AN ANALYSIS OF PROJECT PRIORITIZATION METHODS AT THE REGIONAL LEVEL IN THE SEVENTY-FIVE LARGEST METROPOLITAN AREAS IN THE UNITED STATES OF AMERICA

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AN ANALYSIS OF PROJECT PRIORITIZATION METHODS AT THE REGIONAL LEVEL IN THE SEVENTY-FIVE LARGEST METROPOLITAN AREAS IN THE UNITED STATES OF AMERICA

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SUMMARY

Due to a lack of adequate funding for transportation projects, decision-makers are facing the challenge of selecting which projects are pursued and which have to be deferred. Project prioritization is widely used as a tool to evaluate and rank projects, but methods differ greatly across the nation. This thesis documents the methods used by metropolitan planning organizations (MPOs) in the seventy-five largest metropolitan areas in the United States. The research was internet-based and focused on the material discussed in the long-range plan. This research is valuable in the development of the practice of project prioritization through the identification of common approaches and deficiencies. By understanding prioritization experiences, failures, and accomplishments, MPOs can adopt those approaches that best provide the information needed and desired by decision makers to establish project priorities.

INTRODUCTION

Current levels of transportation funding are inadequate to meet all the transportation needs of the country. Metropolitan areas face a particularly daunting challenge as the demand for improved service is the greatest in locations already severely constrained geographically and financially. Identifying the most cost effective projects as part of an overall capital program becomes a critical activity in areas experiencing constrained finances. This effort becomes even more important when funding cutbacks require officials to identify which projects must be dropped from the program. In both instances, the foundation of effective project prioritization is using performance measures to determine which projects are most desirable.

There is no common method for project prioritization. Regional differences in needs, resources, and preferences make a "one-size-fits-all" method inadequate. However, understanding varying approaches to prioritization can aid individual jurisdictions in developing their unique prioritization solution. This thesis explores the range of prioritization techniques being employed in the United States' largest metropolitan areas today.

As outlined in the Safe, Accountable, Flexible, Equitable, Transportation Efficiency Act, A Legacy for Users (SAFETEA-LU) of 2005, all urbanized areas with a population of greater than 50,000 are required by federal law to have a Metropolitan Planning Organization (MPO) that is responsible for the transportation planning process. These entities "are responsible for determining the best transportation investments to meet metropolitan transportation needs" ("SAFETEA-LU…"). To comply with these requirements, the MPO prepares two key documents, the Long-Range Transportation Plan or Regional Transportation Plan (Plan), which outlines the projects to be undertaken in the twenty-five to thirty years following its publication, and the Transportation Improvement Program (TIP), which establishes a program for execution of projects in the subsequent three to five years. This thesis will focus on the examination of project prioritization for the Plan as it is in the Plan where the overall framework is formulated, and the base from which the TIP is developed. Being a short-term, executable program, the TIP is the result of prioritization of the projects contained in the Plan.

This thesis is organized in the following way. The next section, the literature review, highlights past contributions that describe the process or prioritization as wells as its benefits and drawbacks. The methodology section outlines the research procedure, and the results section compiles all the data gathered. The discussion looks at some cases in greater detail and identifies general trends across the nation. The conclusion addresses the importance of the issue of prioritization and where it is headed in the future.

LITERATURE REVIEW

Importance of Prioritization

For nearly four decades, engineers and transportation planners have struggled with a growing gap between the cost of building needed transportation improvements and the funds available for this purpose. For example, a 1981 paper by Humphrey (1981) states that although government expenditure in transportation increased between 1970 and 1980, it did not keep up with inflation, resulting in a decrease in real investment levels. A paper by Mak in 1973 highlighted the same problem, claiming that available financing in Georgia would fall short of that needed to complete the identified transportation improvements from 1970 to 1990 (Mak 1973). Since then, growth has only exacerbated the problem. With decision-makers facing critical choices regarding what gets built and when, prioritization processes emerged as a way to approach the subject in a more systematic manner.

As far back as 1973, Mak understood the importance that prioritization played in project programming. He suggested that transportation "improvements be considered as investments competing for limited resources"(Mak 1973), and that priorities need to be established to make the

maximum use of those resources. Hill added to the argument by asserting that in the private sector, the market mechanism drives the allocation of resources. The public sector cannot rely on the market, and must therefore actively pursue a prioritization scheme.(Hill 1968)

Mak claims that priorities are mostly established subjectively, on the basis of experience(Mak 1973). This method leaves the selection process vulnerable to personal engineering biases and lack of comprehension(Mak 1973). Furthermore it lacks consistency and transparency and, with a large number of complex projects, can become unmanageable(Mak 1973). This same argument is echoed in a National Cooperative Highway Research Program (NCHRP) paper from 1978 that claims that:

> Priorities that are established subjectively run the risk of personal engineering bias, lack of comprehensiveness, and political bias. Furthermore, the increasing number, magnitude and complexity of the programs will soon make the subjective analysis unmanageable. (1978)

A rational approach will take the “politics” out of the process of project selection, and will allow citizens and independent authorities to review and critique the system(1978). Turochy and Willis agree, saying it clarifies “the process such that the technical information is not muddled by the political framework within which the

programming decisions are ultimately made”(Turochy and Willis 2006). Above all, it will provide valuable information on how projects compare to each other to allow those in charge to make more calculated decisions(1978).

Characteristics of the Prioritization Process

The main concern of any prioritization system will be to evaluate identified projects and rank them in order of importance. The level of complexity of the project prioritization processes, though, varies greatly. The literature has described minimum conditions for consideration as an acceptable methodology.

First and foremost, there is the issue of rationality. Turochy and Willis define a rational procedure as “one with clear steps and a sequence”(Turochy and Willis 2006). This idea is critical as it distinguishes between a systematic methodology that can be consistently replicated versus one without a well-defined structure. A non-rational process is open to the bias of the evaluator.

Secondly, there is the discussion of defensibility. Turochy and Willis (2006) define a defensible procedure as one that is “open to scrutiny with respect to the data used in the process and which resultant scores or rankings assigned to projects evaluated are related to the attributes of the proposed improvements.” The main concept

of defensibility is in the transparency of the data, criteria, and performance measures that allow outside entities to both evaluate the process and ensure that guidelines are being followed. These two characteristics are essential to promote objectivity in project selection.

Each prioritization system will be unique, although each will likely involve the following steps: selecting criteria with which to evaluate projects, creating performance measures to compute project compliance to those criteria, combining scores for each performance measure in some way, and finally ranking the projects in order of importance. The criteria selected will directly relate to the locale's concerns, but tend to correlate to the planning factors outlined in ISTEA (the Intermodal Surface Transportation Efficiency Act of 1991) and TEA-21 (the Transportation Equity Act for the 21st Century of 1998): safety, traffic congestion, environmental impacts, among others. (Turochy and Willis 2006).

Performance measures need not be quantitative, as that would not always be appropriate given the nature of the criteria. The result of each performance measure can be scored on an ordinal, interval, or rational scale. While the ordinal scale merely ranks projects, the interval scale defines the differences between them. The ratio scale goes

one step further by defining the distance in relation to a non-arbitrary origin. It is best to use the highest order scale possible so as to include all the information available. However, it is imperative to recognize limitations and use the appropriate scale. (Hill 1968)

Once the performance measures have been applied, the results have to be aggregated in some way to make sense out of them. At the most basic level, they could be viewed and assessed independently, but a large number of performance measures combined with a large number of projects would make this analysis unmanageable. Most processes involve some compilation to produce a total score for each project; one that encompasses all performance measures and addresses all criteria. In order to do this, decisions have to be made as to how much weight each performance measure and each criterion will carry in the total score. (Hill 1968)

When compiling the total score, a new scale will be developed. The simplest approach is to compile the data on an ordinal scale; assign a +1 or -1 to each criterion depending if the measure is determined to be beneficial or detrimental, weight each score according to the weighting scheme, and add them all up. This method ignores much of the information that could be detected by some performance measures. A more controversial and complex endeavor is to

carry over interval and ratio scales through some sort of transformation function. Each performance measure will have its own units and scale, but when they are aggregated, they will need to be comparable. Adjustments detract from the objectivity of the process, but are essential in compiling data to aid in comparison and comprehension. Once scores are tallied, projects are usually ranked by score or grouped into tiers.(Hill 1968)

Limitations

A project prioritization process should be considered simply as a tool in decision-making. As it is generally employed as part of a broader project programming process, and is thus still subject to human bias and the politics that guide these decisions. Someone has to decide on the goals and objectives and how criteria will be weighted in the compilation of project scores. Hill claims that "benefits and costs have meaning only in relation to a well-defined objective" (Hill 1968), and the development of these objective will be subject to the values and principles of decision-makers and their constituents. Although project prioritization is touted as the answer to bias in project selection, its foundation is explicitly subjective. At least in this case, subjectivity is openly

expressed so that citizens are aware of it and respond through the political process if they are dissatisfied.

Another drawback in project prioritization is the difficulty in comparing projects with different purposes. Hill warns that "until interaction between objectives is accounted for in the analysis, the goals-achievement matrix is recommended only for the evaluation of plans in a single sector" (Hill 1968). The goals-achievement matrix is the particular prioritization method Hill is proposing, not specifically for transportation, but for any projects competing for funding in general. The implications of this limitation are that comparisons across transportation improvements of disparate characteristics (e.g. across modes) will be difficult if not inappropriate.

A systematic limitation of this approach is the fact that relationships between projects cannot be registered. Synergistic effects in a transportation networks are not measured as evaluation is performed at the project level. Mann and Dawoud (Mann and Dawoud 2006) of the Virginia Department of Transportation identified this problem and developed software to overcome it. Their software chooses the one project, out of a list of available projects, that reduces congestion the most. Then, through an iterative loop that tests all remaining projects, it determines which

one will result in the greatest reduction in congestion when combined with the first one. The process continues until all projects are assigned an order. This method does not evaluate the projects individually, but rather the system as a whole. The drawback with this methodology is that it is locked into following a certain path, determined largely by the first few projects and how other projects tie into them. There is no way to try all possible scenarios, which would be the ideal case.

In terms of problems of a logistical nature, Humphrey warns about a need for flexibility in programming to account for unknown factors. It is always in the best interest of the MPO to spend all of their available funds, especially when they would not carry over, so there needs to be a certain flexibility to maneuver and maintain an efficient program. Also, Berechman brings up the issue of data availability. At the time when a project needs to be evaluated, early enough for decisions to be made, there may not be enough information to make a reasonable decision, particularly regarding environmental impacts.(Berechman and Paaswell 2005; Humphrey 1981)

Very few efforts have been made to understand the implementation of project prioritization across the country at the regional level, which is the core of the federally

mandated planning system today. Though Turochy and Willis (2006) reviewed methods from several MPOs, they did not perform a widespread examination across the nation, but rather singled out areas of interest. The research in this thesis is geared towards finding out what the current state of the practice is.

Meyer and Miller (Meyer and Miller 2001) similarly explored the prioritization processes undertaken by several MPOs to illustrate the different approaches they identified. The first approach, goal achievement, consists of a commitment to adhere to regional goals and objectives; it was implemented in St. Louis, Seattle, and Sacramento. The numerical rating approach introduces performance measures to determine preferential projects, and they are commonly used in the evaluation of pavement condition and bridge sufficiency. The priority index method is the most common approach and consists of a comparative evaluation of projects along various categories that result in scores and a ranking. The programming evaluation matrix approach consists of evaluating how well a project conforms to criteria representing project priorities, and it is practiced in Albany, Phoenix, Portland, and Denver. Lastly, the systems analysis technique evaluates the program as a whole.

Meyer and Miller concluded that, although each prioritization process was unique, there were several good, recurring practices. First, there needs to be a direct correlation between identified goals and evaluation criteria. Second, subjective analysis is valuable where data cannot be quantified and should be included. Third, fiscal concerns have elevated the need for project prioritization. Last, the project prioritization framework is just as important for the credibility of the results as is the technical analysis.

METHODOLOGY

The seventy-five largest Metropolitan Statistical Areas (MSAs) were identified as defined by the 2007 U.S. Census estimates. An MSA is defined as a region that has "at least one urbanized area of 50,000 or more population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties" (Portman 2006). Though the MPO designation is based on MSAs, the correlation is not always one-to-one as some of the largest MSAs are divided into Metropolitan Divisions that each have independent MPOs. Alternatively, a single MPO can span several MSAs. Table 1 lists these metropolitan areas along with their associated MPOs.

The Plan for each of the listed MPOs was examined for any mention of a prioritization process. Supporting material referenced in the Plan was also considered.

Table 1. List of the Metropolitan Statistical Areas evaluated and their respective MPOs

Rank	Metropolitan Statistical Area (Metropolitan Divisions are indented)	2007 Population Estimate	MPO
1	New York-Northern New Jersey-Long Island, NY-NJ-PA	18,815,988	
	Edison, NJ	2,319,704	North Jersey Transportation Planning Authority (NJTPA)
	Nassau-Suffolk, NY	2,759,762	New York Metropolitan Transportation Council (NYMTC)
	Newark-Union, NJ-PA	2,128,679	North Jersey Transportation Planning Authority (NJTPA)
	New York-White Plains-Wayne, NY-NJ	11,607,843	New York Metropolitan Transportation Council (NYMTC)
2	Los Angeles-Long Beach-Santa Ana, CA	12,875,587	
	Los Angeles-Long Beach-Glendale, CA	9,878,554	Southern California Association of Governments (SCAG)
	Santa Ana-Anaheim-Irvine, CA	2,997,033	Southern California Association of Governments (SCAG)
3	Chicago-Naperville-Joliet, IL-IN-WI	9,524,673	
	Chicago-Naperville-Joliet, IL	7,952,540	Chicago Metropolitan Agency for Planning (CMAP)
	Gary, IN	698,971	Northwest Indiana Regional Planning Commission (NIRPC)
	Lake County-Kenosha County, IL-WI	873,162	Southeastern Wisconsin Regional Planning Commission (SEWRPC)

Table 1 (continued)

4	Dallas-Fort Worth-Arlington, TX	6,145,037	
	Dallas-Plano-Irving, TX	4,111,529	North Central Texas Council of Governments (NCTCOG)
	Fort Worth-Arlington, TX	2,033,508	North Central Texas Council of Governments (NCTCOG)
5	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	5,827,962	
	Camden, NJ	1,246,339	Delaware Valley Regional Planning Commission (DVRPC)
	Philadelphia, PA	3,887,694	Delaware Valley Regional Planning Commission (DVRPC)
	Wilmington, DE-MD-NJ	693,929	Wilmington Area Planning Council (Wilmapco)
6	Houston-Sugar Land-Baytown, TX	5,628,101	Houston Galveston Area Council (H-GAC)
7	Miami-Fort Lauderdale-Pompano Beach, FL	5,413,212	
	Fort Lauderdale-Pompano Beach-Deerfield Beach, FL	1,759,591	Broward County MPO
	Miami-Miami Beach-Kendall, FL	2,387,170	Miami Urbanized Area MPO
	West Palm Beach-Boca Raton-Boynton Beach, FL	1,266,451	Palm Beach MPO
8	Washington-Arlington-Alexandria, DC-VA-MD-WV	5,306,565	
	Bethesda-Gaithersburg-Frederick, MD	1,155,518	Metropolitan Washington COG (MWCOG)
	Washington-Arlington-Alexandria, DC-VA-MD-WV	4,151,047	Metropolitan Washington COG (MWCOG)
9	Atlanta-Sandy Springs-Marietta, GA	5,278,904	Atlanta Regional Commission (ARC)
10	Boston-Cambridge-Quincy, MA-NH	4,482,857	
	Boston-Quincy, MA	1,858,216	Boston Region MPO
	Cambridge-Newton-Framingham, MA	1,473,416	Boston Region MPO
	Peabody, MA	733,101	Boston Region MPO

Table 1 (continued)

	Rockingham County-Strafford County, NH	418,124	Southern New Hampshire Planning Commission (SNHPC)
11	Detroit-Warren-Livonia, MI	4,467,592	
	Detroit-Livonia-Dearborn, MI	1,985,101	Southern Michigan Council of Governments (SEMCOG)
	Warren-Troy-Farmington Hills, MI	2,482,491	Southern Michigan Council of Governments (SEMCOG)
12	San Francisco-Oakland-Fremont, CA	4,203,898	
	Oakland-Fremont-Hayward, CA	2,483,842	Metropolitan Transportation Commission (MTC)
	San Francisco-San Mateo-Redwood City, CA	1,720,056	Metropolitan Transportation Commission (MTC)
13	Phoenix-Mesa-Scottsdale, AZ	4,179,427	Maricopa Association of Governments (MAG)
14	Riverside-San Bernardino-Ontario, CA	4,081,371	Southern California Association of Governments (SCAG)
15	Seattle-Tacoma-Bellevue, WA	3,309,347	
	Seattle-Bellevue-Everett, WA	2,536,182	Puget Sound Regional Council (PSRC)
	Tacoma, WA	773,165	Puget Sound Regional Council (PSRC)
16	Minneapolis-St. Paul-Bloomington, MN-WI	3,208,212	Metropolitan Council of the Twin Cities (Metro Council)
17	San Diego-Carlsbad-San Marcos, CA	2,974,859	San Diego Association of Governments (SANDAG)
18	St. Louis, MO-IL	2,803,707	East-West Gateway Council of Governments (EWCOG)
19	Tampa-St. Petersburg-Clearwater, FL	2,723,949	Hillsborough County MPO
20	Baltimore-Towson, MD	2,668,056	Baltimore Metropolitan Council
21	Denver-Aurora, CO /1	2,464,866	Denver Region Council of Governments (DRCOG)
22	Pittsburgh, PA	2,355,712	Southwestern Pennsylvania Commission (SPC)
23	Portland-Vancouver-Beaverton, OR-WA	2,175,113	Metro

Table 1 (continued)

24	Cincinnati-Middletown, OH-KY-IN	2,133,678	Ohio Kentucky Indiana Regional Council of Governments (OKI)
25	Cleveland-Elyria-Mentor, OH	2,096,471	Northeast Ohio Areawide Coordination Agency (NOACA)
26	Sacramento--Arden-Arcade--Roseville, CA	2,091,120	Sacramento Area Council of Governments (SACOG)
27	Orlando-Kissimmee, FL	2,032,496	Metroplan Orlando
28	San Antonio, TX	1,990,675	San Antonio-Bexar City MPO (SA-BC MPO)
29	Kansas City, MO-KS	1,985,429	Mid-America Regional Council (MARC)
30	Las Vegas-Paradise, NV	1,836,333	Regional Transportation Commission of Southern Nevada (RTC)
31	San Jose-Sunnyvale-Santa Clara, CA	1,803,643	Metropolitan Transportation Commission (MTC)
32	Columbus, OH	1,754,337	Mid-Ohio Regional Planning Commission (MORPC)
33	Indianapolis-Carmel, IN	1,695,037	Indianapolis MPO
34	Virginia Beach-Norfolk-Newport News, VA-NC	1,658,754	Hampton Roads MPO (HRMPO)
35	Charlotte-Gastonia-Concord, NC-SC	1,651,568	Mecklenburg-Union MPO (MUMPO)
36	Providence-New Bedford-Fall River, RI-MA	1,600,856	Rhode Island Statewide Planning Program
37	Austin-Round Rock, TX	1,598,161	Capital Area Metropolitan Planning Organization (CAMPO)
38	Milwaukee-Waukesha-West Allis, WI	1,544,398	Southeastern Wisconsin Regional Planning Commission (SEWRPC)
39	Nashville-Davidson--Murfreesboro--Franklin, TN	1,521,437	Nashville Area MPO
40	Jacksonville, FL	1,300,823	North Florida TPO
41	Memphis, TN-MS-AR	1,280,533	Memphis and Shelby County Division of Planning and Development (DPDGOV)
42	Louisville/Jefferson County, KY-IN	1,233,735	Kentuckiana Regional Planning and Development Agency (KIPDA)
43	Richmond, VA	1,212,977	Richmond Area MPO

Table 1 (continued)

44	Oklahoma City, OK	1,192,989	Association of Central Oklahoma Governments (ACOG)
45	Hartford-West Hartford-East Hartford, CT	1,189,113	Capital Region Council of Governments (CRCOG)
46	Buffalo-Niagara Falls, NY	1,128,183	Greater Buffalo-Niagara Regional Transportation Council (GBNRTC)
47	Birmingham-Hoover, AL	1,108,210	Birmingham MPO
48	Salt Lake City, UT	1,099,973	Wasatch Front Regional Council (WFRC)
49	Raleigh-Cary, NC	1,047,629	Capital Area MPO (CAMPO-NC)
50	Rochester, NY	1,030,495	Genesee Transportation Council (GTC)
51	New Orleans-Metairie-Kenner, LA	1,030,363	New Orleans Regional Planning Commission (NORPC)
52	Tucson, AZ	967,089	Pima Association of Governments (PAG)
53	Tulsa, OK	905,755	Indian Nations Council of Governments (INCOG)
54	Honolulu, HI	905,601	Oahu MPO
55	Fresno, CA	899,348	Council of Fresno County Governments (Fresno COG)
56	Bridgeport-Stamford-Norwalk, CT	895,015	Southwestern Regional Planning Agency (SWRPA)
			Greater Bridgeport Regional Planning Agency (GBRPA)
57	Albany-Schenectady-Troy, NY	853,358	Capital District Transportation Committee
58	New Haven-Milford, CT	845,494	South Central Regional Council of Governments (SCRCOG)
59	Dayton, OH	835,537	Miami Valley Regional Planning Commission (MVRPC)
60	Albuquerque, NM	835,120	Mid-Region Council of Governments (MRCOG)
61	Omaha-Council Bluffs, NE-IA	829,890	Metropolitan Area Planning Agency (MAPA)
62	Allentown-Bethlehem-Easton, PA-NJ	803,844	Lehigh Valley Planning Commission (LVPC)

Table 1 (continued)

63	Oxnard-Thousand Oaks-Ventura, CA	798,364	Southern California Association of Governments (SCAG)
64	Bakersfield, CA	790,710	Kern Council of Governments (Kern COG)
65	Worcester, MA	781,352	Central Massachusetts MPO (CMMPO)
66	Grand Rapids-Wyoming, MI	776,742	Grand Valley Metropolitan Council (GVMC)
67	Baton Rouge, LA	770,037	Capital Region Planning Commission (CRPC)
68	El Paso, TX	734,669	El Paso MPO
69	Columbia, SC	716,030	Central Midlands Council of Governments (CMCOG)
70	McAllen-Edinburg-Mission, TX	710,514	Hidalgo County MPO
71	Akron, OH	699,356	Akron Metropolitan Area Transportation Study (AMATS)
72	Greensboro-High Point, NC	698,497	Greensboro Urban Area MPO (GUAMPO)
73	Sarasota-Bradenton-Venice, FL	687,181	Sarasota-Manatee MPO
74	Springfield, MA	682,657	Pioneer Valley Planning Commission (PVPC)
75	Knoxville, TN	681,525	Knoxville Regional Transportation Planning Organization (Knoxtrans)

RESULTS

Most MPOs examined claim to have employed a project prioritization process of some sort. The level of commitment to these endeavors varies greatly across entities. The most involved methods had dedicated chapters and appendices detailing the process while others were mentioned merely in passing. Some included all projects, while others were limited to particular modes. Table 2, below, highlights the key issues in each of the MPOs.

Particular attention was given to determine whether the approach was rational and defensible as described by Turochy and Willis (discussed in the literature review). Another crucial characteristic of any process is the scale of the evaluation. No distinction was made between the interval and ratio scales as often both scales were used in the same approach. The main distinction was between these two and the ordinal scale. Whereas the former scales tell us the degree by which a ranked project is superior or inferior to another, the latter does nothing more than rank the projects. Therefore, a scale was listed as being either interval/ratio or ordinal. Other relevant and interesting considerations pertaining to any individual projects were also listed.

Table 2. Prioritization processes in the nation's largest MPOs

MPO	Prioritization Process Review
North Jersey Transportation Planning Authority (NJTPA)	The MPO uses performance measures to identify needs and projects to fulfill those needs, but it is not comprehensive and they are not ranked.
New York Metropolitan Transportation Council (NYMTC)	A rational system has not yet been fully implemented. Performance measures are being developed to measure how well a project meets the council's goals. Some are already in place, but there is no mention of how they're used.
Southern California Association of Governments (SCAG)	A rational and defensible system is in place where performance measures are selected to evaluate individual projects. All projects, regardless of mode, are split into different categories - categories are then prioritized as well.
Chicago Metropolitan Agency for Planning (CMAP)	The MPO leaves all prioritization responsibilities to the implementing agencies: the Illinois Department of Transportation, transit agencies, City of Chicago, etc. A CMAQ process is explicitly followed, but not explained.
Northwest Indiana Regional Planning Commission (NIRPC)	The MPO follows a rational approach for the evaluation of roadway and transit projects. Projects were screened to pre-approve those that have achieved a critical threshold of readiness. Additionally, the screening sorted out the system expansion projects (which would be prioritized at that time) and the preservation/modernization projects (that would be evaluated during TIP development). Criteria were mostly defensible, though in some instances sponsors were asked to self-score their projects with minimal guidelines. Scores were assigned on an interval/ratio scale. Bike/ped projects were guided by a previously completed priority corridors study.

Table 2 (continued)

Southeastern Wisconsin Regional Planning Commission (SEWRPC)	The MPO conducted a rigorous evaluation of three scenarios: no build; system optimization + transit and bike/ped; optimization + transit + bike/ped + road capacity expansion. The evaluation was not rational, but rather explored the implications of each option and how it relates to the region's goals. Ultimately, they recommended the third option. The Plan states that each of the road projects will be evaluated only after the preliminary engineering is conducted. Additionally, the Plan states that "all elements of the year 2035 regional transportation plan are considered to be of equal priority, each element needs to be fully implemented to meet existing and forecast future year 2035 transportation needs."
North Central Texas Council of Governments (NCTCOG)	The Plan describes a rational and defensible approach to highway project prioritization where interstate improvements are given highest priority based on readiness. A second tier is evaluated based the following criteria, equally waited, on an ordinal scale: age of existing facility, cost-effectiveness, regional importance, independent utility and bottleneck reduction, ability to satisfy needs of parallel improvements.
Delaware Valley Regional Planning Commission (DVRPC)	A rational and defensible process is described where projects are separated by the goal they are intended to meet, and evaluated against set criteria on an ordinal scale.
Wilmington Area Planning Council (Wilmapco)	The Plan states that quantifiable measures are used to evaluate projects in safety, air quality, congestion, traffic and transit, environment, transportation justice, economic development, freight, and local/private funding contributions. Although referenced, the actual methodology was not included so no judgment can be made on the suitability of the criteria.

Table 2 (continued)

Houston Galveston Area Council (H-GAC)	The MPO employs a rational and defensible process for all projects. Projects are split by mode/purpose: system preservation, intersection and bottleneck improvement, transit, and bike/ped. Driving the project selection process are the critical issues of: congestion, safety, security, environment, mobility and equity, connectivity, and economic development. Scores are ultimately determined by the B/C ratio.
Broward County MPO	The Plan mentions a process by which they identify needs and measure system performance, but do not address projects.
Miami Urbanized Area MPO	The Plan states that roadway improvements and ITS projects were evaluated by the Steering Committee with an interactive, web-based program analyzing technical data. There are no details about the methodology.
Palm Beach MPO	The MPO has initiated an attempt to prioritize all types of projects through a rational process. Dependant on data from the county's congestion management system. Criteria reflect 8 goals established in the RTP. Although the actual criteria are not described, the process alludes to defensible, quantifiable measurements on available data. Scores are assigned mostly on an ordinal scale. Transit projects are evaluated by the transit entity, and bike/ped projects were evaluated by a separate committee. The MPO ultimately adopted all recommendations into one plan.
Metropolitan Washington COG (MWCOG)	Due to the unique condition of DC as a federal district, the MPO is strongly dependent on input from outside entities. The Maryland, Virginia, and DC departments of transportation along with the Washington Metropolitan Area Transit Authority prioritize their own projects separately. The MPO believes that "the role of the [MPO] during planning is to review the regional system as a whole and how all the components work together, not to make project level decision."

Table 2 (continued)

Atlanta Regional Commission (ARC)	The ARC utilizes a rational and defensible approach for the prioritization of all projects that expand the transportation system. Projects are evaluated on an interval/ratio scale and lumped into tiers. Scores are heavily influenced by congestion mitigation.
Boston Region MPO	A rational and defensible process was employed to determine how consistent highway and transit projects were with the MPO's policies. A set of criteria scored projects on an interval/ratio scale.
Southern New Hampshire Planning Commission (SNHPC)	The Plan states that projects were prioritized according to the eight factors presented in TEA-21 and SAFETEA-LU, but it does not explain how it was done.
Southern Michigan Council of Governments (SEMCOG)	The MPO has developed a rational and defensible system to prioritize corridors that deserve the greatest funding based on several criteria. The projects are scored on an interval/ratio scale and placed into tiers. The Plan states that 92% of the investment in the preferred plan is directed towards the top two tiers, but it does not explicitly state how projects were selected.
Metropolitan Transportation Commission (MTC)	A rational and defensible process is followed to prioritize all regionally significant projects (over $5M in cost) in the Plan. Performance measures were used to determine consistency with six major goals and scores were assigned on an interval/ratio scale for those projects deemed likely to be regionally important (about half) and on an ordinal scale for the rest. Projects scores were not compiled across categories to produce a ranking, each goal was assessed individually. Additionally, projects were grouped to perform corridor level alternative scenario analyses. Costs will be considered in the prioritization process as a stand-alone factor, not scored with the rest of the measures. Consideration was given to freight movement, even though no measure was included in the analysis.

Table 2 (continued)

Maricopa Association of Governments (MAG)	The MPO first categorizes projects along the lines of established funding/modal categories: freeways, streets, transit, bike/ped, planning, and air quality. Projects to receive CMAQ and CMS funds will be reviewed separately and results will be incorporated into the modal evaluation. A rational and defensible approach is implemented for each mode with varying degree of complexity. Freeways are ranked on an interval/ratio scale. Transit projects are organized less rigorously, grouped into tiers favoring 1. projects mandated by law, 2. projects maintaining current services, 3. expansion. ITS projects are scored on an interval/ratio scale based on mode-specific criteria and also refer to CMAQ and CMS evaluations. Bike/ped projects are evaluated on an interval/ratio scale based on several criteria, but focusing on access to points of interest.
Puget Sound Regional Council (PSRC)	A rational and defensible approach is followed for the prioritization of all projects. Five objectives have been set and performance measures established to evaluate consistency with those objectives. Each measure is weighted differently, depending on its relevance to the objective, scores are set on an interval/ratio scale . Scores for each objective are compiled to produce a total score, each objective is given equal weight. Project sponsors complete their own evaluation with significant guidance from the MPO.
Metropolitan Council of the Twin Cities (Metro Council)	Though there are several "priorities" mentioned for each mode, the Plan does not outline a rational framework to evaluate projects.
San Diego Association of Governments (SANDAG)	The Plan describes a rational and defensible process in which projects are first divided into categories: highway, HOV, freeway, transit, rail grade separations, freight, and bike/ped. The criteria and performance measures differ for each project type, but are all set on an interval/ratio scale.

Table 2 (continued)

East-West Gateway Council of Governments (EWCOG)	The MPO performs a rational and defensible evaluation to rank its projects based on the six established focus areas (preservation, safety, congestion, access to opportunity, goods movement, and sustainable development). The list is then shared with implementing agencies and modified according to their own priorities.
Hillsborough County MPO	A rational and defensible prioritization process was implemented for roadway projects. Projects were scored along ten categories on an interval/ratio scale whose scores were weighted and added to produce a ranked list. Bike/ped projects were prioritized in a similar fashion, but with different criteria. Transit projects were prioritized solely on the basis of ridership.
Baltimore Metropolitan Council	The Plan describes a prioritization process where 60% of the score is determined by policy and the other 40% is determined by technical evaluation. It is unclear why the division was made. Paradoxically, one of the inputs to the policy evaluation is "priority"; where each locality can express preference over a certain number of projects. Additionally, the state department of planning weighs in with their preference towards projects in predetermined geographical development regions (priority funding areas). Although the framework provides a rational system for the ranking of projects, it is unclear form the Plan whether the performance measures used in the process are defensible. The method is not described well enough to understand the link between criteria and score. The process applies for roadway, transit, and bike/ped projects.

Table 2 (continued)

Denver Region Council of Governments (DRCOG)	A rational and defensible process is implemented to prioritize roadway projects (new construction and improvements). Eleven performance measures were used to score projects on an interval/ratio scale. The congestion measurement was split between the process followed in the congestion management program and the volume/capacity ratios. Projects already in the TIP and projects with 100% local funds are exempt from the evaluation. Transit projects were not prioritized as the MPO expects to carry out the full list.
Southwestern Pennsylvania Commission (SPC)	The Plan states that projects are prioritized to fit into a financially-constrained plan and again to determine when they will be programmed. Decisions are made based on local needs, regional needs, technical evaluation and money mix. There is no description as to how these factors are used to prioritize projects. It is also stated that large projects undergo a technical evaluation at the long-range level whereas the smaller projects are more likely to get evaluated for the TIP only.
Metro	A growth map outlines areas of priority. The Plan does not rank projects, but it does identify a "priority system" that cuts from the "preferred system" due to budget concerns, but still provides adequate improvement. The process used for this selection is not well documented - no rational method is presented.
Ohio Kentucky Indiana Regional Council of Governments (OKI)	The Plan describes a prioritization framework for roadway and transit projects that is both rational and defensible. Criteria differ between modes with performance measures that assign scores on an interval/ratio scale. The projects are then split into lists based on mode, reviewed, and modified to address comments. This process precedes the allocation of funding sources. Freight projects undergo a similar process with fewer criteria. There is no framework for bike/ped projects.
Northeast Ohio Areawide Coordination Agency (NOACA)	A rational and defensible approach is used to identify projects for federal congestion funds based on a volume/capacity ratio. The Plan does not provide a description of a prioritization process for other projects.

Table 2 (continued)

Sacramento Area Council of Governments (SACOG)	The Plan states that projects are input into a software that selects the projects that "meet the criteria of being regional priorities and higher performers." There is no description of the software, but by the very nature of its independence of human interaction, it can be said to be a rational and defensible process.
Metropolitan Orlando	The Plan states that bike/ped projects were prioritized, but does not describe the method. It explicitly states that transit projects were not prioritized and will be measured solely against themselves. The MPO has defined a "bold new approach" where prioritization is de-emphasized and focus is given to closing the gap between funding and needs. Goals and performance measures to evaluate projects were developed, but are only used to determine overall system performance, not project rankings. However, the MPO does produce a list of ranked projects to help in TIP development, categorized by mode. The methodology is not explained, though
San Antonio-Bexar City MPO (SA-BC MPO)	Pedestrian projects are prioritized through a rational and defensible process with scores on an interval/ratio scale. The Plan does not specify the process by which other projects are selected, though it does state that selection is performed at the time the TIP is developed and the evaluation method changes every cycle.
Mid-America Regional Council (MARC)	A rational and defensible prioritization process was used to rank roadway projects. Performance measures were used to assess the projects' consistency with six major criteria on an interval/ratio scale. Scores for each category are weighted and added together to provide a total score. There is no rational approach to project prioritization for other modes.

Table 2 (continued)

Regional Transportation Commission of Southern Nevada (RTC)	The Plan claims that BRT projects were selected based on ridership, availability of ROW, and cost-effectiveness. It is not clear, though, whether the selection process was rational, if the variables are defensible, and which projects were considered. The Plan sets performance thresholds for a bike/ped project to be selected, but does not differentiate between those projects that meet the minimum criteria. The Plan does not describe a prioritization framework for other projects.
Mid-Ohio Regional Planning Commission (MORPC)	Plan not available online.
Indianapolis MPO	A rational and defensible approach to prioritization was implemented for all projects in the Plan. Criteria were selected to evaluate performance for five goals on an interval/ratio scale. The scores for each of the five goal categories were combined in a weighted average where the weights were previously decided upon by various committees. Project scores were divided by cost to develop a "benefit cost index" which was used for rankings.
Hampton Roads MPO (HRMPO)	The Plan describes a rational and defensible approach towards prioritization of highway projects. Projects are evaluated based on ten criteria and ranked among other projects competing for the same source of funding. The criteria were given different emphasis depending on the funding source. A separate toll highway study identified toll projects. No process is referenced for other modes.
Mecklenburg-Union MPO (MUMPO)	A rational and defensible prioritization process exists for major road projects. It consists of 10 criteria measured on an interval/ratio scale. Bike/ped projects also undergo evaluation and ranking (based on demand, safety, connectivity, and accessibility), but the method is not described (though it can be inferred that it is rational and defensible as well).

Table 2 (continued)

Rhode Island Statewide Planning Program	The Plan boasts a well-developed framework for the recommendation of projects, but it does not include a rational approach to prioritization. The framework consists of goals and objectives with no consistent method or defensible criteria to evaluate projects.
Capital Area Metropolitan Planning Organization (CAMPO)	The plan states that bike/ped projects are prioritized using set criteria, but does not elaborate on the method. There is no mention of a framework to prioritize projects for other modes of transportation.
Nashville Area MPO	The Plan describes a rational and defensible approach to project prioritization with rankings on an interval/ratio scale. This MPO establishes a clear, independent framework for bike/ped projects.
North Florida TPO	The Plan describes a rational and defensible method that includes all projects and ranks them on an interval/ratio scale.
Memphis and Shelby County Division of Planning and Development (DPDGOV)	A rational and defensible process is implemented for roadway projects with criteria measured on an interval/ratio scale. It is based on the MPO's TIP development process. Other types of project do not have an established prioritization process.
Kentuckiana Regional Planning and Development Agency (KIPDA)	The Plan states that priority corridors have been designated for bike/ped improvements and will favor projects along those locations. Criteria were set to determine whether a project served a "Regional Priority", but projects were not individually ranked.
Richmond Area MPO	The MPO set up a task force representing local jurisdictions to develop a financially constrained plan by selecting projects for each funding source. The task force prioritized roadway improvements in such a way that regional benefits were enhanced, but no description of the process was provided. The MPO expressed an interest to move away from this method in the future.

Table 2 (continued)

Association of Central Oklahoma Governments (ACOG)	The Plan mentions a project prioritization process where "projects were evaluated and identified as long or short range based on local priorities and budgeting considerations." However, no description of this process was provided.
Capital Region Council of Governments (CRCOG)	The MPO designates priority areas for both development and conservation and promotes developing projects according to these limits. The Plan states that this is only a preliminary analysis and each project considered for funding will be evaluated for consistency with the Plan's goals, but does not reference a rational process through which this is done.
Greater Buffalo-Niagara Regional Transportation Council (GBNRTC)	Many priorities are listed throughout the Plan (safety, preservation…), but no framework is presented to link them all together. Ultimately, the Plan relies on system-wide performance measures of alternative scenarios to determine which projects were selected. This is not a rational and defensible approach to prioritization.
Birmingham MPO	Rational and defensible prioritization process that makes use of performance measures set on a ratio scale. All projects are evaluated and tested against the goals the region is trying to achieve.
Wasatch Front Regional Council (WFRC)	Only motorized facilities were ranked. Highway projects were ranked on a ratio scale through a rational and defensible process based on criteria from the MPO, local governments, and the state government. Projects were put into tiers. The need for transit projects was evaluated on a ratio scale. The projects were ranked based on their cost/need ratio and placed into tiers.
Capital Area MPO (CAMPO-NC)	The prioritization process combined "local knowledge" with a rational, defensible approach that focuses on projects that reduced congestion (based on their traffic model). Projects were placed into tiers, with those already programmed given the highest priority, those that reduced congestion the most given second priority, and the rest placed last.

Table 2 (continued)

Genesee Transportation Council (GTC)	There is no mention of a prioritization process in the Plan.
New Orleans Regional Planning Commission (NORPC)	Project evaluation is described as "a process, not a quantifiable list of parameters." The criteria presented in the Plan seem too vague to be deemed defensible. The Plan does not demonstrate a rational process.
Pima Association of Governments (PAG)	The Plan mentions priorities for transit, aviation, freight, bicycle, and roadway projects, but only describes the process for pedestrian projects. From the information given, it can be said that the pedestrian process is rational.
Indian Nations Council of Governments (INCOG)	The MPO relies on public participation to identify needs and local governments to define priorities. This approach is neither rational nor defensible. There is some mention of cooperation with the state department of transportation and other stakeholders.
Oahu MPO	Bicycle projects are prioritized as directed by the Honolulu Bicycle Master Plan, based mostly on access to areas of interest. Other projects are mentioned to have priority, but it is not specified how that priority was placed.
Council of Fresno County Governments (Fresno COG)	A rational and defensible prioritization system is used for highway projects. The California Transportation Commission determines the process for Transportation Enhancement projects.
Southwestern Regional Planning Agency (SWRPA)	The Plan mentions several prioritizing schemes at varying levels of government for different types of projects.
Greater Bridgeport Regional Planning Agency (GBRPA)	The Plan makes no mention of a project prioritization process.

Table 2 (continued)

Capital District Transportation Committee	The Plan focuses on evaluating system performance and identifying needs but provides no framework to evaluate individual projects.
South Central Regional Council of Governments (SCRCOG)	The MPO prioritizes projects of regional importance while local governments prioritize municipal roads. No explanation of the process itself is given in the Plan.
Miami Valley Regional Planning Commission (MVRPC)	A rational and defensible project evaluation system was developed and analyzes all projects. Project sponsors are charged with the responsibility of evaluating the projects, and they are given strict guidelines on how to proceed. Scores are based on a large number of performance measures set on an interval/ratio scale.
Mid-Region Council of Governments (MRCOG)	The Plan does not define a project level system of evaluation.
Metropolitan Area Planning Agency (MAPA)	A prioritization process exists though it cannot be said to be rational and defensible. The Plan indicates that, "Projects are prioritized by each jurisdiction based on public input, jurisdictional priority, need and financial availability." This implies lack of consistency in evaluation techniques.
Lehigh Valley Planning Commission (LVPC)	Though the Plan outlines general guidelines for prioritization, there is no rational framework for the ranking of projects.
Kern Council of Governments (Kern COG)	A traffic model predicts level-of-service exceedances and prioritizes the Capital Improvement Program. No clear framework.
Central Massachusetts MPO (CMMPO)	An established set of Transportation Evaluation Criteria (TEC) is considered for each eligible project. The MPO works with the MassHighway District #2 & #3 offices and the Office of Transportation Planning. No mention of criteria or actual process, but concerns are raised over its lack of consistency.

Table 2 (continued)

Grand Valley Metropolitan Council (GVMC)	There is no defined process as, "it is the sole discretion of the GVMC Committees to prioritize and program projects based upon circumstances that exist when programming efforts occur."
Capital Region Planning Commission (CRPC)	The Plan does not rank specific projects, but does create tiers of funding priorities: first to projects in the state long range plan (these are assumed to have been previously prioritized), second to projects in the TIP, and third to projects identified after the TIP was developed.
El Paso MPO	No systematic approach to prioritization described in the Plan. There is mention of "strategic priority" projects selected by the state, but methodology is not presented.
Central Midlands Council of Governments (CMCOG)	Plan not available online.
Hidalgo County MPO	No systematic approach to prioritization described in the Plan. There is mention of "strategic priority" projects that are selected by a commission, but methodology is not presented.
Akron Metropolitan Area Transportation Study (AMATS)	Projects are first separated by mode, with top ranking projects from each mode receiving the available funds. Rational and defensible prioritization method for highway projects gives first priority to active projects and then ranks the rest depending on LOS and safety deficiencies. In transit, priority is given, again, to active projects, though the prioritization process cannot be said to be rational or defensible as the ranking is based solely on type of project with no distinction within each category. Active bike/ped projects were also given priority with other projects being evaluated through a rational and defensible process, albeit with limited criteria.
Greensboro Urban Area MPO (GUAMPO)	No rational approach is described in the Plan, and projects are not ranked. Goals and performance measures are utilized, but not organized into a systematic approach.

Table 2 (continued)

Sarasota-Manatee MPO	Rational process in which projects are divided into groups based on mode and location, prioritized on an interval scale, and grouped into tiers. Priority is given to projects with previous funding or commitments, others are evaluated based on five criteria. One of these criteria involves public input and may not be completely objective and defensible. Project list details score and sates which projects are considered financially feasible.
Pioneer Valley Planning Commission (PVPC)	Rational and defensible process undertaken by the MPO, Executive Office of Transportation, and state Highway Department. Projects are categorized into 4 emphasis areas (safety and security, movement of people, movement of goods, movement of information), and then prioritized on an interval/ratio scale and separated into three tiers.
Knoxville Regional Transportation Planning Organization (Knoxtrans)	Rational and defensible prioritization system based on 8 clearly defined goals as well as 3 measures of urgency (congested corridors, high crash locations, environmental justice locations). Projects are separated by mode and then ranked on an interval/ratio scale.

DISCUSSION

Common Deficiencies

Although project prioritization schemes emerged throughout all the MPOs, they varied greatly in complexity, scope, and disclosure. The concept of "priorities" is used loosely and brought up often in many of the studied transportation plans. In this regard, it has lost a lot of its meaning, and it has resulted in a lack of clarity in the discussion of priorities. For example, the MPO of the Sacramento area claims that residents have set priorities for:

> "smarter land use, increased transit, better connections with transit, freeway enhancements and bicycle paths throughout the region. They also ranked road maintenance as a high priority."

It is not productive to identify so many "priorities" without further explanation. This sort of language was found to be standard practice, and served only rhetoric that could ultimately muddle a rational process with concrete priorities. Another example of how "priorities" have been muddled is SAFETEA-LU's term "High Priority Project" to designate earmarks that by definition fall outside of any prioritization scheme.

Overall there seemed to be a lack of dedication to the purpose of prioritization. Though most MPOs developed some type of procedure, it was often fragmented and de-emphasized. Oftentimes, it was driven by a desire to obtain federal funds through programs that require prioritization – projects that relieve the most congestion or those that reduce emissions the most. The result is a piece-meal approach that falls short of comprehensive and is hard to understand and evaluate. This type of structure will regularly lack an overarching framework to relate all projects severely hampering a decision-maker's ability to compare them.

A prime example of this disjointed approach to programming is found in Chicago's MPO, CMAP. According to its TIP, the only explicit prioritizing undertaken is that which is federally mandated to obtain Congestion Mitigation and Air Quality CMAQ) funds. The rest of the projects are prioritized by the implementing agencies such that the Illinois Department of Transportation will evaluate highways, transit agencies and the City of Chicago might evaluate transit projects, etc. This situation undermines the ability for an MPO to develop a comprehensive transportation plan for the region. The same can be said for the Washington, D.C. MPO (MWCOG), but this could be

directly attributed to the fragmented governmental structure of the city.

An unsurprising feature of most prioritization schemes was the breakdown of projects based on mode or type of improvement. As addressed in the literature review, comparison of projects with different purposes can be challenging and this is reflected in the results. A few key exceptions stand out, the largest being Los Angeles (SCAG). In this case, performance measures need to be general enough to apply to all projects. For example, there is no measure for transit ridership, a common measure used in other reports. Instead, there is a measure labeled "productivity", meaning the percent capacity utilized at peak times. This is applicable to any facility – ridership for transit or volume to capacity ratio for roads. The measure of delay, on the other hand, may be key for roadway evaluation but irrelevant for fixed-guideway transit. At the same time, lack of delay on transit would serve to highlight one of transit's greatest strengths and would be appropriate for comparison with road improvements.

This method preempts funding considerations, focusing on the needs of the region. Most other MPOs operate the opposite way. By defining priorities preemptively, SCAG has an idea of what sort of funding to pursue, but they may

run into problems later in the process. Lack of funds is what draws many MPOs to prioritization in the first place, and SCAG would be vulnerable to this concern under this scheme. Other MPOs know their budget beforehand and tailor their program accordingly.

A number of MPOs either did not prioritize their projects at all, or did not bother to describe their process in their Plan. Some mentioned they followed a process but failed to explain their methodology. Some cities seemingly presented a non-rational approach to prioritization. The Rhode Island Statewide Planning Program, for example, goes to great lengths to describe the project selection process and its prioritization criteria. Yet, its approach is anything but straight-forward.

They identify fourteen “topics” they need to address in their transportation plan, somewhat congruous to modes. Within each topic they list goals, objectives, policies, strategies, and performance measures that will guide each topic into its preferred state. Although lengthy, the framework does not deliver any concrete recommendations. A prioritization process is a tool that allows a planner to evaluate projects in relation to the region’s goals through the use of performance measures; Rhode Island’s prioritization process would more appropriately be labeled

an extended policy statement. For example, a performance measure identified in the bicycle topic was to "increase mode share of bicycle commuters 1.0% to 1.2% in 2010, 1.5% in 2020, and 1.7% in 2030." This sounds more like an objective than a tool with which to measure consistency with an objective, and in fact a listed objective is to "increase bicycle ridership." It is not clear whether project selection was done without a real framework or if the MPO just neglected to describe it, but one is led to believe by the vague recommendations that their projects have indeed undergone selection under a highly political process.

The Rational Process

Despite the abundance of ambiguities described above, a large part of the MPOs did partake in a rational and defensible project prioritization process. The vast majority of these opted for interval or ratio scales for their performance measures and compiled them to form a total score for each projects. Notable exceptions are Philadelphia (DVRPC), which chose an ordinal scale for project comparison, and the San Francisco Bay Area (MTC), which did not aggregate scores.

There were a few MPOs that stood out as leaders in the field of project prioritization not only because of their

well-formulated methodology, but also for the availability and presentation of the methodology. The MPOs in some urban areas, such as Denver (DRCOG), San Francisco (MTC), Phoenix (MAG), and San Diego (SANDAG) publish their methodology in separate technical documents or appendices available online. This increases the transparency of the process and encourages citizen participation. The MPOs have been deliberate and enthusiastic about their project prioritization process and have taken measures to ensure its understanding by the general public and any evaluator. This is one of the key benefits of a rational prioritization process. In the best of cases, the MPO provided step-by-step guides detailing how scores are designated for each performance measure, how to compile individual performance scores into total scores, and then provides the results of the analysis.

Case Study: Philadelphia

The DVRPC, Philadelphia's MPO, follows one of the simplest approaches to project prioritization. They list six goals they intend to achieve and designate performance measures to evaluate projects against those goals, as illustrated by Figure 1. A positive response to any of the criteria signifies consistency with the Plan's goals, and

the greater the number of positive responses a project receives, higher it will be ranked. (2005)

This approach ranks projects on an ordinal scale since the score does not provide information as to how much better one project is in relation to another. Also, it does not explicitly assign a relative importance to each goal. Rather, it places equal weight on each of the performance measures. Most of the goals have two performance measures each, making them equal in weight towards the final score. The last goal, however, has four performance measures, meaning it will hold twice as much weight as the other goals in the determination of an overall score for a project.

Goal:

Improve Safety

Evaluation Criteria:

- Is the project located in a high-accident location with more than twice the statewide average number of accidents for similar type facilities?
- Does the project improve safety by reducing the number or severity of accidents that occur on highways or transit systems by reconstructing a facility to modern standards or improving the geometry or alignment of a facility?

Goal:

Reduce Congestion

Evaluation Criteria:

- Is the project located in a congested corridor as identified in the regional Congestion Management Process?
- Is the project a transportation demand management strategy or does it provide an alternative to, or improve the area coverage and/or operation of an alternative to, the single-occupant vehicle?

Goal:

Rebuild the Transportation Infrastructure

Evaluation Criteria:

- Does the project maintain or improve an existing facility?
- Does this project serve or support an existing Plan Center as identified in the Land Use Plan Map?

Goal:

Enhance the Environment

Evaluation Criteria:

- Is the project located beyond an area targeted for preservation in the Greenspace Network or Conservation Focus Areas?
- Will the project contribute to a reduction in vehicle miles traveled by reducing single-occupant vehicle trips, or promoting the use of public transit and ridesharing, and/or improving or expanding bicycle and pedestrian facilities?

Figure 1. DVRPC project selection evaluation criteria

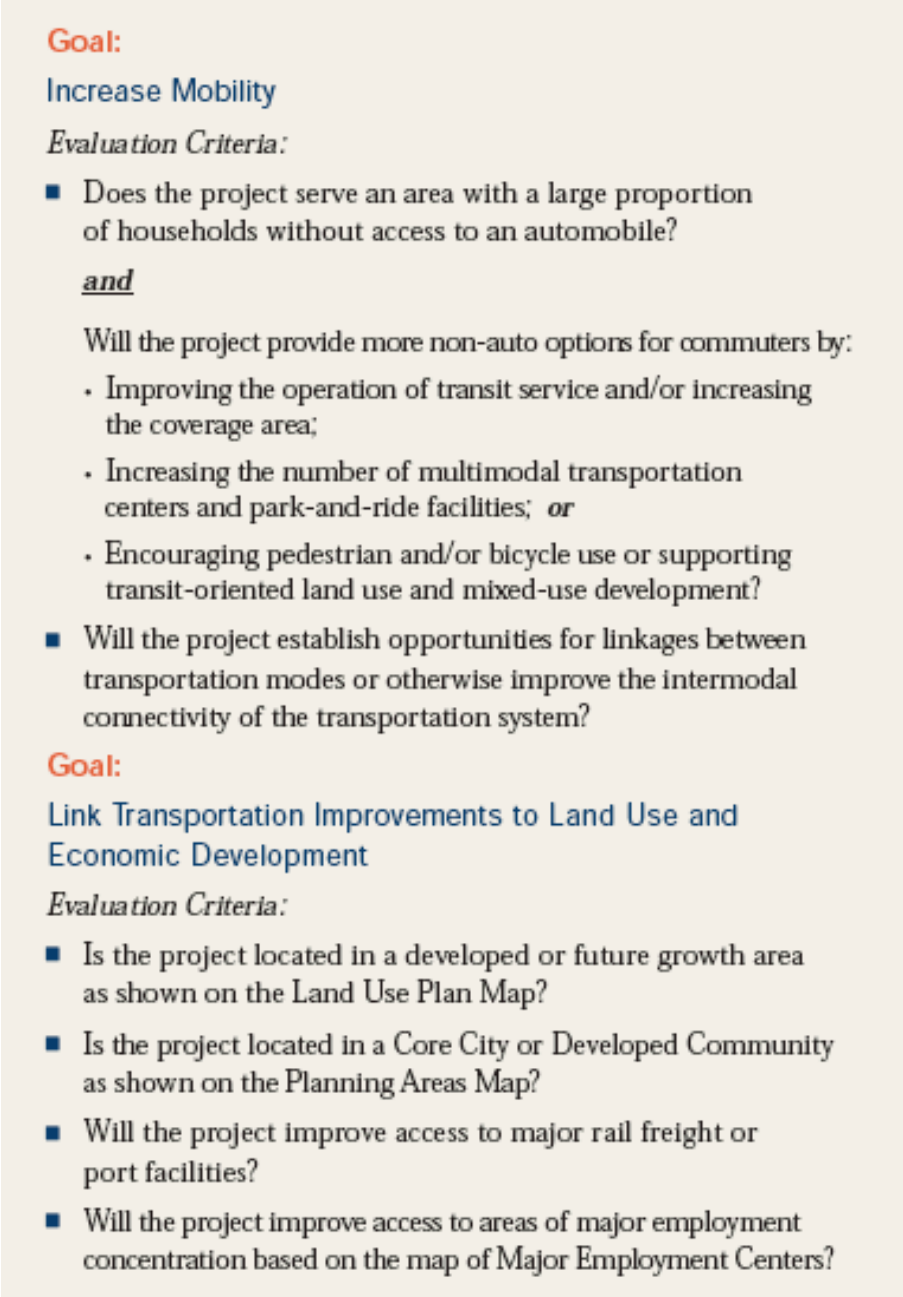

Figure 1 (continued)

Case Study: San Diego

SANDAG, the MPO for San Diego, has presented one of the most developed and best-documented prioritization processes. They publish a lengthy document, Technical

Appendix 7: Transportation Evaluation Criteria and Rankings, where the framework and evaluation is described. The document includes different methodologies for each of eight types of projects: highways, HOV, freeways, transit, rail grade separation, transit capital rehabilitation, regional arterial, and goods movement. The document states that these rankings are used as a tool for the ultimate goal of project selection, but are not strictly followed.("Pathways to the Future")

Table 3, below, outlines the goals, criteria, performance measures, and weighting used in the evaluation of highway projects. In addition to this table, the MPO publishes a document that sets concrete guidelines for the scoring of each criterion. This system focuses strongly on quantitative measures when possible and reduces qualitative evaluation to yes/no questions, thus eliminating bias almost entirely.

For example, the first measure, reliability, is easy to quantify and will receive a score of 5 if the location has a crash rate greater than 160% the state average for similar facilities. It will receive a score of for if the crash rate is greater than 150% of the state average, and so on. On the other hand, the environmental sustainability measure is hard to quantify so the score decision is based

on whether the project avoids areas of interest. For further illustration, the complete highway project evaluation guidelines as outlined in Technical Appendix 7 are included in the appendix of this thesis.

The same sort of process is followed for each of the project types. Following the explanation of the evaluation methodology, result tables show projects' scores and rankings. This document successfully guides the reader through the whole project prioritization process, elucidating the method by which regional goals are translated into a transportation improvement program.

Table 3. SANDAG evaluation of highway projects

CRITERIA CATEGORY	RTP GOALS	CRITERIA	DESCRIPTION	MAX SCORE	TOTAL PERCENT
SERVES TRAVEL NEEDS	Reliability	Located in a High Accident Rate Area	Is the project located in an area with a high vehicular crash rate?	5	45
	Mobility	Serves Goods Movement	Does the project provide for goods movement?	10	
	Accessibility, Mobility, Environmental Sustainability	Serves Peak-Period Trips	What is the number of peak-period trips located within one mile of the highway corridor?	5	
	Mobility	Provides Mobility	What is the increase in person capacity resulting from the project?	10	
	Livability, Mobility	Provides Congestion Relief	What is the number of daily person-hours saved?	15	
DEVELOPS NETWORK INTEGRATION	Livability, Accessibility	Serves RCP Smart Growth Areas	Does the project serve RCP Smart Growth Areas?	5	25
	Accessibility, Efficiency	Facilitates Carpool and Transit Mobility	Does the project contain carpool/managed lane facilities and/or regional or corridor transit service?	10	
	Environmental Sustainability	Minimizes Habitat and Residential Impacts	Does the project minimize negative habitat and residential impacts?	5	
	Reliability, Mobility	Critical Linkage	Is the project located in a high volume freeway corridor and/or lacking a continuous parallel arterial listed in the Regional Arterial System **or** completes a missing link?	5	
COST-EFFECTIVENESS	Efficiency	Cost-Effectiveness	What is the annual capital and operating project cost divided by person hours saved?	30	30

Alternatives

In a few instances an MPO deliberately distanced itself from the idea of project prioritization. The Buffalo area (GBNRTC) opted for scenario development and evaluation. Unlike the project level approach, the scenario approach takes synergistic relationships into

consideration. It allows for a more realistic and coherent evaluation of the system. They are able to select the scenario that provides the best overall performance. However, the selection of projects for each scenario would have to be determined somehow, and the GBRNTC did not explain how that was done. The MTC in San Francisco Bay did some corridor scenario evaluations along with their prioritization process, showing how these processes can complement each other.

Orlando refused to take part in prioritization, claiming that it does not solve the root problem – lack of funds. They decided that if a project was listed as needed, their objective should be to find the funds to finance it, not to find out if they should cut it.

Case Study: Orlando

Despite its rejection of project prioritization in their Plan, the Orlando MPO has to deal with the reality of project programming when developing the TIP. All projects cannot be completed at one time, so decision makers have to determine which ones to pursue at what time. The TIP lists prioritization criteria for highway, bike/ped, and transit projects. No information is given as to how each criteria is scored and weighted.

Highway projects located on a roadway with a high volume-to-capacity ratio, already acquired right-of-way, and a high functional classification (i.e. freeways) are given preference. The implication of the first measure is that the most congested corridors will be addressed first. The second measure addresses project readiness. The third, as stated, simply favors a certain type of roadway.

Bicycle and pedestrian facilities are prioritized based on their projected usage, connection to transit, connection to other bicycle and pedestrian facilities, and their inclusion in local plans. These criteria clearly emphasize system connectivity and favor those projects that will get the most use.

Transit priorities are determined by the implementing agency, LYNX. As described in the TIP, the criteria they used are: basic service and program funding, service development projects, bus replacement/repair/maintenance, customer amenities, additional capital, systems development, and studies. It is hard to determine what is meant by these criteria.

Overall, Orlando's prioritization process is vague and misleading. They refuse to address project prioritization in the Plan, and therefore miss the opportunity to explain the links between regional goals and project programming.

Instead, they rely on limited information in the TIP to explain their programming decisions.

CONCLUSION

Recommendations

The results of this research show that a project prioritization process is common to most MPOs. However, not all prioritization processes are equal – some MPOs have taken a lead in the development of this concept. This thesis points out a number of common flaws as well as some qualities found in the most successful strategies. An MPO would benefit from learning how they compare to other institutions. Although an MPO's process should be tailored to that region's unique needs and priorities, there are some universal characteristics they should incorporate. Through this comparison, an MPO can see where they are deficient, and how other organizations have overcome those deficiencies. Overall, I would recommend that an MPO take special care in being deliberate in the prioritization framework they develop. If they choose to undertake a prioritization process, they need to:

1. ensure clarity in its scope and influence in project selection
2. make the methodology and results reasonably available so that it truly achieves the goal of providing greater transparency.

Limitations

The primary limitation of this research was the fact that it was conducted from material available online. It is certainly possible that an MPO choose not to publish its prioritization methodology. It could conduct it outside of the framework of the federally mandated planning process, after the Plan identifies the projects and before the TIP programs them. It is possible they simply do not make it available online or that it is not easily found on their website. For this reason, it is probable that MPOs conduct a more elaborate analysis than stated in this document.

Future Research Opportunities

Ideally, research should be conducted on a personal level, so that the MPO has a chance to express its prioritization process in its entirety, as well as explain the rationale behind the methodology. This would ensure complete data and would offer more insight as to why a particular process was chosen.

The culmination of all this research would logically be the creation of a forum for MPOs to discuss the issues and share information. This could take part within already established MPO associations. Alternatively, it could be expanded to include other entities interested in the

prioritization of transportation projects, which would be numerous and include state agencies, transit agencies, and cities. The principal intention would be for participants to share their experiences, reveal successes and failures, and ultimately develop best practices.

APPENDIX

SANDAG REGIONAL TRANSPORTATION PLAN
TECHNICAL APPENDIX 7
HIGHWAY PROJECT EVALUATION CRITERIA

CRITERIA	DESCRIPTION
1. Located in a High Crash Rate Area	Is the project located in an area with a high vehicular crash rate? **Score — Description** 5 — Greater than 160 percent of the 3-year average statewide crash rate for a similar facility (i.e. 60% over the statewide average) 4 — Greater than 150% " " 3 — Greater than 140% " " 2 — Greater than 130% " " 1 — Greater than 120% " " Analysis based on accident data provided by Caltrans.
2. Serves Goods Movement	Does the project provide for goods movement? A) Is the highway a major freight corridor as measured by truck AADT% 2 >7% 1 4%-7% 0 less than 3% B) Is the highway part of a designated trade corridor as defined in the Regional Truck Network- as part of the RTP Freight Strategy? 2 Yes 0 No C) Does the highway serve a major freight center (within one mile of the corridor) such as a Port, International Airport, Port of Entry, Rail Intermodal/Transload Facility or Industrial Cluster/Distribution Center? 1 Yes 0 No
3. Serves Peak-Period Trips*	What is the number of peak-period trips located within one mile of the highway corridor? Calculated as all peak-period origin and destinations within one mile of the highway corridor. **Score — Description** 5 - 1 Number of peak-period trips per mile
4. Provides Mobility*	What is the increase in person capacity resulting from the project? Calculated as change in person miles traveled divided by project length (miles). **Score — Description** 10 - 1 Change in persons per lane mile

Figure 2. SANDAG highway project evaluation guidelines

CRITERIA	DESCRIPTION
5. Provides Congestion Relief *	What is the number of daily person-hours saved? This criterion accounts for both current (2006) and 2030 congestion relief. Total daily travel time is computed for a baseline condition that includes all current (2006) fully funded and/or environmentally cleared projects. Travel time is again computed by adding each project, one by one, to the baseline condition. The resulting travel time is then compared to the baseline travel time. The difference is the travel time savings that can be attributed to each project. Higher ranking projects have the largest number of person-hours saved. To incorporate existing congestion the 2006 Congestions Mitigation Map was utilized to determine the level of service (LOS) on the existing network. The LOS were grouped into categories of F, E-D, and C-A. The 2030 hours were then divided by a factor assigned to these three groups. F = 1, E-D = 1.5 and C-A = 2. **Score** **Description** 15 -1 Number of person hours saved (per lane mile)
6. Serves RCP Smart Growth Centers	Does the highway corridor serve existing/planned and/or potential RCP Smart Growth areas? Highway Corridors shall receive points for each place type they serve. **Score** **Description** 5 Serves existing/planned Metropolitan Center or Urban Center 3 Serves existing/planned Special Use Center 1 Serves potential Urban Center or Special Use Center Scores are based on the total number of these points* 5 More than 7 points 4 6 to 7 points 3 5 points 2 3 to 4 points 1 1 to 2 points
7. Facilitates Carpool and Transit Mobility	Does the project contain carpool/managed lane facilities and/or regional or corridor transit service? **Score** **Description** 5 Includes carpool/managed lane facility **and** Regional or Corridor transit services identified in the Regionally Significant Transportation Network 3 Includes carpool facility/managed lane or Regional **or** Corridor transit services identified in the Regionally Significant Transportation Network.

Figure 2 (continued)

CRITERIA	DESCRIPTION
8. Minimizes Habitat and Residential Impacts	Does the project minimize negative habitat and residential impacts? Projects receive points for each of the descriptions they satisfy **Points — Description** 2 — Avoids preserve areas as defined by habitat preserve plans 1 — Avoids natural areas as defined by habitat preserve plans 2 — Avoids existing residential development (defined as existing housing stock within 500-feet of the highway right of way is less than two dwelling-units per acre- this does not imply a taking and is used only as a measure of proximity)
9. Critical Linkage	Is the project located in a high volume freeway corridor and/or lacking a continuous parallel arterial **or** completes a missing link? **Score — Description** 5 — High volume freeway corridor **and** lacking a continuous parallel arterial listed in the Regional Arterial System (High volume is defined as greater than 250,000 ADT using the 2030 Smart Growth forecast) 3 — Completes a missing regional link 1 — High volume freeway corridor **or** lacking a continuous parallel arterial listed in the Regional Arterial System
10. Cost-Effectiveness*	What is the annual capital and operating project cost per project mile divided by person hours saved? Calculated as: [((Capital project cost/project life) +(operating & maintenance costs))/project mile)] / Project life] / annual weekday person hours saved Higher ranking projects have a lower cost per person hour saved. **Score — Description** 30 - 1 — Cost per person hour saved per lane mile

* Criterion denoted with an asterisk were calculated using a relative score quantitative method where the top scoring project received the full number of points for that criterion and the subsequent projects received points relative to the top project score.

Figure 2 (continued)

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