

Using Performance Measures for Project Prioritization

Authors:

Erik Cempel, Cambridge Systematics

Tom Murtha, Chicago Metropolitan Agency for Planning

c/o

Cambridge Systematics
115 S. LaSalle St., Suite 2200
Chicago, IL 60603
Phone: (312) 665-0236
Fax: (312) 346-9908

Chicago Metropolitan Agency for Planning (CMAP)
233 S. Wacker Dr., Suite 800
Chicago IL 60606
Phone: (312) 386-8790

Using Performance Measures for Project Prioritization

Abstract

Congressional reauthorization of transportation legislation is likely to stipulate the use of performance measurement in transportation planning; this legislation will affect both states and MPOs. In preparation, AASHTO and FHWA have developed frameworks including goal areas as a means of categorizing the measures. The CMAP Regional Freight Planning Recommendations Study utilized a performance-based approach to prioritizing projects and needs consistent with both the ongoing GOTO2040 Plan as well as the anticipated Federal approach. First, a thorough review of freight performance measures in use throughout the world was conducted to create a list of commonly used measures. Ultimately, 11 measures, including all freight transportation-related CMAP GOTO2040 Regional Indicators, were selected based on their ability to measure accessibility, economic development, mobility, and safety and based on the availability of data and tools. These measures were first used to identify “hot spots” in the existing system; corridor or area-wide projects that would improve performance in those locations were identified. These potential projects were combined with freight-related projects from the RTP, TIP, and stakeholder outreach. Where possible, similar and complementary projects were grouped into “packages”; these were evaluated against other packages of similar type and mode, and ranked relatively to each other. A score was assigned to each package for each measure, and an average score tabulated; if the package benefited more than one mode, the average score was increased. All projects were checked against stakeholder input, engineering and local knowledge to provide a “reality-check” for the scores. The highest-scoring packages were short-listed for further consideration in the planning process.

1.0 Overview

The Chicago Metropolitan Agency for Planning (CMAP) is developing *GO TO 2040*, a regional comprehensive plan with a horizon year of 2040 that will guide growth in Cook, DuPage, Kane, Kendall, Lake, McHenry, and Will Counties. In addition to land use and transportation, *GO TO 2040* also addresses the full range of quality-of-life issues, including the natural environment, economic development, housing, and human services. *GO TO 2040* is expected to be adopted in October, 2010.

Regional freight system planning occupies a unique nexus of economic development, transportation system development, transportation operations, and land use planning. As the *GO TO 2040* process commenced, stakeholders understood that freight system improvements were important for regional development. However, stakeholders were unable to articulate regional freight planning priorities, aside from the ongoing Chicago Region Environmental and Transportation Efficiency (CREATE) Program.

In order to articulate a *GO TO 2040* regional freight system planning program proposal and to estimate the potential impact of such a program, CMAP and Cambridge Systematics undertook a comprehensive, high-level study of Chicago area freight transportation. As of this writing, the project has led to a series of policy recommendations presented to the Board of CMAP, to be included in the *GO TO 2040* plan.¹ Some, but not all, of the capital improvements recommended in this process are being carried forward as major capital recommendations in the *GO TO 2040* draft plan now being developed.

1.1 Project Scope

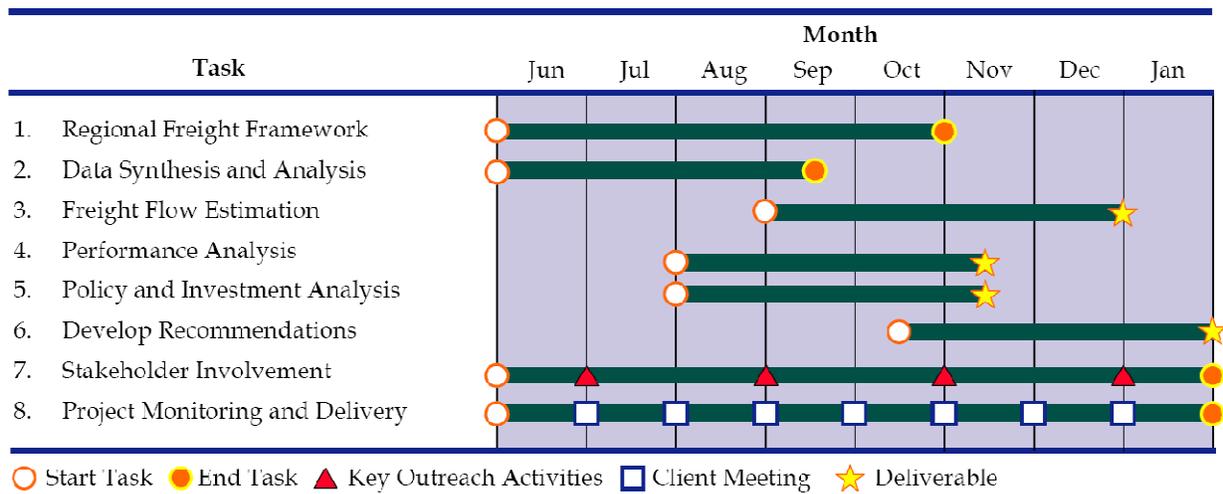
The Regional Freight System Planning Recommendations Project prepared recommendations related to both policies and projects. Evaluation procedures included data synthesis, freight flow estimation, performance analysis, policy analysis, and investment analysis. The project also included stakeholder involvement, including stakeholder reviews of project and policy recommendations.

The initial schedule called for a seven-month project development timeframe (see Figure 1). The key parts of the project, leading up to policy and project recommendations, were conducted in a very short time frame. Since draft documents for *GO TO 2040* were scheduled for preparation in early 2010, it was important that key recommendations be understood by January 2010.²

¹ *GO TO 2040* Policy Briefing: Freight. March 3, 2010. Posted at <http://www.cmap.illinois.gov/WorkArea/DownloadAsset.aspx?id=19022>. Accessed May, 2010.

² While this goal was met, and the project is over 90% complete, a final economic evaluation needs to be completed.

Figure 1. Freight Planning Recommendations Schedule



Source: Cambridge Systematics

1.2 Performance Measures and the Regional Freight Planning Framework

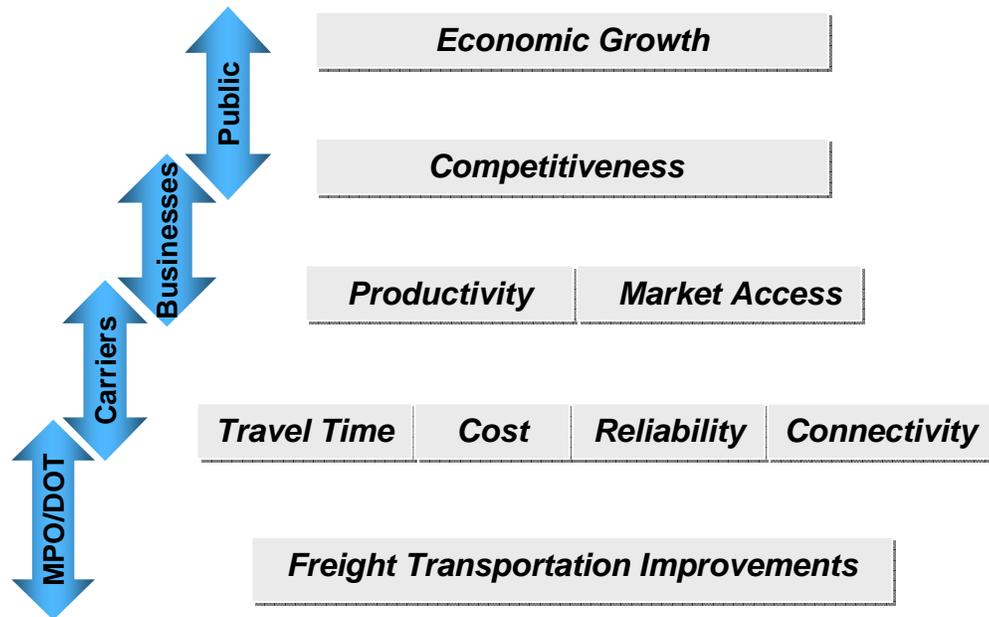
As part of the project, the project consultants engaged regional stakeholders to develop a Freight Planning Framework to respond to current needs and create guiding principles for future development. The Framework addressed such issues as:

- Roles of freight services in meeting the transportation needs of businesses and communities;
- Local government interests in freight, and options for public participation in freight through actions such as direct investment, financial incentives, regulation, planning, and advocacy;
- Linkages between government actions on freight and the region’s environmental, energy, development, land use, social, and fiscal goals;
- Expected benefits, costs, and risks to rail transportation stakeholders;
- Key performance measures; and
- Procedures for updating recommendations as the Chicago region’s freight transportation system evolves.

Importantly, the Framework recognizes the linkage between investment in the system and future economic outcomes, as illustrated in Figure 2.

For this paper, it is important to note that performance measures gauge the strength of the linkages in Figure 2. The performance measures are particularly important for relating projects impacting freight transportation to changes in travel time, travel cost, freight system reliability, and system connectivity.

Figure 2. Linking Freight Improvements to Economic Growth



Source: Cambridge Systematics

2.0 Performance Measure Development

In August 2009, prior to identifying recommendations and concurrently with stakeholder outreach and data acquisition, the project consultants set about developing system performance measures for use in the project. First, a set of “goal areas” were developed as a means of categorizing the measures, ensuring that all areas of importance to all stakeholders are addressed. Goal areas had been suggested by AASHTO and separately by FHWA to be included as part of a national performance measurement framework.³ The consultant team’s suggested goal areas included:

- System Preservation – condition of existing infrastructure, e.g., pavement and bridges, relative to a state of good repair;
- Mobility – the operating characteristics of the system and existing or potential demand on the system;
- Connectivity/accessibility – population and businesses served by existing or expanded freight system and the impact of investments on the larger multimodal transportation network;
- Safety – ability of freight system investments to enhance safety (reduced crashes, injuries, and fatalities) and security;
- Environment and community – Impact of investments on the natural and built environments, overall quality of life, and consistency with community land use plans; and

³ For examples of how these are being applied at the national level, see <http://www.transportation.org/sites/aashto/docs/Kane-2010-04-12.pdf> or http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_551.pdf (Volume II, beginning on the 121st page).

- Economic growth – estimated cost, revenue generating potential, and economic benefits resulting from investments in the freight system.

Through a literature review, performance measures that address each of these areas were investigated, including measures suggested through ongoing CMAP studies (Table 1). Further measures were developed to address specific problem areas identified through stakeholder outreach.

Table 1. Performance Measures from CMAP Sources

Performance Measure	Goal Areas	Source
Gross Regional Product	Economic Growth	CMAP Regional Indicators Project
Value of goods exported annually vs. value of goods imported	Economic Growth	CMAP Regional Indicators Project
Vehicle-miles of delay for at-grade crossings/length of time for traffic to recover	Mobility	CMAP Regional Indicators Project / Congestion Management
Vehicle classification by time of day; percent of trucks off-peak	Mobility	CMAP Regional Indicators Project / Congestion Management
Condition rating for National Highway System Intermodal Connectors	System Preservation, Connectivity	CMAP Regional Indicators Project / Congestion Management
Planning time index (ratio of the total time needed to ensure 95% on-time arrival as compared to free-flow travel time)	Mobility	CMAP Regional Indicators Project / Congestion Management
Congested hours (average number of hours per day during which at least 20% of vehicle miles traveled on the highway network or corridor are operating at less than 50 mph.)	Mobility	CMAP Regional Indicators Project / Congestion Management
Rail system travel time averages and variations across the region for intermodal containers;	Mobility	CMAP Regional Indicators Project / Congestion Management
Peak and off-peak travel times for trucks in freight-significant corridors	Mobility	CMAP Regional Indicators Project / Congestion Management
Travel time index (ratio of the average peak-period travel time to the free-flow travel time for a selected highway or network)	Mobility	CMAP Regional Indicators Project / Congestion Management

From this universe of measures, a short-list was created by selecting measures which could be evaluated either quantitatively with data or qualitatively, and that were capable of both describing the existing

freight transportation system and evaluating the relative effectiveness of potential policy and infrastructure strategies. A diverse set of measures addressing all of these needs was desired; measures that were useful from multiple perspectives were desired. The actual evaluation of the potential performance measures is included as Appendix A; based on this evaluation, the following performance measures were carried forward for the evaluation of project bundles and projects:

- Accessibility:
 - Intermodal Facilities with National Highway System roadway or rail access
 - Major generators near Interstate highways, four-lane highways, or intermodal terminal
- Economic Development:
 - Gross regional product
 - Value of goods exported less goods imported
- Mobility:
 - Congested hours
 - Planning Time Index
 - Travel time averages and variations
 - Travel time index
 - Vehicle classification by time of day; % of trucks off-peak
 - Vehicle-minutes of delay for at-grade crossings
- Safety:
 - Exposure factor of heavy-vehicle ADT and the number of daily trains for at-grade rail crossings

The gross regional product evaluation was, however, dropped because it was unavailable at the time of project evaluations.

For the evaluation measures above, the data were available for evaluation geographically, enabling geographically-defined project bundles to be evaluated in their geographic context. However, it was not possible to evaluate policy proposals using these geographic measures, so alternative evaluation measures needed to be used for policy evaluation. These measures were necessarily subjective, but showed the relative types of effects of various policy options. The performance measures for policy analysis follow:

- Accessibility:
 - Average length of haul by carrier type
 - Modal options for goods movement
- Economic Development:
 - Gross Regional Product
- Environmental and Community Impacts:
 - Ton-miles per emissions output
 - Quality of Life
- Mobility:
 - Freight mobility
 - System mobility
- Safety:
 - Reduction of Crash Rates

3.0 Policy and Project Identification and Bundling

To identify potential projects and policies for evaluation, consultants and CMAP staff combed through the existing 2030 Regional Transportation Plan and FY 2007-12 Transportation Improvement Program, on-going project studies, various technical evaluations of freight data, and a specific public involvement effort that included outreach to local communities and freight industry stakeholders. A total of approximately 150 freight capital projects and 50 potential freight policies were identified. An evaluation of such a large number of projects was seen as unwieldy, and probably not useful. Therefore, to the extent practical, like projects and policies were bundled together for evaluation together.

Capital projects were bundled for evaluation by general functionality within a geographic area. For example, “O’Hare Access” was a bundle of projects consisting of seven distinct improvements to improve truck access in the area of Chicago O’Hare International Airport, including additional capacity on existing highways, new highways, truck access to airport cargo areas, and truck parking facilities. Similarly, the I-355/North Will County East-West bundle included the Caton-Bruce strategic regional arterial (including a new bridge over the Des Plaines River near Lockport) and additional lanes on Cedar Road, 143rd Street, I 7, and US 45, a bundle designed to link freight-intensive areas of northern Will and southern Cook Counties. Altogether, 47 highway projects were included in eleven bundles. Fourteen additional highway projects were evaluated separately. The remainder of the projects were not bundled together for evaluation, but were grouped by the type of project, including rail capacity projects, rail access improvements, rail/highway grade separations, grade crossing improvements, projects to increase rail utilization, viaduct improvements, and other modes (aviation and water).

Like projects, policies were bundled where appropriate. In particular, projects to improve truck mobility were bundled. Other policies using similar means to the same end were also grouped together. Initially, it was anticipated that capital projects of various types and policies could be bundled together and evaluated as a bundle. However, it was determined that such an evaluation would not be meaningful, and the results would be misinterpreted. Thus, projects with like evaluation measures were bundled together, while related projects with different performance measures were evaluated separately.

In retrospect, the bundling worked well to the extent that the planning project was high-level and conceptual. However, since there were specific projects identified for improvement, and since these were identified for later travel demand modeling, staff and consultants needed to confer frequently about the details of the bundles and, indeed, the project definitions for stand-alone projects. Further scrutiny as the bundles were later coded resulted in questions about the bundle elements, and their redefinition. For example,, as noted above, the improvements to 143rd Street were an initial element of the I-355/North Will County East-West bundle. However, additional scrutiny didn’t support a freight justification for such a project, given low truck volumes and limited truck utility, even with a new Caton-Bruce bridge over the Des Plaines River, and the 143rd Street project was not considered further. Similar scrutiny, sifting, and winnowing of projects and policies continued throughout the project.

4.0 Performance Evaluation Methodology

4.1 Overview

The overall purpose of the performance evaluation was to develop a relative ranking of each project and project bundle within each project category, and then group the projects into three tiers of projects. The first step in this process involved evaluating each measure individually for each project, including projects within a bundle. For a particular measure, the performance results were compared across a single project category and assigned a relative value on a five-point scale, ranging from “little or no relationship” (i.e., a value of 1) between the project and measure to “very strong relationship” (i.e., a value of 5). Individual project scores for each measure within a bundle were rolled up into a single score per measure.

Not all evaluation measures could be applied to every type of project. For example, selected measures of mobility could not be applied to capacity projects; the travel time index is not applicable to rail projects. Thus, measures were applied where appropriate for capital projects.

For each project and bundle, scores were added together across measures and divided by the number of applicable measures to get an average score. Additional points were added to the average score if the project addressed multiple modes and if the project was identified as critical by stakeholders (see Section 3 on stakeholder outreach above). Projects and project bundles were ranked relative to each other within each project category according to these average scores, allowing the grouping of the projects and bundles into three tiers. Projects from the highest tier were developed into a project short-list; projects from the second tier were considered for the short-list, with some higher-scoring projects within the tier added to the short-list after CMAP and stakeholder input.

Ultimately, all individual performance measure scores for each project, total average scores, and relative rankings were reviewed using engineering judgment, local knowledge, and experience from previous studies by the consultant team, CMAP, and the CMAP Freight Committee.

4.2 Data Sources and Calculations

Within the timeframe of the study, it was necessary to use available data without additional data collection or creation and implementation of complex models. Data for the evaluation was primarily from CMAP, supplemented by other national, state, and local data sources.

The level of detail varied for the available data from measure to measure. Some allowed for detailed calculation and analysis using GIS, with values being grouped in five tiers within a particular project category for relative ranking on the five-point scale.

For example, for the “intermodal facilities with NHS roadway/rail access” performance measure, analysts graded potential improvements by developing a series of spatial buffers surrounding facilities. Data considered in this evaluation included spatial proximity of projects to intermodal facility clusters, access to high-volume intermodal sites, and the traffic volumes or rail density around intermodal centers, among other data. To determine the relationship between infrastructure and major freight generators (for the measure “major generators near interstate, four-lane highway, or intermodal facility”), sales and employment figures for any business generating freight traffic were examined. Hot

spot clusters were developed using both sales figures and the numbers of employees as weights in the analysis. From these clusters, GIS analysts created spatial buffers to ascertain the grades for infrastructure improvements. For “value of goods exported annually vs. value of goods imported”, a proxy was developed by assuming that improving access to major industrial areas, as well as areas slated for potential industrial development, would ultimately improve this measure. Therefore, clusters and buffers around manufacturing business, industrial land use areas, and industrial and enterprise zones were created and projects within the greatest densities of clusters were given the highest scores.

In other cases, with limited data to evaluate a measure, the general conditions in corridors with proposed projects were evaluated. Projects that would improve a given measure that were geographically located within corridors exhibiting the worst performance for a particular measure were scored highly; projects in corridors generally exhibiting good performance already were given lower scores. For example, peak period travel time index (TTI) data were available for the region, but not on every roadway. A roadway expansion project in a corridor in which most facilities were operating under highly congested conditions according to the TTI was assigned a high score. A similar level of analysis was performed for “vehicle classification by time of day/percent trucks off-peak”.

Projects that did not address a particular measure were not evaluated, as stated above.

5.0 Performance Evaluation Results

Table 2 provides the results of the performance evaluation. Projects and project bundles are in the first column of the table. Performance measures by goal area are listed across the top on the left half of the table; the sectors to which each project applies and the source of the project are listed on the right. For the performance evaluation, an empty circle indicates “little or no relationship” of a project to a measure, and a completely filled circle indicates a “very strong relationship.”

This table presents an initial shortlist of projects: these projects and bundles represent the highest tier from the performance evaluation and those higher scoring projects from the second tier that were deemed critical for inclusion in the short-list. Overall, these projects and bundles constitute about half the projects evaluated. As projects within each category were evaluated against other projects within the same category, a relatively even percentage of projects from each category made the cut.

6.0 Conclusion: Freight Performance Measures in a Broad Regional Planning Context

Among the projects evaluated within the freight system context above, several were included in one form or another in the draft CMAP *GO TO 2040* fiscally constrained major capital recommendations.⁴ Highlights of such projects include:

- Major capital elements of the O’Hare Access bundle (including the O’Hare Bypass, I-190/Mannheim Road improvements, and the Elgin-O’Hare Expressway).
- The Illiana Expressway (Phase-I engineering).
- I-80 improvements (partial)

⁴ <http://www.goto2040.org/scenarios/capital/main/>. Accessed May, 2010.

- I-290 additional lanes (endorsed a multi-modal corridor in support of on-going project study)
- I-55 improvements, I-90/94 to Weber Road (endorsed managed lane concept)
- I-90 additional lanes, I-39 to I-294 (endorsed managed lane concept)

Further, the CREATE Program is included in the plan as a recommended project within the “strategic improvements” category. Proposed truckways, truck parking, additional rail system improvements, and other strategic freight improvements have similarly been addressed in the draft *GO TO 2040* plan recommendation to “Create a more efficient freight network.”⁵

Inevitably, several freight system major capital recommendations were not included in the *GO TO 2040* major capital recommendations. There is simply not enough funding to address all of the needed improvements in the transportation system. However, with one exception (additional lanes on I-55 south from I-80 to Coal City Road), such projects left unaddressed tended to have lower performance rankings than the freight recommendations included in the constrained *GO TO 2040* capital list. The high correlation between freight performance measure rankings and *GO TO 2040* major capital recommendations provides some validation for each evaluation mechanism.

Though, in the end, the freight performance measures were not decisive in major capital recommendations, the freight performance measures have been validated by the broader decision-making process. Further, it became understood through this process that such measures provide unique insight to goods movement issues. Finally, the applicability of these measures to projects and bundles of projects at scales not reaching those of major capital projects lends credence to future efforts to apply such measures to short-run multi-modal program project selection.

In conclusion, freight-focused performance measures implemented at a regional level can be valuable tools, among others, in evaluating potential freight system improvements on transportation systems. The particular measures implemented by Cambridge Systematics in their work developing *Regional Freight System Planning Recommendations* for the Chicago Metropolitan Agency for Planning could be developed and implemented in a short time frame, providing useful information on a wide variety of projects and bundles of projects. The process outlined above will serve as a touchstone for future freight system performance measure development in the region. The information will be useful for future refinements to the *GO TO 2040* capital project recommendations and project programming activities, as well as the implementation phase of *GO TO 2040*, commencing in October, 2010.

⁵ Forthcoming, June 2010.

Table 2. CMAP Project Performance Ranking

Projects/Project Bundles	Accessibility		Economic Development		Mobility					Mobility; Safety	Sectors					Project Source				
	Intermodal Facilities with NHS Roadway, Rail Access	Major Generators Near Interstate, Four-Lane Highway or Intermodal Facility	GRP ^{a, b}	Value of Goods Exported Annually versus Value of Goods Imported ^a	Average Number of Hours with 20% of VMT Congested ^a	Planning Time Index: "Worst" Time as Compared to Free-Flow Travel Time ^a	Travel Time Averages and Variations ^a	Travel Time Index	Vehicle Classification by Time of Day; Percent Trucks Off-Peak ^a	Vehicle-Miles of Delay for at-Grade Crossings ^a	Exposure (Truck AADT and Daily Trains) Factor for Rail Crossings	Intermodal Connector	Aviation	Trucking	Water	Rail	Stakeholder Outreach	Data Analysis	CMAP 2030 RTP	CMAP 2030 TIP
O'Hare Access	●	●		●	●	○	●	●	●											
Elgin-O'Hare - add lanes												A	T					X		
I-90/Mannheim Road add lanes, O'Hare Landside Improvements												A	T					X		
Dedicated truckway around O'Hare (Mannheim Road)												A	T			X				
Elgin-O'Hare - West Extension												A	T							X
Elgin-O'Hare East Extension, O'Hare Bypass												A	T			X		X		
O'Hare New North Cargo Area												A	T			X				
O'Hare Truck Parking												A	T			X				
South Will County East-West	●	●		●	●	○	●	●	●											
Illiana Expressway I-65 to I-55												A	T			X				
Manhattan Road add lanes from Baseline Road to IL 53											X		T							X
U.S. 30 add lanes, Williams Street to IL 43												A	T							X
Wilmington-Peotone Road improvements, IL 53 to I-57												A	T			X				
Laraway Road from U.S. 52 to IL 43													T		R	X				X
Arsenal Road interchange relocation											X		T							X
Joliet North-South Access	●	●		●	●	○	●	●	●											
I-55 widening, I-80 to Coal City Road											X		T							X
Weber Road improvements, Rodeo Road to Romeo Road													T			X				
I-355/North Will County East-West	○	○		●	●	○	●	●	●											
I-80 add lanes, US 45 to Grundy County line													T			X				X
Caton Farm Road - Bruce Road Corridor Improvements													T							X
Cedar Road improvements, IL 7 to US 52													T			X				
IL 7 add lanes, I-355 to U.S. 45													T							X
U.S. 45 add lanes, 143 rd Street to 183 rd Street													T							X
I-290 Bottleneck	●	●		●	●	○	●	●	●											
I-290 add lanes from Street Charles Road to IL 50											X		T							X
I-294/I-290 interchange improvements													T			X				

○ Little or No Relationship ● Some Relationship ● Moderate Relationship ● Strong Relationship ● Very Strong Relationship

^a Measures from CMAP GoTo 2040.

^b Measure will be evaluated during economic analysis.

Table 2. CMAP Project Performance Ranking (continued)

Projects/Project Bundles	Accessibility		Economic Development		Mobility						Mobility; Safety	Sectors					Project Source			
	Intermodal Facilities with NHS Roadway, Rail Access	Major Generators Near Interstate, Four-Lane Highway or Intermodal Facility	GRP ^{a, b}	Value of Goods Exported Annually versus Value of Goods Imported ^a	Average Number of Hours with 20% of VMT Congested ^a	Planning Time Index: "Worst" Time as Compared to Free-Flow Travel Time ^a	Travel Time Averages and Variations ^a	Travel Time Index	Vehicle Classification by Time of Day; Percent Trucks Off-Peak ^a	Vehicle-Miles of Delay for at-Grade Crossings ^a	Exposure (Truck AADT and Daily Trains) Factor for Rail Crossings	Intermodal Connector	Aviation	Trucking	Water	Rail	Stakeholder Outreach	Data Analysis	CMAP 2030 RTP	CMAP 2030 TIP
Southern Access	●	○		●	●	○	●	●	●											
IL 394 improvements, I-80/94 to IL 1, conversion to limited access												A	T		R	X		X		
I-57 improvement, I-80 to Wilmington-Peotone Road												A	T			X		X		
IL 43 from US30 to Steger Road													T						X	
Other Individual Highway Projects																				
I-55 improvements, I-90/94 to Weber Road	●	●		●	●	●	●	●	●		X		T	W	R	X	X			
IL 59 add lanes, I-88 to New York Street	○	●		●	●	○	●	●	●				T			X	X		X	
I-90 additional lanes, I-39 to I-294	●	●		●	●	○	●	○	●		X	A	T					X		
MidCity Freightway	●	●		○	●	●	●	●	●		X		T			X				
I-90/I-190 Kennedy Expressway - WB Truck Capacity	●	●		●	●	●	●	●	●			A	T				X			
Central Avenue connector across Clearing Yard, 63 rd -79 th	●	●		●	●	●	●	●	●		X		T						X	
Rail Capacity Projects																				
CREATE Program	●	●		●					●	●	X		T		R	X				
BNSF Chillicothe Subdivision - Joliet Arsenal to Nerska	●	○		○											R		X			
BRC - 59 th Street Subdivision from Bedford Yard to Kenton Line	●	○		○											R		X			
BRC - Kenton Line from 59 th Street Subdivision to Hawthorne	●	○		○											R		X			
CSXT Barr Subdivision - Blue Island to Indiana border (segments)	●	○		○											R		X			
CSXT Blue Island Subdivision - Blue Island to Forest Hill Yard	●	○		○											R		X			
UP Geneva Subdivision - A-2 to Wheaton	●	○		○											R		X			
UP Milwaukee Subdivision - West side of O'Hare	●	○		○								A			R		X			
Improve at-Grade Rail Crossing																				
119 th Street (Intermodal Connector)-CN Joliet Subdivision crossing	●	○		○					●	●	X		T		R		X			
25 th Avenue/Rose Street-CP Elgin Subdivision crossing	○	○		○					●	●	X	A	T		R		X			
Cass Avenue - BNSF Chicago Subdivision crossing	○	○		○					●	●					R		X			
Crawford Avenue-CTA Yellow Line	○	○		○					●	●			T		R		X			
Des Plaines River Road-CP Elgin Subdivision crossing	○	○		○					●	●		A	T		R		X			
Fairview Avenue-BNSF Chicago Subdivision crossing	○	○		○					●	●					R		X			

○ Little or No Relationship ● Some Relationship ● Moderate Relationship ● Strong Relationship ● Very Strong Relationship

^a Measures from CMAP GoTo 2040.

^b Measure will be evaluated during economic analysis.

Table 2. CMAP Project Performance Ranking (continued)

Projects/Project Bundles	Accessibility		Economic Development		Mobility						Mobility; Safety	Sectors					Project Source			
	Intermodal Facilities with NHS Roadway, Rail Access	Major Generators Near Interstate, Four-Lane Highway or Intermodal Facility	GRP ^{a, b}	Value of Goods Exported Annually versus Value of Goods Imported ^a	Average Number of Hours with 20% of VMT Congested ^a	Planning Time Index: "Worst" Time as Compared to Free-Flow Travel Time ^a	Travel Time Averages and Variations ^a	Travel Time Index	Vehicle Classification by Time of Day; Percent Trucks Off-Peak ^a	Vehicle-Miles of Delay for at-Grade Crossings ^a	Exposure (Truck AADT and Daily Trains) Factor for Rail Crossings	Intermodal Connector	Aviation	Trucking	Water	Rail	Stakeholder Outreach	Data Analysis	CMAP 2030 RTP	CMAP 2030 TIP
Improve at-Grade Rail Crossing (continued)																				
Gilbert Avenue-BNSF Chicago Subdivision crossing	○	○		○					●	●	X		T		R		X			
IL 171-CP Elgin Subdivision crossing	○	○		○					●	●			T		R		X			
IL 43-CP Elgin Subdivision crossing	○	○		○					●	●			T		R		X			
IL 50-CTA Pink Line	◐	○		○					●	●	X	A	T				X			
IL 68 - CPRS C&M Subdivision crossing	○	○		○					●	●			T		R		X			
Main Street (Downers Grove)-BNSF Chicago Subdivision	○	○		○					●	●					R		X			
Oakton Street-CTA Yellow Line	○	○		○					●	●			T				X			
Roselle Road-CP Elgin Subdivision crossing	○	○		○					●	●			T		R		X			
Touhy Avenue - CPRS C&M Subdivision crossing	○	○		○					●	●			T		R		X			
U.S. 12 (LaGrange) - BNSF Chicago Subdivision crossing	○	○		○					●	●			T		R		X			
U.S. 12 (95 th St.) - CN Joliet Subdivision crossing	○	○		○					●	●			T		R		X			
U.S. 14 (Dempster)- CPRS C&M Subdivision crossing	○	○		○					●	●			T		R		X			
Vermont Street-CN Joliet Subdivision crossing	○	○		○					●	●	X		T		R		X			
Wolf Road-CN Joliet Subdivision crossing	○	○		○					●	●			T		R		X			
York Road-CP Elgin Subdivision crossing	○	◐		○					●	●		A	T		R		X			
Increase Utilization																				
CN Elsdon Subdivision	●	○		●											R		X			
CN Freeport Subdivision	●	○		●											R		X			
Viaduct Improvements																				
79 th St. at CSXT Blue Island Subdivision (Near Oakley)	◐	○		●			◐				X		T		R					
Cermak Rd. at CN Freeport Subdivision (Near Archer)	◐	○		●			◐						T	W	R					
Irving Park Rd. at UP Harvard (near I-90/94)	○	○		◐			●						T		R					
Western Ave. at BNSF Chillicothe/CN Freeport (near 32 nd St.)	◐	○		●			◐				X		T	W	R					
Other Modes																				
New port facility near Logistics Park Chicago	●	●		○										W	R	X				

○ Little or No Relationship ◐ Some Relationship ◑ Moderate Relationship ◒ Strong Relationship ● Very Strong Relationship

^a Measures from CMAP GoTo 2040.

^b Measure will be evaluated during economic analysis.

Appendix A. Evaluation of Potential Performance Measures

Performance Measure	Goal Areas	Useful for				Policy Areas					
		Government	Carrier	Other Businesses	Public	Economy	Ind. Log. Patterns	Freight Infra.	Commodity/Veh. Flows	Org./ Pub. Policy ^b	Env./ Comm.
Arterial road network accessible to legal freight vehicles	Accessibility	●	●	◐	◐	○	○	●	●		◐
Intermodal facilities with NHS roadway, rail access	Accessibility	●	●	◐	◐	◐	○	●	◐		◐
Major generators within X miles or minutes of interstate, four-lane highway, or intermodal facility	Accessibility	●	●	●	◐	◐	●	●	◐		●
Percent of goods moved with option of more than one modal choice	Accessibility	●	●	●	◐	◐	●	●	◐		◐
Track-miles with 286,000-pound railcar capacity rating ^a	Accessibility	●	◐	◐	◐	○	○	●	◐		◐
Condition rating for NHS intermodal connectors ^a	Accessibility; System Preservation	●	●	◐	●	○	○	●	◐		○
Dollar losses due to freight delays	Economic Development	●	●	●	●	●	○	●	◐		○
Geographic market share	Economic Development	●	●	●	●	●	●	○	◐		○
GRP ^a	Economic Development	●	○	◐	◐	●	○	○	○		○
Value of goods exported annually versus value of goods imported ^a	Economic Development	●	●	●	●	●	◐	○	○		○
Regional truck VMT or TMT per unit of regional economic activity/output	Economic Development; Mobility	●	◐	◐	◐	●	○	◐	◐		◐
Ton-miles per emissions output	Env./Comm.	●	◐	◐	◐	○	◐	◐	◐		●
Ton-miles per gallon of fuel	Env./Comm.	●	◐	◐	◐	◐	◐	◐	◐		●
Average number of hours with 20% of VMT congested ^a	Mobility	●	◐	◐	◐	○	○	●	◐		○
Delay per ton-mile traveled	Mobility	●	◐	◐	◐	○	○	●	◐		○
Lift capacity (annual volume)	Mobility	◐	●	◐	◐	◐	○	●	◐		○
Mobility index (ton-miles of travel/vehicle miles of travel times average speed)	Mobility	●	◐	◐	◐	○	○	●	◐		○
Mode share (tonnage and value)	Mobility	●	◐	◐	◐	○	◐	◐	◐		◐
Truck VMT or TMT at LOS D or above	Mobility	●	◐	◐	◐	○	○	●	◐		○
Planning Time Index: “worst” time as compared to free-flow travel time ^a	Mobility	●	●	◐	●	○	○	●	●		○
Travel time averages and variations ^a	Mobility	◐	●	◐	◐	○	○	●	●		◐
Tons of commodity undergoing intermodal transfer	Mobility	●	◐	◐	◐	◐	◐	◐	◐		○
Travel time index	Mobility	●	◐	◐	●	○	○	●	◐		○
Vehicle classification by time of day; % trucks offpeak ^a	Mobility	●	◐	◐	◐	○	○	◐	●		○
Vehicle-miles of delay for at-grade crossings ^a	Mobility	●	◐	◐	●	○	○	●	●		○
Exposure (truck AADT and daily trains) factor for rail crossings	Mobility; Safety	●	◐	◐	◐	○	○	●	◐		○
Average crash cost per trip, VMT, or TMT	Safety	●	◐	◐	◐	○	○	◐	○		●
Fatalities or crashes involving large trucks per truck VMT	Safety	●	◐	◐	●	○	○	◐	○		●
Grade crossing accidents/product of million train-miles and trillion vehicle-miles traveled	Safety	●	◐	◐	●	○	○	◐	○		●
Number of heavy truck-related fatalities (three-year average)	Safety	●	◐	◐	●	○	○	◐	○		●
Rail-related fatalities per train-mile	Safety	◐	◐	◐	◐	○	○	◐	○		●
Percentage of truck VMT on roads with pavement worse than X	System Preservation	●	●	◐	◐	○	○	●	◐		○

○ Little or No Relationship ◐ Some Relationship ◑ Moderate Relationship ● Strong Relationship ● Very Strong Relationship

^a Measures from CMAP GoTo 2040.

^b Organization and Public Policy strategies encompass and promote all other strategies, and therefore have no “explicit” performance measures.