San Francisco Streetscape Prioritization

Best Practices Review

November 2014

Table of Contents

Executive Summary ES-1

Introduction 1

Case Study Prioritization Methodologies 1

- Charlotte – Sidewalk Retrofit Program 1
- Portland – Safe Routes to School 2
- Los Angeles – Mobility Plan 4
- Seattle – Pedestrian Master Plan 5
- Portland – Metro TOD Strategy 8

Other Prioritization Techniques and Processes 9

- Assessing Economic Impact: New York's "Economic Benefits of Sustainable Streets" 9
- Weighting Criteria – Abu Dhabi's Pairwise Comparison Method 11

Discussion of Prioritization Issues 12

- Objective vs. Subjective Criteria 12
- Catalyzing Positive Impacts 13
- Grouping Projects 13
- Geographic Equity 13
- GIS as a tool 14

Appendix 1: Overview of Criteria

Appendix 2: Detailed Criteria Tables

Table of Figures

Figure 1: Charlotte Sidewalk Retrofit Program, Summary of Criteria 2
Figure 2: Portland SRTS, ESR and Infrastructure Prioritization Criteria 3
Figure 3: Portland SRTS, Programmatic Prioritization Criteria 3
Figure 4: Los Angeles Mobility Plan Heat Map of Prioritized Pedestrian Districts 5
Figure 5: Seattle Pedestrian Master Plan, Pedestrian Demand Criteria 6
Figure 6: Seattle Pedestrian Master Plan, Population Forecast Weights 6
Figure 7: Seattle Pedestrian Master Plan, Equity Analysis Criteria 6
Figure 8: Seattle Pedestrian Master Plan, Corridor Function Analysis Criteria 6
Figure 9: Seattle Pedestrian Master Plan, "Walking Along the Roadway" Criteria 7
Figure 10: Seattle Pedestrian Master Plan, "Crossing the Roadway" Criteria – Road Segment 7
Figure 11: Seattle Pedestrian Master Plan, "Crossing the Roadway" Criteria – Intersection 8
Figure 12: Portland Metro TOD Strategy, Transit Orientation Criteria 8
Figure 13: Portland Metro TOD Strategy, TOD Typologies 9
Figure 14: New York Economic Benefits of Sustainable Streets, Example Pre- and Post-Implementation Analysis 10
Figure 15: New York Economic Benefits of Sustainable Streets, Combined Sales – Improvement Sites vs. Comparison Sites for Columbus Avenue. 11
Figure 16: Abu Dhabi Surface Transport Master Plan, Example of Crosswise Comparison Scale 11
Figure 17: Abu Dhabi Surface Transport Master Plan, Final weightings for second tier objectives 12
Figure 18: Charlotte Sidewalk Retrofit Program, Detailed Prioritization Criteria A-2
Figure 19: Portland SRTS, Detailed ESR and Infrastructure Prioritization Criteria A-2
Figure 20: Portland SRTS, Detailed Programmatic Prioritization Criteria A-2
Figure 21: Seattle Pedestrian Master Plan, Detailed Pedestrian Demand Criteria A-2
Figure 22: Seattle Pedestrian Master Plan, Detailed "Walking Along the Roadway" Criteria A-2
Figure 23: Seattle Pedestrian Master Plan, Detailed "Crossing the Roadway" Criteria – Road Segment A-2
Figure 24: Seattle Pedestrian Master Plan, Detailed "Crossing the Roadway" Criteria – Intersection A-2

Executive Summary

The City of San Francisco completed WalkFirst in February 2014, which prioritized pedestrian safety infrastructure improvements on 70 miles of targeted Safety Streets. The City is currently developing a complementary methodology to prioritize how streetscape improvements are implemented on its 167 miles of Streetscape Streets. As part of this process, the project team was interested in learning from the strategies developed by other cities that have undergone similar prioritization processes.

The following seven programs were examined for this Best Practices Review, including five examples of prioritization methodologies with elements that San Francisco may consider incorporating into its own efforts and two projects that provide additional insights into specific aspects of prioritization:

- Charlotte, North Carolina: Sidewalk Retrofit Program
- Portland, Oregon: Safe Routes to School (SRTS)
- Seattle, Washington: Pedestrian Plan
- Los Angeles, California: Mobility Plan
- Portland Metro: Transit Oriented Development Strategic Plan
- New York DOT: Economic Benefits of Sustainable Streets Report
- Abu Dhabi DOT: Surface Transport Master Plan

Methodologies and Processes: The five examined cities used various analysis techniques in their prioritization processes, including spreadsheet analyses, GIS raster analyses, and a combination of the two where GIS was used to query specific data, identify categories, or ensure geographic equity of projects.

Public Involvement: In Portland and Charlotte, where prioritization led to direct on-street improvements, input from the public was built directly into the prioritization process and/or the ranking criteria. Where prioritized projects were more strategic in nature, as in Seattle and Los Angeles, little public outreach was conducted, or it was incorporated as part of a larger planning process.

Criteria: The examined cities focused on the following types of criteria in their prioritization methodologies for pedestrian projects:

- Pedestrian Demand – including residential and employment density, and proximity to destinations
- Equity – including income, race/ethnicity, and physical ability
- Public Health – including collisions, physical activity, diabetes, and obesity rates
- State of Repair – including current infrastructure quality and opportunities for improvement
- Walkability – including completeness of network
- Safety/Exposure to Risk – including traffic volumes and speeds, collisions
- Economic Vitality – including sales tax revenues

Subjective vs. Objective Criteria: Cities largely relied on objective data to define their prioritization criteria. When the necessary data to directly measure a desired criterion were not available, staff created proxies. Subjective criteria were rarely used in the prioritization process, for both logistical and political reasons. The geographic areas covered by the projects are large, and developing subjective criteria for the entire areas would have been time consuming. Non-subjective metrics, whose results would be defensible to city stakeholders and decision-makers, were essential. Portland was the only city to include a subjective criterion in its prioritization process: demonstrated school support for providing educational programs.

Weighting: Most prioritization processes included weighting, where each criteria category was assigned a score or set of points relative to the other categories. These weightings identified the relative importance of each criterion to the overall goals of the program. Criteria weights were often developed through discussion and consensus among the project team. Abu Dhabi more objectively developed its criteria weights using a pairwise comparison methodology that asked stakeholders to compare on a numeric scale each individual factor against every other factor. The scores were then averaged, and a ranked list of criteria was developed. This methodology allowed city staff to quickly identify objective weightings for criteria based on the differing priorities of various stakeholders.

Introduction

The City of San Francisco is currently developing a methodology to prioritize project implementation on its 167 miles of Streetscape Streets. As part of this effort, the project team was interested in learning from the methodologies developed by other cities that have undergone similar prioritization processes.

This Best Practices Review examines prioritization methodologies from the following five city projects, identified through a request for information sent to the NACTO email listserve, as well as two additional projects that provide insight into specific aspects of prioritization:

- Charlotte, North Carolina: Sidewalk Retrofit Program
- Portland, Oregon: Safe Routes to School (SRTS)
- Seattle, Washington: Pedestrian Plan
- Los Angeles, California: Mobility Plan
- Portland Metro: Transit Oriented Development Strategic Plan
- New York DOT: Economic Benefits of Sustainable Streets report
- Abu Dhabi DOT: Surface Transport Master Plan

The peer review of prioritization criteria and processes was conducted by initially identifying specific questions, issues, and areas of inquiry that the project team was interested in investigating. Where additional information was needed beyond the documentation initially provided by the cities or available online, the consultant team scheduled a follow-up phone call with a city representative.

Portland SRTS and Los Angeles are about to undergo a similar review and enhancement of their prioritization processes. This Best Practices Review focuses primarily on their existing prioritization processes, but it also addresses some of the aspects they have been contending with in the lead-up to development of their new processes.

A summary table of the projects examined for the Best Practices Review and the criteria that they utilized in their prioritization processes is included in **Appendix 1**.

Case Study Prioritization Methodologies

Charlotte – Sidewalk Retrofit Program

Charlotte developed a prioritization process for its sidewalk retrofit program because it has a high need for sidewalk improvements and limited budget. The City's goal is for sidewalks to be installed on both sides of every thoroughfare and on one side of every collector street and local street.

In the sidewalk program, thoroughfares and collector/local streets are ranked according to the same criteria, which are shown in **Figure 1**, and included in the same ranked list. Projects are reviewed and ranked each fiscal year and selected for implementation according to funding availability. The processes that determine a project's inclusion on the list, selection for implementation, and eventual completion differ by street type, as described below.

Thoroughfare Process: Projects on thoroughfare streets are identified and ranked according to the criteria shown in **Figure 1**. They are then added to the City's Sidewalk Priority List. Each year, rankings are reviewed and projects are selected for implementation based on available funding. Selected projects are then designed, implemented, and removed from the list. No additional improvements take place through this program.

Neighborhood Process: Projects on local and collector streets follow a more public process and require significant neighborhood input and support to move from one stage to the next. A project first is nominated by a resident through submission of a nomination form, which requires the support of at least 25% of the property owners on the street segment proposed. Segments that meet this requirement are then ranked according to the **Figure 1** criteria and added to the City's Sidewalk Priority List. If a project of this type is then selected for implementation, initial designs are developed and presented at a public meeting. A second public meeting is held to present design adjustments made according to comments received. The City then administers a petition to all property owners along the street segment. There must be 60% property owner

support for the project to continue to implementation. If it receives this support, and is not subject to an appeal, then all property owners must contribute to paying for the sidewalk construction. Projects are then implemented and removed from the list. No additional improvements take place through this program.

Figure 1: Charlotte Sidewalk Retrofit Program, Summary of Criteria

Criteria	Weight
AAWT (Average Annual Weekday Traffic)	20
Proximity to transit	10
Roadway related safety need	10
Length of proposed sidewalk	8
Proximity to a school	7
Proximity to a park	7
Connectivity to other sidewalks	6
Proximity to land uses serving elderly or people with disabilities	5
Proximity to neighborhood serving land uses	5
Evidence of a worn path	5
Existence of curb/gutter/drainage	5
School Type	3
Pedestrian Friendly Index Rating (From Charlotte Neighborhood Quality of Life Study)	3
Proximity to pedestrian overlay district	3
Greenway Overland Connector Route	3

Note: Full list of criteria included in **Appendix 2**.

Neighborhood Improvement Plan and Area Improvement Plan Process: For Neighborhood Improvement Plans and Area Improvement Plans, projects are identified through a public meeting process. Projects under these plans can include sidewalk and non-sidewalk improvements. The sidewalk projects are ranked according to the criteria in **Figure 1** and are subject to the same street type processes described above. However, plan projects compete for funding with other projects proposed in the Neighborhood or Area Improvement Plan and are implemented with funding from those programs rather than from the Sidewalk Program.

Portland – Safe Routes to School

Portland's Safe Routes to School (SRTS) program is housed within the Portland Bureau of Transportation (PBOT). It provides funding and planning for infrastructure improvements at city schools, biking and walking educational programs for elementary school students, and other encouragement programs. The organization works in collaboration with the three school districts in Portland, as well as the Bicycle Transportation Alliance organization, which provides the educational programming. In 2012, the program developed a prioritization process that reflected their newly developed strategic policy, as well as state and federal requirements and prioritization criteria for Safe Routes to School funding. Two prioritization processes were developed: one focused on prioritizing infrastructure and physical improvements; another focused on prioritizing education programs and encouragement campaigns. These two processes are described below.

Safe Routes to School ESR and Infrastructure Prioritization Process

Every Portland school must complete an Engineering Strategies Report (ESR) to receive funding for SRTS infrastructure improvements. This requires PBOT to work with the school's administration, parent-teacher association, and the neighborhood association to identify and prioritize improvements. Because of the demand for ESRs and the time required to complete them, a scoring system was developed to prioritize schools to receive ESRs and subsequently implement the infrastructure projects identified in them. The criteria and weights used to score schools are shown in **Figure 2**.

Recently, a bond measure was passed by Portland Public Schools (PPS), the largest school district in Portland, that includes funding for SRTS infrastructure improvements. This funding requires that the ESR process be revised with updated prioritization criteria, which will use a more sophisticated GIS-based analysis method.

Projects are currently prioritized based on a desire to complete improvements to areas surrounding specific schools and complete top priority projects citywide. Short-term high priority projects are typically prioritized over long-term high priority projects. If there is political will or opportunities for SRTS capital projects to be included in other planning efforts, specific projects may be implemented outside of the typical ranking process. Under the process currently being developed, capital funding would be allocated by high school "group" rather than by individual schools. A high school group includes the one-mile radius surrounding a high school and the elementary and middle schools that feed into it. Many of these school buffers and their communities overlap, so public meetings would be able to look at an area more holistically.

Figure 2: Portland SRTS, ESR and Infrastructure Prioritization Criteria

Area	Criteria	Weight
Equity	Percentage of students who receive free or reduced lunch	10
	Percentage of students that are within communities of color	10
	Percentage of students that have physical disabilities	10
	Percentage of students that come from families where English is not the primary language spoken at home or are immigrants or refugees	10
Safety	Current network completeness, based on PBOT sidewalk and bikeway methodology	20
	Five year crash rates for youth walking and biking within the school boundary	10
Past Expenditures	Amount spent on SRTS infrastructure efforts in the past at the school	30

Note: Full list of criteria included in **Appendix 2**.

Safe Routes to School Programming Prioritization Process

For programmatic funding prioritization, Portland SRTS categorizes programmatic activities into "bicycle and pedestrian education" and "other". For bicycle and pedestrian education, all schools are asked if they want to participate in the SRTS programming and ranking each spring. Only schools that respond are included in the ranking for the next school year, and the number of schools that receive programs is determined by available funding. Some schools decide that they do not want to participate because it requires classroom time.

Prioritization criteria for the programmatic components, shown in **Figure 3**, is intended to continue the focus on equity and ensure that biking and walking infrastructure is safe before providing education and encouragement programs. Subjective criteria attempt to ensure that funding is used at schools where it is effective, where programming will help spur more students to walk and bike, and where there is administrative, staff, and potentially parent support to coordinate instruction, provide classroom time, and build on the educational components to provide additional encouragement programs.

Scores for the subjective criteria are initially determined by one staff member, based on his or her knowledge of the schools, administration, and neighborhood context. Scores are then reviewed and adjusted based on feedback by the rest of the SRTS team and by the partner organization that provides the education at schools.

Figure 3: Portland SRTS, Programmatic Prioritization Criteria

Area	Criteria	Weight
Equity	Percentage of students who receive free or reduced lunch	20
	Percentage of students that are within communities of color, are newcomers (immigrants or refugees), have a physical disability, and/or come from families where English is not the primary language	20

Leverage	Ability to change school travel behavior given built environment and school's travel history	30
	School has recently or will soon receive infrastructure improvements that will improve walking and or biking opportunities	
School Support	School has a champion that could potentially lead future SRTS programming	30
	School has historically received SRTS education and been a valuable SRTS partner	
	School has never had bike and pedestrian education but has asked repeatedly	

Note: Full list of criteria included in **Appendix 2**.

Los Angeles – Mobility Plan

The Los Angeles Mobility Plan serves as the update to the City's General Plan Transportation Element. It is meant to balance the needs of all road users and set a new course for transportation improvements and planning in the City of Los Angeles that focuses on mobility and placemaking. The plan is currently in the draft phase. This Best Practices Review looks at the prioritization of pedestrian improvements and districts in the Mobility Plan.

As a high-level strategic document, the Mobility Plan identifies districts for prioritization of pedestrian improvements, but it does not identify specific projects. The process used a GIS raster analysis (example shown in **Figure 4**) to develop a set of Pedestrian Enhanced Districts. The analysis incorporated the following factors:

- Population density
- Job density
- Retail job concentrations
- Commercial land use intensity
- Transit facility proximity and intensity (within ¼ mile)
- Concentration of landmark destinations
- Intersection density
- Pedestrian collisions
- Park proximity
- School proximity

During the strategic phase of the Mobility Plan, all factors used were objective, since the area was too large to identify and categorize subjective criteria.

Weighting was used in the first round of analysis to double-count two of the variables, intersection density and pedestrian collisions, as proxies for pedestrian volumes, since those data were not available. This proved to be difficult to explain to the public and decision-makers, and it resulted in concentrating improvements primarily in the downtown area. In order to gain broader buy-in from the City Council, it was important to show a more geographically equitable distribution of improvement areas and ensure significant improvements in each Council District. In the second round of analysis, no factors were weighted.

The City is currently developing a GIS-based prioritization process for the implementation stage. This process will likely:

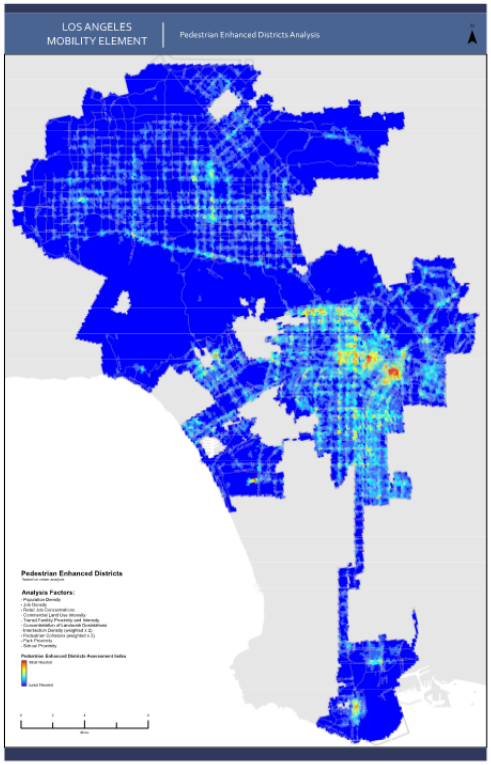
- Identify hotspots within each district, as well as specific projects within hotspot areas that respond to local opportunities and needs.
- Be flexible to reflect changing neighborhood/district needs as well as public feedback during the implementation phase, rather than identifying a specific improvement network from the outset.
- Not be geographically equitable funding-wise, but rather consider the specific context of each area, whether projects respond to multiple goals, and the level of impact of improvements on users.

- Be a non-modal approach while also considering modal factors in order to take advantage of available funding streams.

Project grouping will depend in large part on the political climate. Because many types of improvements envisioned are innovative and new in the Los Angeles area, staff is considering implementing pilot districts to showcase these improvements, test response, and gain support for citywide implementation.

Projects from the 2010 Bike Plan will also be incorporated into the Mobility Plan implementation phase and re-branded where possible to focus on street calming and other improvements that will gain broader support.

Figure 4: Los Angeles Mobility Plan Heat Map of Prioritized Pedestrian Districts



Seattle – Pedestrian Master Plan

Seattle's Pedestrian Master Plan used a GIS-based process to identify priority projects in the short-term and guide long-term decision-making based on a robust set of criteria. It was designed to be a living database that gets updated as projects are completed and other on-street conditions change. It is so far unique in that it provides specific intersection and street level prioritization and flexibility.

A four-step process was developed for defining high priority areas:

1. Base Analysis
    a. Pedestrian Demand
    b. Equity Analysis
    c. Corridor Function Analysis
2. High Priority Project Areas
3. Pedestrian Needs Analysis
4. Development of Project Lists

For each step and sub-step, GIS layers were developed to score each criterion, then combined into a total score GIS layer. This allows each criterion or group of criteria to be queried individually when developing project lists, so they can be fully customized to specific program or funding needs.

Step 1: Base Analysis

1a: Pedestrian Demand. Current pedestrian demand was calculated using generators by type and three buffer zone distances. Future pedestrian demand was calculated using population and employment forecasts. The criteria and weighting for these are shown in **Figure 5** and **Figure 6.**

Figure 5: Seattle Pedestrian Master Plan, Pedestrian Demand Criteria

Category	Sub-Category	Points
High Generator	Universities and colleges, major generator such as Pike Place or the Convention Center, light rail stations, multi-family housing, major bus stops, and rapid bus routes.	70
Medium Generator	Schools, major retail, local bus routes, hospitals, trails, community service sites such as libraries and community centers, and parks.	35
Low generator	Minor retail, minor bus stops, park and ride sites, bridges, and stairs.	13

Note: Full list of criteria included in **Appendix 2**.

Figure 6: Seattle Pedestrian Master Plan, Population Forecast Weights

2025 Population Forecast (per sq mile)	Weight	2025 Employment Forecast (per sq mile)	Weight
0 - 2,527	0	0 – 1,040	0
2,528 – 7,929	2	1041 – 2,888	2
7,930 – 13,071	4	2,889 – 8,007	4
13,072 – 22,626	8	8,008 – 41,258	8
22,627 – 134,959	10	41,259 –464,493	10

1b: Equity Analysis. The equity analysis prioritized pedestrian improvements in communities with the greatest socioeconomic, transportation, and physical activity needs. For each of the criteria shown in **Figure 7**, 5 points were assigned to Census block groups within the top quintile.

Figure 7: Seattle Pedestrian Master Plan, Equity Analysis Criteria

Criteria	Data Source
Automobile ownership	Census Data
Low income population	Census Data
Disability population	Census Data
Diabetes rate	HPA Health Data for King County
Physical activity rate (self-reported)	HPA Health Data for King County
Obesity rate	Self-reported

1c: Corridor Function Analysis. Street types were scored according to their function and contribution to the pedestrian network. These classifications, shown in **Figure 8**, built on the typical arterial, collector, and local street classification, to provide better description of a street's character, design elements, and function.

Figure 8: Seattle Pedestrian Master Plan, Corridor Function Analysis Criteria

Street Type	Description	Weight

Regional connectors	Principal arterial with any adjacent land use	25
Commercial connectors	Minor arterial with any adjacent land use	25
Local connectors	Collector arterial with any adjacent land use	25
Main streets	Arterial adjacent to neighborhood commercial zoning with a pedestrian overlay	15
Mixed streets	Arterial adjacent to neighborhood commercial zoning	15
Green streets	Non-arterial in downtown Seattle with a pedestrian emphasis	15
Residential	Non-arterial streets within an urban village	10
Residential green	Non-arterial residential street outside of downtown Seattle	10
Industrial access	Non-arterial adjacent to industrial or maritime land uses	10
Industrial arterial	Arterial adjacent to industrial or maritime land uses	10

Step 2: High Priority Project Areas

The final scores from steps 1a, 1b, and 1c were normalized based on the following weights and combined into a single score to identify the high priority project areas:

- Potential pedestrian demand: 40%
- Equity: 35%
- Corridor typology: 25%

Step 3: Pedestrian Needs Analysis

The Pedestrian Needs Analysis used available GIS data to determine pedestrian deficiencies along roadway segments and at intersections. It used roadway characteristics to measure how comfortable and safe it is to walk along and across roadways. Analyzed criteria and their weights are shown in **Figure 9**, **Figure 10** and **Figure 11**. For these analyses, higher scores indicated that a road is less comfortable to walk along or across. Negative scores were included in some categories.

Figure 9: Seattle Pedestrian Master Plan, "Walking Along the Roadway" Criteria

Factor/Criteria	Max Points Allocated
Street Type Classifications (to indicate traffic volumes)	5
Arterial Speed Limit	5
Sidewalk Buffer Width	10
Sidewalk Width and Presence	10
Sidewalk Slope	3
On-Street Parking Presence	5
Curb Presence	2
Length of Block	3

Note: Full list of criteria included in **Appendix 2**.

Figure 10: Seattle Pedestrian Master Plan, "Crossing the Roadway" Criteria – Road Segment

Factor/Criteria	Max Points Allocated
Street Classifications (to indicate traffic volumes)	5
Arterial Speed Limit	5
Road Width	10
Distance Between Traffic Signals	5

Note: Full list of criteria included in **Appendix 2**.

Figure 11: Seattle Pedestrian Master Plan, "Crossing the Roadway" Criteria – Intersection

Factor/Criteria	Max Points Allocated
Crosswalks per Intersection	2
Curb Ramps - existence and type (per ramp)	1
Signal Control - existence and type	3
Stop Sign Control (per stop sign)	-0.25
Number of Collisions at Intersection (3 years)	20

Note: Full list of criteria included in **Appendix 2**.

Step 4: Development of Project Lists

The highest priority projects for implementation were those that had the highest scores in both the High Priority Project Areas aggregate analysis and the Pedestrian Needs Analysis.

Importantly, the prioritization structure was developed so that each criterion could be scored separately, and each portion of the analysis totaled separately. This allowed both the database and process to be flexible. Criteria can easily be added if additional data become available, and custom priority lists can be developed to meet the requirements of specific funding sources by creating queries to the individual criterion level. The data itself can also be updated on an ongoing basis as conditions change and improvements are implemented. Because GIS allows selections within specific boundaries, priority lists can also be generated for specific neighborhoods or area plans.

Portland – Metro TOD Strategy

Portland Metro TOD performed an analysis to determine which light rail stations to prioritize for improvement. They wanted their investments to be used to prepare, assist, and catalyze neighborhoods to become more transit-oriented. In this analysis, existing conditions were important, as well as future potential for station improvements to spur neighborhood development. Criteria, shown in **Figure 12**, were developed to capture existing transit orientation and compared against existing market strength to develop three TOD typologies for how Metro could invest. Data were analyzed for areas within a half-mile radius of light rail and streetcar stops and within a quarter-mile of quality bus corridors.

Figure 12: Portland Metro TOD Strategy, Transit Orientation Criteria

People	Residential and employment population
Places	Number of employees in neighborhood serving business sectors, used as proxy for business density, based on NAICS codes
Physical Form	Average block size by acre
Performance	Number of peak hour rail and bus trips that serve each station area
Pedestrian/ Bicycle Connectivity	Sidewalk density and low-stress bikeway density

The data for each of these criteria were compiled and aggregated in a GIS model to provide a single score for transit orientation.

Market strength was then determined using all residential and mixed-use residential/commercial real estate sales transactions between 2000 and 2010, on a price per square foot basis. Designations of "limited", "emerging", and "stronger" market strength were determined through natural breaks in the data.

TOD Typologies

Error! Reference source not found. shows how typologies were assigned to provide a guide for how best to invest time and infrastructure into each station area to promote and encourage transit oriented development. The following summarizes the plans for direct investment in each of the typologies:

- Plan & Partner (gold): Lowest priority for direct investment. These areas do not currently have the land use or market strength to take advantage of investments to create a more transit-oriented neighborhood.
- Catalyze & Connect (light blue): Highest priority for direct investment. These areas have strength in either transit orientation or market support, or are emerging in both. Infrastructure projects in these areas could help spur new transit-oriented development, improve market strength, and improve connectivity for transit, biking, and walking.
- Infill & Enhance (purple): Moderate priority for direct investment. These areas are the most ready for transit-oriented development, and in many cases they already have it. While investments are considered to continue to enhance and further catalyze transit-oriented development, they do not need heavy infrastructure investments to be successful.

Figure 13: Portland Metro TOD Strategy, TOD Typologies

Specific types of investment strategies were assigned to each TOD typology to encourage transit oriented development and improve the ease and safety of accessing transit. Strategies ranged from supporting other public agencies and providing technical assistance to banking land and investing in transit oriented infrastructure improvements. This analysis was intended to revise Metro's policies toward station and stop area investments and did not include development of project lists.

Other Prioritization Techniques and Processes

Assessing Economic Impact: New York's "Economic Benefits of Sustainable Streets"

New York's evaluation of the Economic Benefits of Sustainable Streets was a post-implementation analysis of whether street improvements affect the economic health of a business district; it was not a prioritization methodology. The study is useful here because it provides the basis for considering economic vitality and development as a criterion in the prioritization process.

The New York study's methodology aimed to provide objective, data-driven evidence for improved economic vitality on corridors where bicycle and pedestrian improvements had been implemented, compared to corridors without these improvements.

Quarterly sales tax filings by site were used for the analysis. These data provided a frequently updated set of

sales data that businesses were required to submit, and the information could be disaggregated by self-reported NAICS codes. Sales tax filing data required significant cleaning to make it useful, largely because filing addresses were at times not linked to actual business sites.

Improvement and comparison sites were selected that met the following criteria:

- Had a significant proportion of retail businesses;
- Reflected the range of street improvements implemented throughout the city (plaza, complete street, and select bus service project types);
- Implemented projects primarily between 2006 and 2009, some projects completed in 2010; and
- Had a geographic diversity of sites.

Comparison sites were selected to control for outside factors. The boroughs were used to compare economic trends. Each improvement site was also compared with one to four nearby neighborhood comparison sites, depending on availability, with a similar retail mix.

In each of the improvement and comparison sites, business addresses were geocoded and the site areas specifically defined. Datasets were then developed for businesses within these site areas that would be most affected by transportation changes. These included ground floor retail, accommodation, and food service businesses (by NAICS codes) that were not gas stations or auto repair shops.

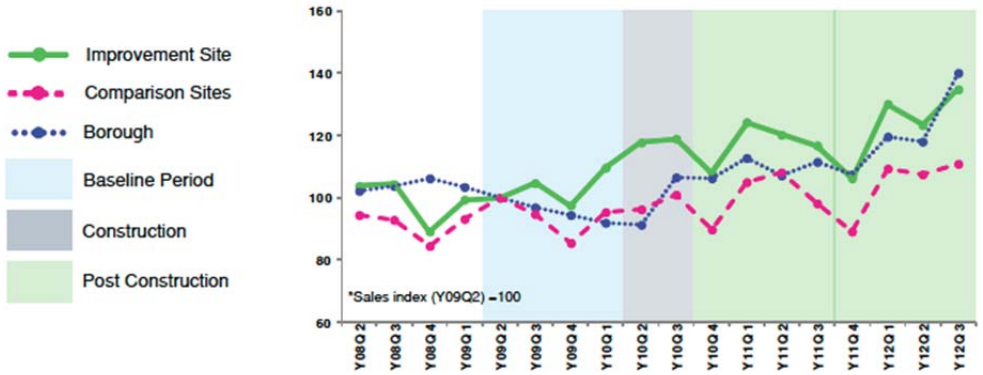
The analysis time period included the four quarters prior to the improvement and the three years after completion of the improvement.

Similar to the SFMTA streetscape and economic indicator study (planned for release in 2014), information for each case study site included the improvement project goals, the specific improvements implemented, before and after photos, a map of the improvement and comparison sites, the analysis results and a brief discussion. **Figure 14** and **Figure 15** show some of the information provided for one of the case study sites.

Figure 14: New York Economic Benefits of Sustainable Streets, Example Pre- and Post-Implementation Analysis

Area	Baseline Quarterly Sales	Δ Sales Post-Improvement	
Improvement Site		1st Year	2nd Year
Columbus Ave (77-96)	$17,476,299	+14%	+20%
Borough			
Manhattan	$ 4,054,385,966	+14%	+27%
Neighborhood Comparisons			
Average	$19,275,711	7%	11%
Amsterdam (77-96)	$25,129,981	+7%	+12%
Columbus (70-77)	$13,421,440	+7%	+9%

Figure 15: New York Economic Benefits of Sustainable Streets, Combined Sales – Improvement Sites vs. Comparison Sites for Columbus Avenue.



The results of the New York analysis, though varying across each of the case study sites, showed significant evidence that street improvements can positively impact economic vitality.

Weighting Criteria – Abu Dhabi's Pairwise Comparison Method

Weighting identifies how important each criterion is in determining the overall prioritization. Most of the projects in this Best Practices Review weighted prioritization criteria by assigning a certain amount of points to each criterion in the overall score calculation. Many of the city reports provide little, if any, discussion of how weights were determined. Conversations with city staff indicated that weights were developed primarily through discussion among the project team and eventual consensus on the relative importance of each criterion or set of criteria.

While prioritization weights are often assigned through discussion and consensus, in some cases a more objective approach would be beneficial. As the number of prioritization criteria increases, it becomes more difficult to identify relative weights that accurately reflect the goals of the project. An additional complication is the presence of multiple stakeholders who often have different priorities, even when they agree on the ultimate project goal. As with any large project, it is also difficult or even impossible to get everyone in the room to agree.

The Abu Dhabi Surface Transport Master Plan (STMP) used a method to systematically assign weights in a prioritization process. Abu Dhabi's method used a pairwise comparison, evaluating each element against the others on a scale to create a hierarchy, as shown in **Figure 16**.

The individuals on the project team, as well as city decision-makers and other stakeholders, completed the comparison, and the scores were averaged to get an overall weighting for each objective.

Figure 16: Abu Dhabi Surface Transport Master Plan, Example of Crosswise Comparison Scale

The top tier objectives were compared against one other, as listed below, on a scale similar to the one shown in **Figure 16**.

- Economy vs. Environment
- Economy vs. Social
- Environment vs. Social

The preferences expressed in the survey results led to the following weighting outcomes:

- Economy Weighting - 30%
- Environmental Weighting - 37%
- Social Weighting - 33%

Each second tier objective was then paired with every other second tier objective within its first tier grouping, as follows:

- Objective 1 vs. Objective 2
- Objective 1 vs. Objective 3
- Objective 2 vs. Objective 3

The second tier objective weights within each first tier grouping were then normalized according to the first tier weightings, giving the final weighting for each objective, shown in **Figure 17**.

This weighting methodology provided a very accurate reflection of stakeholder priorities. Discussions were conducted to review the results, but the overall process required significantly less time than a purely discussion-based consensus approach.

Figure 17: Abu Dhabi Surface Transport Master Plan, Final weightings for second tier objectives

Minimise congestion on Abu Dhabi's road network	13.8
Reduce reliance on cars and encourage alternative modes	12.3
Enhance the pedestrian realm	12.0
Develop a low carbon economy in Abu Dhabi by 2030	10.5
Preserve the critical natural environment in Abu Dhabi	8.1
Improve safety	7.8
Local air quality	6.9
Improve the connectivity of Abu Dhabi within the Metropolitan area	5.1
Encourage sustainable and efficient freight distribution	3.9
Improve regional connectivity	3.3
Protect/enhance cultural heritage, landmarks, symbols and monuments	3.0
Improve the international connectivity	2.1
Noise	1.5

Criteria weighting is often used in project prioritization, but it is not necessary. In conducting the analysis for the City of Los Angeles Mobility Plan, staff removed the weighting because they found that it concentrated improvements geographically to the point that the plan would not be supported politically. They found that the basis of the weights were also difficult to explain to the public and decision-makers.

Discussion of Prioritization Issues

The following discussion focuses on aspects of the prioritization processes examined for the Best Practices Review that address a specific interest of the project team.

Objective vs. Subjective Criteria

One key research question was how other cities incorporate and score subjective criteria in their prioritization process. Through the course of this review, it was found that most agencies used only objective criteria for the following key reasons:

- Analyses covered large areas and networks, and attempting to bring in subjective criteria would have been too difficult and time consuming;
- Analyses needed to be supportable, and staff found it difficult to explain or support subjective variables; and
- The comparability of the analysis methodologies across sites and time periods is more difficult with subjective criteria.

Staff preferred to use imperfect objective criteria, proxies, and available data over subjective criteria.

The Portland Safe Routes to School program is the only one in this examination that used subjective criteria. The City used subjective measures to identify schools that were willing to support and build education and encouragement programs, as well as to determine whether these programs were likely to result in increased biking and walking. The SRTS team and its partners discuss the scores for these criteria each school year. Use of subjective criteria has worked for this SRTS program because the number of schools involved in this program is limited, and there are few changes from year to year.

Catalyzing Positive Impacts

Prioritization programs identify the most critical or important areas for capital or programmatic investment considering limited financial resources. The program's overall goals and how it defines "critical" or "important" are what determine which criteria are used. Most prioritization criteria focus on the number (and often specific groups) of people affected (the Potential), and how bad the situation currently is (the Deficiency). Two studies reviewed here used a process that focused on how capital investments can not only improve infrastructure but can catalyze other positive impacts in the neighborhoods.

The New York economic benefit evaluation and the Portland Metro TOD strategy maintained as their key focus the end result of economic revitalization. While the New York study was conducted after projects were completed, it showed that street improvements can have a positive impact on economic vitality, using pre- and post-implementation sales tax data for ground level retail. The Portland Metro TOD study used real estate sales as a key criterion to identify areas that are "ripe" for development and investment. Areas in the middle range of price per square foot real estate values often take the best advantage of capital investments. Investments in areas on the lower end of this scale often do not catalyze further economic development, and areas on the higher end often do not need the investments to spur development.

Grouping Projects

The reviewed prioritization methodologies and processes primarily sought to develop ranked project lists that would then be implemented based on available funding. This is easier with simpler programs such as Charlotte's sidewalk retrofit program, which conducted a straight ranking and implemented the top ranked projects up to available funding levels. In this example, longer segments of sidewalk were prioritized in the criteria weighting over shorter segments.

Some cities grouped their projects after ranking them, based on different parameters.

Portland SRTS grouped top-ranked projects based on a desire to complete infrastructure improvements at individual schools. Their goal was to target schools one at a time so that students could better take advantage of the improved infrastructure and benefit more from the education and encouragement components of SRTS. They are currently adjusting their policies to complete infrastructure improvements within high school groupings (i.e. a high school and the middle and elementary schools that feed into it). They are moving in this direction since one-mile radii for many of these schools overlap, and it will be more efficient to identify priority needs in a holistic manner when looking at the larger high school group area.

Los Angeles focused on high volume pedestrian locations combined with geographic equity across council districts. This was important in terms of both prioritizing locations where most people walk and bike, while at the same time ensuring that the plan is approved and implemented by distributing improvements across all council districts.

The Seattle model purposely did not address project grouping, as it was developed as a tool for identifying project lists based on other factors that arise such as funding sources, specific plans, etc. Funding can be allocated to specific project types based on queries and projects ranked within those project types.

Geographic Equity

Addressing geographic equity was a critical issue across the Best Practices Review. As previously discussed, Los Angeles removed criteria weights because they led to a concentration of improvements in the downtown area. However, most projects address this factor post-analysis, as it is difficult to include even within GIS-based prioritization models. Because of this, geographic equity is typically the last issue that is addressed when top

projects are ranked, prioritized, and mapped to highlight geographic distribution.

GIS as a tool

GIS is used as a tool to different extents in the methodologies reviewed. On one end of the spectrum, Charlotte's sidewalk retrofit program did not use GIS. At the other end of the spectrum, Seattle and Los Angeles compiled and analyzed all criteria within a GIS program, and data were queried and maps generated to directly provide priority locations for improvement.

The Seattle methodology used geographic databases most extensively, creating new GIS layers for each of the scored criteria and the totaled score by criteria group. The layers were then referenced in queries, as needed to develop project lists. Each dataset could easily be updated as conditions on the ground changed, and new criteria could be incorporated when data became available or priorities shifted.

In the middle of the spectrum, GIS is used to analyze scores for specific criteria, or map final scores to review the geographic distribution of prioritized improvements. Portland Metro, Portland SRTS, and New York fall into this category.

Both Portland SRTS and Los Angeles are in the process of developing more sophisticated GIS-based prioritization models. Although Los Angeles already has a GIS model, they plan to enhance it based on the comments that they received on their draft Mobility Plan, and to meet the needs of the implementation phase that they hope to begin in Spring 2015.

Appendix 1: Overview of Criteria

Category	Criteria	Charlotte	Portland SRTS	Seattle	Los Angeles	Portland Metro	New York
Population	Residential			X	X	X	
	Employment			X	X	X	
Equity	Percentage of students that are within communities of color		X				
	Percentage of students that come from families where English is not the primary language spoken at home or are immigrants or refugees		X				
	Percentage of students that have physical disabilities		X				
	Percentage of students who received free or reduced lunch		X				
	Automobile ownership			X			
	Low income population			X			
	Disability population			X			
Health and Safety	Roadway related safety need	X					
	Collision rates		X	X	X		
	Diabetes rates			X			
	Physical activity rates (self-reported)			X			
	Obesity rates.			X			
Economic Vitality	Residential and Residential/Commercial land sales per sq ft					X	
	Sales Tax Receipts						X
Financial	Amount spent on SRTS infrastructure efforts in the past at the school		X				
Land Use - Proximity or density of:	Parks	X		X	X		
	Schools	X	X	X	X		
	Colleges and Universities			X			
	Land uses serving elderly or people with disabilities	X		X			
	Neighborhood serving land uses such grocery stores, retail, etc.	X		X	X	X	X
	Designated pedestrian district	X			X		
	Hospitals, major landmarks, multifamily residential, and/or other major pedestiran generators			X	X		
Street and Network characteristic	Distance between traffic signals			X			
	Length of block/block sizes			X	X	X	

s and designations	Parking			X			
	Roadway width			X			
	Sidewalk buffer width			X			
	Signal control			X			
	Speed limit			X			
	Stop Sign Control			X			
	Street types	X		X	X		
	Traffic volumes	X					
	Existence of curb/gutter/drainage	X					
Transit	Proximity to transit, rail stations, bus stops, rail or bus routes	X		X	X	X	
Bicycle and Pedestrian	Evidence of a worn path	X					
	Pedestrian Friendly Index Rating (From Charlotte Neighborhood Quality of Life Study)	X					
	Current network completeness		X	X		X	
	Proximity to trails			X	X		
	Proximity to Bridges and stairs			X			
	Slope			X			
	Crosswalk			X			
	Curb ramps			X			
	On bikeway network or bike plan				X		
	Bikeway density					X	
	Connectivity to other sidewalks	X					
	Length of proposed sidewalk	X					
Leverage	Historically, school has received education and been a valuable SRTS partner		X				
	School has a champion that could potentially lead future SRTS programming		X				
	School has recently or will soon receive infrastructure improvements that will improve waling and or biking opportunities		X				
	Ability to change school travel behavior given built environment and school's travel history						
	School has never had bike and pedestrian education but has asked repeatedly		X				

Appendix 2: Detailed Criteria Tables

The following tables provide more detailed criteria and weightings for reviewed methodologies, where available.

Figure 18: Charlotte Sidewalk Retrofit Program, Detailed Prioritization Criteria

Criteria	Criteria weight	Category/Range		Category weight
AAWT (Average Annual Weekday Traffic)	20	more than 23,000		20
		20,000	22,999	18
		17,000	19,999	17
		14,000	16,999	16
		11,000	13,999	15
		8,000	10,999	14
		5,000	7,999	13
		3,500	4,999	12
		3,000	3,499	11
		2,500	2,999	10
		2,000	2,499	8
		1,500	1,999	6
		1,000	1,499	3
		500	999	2
		less than 500		1
Proximity to transit	10	On route		9
		Within 1/4 mile of route		7
		Within 1/4 mile of transit center or Rapid transit stop (extra points)		1
Roadway related safety need	10	Yes		10
		No		0
Length of proposed sidewalk	8	less than 0.25 miles		8
		0.26	0.50	6
		0.51	0.75	4
		0.76	1.00	2
		more than 1.00 miles		0
Proximity to a school	7	Within an 1/8 mile		7
		Within an 1/4 mile		5
		Within a 1/2 mile		3
Proximity to a park	7	Within an 1/8 mile		7
		Within a 1/4 mile		5
		Within a 1/2 mile		3
		None		0
Connectivity to other sidewalks	6	Both ends or connection to multiple side streets with sidewalks		6

		One end	3
		No connections	0
Proximity to land uses serving elderly or people with disabilities	5	Within a 1/4 mile	5
		None	0
Proximity to neighborhood serving land uses	5	Within 1/4 mile (1 point per land use up to 5 points)	5
		None	0
Evidence of a worn path	5	Yes	5
		No	0
Existence of curb/gutter/drainage	5	Yes	5
		No	0
School Type	3	Elementary or K-12	3
		Middle	2
		High	1
Pedestrian Friendly Index Rating (From Charlotte Neighborhood Quality of Life Study)	3	Low	3
		Medium	2
		High	1
Proximity to pedestrian overlay district	3	Within 1/4 mile	3
		None	0
Greenway Overland Connector Route	3	Yes	3
		No	0

Figure 19: Portland SRTS, Detailed ESR and Infrastructure Prioritization Criteria

Area	Criteria	Criteria Weight	Category/ Range		Category Weight	Notes
Equity	Percentage of students who received free or reduced lunch	10	10% or less		1	Changed from 10 pts to 20 pts to supplement not having disability data
			1 point for each additional 10 %			
			90%	100%	10	
	Percentage of students that are within communities of color	10	10% or less		1	
			1 point for each additional 10 %			
			90%	100%	10	
	Percentage of students that have physical disabilities	10	10% or less		1	School districts do not currently report student disability status but might in coming years
			1 point for each additional 10 %			
			90%	100%	10	

	Percentage of students that come from families where English is not the primary language spoken at home or are immigrants or refugees	10	10% or less		1	School districts do not currently report immigrant or refugee status but might in coming years
			1 point for each additional 10 %		2	
			90%	100%	10	
Safety	Current network completeness, based on PBOT sidewalk and bikeway methodology	20				Points assigned based on GIS analysis
	Five year crash rates for youth walking and biking within the school boundary	10				Points assigned based on GIS analysis
Past Expenditures	Amount spent on SRTS infrastructure efforts in the past at the school	30	(1-Historic investments in school/citywide SRTS historic investments)*30			

Figure 20: Portland SRTS, Detailed Programmatic Prioritization Criteria

Area	Criteria	Criteria weight	Category/ Range		Category weight
Equity	Percentage of students who received free or reduced lunch		5% or less		1
			1 point for each additional 5 %		
			95%	100%	20
	Percentage of students that are within communities of color, are newcomers (immigrants or refugees), have a physical disability, and/or come from families where English is not the primary language.		5% or less		1
			1 point for each additional 5 %		2
			95%	100%	20
Leverage	Ability to change school travel behavior given built environment and school's travel history	30	Subjective		
	School has recently or will soon receive infrastructure improvements that will improve walking and or biking opportunities				
School Support	School has a champion that could potentially lead future SRTS programming	30	Subjective		
	Historically, school has received education and been a valuable SRTS partner				

	School has never had bike and pedestrian education but has asked repeatedly		

Figure 21: Seattle Pedestrian Master Plan, Detailed Pedestrian Demand Criteria

			Weight		
Category	Sub-Category	Examples/ Notes	1/8 Mile	1/4 Mile	1/2 Mile
High Generator (highest possible value: 70)	University or College		15	10	5
	Major Generator	Pike Place, convention center Greenlake and Myrtle Edwards Park, etc.	15	10	5
	Light Rail		10	5	3
	Multi-family, condominiums, and apartments		10	5	3
	Major Bus Stop	5 or more routes	10	3	1
	UVTN Route (definite rapid service)		10	3	1
Medium Generator (highest possible value: 35)	School	Daycare, primary, public, private, etc.	5	3	1
	Major Retail	Grocery store, regional retail, etc	5	3	1
	UVTN Route (definite local service)		5	3	1
	Hospital		5	1	0
	Trails		5	3	1
	Community Service	Community centers, libraries, post offices, social services, etc.	5	3	1
	Park	Park, greenbelt, open space, etc	5	3	1
Low generator (highest possible value: 13)	Minor Retail	General retail, office, etc	3	1	0
	Minor Bus Stop		3	1	0
	Park and Ride Location		3	1	0
	Bridges		3	1	0
	Stairs		1	0	0

Figure 22: Seattle Pedestrian Master Plan, Detailed "Walking Along the Roadway" Criteria

Factor/Criteria	Characteristic	Points Allocated
Street Classification (Used to indicate traffic volumes)	Residential and Non-Arterial Commercial /Industrial Streets	1
	Collector Arterial	3
	Minor Arterial	4
	Principal Arterial	5
Arterial Speed Limit	30+	1
	35+	3
	40+	4
	45+	5
Buffer Width	None	10
	Narrow (1-3 feet)	2
	Standard (4-6 feet)	0
	Wide (>6 feet)	-5
Sidewalk Width and Presence	Missing	10
	Narrow (>4 feet)	2
	Standard (4-6 feet)	0
	Wide (>6 feet)	-5
Sidewalk Slope	Low (0-8%)	0
	Moderate (9-12%)	2
	High (13+%)	3
Parking (Calculated using regulatory signage as a proxy)	On-street parking	0
	No on-street parking	5
Curb	Yes	0
	No	2
Length of Block	Less than 600 feet	0
	More than 600 feet	3

Figure 23: Seattle Pedestrian Master Plan, Detailed "Crossing the Roadway" Criteria – Road Segment

Factor/Criteria	Characteristic	Points Allocated
Street classifications (used to indicate traffic volumes)	Residential and Non-Arterial Commercial/Industrial Streets	1
	Collector Arterial	3
	Minor Arterial	4
	Principal Arterial	5
Arterial Speed Limit	1 mph – 30 mph	1
	35+ mph	3
	40+ mph	4
	45+ mph	5

Road Width	0 – 24 ft	0
	24 – 36 ft	2
	36 – 48 ft	4
	48 – 60 ft	6
	61+ ft	10
Distance Between Traffic Signals	0 – 500 ft	0
	500 – 1000 ft	2
	1000 – 2000 ft	4
	2000+ ft	5

Figure 24: Seattle Pedestrian Master Plan, Detailed "Crossing the Roadway" Criteria – Intersection

Intersection Average Value	Characteristic	Points Allocated
Crosswalk (Within 50 feet of the intersection)	3/4 crosswalks per intersection	0
	1/2 crosswalks per intersection	1
	0 crosswalks per intersection	2
Curb ramps	None (per missing ramp)	
	Directional (per ramp)	0
	Diagonal (per ramp)	0.5
Signal Control	Signal	-3
	Pedestrian Signal	-1
	None	3
Stop Sign Control (Within 100 feet of the intersection)		-0.25/stop sign
Number of collisions at Intersection (3 years)	0	0
	1	5
	2-3	10
	4+	20