

Appendix B: Develop Normalization and Weighting for Criteria

Technical Memorandum

Develop Normalization and Weighting for Criteria (Task 7.2)

Date: May 24, 2019
To: Multnomah County
From: Shelly Alexander, PE, David Evans and Associates, Inc.
Hannah Polow, AICP, David Evans and Associates, Inc.
Matthew Hartnett, EIT, David Evans and Associates, Inc.
Subject: Roadway Capital Improvement Plan (RCIP) Update

Table of Contents

Introduction	3
Purpose	3
Organization.....	4
Methodology 1: Equally Weighted Criteria	4
Methodology 2: Strategically Weighted Criteria	5
Discussion of Recommended Methodology	6

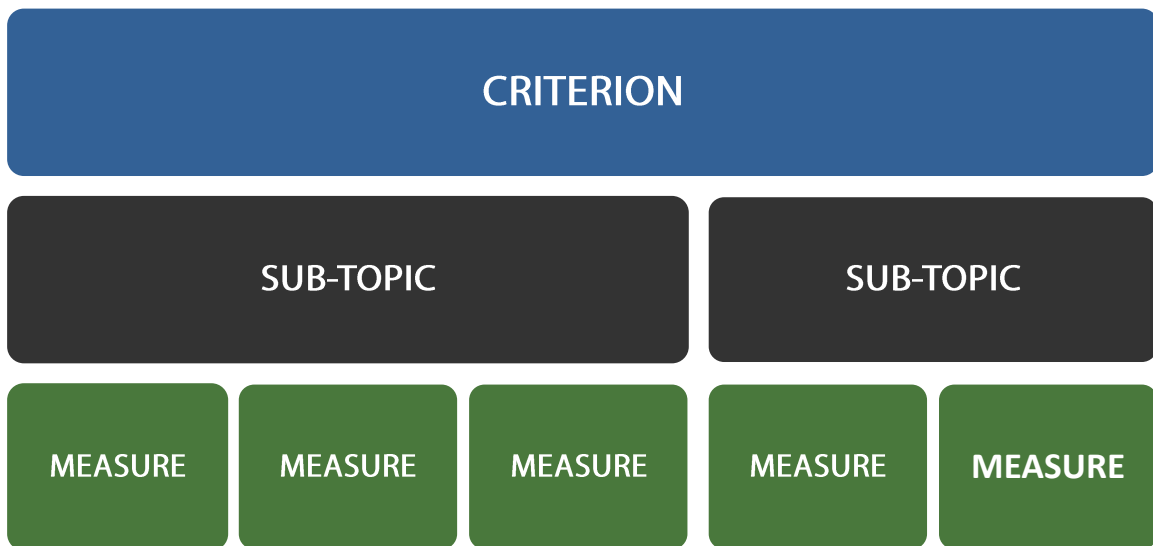
Introduction

Multnomah County is developing a comprehensive scoring evaluation framework for the purpose of ranking and prioritizing transportation projects for its RCIP. Based on a review of adopted plans and documents and national best practices, the County has defined six scoring criteria to evaluate projects across a number of areas: Equity, Safety, Mobility, Asset Management, Resiliency and Emergency Management, and Sustainability. Within each criteria, a number of measures—which are grouped into sub-topics – explain the details associated with evaluating each project. Figure 1 summarizes the hierarchy of these components for this framework.

These components are defined below:

- **Criterion** – Broad subject area to structure the evaluation framework.
- **Sub-topics** – Categories within each criterion to define what topics the criterion will address.
- **Measures** – Evaluative questions associated with each criterion that result in qualitative or quantitative answers.

Figure 1: Evaluation Framework



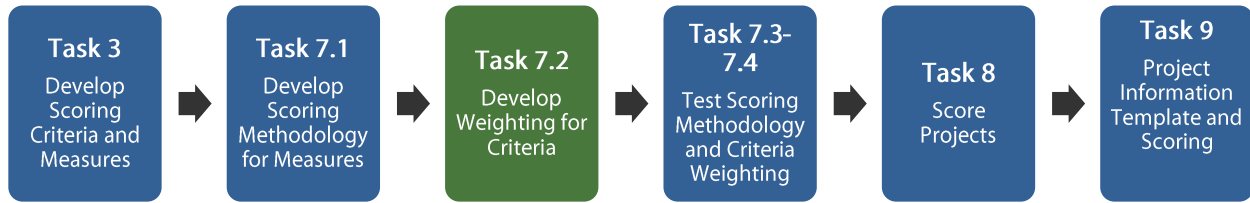
Purpose

The purpose of this memorandum is to summarize how the evaluation will occur once aggregate criteria scores have been determined for projects (as detailed in the memorandum for Task 7.1). This memorandum details the steps taken to determine a project’s total final score based on its aggregate criteria scores. The County has identified two parallel methodologies for the steps discussed in this memorandum:

1. **Methodology 1: Equally Weighted Criteria** – All six criteria are equally evaluated to determine final scores for projects.
2. **Methodology 2: Strategically Weighted Criteria** – A weighting system is applied to the six criteria making some criteria relatively more or less important in the determination of final scores for projects. The weighting system is determined by the Project Management Team (PMT) based on the top values identified by the County.

These two methodologies will be examined individually in the following sections. Figure 2 shows how the work discussed in this memorandum fits into the broader scoring evaluation framework.

Figure 2: Project Timeline



Organization

This memorandum includes three major sections:

1. **Approach 1: Equally Weighted Criteria** – In this approach, all six criteria are assigned equal weight when calculating final scores for projects.
2. **Approach 2: Strategically Weighted Criteria** – In this approach, criteria are assigned specific weights according to differing levels of prioritization as determined by the County. This section provides an overview the methodology used in this approach and the unique weights assigned to each criteria.
3. **Discussion of Recommended Methodology** – In this section, the County’s process for electing to use the Strategically Weighted Criteria approach and determining the specific weights to be assigned to each criteria is discussed.

Methodology 1: Equally Weighted Criteria

Methodology 1 involves evaluating all six criteria equally to determine final scores for projects. Using this methodology, a project’s total score is determined simply by taking the average of its six aggregate criteria scores. This calculation can also be thought of as applying equal weightings of approximately 16.7% (or 1/6) to each of the project’s criteria scores. Table 1 demonstrates this procedure for an example project.

Table 1. Example Project Scoring (Methodology 1)

Criteria	Project’s Aggregate Criteria Score
Equity	60
Safety	65
Mobility	50
Asset Management	25
Resiliency and Emergency Management	30
Sustainability	10
Project’s Total Score	(60+65+50+25+30+10) / 6 = 40

In the above example, the project has a total score of 40 out of 100. Because the criteria are weighted equally, there would be no impact on this project’s final score if its aggregate criteria scores for Safety and Sustainability, for example, were switched.

The methodology illustrated above is applied for all projects to arrive at one total score per project.

Methodology 2: Strategically Weighted Criteria

Methodology 2 involves applying a weighting system to the six criteria making some criteria relatively more or less important in the determination of final scores for projects. The weights assigned to criteria are meant to reflect differing levels of prioritization or importance to Multnomah County. Table 2 summarizes ranking of the level of prioritization or importance and corresponding weights assigned to each of the criteria.

Table 2: Criteria Ranking and Weights (Methodology 2)

Criteria	Rank (1 = most prioritized)	Weight
Equity	1 (tied)	20%
Safety	1 (tied)	20%
Mobility	2	15%
Asset Management	1 (tied)	20%
Resiliency and Emergency Management	3	13%
Sustainability	4	12%

To calculate a project's total score, the weights specified in Table 2 are applied to the corresponding aggregate criteria score for all six criteria. Table 3, below, demonstrates this procedure for an example project.

Table 3. Example Project Scoring (Methodology 2)

Criteria	Aggregate Criteria Score	Weight	Criteria Score * Weight
Equity	60	20%	12.0
Safety	65	20%	13.0
Mobility	50	15%	7.5
Asset Management	25	20%	5.0
Resiliency and Emergency Management	30	13%	3.9
Sustainability	10	12%	1.2
Project's Total Score (Sum of the Criteria Score * Weight Column)			42.6

In the above example, the project has a total score of 42.6 out of 100. Because the criteria are assigned different weights, a project's Safety aggregate criteria score has greater influence on the project's total score than the Sustainability score, for example. If the project presented in the above example had its Safety and Sustainability scores switched, it would instead have a lower total score (38.2 out of 100) because of the weighting system applied in this methodology.

The methodology illustrated above is applied for all projects to arrive at one total score per project.

Discussion of Recommended Methodology

The PMT has assigned the weights used in Approach 2 (Strategically Weighted Criteria) to best reflect the County's priorities. Of the six criteria, Equity, Safety, and Asset Management are given the greatest weight. While all six criteria align with the County and Transportation Division's values (and were incorporated into the scoring framework for that reason), these three criteria were ranked higher primarily due to public feedback and County top priorities. These are discussed in more detail below.

- **Equity:** Social justice and equity are top priorities for the County and Department of Community Services (DCS), and reducing transportation inequity is a top priority for the Transportation Division. Prioritizing equity in the scoring framework elevates projects in areas with greater concentrations of low income, youth, elderly, minority, and non-English speaking populations as well as areas with higher levels of air toxins and BMI (a proxy for chronic illness).
- **Safety:** The Road CIP public outreach has indicated that safety for all modes is a primary concern for the public. This is true across the County in both urban and rural areas.
- **Asset Management:** Transportation Division outreach for the RCIP Update and other projects indicates that fixing potholes, paving and striping, and general maintenance of the transportation system is very important to all users, especially those in the rural areas. The technical term "asset management" doesn't resonate strongly with the general public, but the term definition which is "maintenance" and "maintaining what we have" does. Asset management is a systematic process of developing, operating, maintaining, upgrading, and disposing of assets in the most cost-effective manner (including all costs, risks and performance attributes).

In addition to the above reasons for assigning Equity, Safety, and Asset Management the greatest weight, the weights assigned to each criteria also reflect differences in the availability and comprehensiveness of the data used for measures under each of the criteria. The data used in the measures for the other three criteria are not as well rounded or as available for all projects, and, in some cases, there are fewer measures. Therefore their weights have been lowered to account for less data and fewer measures.