the objectives of the study, which are [54]:
 - To determine which connectors in our region meet the criteria, to confirm or adjust routes, and to then use this information to update the FHWA database of connectors in Pennsylvania and New Jersey.
 - To identify the overall condition of the connectors, and to cite deficiencies.
 - To make recommendations on specific connectors that can lead to capital improvements.

Existing Conditions

Information on existing conditions was evaluated through a stakeholder interview on the topics listed below [54].

- Pavement Conditions
- Operations at Connection Points
- Traffic Operations (roadway widths and on-street parking)
- Traffic Operations (turning movements and gate queuing)
- Railroad crossings
- Bridges (weight and height restrictions)
- Signage and Striping

- Land Use and Community Impacts

Recommendations

Recommendations were based off of site visits and stakeholder interviews [54].

- Administrative
 - Update connector inventory and routes
 - Resolve South Philadelphia intersection bottleneck
 - Manage truck staging issues
 - Promote importance
 - Continue “Freight as a Good Neighbor” practices
 - Plan for rail infrastructure
- Suggested Projects
 - Reconstruct entrance and exit ramps
 - Re-pave
 - Remove or pave over inactive rail crossings
 - Add warning protection at rail crossings
 - Add signs directing trucks to the facility and back to the National Highway System (NHS)
 - Widen road
 - Redesign intersection
- Implementation
 - Harness maintenance funds
 - Incorporate in TIP process
 - Continue work in future years

Delaware County Highway-Railroad Grade Crossing Study

Introduction

- This section sets the purpose and goals of the project [53].

- Purpose: To document existing conditions at the crossings in the corridor, and to propose an improvement program that simultaneously facilitates the flow of freight and mitigates the impacts of the trains on the surrounding communities.

Background

Existing Conditions

- Location
- AADT
- Number of daily trains
- Maximum allowable train speed
- Adjacent land use
- Crash data

Options

- This section introduces options for dealing with grade crossings which include consolidation and elimination, supplemental safety measures, traffic management measures, and new technological devices.

A.11 Sacramento, CA

MPO Overview

The Sacramento Council of Governments (SACOG) is the MPO for the Sacramento area and includes six counties: El Dorado, Placer, Sacramento, Sutter, Yolo and Yuba. Also included are 22 cities. The region has fewer than 2 million residents, making it one of the smaller metropolitan areas assessed in this document. However, this does not discredit their freight planning efforts. Below is an assessment of freight planning in the Sacramento area.

Freight Study

Phase 1 – identify goods movement issues

Phase 2 – delve deeper into issues identified in Phase 1

Phase 3 – develop policies and action plans

Phase 1

Introduction/ Background

This section provides background on freight in the SACOG region. Key responsibilities of this agency in regards to freight are [56]:

- To understand the role of freight in the economic development of the SACOG region and northern California;
- To recognize planning and policy decisions with implications for freight transportation, and recognize freight transportation trends with implications for public policy planning; and
- To make well-informed tradeoffs in regards to planning.

This section identifies the regional freight network, examines regional freight movements, and identifies stakeholders [56].

Modes

- Highways and Trucking
 - This section further identifies the highway infrastructure and provides a brief assessment of major facilities.
 - Next it categorizes the trucking industry structure and identifies vehicles common to SACOG's highways and their uses.
 - Commodities that trucks often carry in the SACOG region are identified and truck trip patterns are examined.
 - The locations of truck fleet terminals are identified using public databases and commercially available data.
- Railroads
 - The regional freight rail system is identified (lines, yards, transload facilities, etc.).
 - Freight rail stakeholders are identified along with their physical organizational structure (subdivisions).
- Airports
 - A brief overview of the air cargo system in the SACOG region is given along with identifying air cargo stakeholders (FedEx, UPS, and DHL).
 - Air cargo projections at the region's major airports: Sacramento International Airport (SMF) and Mather Airport (MHR).
 - Providing adequate truck access to the region's airports.
- Seaports
 - A brief overview of the Port of Sacramento is given along with its primary commodities and its amount of developable land.
 - Limitations and obstacles faced by the port are identified.
 - Strategies already being implemented to help its success are discussed, such as alliances with the Port of Oakland, changes in governance, etc.

Freight and Distribution Facilities

- Freight handling facilities, whose responsibilities are sorting, consolidating, deconsolidating, and transloading freight, throughout the SACOG region are identified.
- Also located are truck stops, scales, fueling facilities, and rail yards.

Data and Gap Analysis

- There are many gaps in freight data, especially at the local level. Approaches to bridge this gap are identified:
 - Truck counts
 - Surveys
 - Stakeholder interviews
 - Automated data collections
- Important freight data across all modes is reported along with information on their respective sources.

Decision Factors

- Freight demand is based on the following factors:
 - Population
 - Economic activity
 - Resources
 - Land use
 - Modal options
 - Shipment characteristics
- Supply chain
- Customer requirements
- Modal choice
- Potential Diversion of Highway Trips

Issues and Needs

- Municipalities in the SACOG region were asked to rank freight issues of importance to them. The results are as follows:
 - Street deterioration due to trucks
 - Construction trucks
 - Truck parking
 - Truck noise
 - Truck congestion
 - Long haul trucks
 - Truck air pollution
 - Neighborhood intrusion by trucks
 - Short haul, local delivery trucks
 - Truck traffic safety
 - Nighttime truck operations
 - Hazardous materials hauling
- Truck planning requirements
 - Planning for trucks whose large size was not initially designed for;
- Truck routes
 - Routes are the results of the planning activities of various organizations and have not been coordinated or reconciled.
- Truck parking – there is a shortage of legal parking options for trucks resulting in:
 - Overnight parking in residential areas;
 - Illegal overnight parking of trailers, with or without tractors, adjacent to industrial zones resulting in noise and security problems;
 - Legal or illegal parking of tractors and/ or trailers close to intersections and driveways obscures vision and is perceived as a safety problem.
- Congestion

- Congestion reduces trucking productivity and reliability and forces close contact with passenger vehicles.
- Circuitry
 - Highway and street systems are ill-suited for freight traffic.
- Truck Safety and Accidents
 - Summarizes truck-involved collision characteristics along the four freeways in the SACOG region.
- Truck traffic generators
- Elimination of rail grade crossings
- Rail capacity
- Case Studies

Economic Impacts

- Large population growth is expected in the coming years
- Growth in logistics may replace loss of manufacturing jobs for unskilled and marginally educated workers

Land Use

- Industrial real estate demand in the area continues to grow
- Goods movement and Smart growth
 - Take advantage of goods movement improvement opportunities in the process of rethinking development patterns;
 - Ensure that proposed developments and development patterns meet functional as well as aesthetic requirements; and
 - Avoid unforeseen goods movement issues late in the development cycle.
- Location options
 - Urban hubs with urban line-haul access
 - Peripheral hubs with urban delivery access

- Corridor strategy

Phase 2

Implications of Land Use Decisions [57]

- Identifies current planning issues faced by each municipality.
 - Integration of transportation planning through designated truck routes.
 - Compatibility of land use and zoning policies for the efficient location of goods movement activities.
- Trends in Goods Movement and Logistics
 - Value added logistics (outsourcing of light production and assembly activities to logistics companies)
 - Location factors (low transportation costs and ease of access to customers)
- Supply and Demand Analysis
 - Strong demand for industrial real estate
 - Competition from other land uses (residential)
 - Increased land values
- Conclusions

Growing the Logistics Sector

- Is it in the interest of the SACOG region to develop huge logistical complexes able to serve Northern California?
 - Job creation
- Conclusions

Modal Shift Potential

This section explores the potential for shifting the movement of goods to modes other than truck. It has the possibility of improving air quality and alleviating congestion.

- Modal choice
 - Fundamental criteria are shipment size, distance, and expected travel and arrival times.

- Highway/ Intermodal Shifts
 - Rail intermodal service is increasingly competitive to long-distance trucking.
- Truck to Rail Carload Shifts
 - Rail cars can hold 3-5 truckloads of freight, therefore, removing 3-5 trucks from the roads.
 - Rail-to-truck transloading centers are much easier to locate and build than intermodal terminals.
 - Can serve as starting points for “logistics parks”.
- Marine Cargo Growth
 - Moving containers between the Port of Oakland and the Port of Sacramento by barge.

Project Analysis

Projects already included in the MTP were evaluated on their preliminary affect of goods movement in the SACOG region. The rating system is as follows [57]:

- Rating of 3: Specific Improvement for Goods Movement: Would directly serve the movement of goods by providing improved access to a seaport, airport, rail yard, or existing industrial area.
- Rating of 2: Improvement for Goods Movement: Would improve the movement of goods by improving facilities that serve industrial-zoned areas.
- Rating of 1: Minor improvement for Goods Movement: Would improve facilities that serve commercial areas or general goods distribution or improvements to large transportation facilities that improves the operation of the facility.
- Rating of 0: Not related to Goods Movement.

Phase 3

Not yet available.

A.12 San Francisco/ Oakland, CA

MPO Overview

Created by the California State Legislature in 1970, the Metropolitan Transportation Commission (MTC) is the MPO for the San Francisco-Oakland Bay Area. This area includes nine counties - Sonoma, Napa, Marin, Solano, Contra Costa, Alameda, Santa Clara, San Mateo, and San Francisco – and 101 cities. The region has over 6.7 million residents.

Due to the economic significance and presence of ports, the Bay Area began to recognize the importance of freight in their region. Freight planning in the Bay Area started in 2001 with the Regional Transportation Plan, but was not explored in detail. Subsequent freight planning efforts have produced documents of greater significance and seek to answer the following questions [58]:

- Who is moving goods?
- Where are the goods being sent?
- How are they being moved?

Freight Study

MTC conducted their Regional Goods Movement Study using a two phase system [58]:

- Phase 1- Assess the movement of goods and their economic impact on the Bay Area.
 - Compile data and information on the freight system
 - Evaluate economic significance of goods-movement
 - Analyze land-use and goods-movement issues
- Phase 2
 - Identify air quality issues related to goods-movement

- Summarize key goods-movement issues
- Identify project and policy options for the RTP
- Identify ongoing transportation planning and goods-movement/ land-use issues and options

Data Collection, Inventory, and Assessment

Data compiled on the MTC’s freight system is in relation to economics, travel modes, and origins and destinations of domestic trade [58]. Information such as dominant travel modes, commodities, trade partners, important corridors, and congestion was looked at. This allowed MTC to create a baseline of where they are at with regards to freight and to guide succeeding tasks. Information gathered was aimed towards application in planning, policy analysis, and strategic development.

Goals and Objectives

The purpose of this task is to develop goals and objectives based on the previous tasks. In turn, they will be used to develop strategies, recommendations, and freight projects for regional planning.

The goals for goods movement for the region are as follows [58]:

1. Ensure the economic viability of the Bay Area’s international gateway facilities and will ensure that regional businesses have access to efficient transportation
2. Provide for the efficient delivery of goods and services to the residents of the Bay Area
3. Improve the safety, reliability and environmental quality of the goods movement system and neighboring communities
4. Support and enhance the regional Smart Growth strategies

Economic Analysis

Freight plays an important role in determining a region’s economic competitiveness. This task will quantify the important role of freight and logistics to the

regional economy and demonstrate the potential economic benefits associated with facilitating efficient freight mobility.

In regards to economics MTC, as well as SCAG, tie freight planning to social equity. Freight requires a large, skilled labor force, but it does not require higher education. California MPO's see the forecasted increase in freight, due to trends in the national economy and to the manufacturing boom in China as well, as an opportunity to replace a significant amount of well paying, blue collar jobs lost after World War II.

Air Quality

Freight movement has significant environmental impacts, particularly in regards to air quality. Common pollutants from freight movement (VOC, NOx, and PM) are emitted during both onroad and nonroad (e.g., cargo loading, truck idling) activity. Any goods-movement program must address these issues and the Bay Area does so through incentive programs to encourage businesses to [58]:

- Purchase low- or zero-emission vehicles or engines
- Replace or retrofit engines
- Install exhaust treatments and add-on equipment
- Use clean fuels or additives
- Build infrastructure to supply alternative fuels

Other efforts to improve air quality include limiting the idling time of trucks (as implemented by the California Air Resources Board) and diverting freight from trucks to rail (as is encouraged by the California Inter-Regional Intermodal Study (CIRIS)).

Goods-Movement Issues

Identifying goods-movement issues followed assessing the Bay Area freight system. The identification of issues was an important step as it allowed them to understand where best to direct their resources. Freight modal profiles include taking inventory of freight facilities and identifying subsystems that are critical to that region's needs was a part of

this process. Issues were divided up by mode: Highway, rail, marine, and air. Key issues identified are as follows [58]:

- Highway
 - Congestion
 - Reliability (largely due to inconsistent periods of congestion)
 - Safety in older corridors
- Rail
 - Grade crossings
 - Passenger and freight rail conflicts
- Marine
 - Intermodal connectivity- It is difficult for trucks getting into and out of the Port of Oakland because of peak-hour congestion
 - Freight rail access to the Port of Oakland because of competition with passenger rail needs of the rail system
 - Competing truck and passenger vehicle access to land around the Port of Oakland (Jack London Square)- the City of Oakland wants to use this area as a tourist attraction
- Air
 - Peak period congestion, particularly as it relates to the evening cutoff for overnight deliveries
 - Bay crossing alternatives that provide access to both San Francisco International and Oakland International- San Francisco focuses on international shipments whereas Oakland focuses on domestic shipments however, shippers regularly need access to both airports
 - The availability of landside capacity for support facilities constrain growth at San Francisco International

Strategic Investments

The Regional Goods Movement Study allowed for the identification of critical strategies to support regionally significant goods-movement facilities. Also identified are possible funding sources such as local agencies (city and county governments), state and regional agencies (California Transportation Commission), and federal agencies for projects that are of national significance.

Investment strategies are divided up by mode: highway, rail, marine, and air. These strategies are as follows [58]:

- Highway- comprehensive improvements on significant freight corridors, including:
 - Bottleneck capacity improvements
 - Adoption of ITS solutions on particular corridors
 - Correction of design deficiencies at older interchanges
 - Improvements to connecting and parallel arterial streets
 - Industrial preservation land-use strategies
 - Improvements to interregional routes
- Rail
 - Rail grade-crossing safety and rail grade separation improvements through cost-shared funding
 - Alternative modal services- This would provide short-term operating subsidies for short-haul intermodal rail services to provide modal alternatives in congested interregional corridors.
- Marine
 - Provide improvements to freeway interchanges and connecting arterials to provide better access to the Port of Oakland

- The integration of public information technology programs (traveler information and incident management) with private dispatch and appointment systems
- Air
 - Development of a freight ferry system linking airports and major shipper concentrations to improve cross-bay connections

Land Use Assessment

MTC seeks to coordinate its transportation investment and policy decisions with regional land-use policies in order to improve mobility and the quality of life. This will include consideration of the implications of local land-use decisions on regional goods-movement costs, efficiency, and the environment. MTC wants to preserve the supply of land throughout the inner Bay Area for goods-movement uses. Freight businesses need access to reasonably priced land, in reasonable proximity to their customers. The conversion of brownfields to residential, commercial, and mixed-use purposes would drive freight facilities out into the perimeter. This will possibly increase the costs of goods due to increased congestion already being experienced in critical corridors and reduce job diversity options in the inner Bay Area. Smart growth policies encourage infill residential and commercial development, but do not take into account the implications on goods-movement.

Land-use conflicts around trade gateway facilities, such as seaports and airports, should be resolved as they threaten the long-term viability of these gateways. These following principles should be incorporated into regional planning [58]:

- Central location options for goods-movement oriented businesses should be maintained while achieving community benefits through off-site impact mitigation and better business practices.
- Suburban locations should absorb some of the region's growing need for warehouse and regional distribution facilities. These facilities should be

integrated with current land uses and not cause any major modal conflicts.

‘Smart’ suburban development practices should be implemented through new approaches to site layout and street design as well as the consideration of targeted locations for key perimeter goods-movement facilities in “freight villages” to reduce conflicts and provide greater efficiency.

- Achieve a jobs-housing balance through diversity of job opportunities for residents with the widest range of skill levels and training. Particularly, good paying jobs at the low end of the skill range must be preserved and land-use policies and transportation investments should be supportive of this objective.
- As global trade continues to grow, preserving land-uses around gateway facilities is important to ensuring that these facilities remain functional and economically viable. Regional strategies and incentive programs need to be developed so that the preservation of critical supporting land-uses is achieved.

Ongoing Planning

In order to ensure that freight planning is well integrated into regional transportation planning new programs and support to other planning agencies must be implemented.

Program concepts that could achieve this include the following [58]:

- Truck Route Planning
 - Establish standards for the selection and physical features of designated truck routes
 - Develop coordinated city/ county truck route plans that ensure route continuity across jurisdictions
 - Provide priority consideration for projects that improve and maintain truck routes in the regional truck route system
- Rail Grade Crossings

- This plan would prioritize and fund rail grade crossing improvements and grade separations to reduce crossing delays at critical locations, improve safety and improve rail freight operations.
- Travel Demand Model Improvements
 - This plan would make improvements to the demand model to forecast interregional truck trips, and would better represent the congestion impact of large trucks.
- Freight/ Land-use Planning
 - Include goods-movement considerations in smart growth plans and policies.
- Airport/ Seaport Planning
 - Work with all relative agencies to expand the scope of regional seaport and airport plans to include land uses in key locations likely to be needed to support seaport and air cargo facilities.

A.13 Seattle, WA

MPO Overview

The Puget Sound Regional Council (PSRC) is the metropolitan planning organization for the Seattle, WA metropolitan area. Local governments include the counties of King, Pierce, Snohomish, and Kitsap as well as 82 cities and towns. PSRC is responsible for the transportation and land-use planning for the nearly 3.6 million residents of the Seattle metropolitan area. A regional planning council for Seattle existed as far back as 1956, but was formally designated the MPO in 1973 in adherence to the Federal Aid Highway Act.

Freight Study

PSRC addresses issues of freight in their region through the FAST Corridor program, a public-private partnership established to move needed goods and support port operations on the highways and rail lines that sustain the maritime international trade corridor through the Puget Sound region [32]. In this program the region's ports, Tacoma, Seattle, and Everett, act as the anchors and highway and rail facilitates the movement of goods into and out of the region. FAST Corridor projects accommodate through-movements to inland markets, serve the freight needs of Washington's producers and suppliers, and distribute freight and goods locally.

Vision & Goals

The vision of FAST is to integrate local and regional transportation system improvements along mainline rail lines and truck corridors near ports in the central Puget Sound region [32]. These projects move international maritime and domestic trade, while supporting Puget Sound's economy and locally mitigating the impact of freight that benefits other parts of the country. The FAST Corridor's goals are to [32]:

- Improve the functionality, capacity and connectivity of the mainline rail system.

- Eliminate chokepoints where railroad and arterial networks intersect.
- Provide safe rail crossings and reliable emergency access for local communities.
- Establish reliable truck links between ports, railroad intermodal yards and regional distribution centers.

Economic Analysis

As trans-Pacific trade continues to grow, communities along the FAST Corridor will do likewise. Maritime trade accounts for approximately 30,000 direct, indirect and induced jobs and about \$1.8 billion in personal income. Puget Sound ports serve a national market with between 65%-75% of containers being transferred to inland markets beyond Washington State. Total maritime trade in Washington State in 2004 was \$12 billion in exports and nearly \$60 billion in imports.

Project Selection Process [32]

1. Establish public-private “communication hub” (regional partnership for freight issues).
2. Identify projects that bundle freight modes and have a short action horizon.
3. Develop consistent corridor criteria, combine with other project criteria, and jointly screen and rank projects.
4. Add port access.
5. Sequence projects.
6. Concurrently support freight projects that are a part of other programs.

A.14 Tampa, FL

MPO Overview

The Hillsborough County MPO is the state designated planning organization for the Tampa, FL metropolitan area. It is important to note that St. Petersburg, FL is not under the jurisdiction of this MPO. Local governments represented by Hillsborough County MPO include Hillsborough County, the City of Tampa, and the City of Plant City. The region has nearly 1.2 million residents and expects to add about 400,000 more through the year 2020. Freight is very important to the region not only because of the number of interstate highways bisecting the region, but the Port of Tampa as well. A freight study for the region was conducted and incorporated into the regional transportation plan [27].

Freight Study

Purpose

The Tampa Bay Regional Goods Movement Study was undertaken for the following reasons as stated in the study [27]:

- The Federal Transportation Act for the 21st Century (TEA-21) requires consideration of freight mobility in our planning processes.
- Florida's governor is strongly emphasizing the need to provide for efficient freight mobility in order to promote Florida's economic prosperity.
- The Florida Department of Transportation (FDOT) recognizes freight mobility considerations as one of the primary criteria in defining and improving the Strategic Intermodal System (SIS), the state's core transportation network.
- Local governments are experiencing increasing volumes of trucks on their roadways as the area's economy grows and must balance the needs of goods movement against the needs of passenger travel and neighborhoods.

Purpose: To provide a framework for integrating freight mobility considerations into the regional and local planning processes. This framework includes the processes, information, and tools that decision-makers and planners will need for effectively addressing freight mobility issues.

Objectives

The stated objectives of the Tampa Bay Regional Goods Movement Study are to [27]:

- Identify the regional freight delivery system and its components,
- Identify and measure the importance of goods movement to the local and regional economy,
- Identify freight operational and capacity issues, and
- Identify emerging freight needs and development opportunities.

Comprehensive Picture of Freight

This section explores what is happening with freight at the national, state, and regional levels.

- National freight policy and potential changes
- State freight planning activities and economic development

Economic Considerations

This section discusses the positive benefits of freight to the regional economy and its ability to provide jobs and development.

- The economic value of freight mobility
 - Tampa's opportunity to take advantage of Central and South American trade
 - Business leaders stress the importance of an adequate freight system
 - Regional freight related employment

Modal Assets

This section looks into all the different modes a part of the freight transportation system and explains different operating characteristics, commodities associated with each mode, and needs and opportunities for market growth.

- Commodity flows by mode (truck, rail, air, and water) are presented
- Distinctive operating characteristics, needs and opportunities for market growth
- Commodities determine the mode of transport

Barriers Toward Efficiency

This section identifies existing physical, operational, institutional, financial and political barriers preventing efficient freight movement. Industry is evolving to meet these needs and challenges.

- Barriers exist that impede the efficient movement of freight.
 - Physical – Structures that contribute to congestion by physically blocking the roadway, causing queues that slow traffic, or reduce access to activity centers.
 - Operational – Barriers related to the functioning of the freight movement system that makes it difficult for trucks to operate (improperly timed signals, height and weight restrictions, and lack of loading zones).
 - Institutional – Differences between the timeframes and operating practices of public agencies versus private sector companies. Also, information is aggregated at the state and national levels, often times rendering it useless to local and regional planning.
 - Financial – It is difficult to get public funds for goods movement projects because of a lack of resources, ignorance of its importance, and the nonexistence of targeted federal funds.
 - Political/ Public Opinion – Generally related to the “Not In My Backyard” (NIMBY) and “Find Any Reason to Reject” (FARR) syndromes.

- Technology is changing how the industry works.
- Container improvements allow for the transportation of larger loads.
- Access is still the biggest challenge.

Regional Freight Opportunities

Regional opportunities to promote and enhance freight within the region are identified. This includes already established freight activity centers and mobility corridors. The concept of the freight village is explored and its opportunities in the region.

- Freight activity centers directly benefit the region's economy.
- Freight mobility corridors promote efficient goods movement and reduce impacts to neighborhoods.
- Freight villages provide an opportunity to concentrate freight activities to create a more efficient network.

Comprehensive Local and Regional Freight Planning

This section identifies ways for local and regional planning agencies to incorporate freight needs into long-term planning activities. The transportation planning process must consider growing freight needs to support economic growth.

- The benefits of incorporating freight into the long-term planning process.
- A freight planning model is proposed that corresponds to existing planning structure for other modes as shown in Figure A.8 and A.9 [27].
- Maintain a healthy freight delivery system through freight system performance.
- Four elements of an effective Goods Movement Management System (GMMS)
 1. Establish a goods movement advisory committee.
 2. Communicate with decision-makers.
 3. Create a goods movement database.

- Implement a freight project planning and programming process.

FIGURE 7-2
FREIGHT PROJECT PLANNING PROCESS

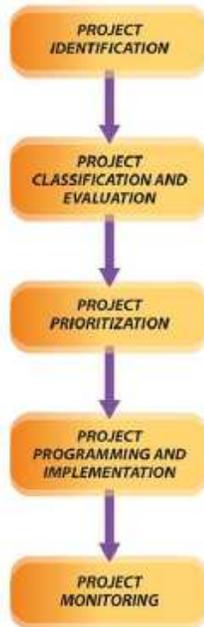


Figure A.8 Tampa Freight Study project planning process.

FIGURE 7-1
PROPOSED STRUCTURE FOR INTEGRATING FREIGHT CONSIDERATIONS
IN TAMPA BAY'S REGIONAL PLANNING PROCESS

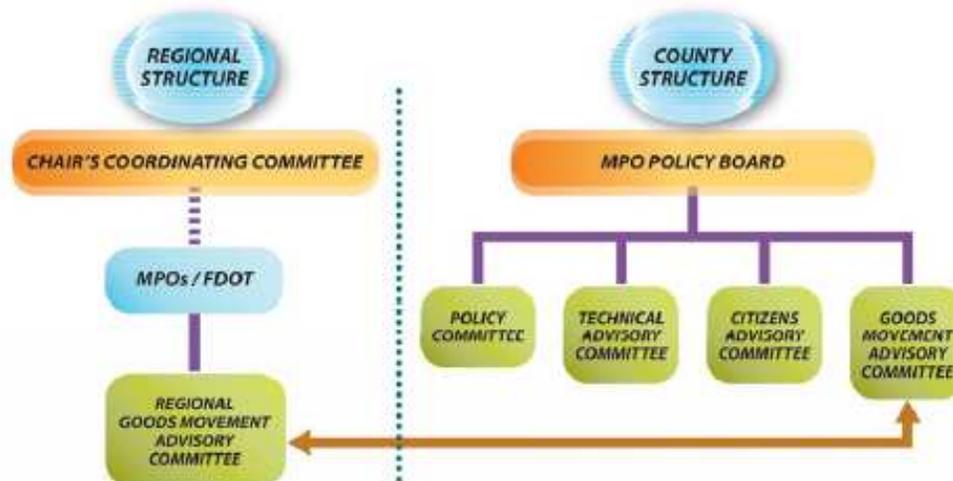


Figure A.9 Proposed structure for integrating freight considerations into Tampa Bay's regional planning process.

Study Summary and Recommendations

This section summarizes the study and provides recommendations for improving the freight mobility network.

- A review of key study themes and findings is provided.
- A listing of recommendations for improved freight mobility is presented.

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