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Evaluation of a Scoring Approach for Pedestrian and Bicycle Projects

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Abstract

State transportation agencies have limited funding to deliver multimodal transportation programs that address the needs of all users. To allocate project funding in an impartial and objective manner, many agencies have adopted data-driven scoring systems to evaluate the merits of proposed capital improvement projects. The Kentucky Transportation Cabinet introduced the Strategic Highway Investment Formula for Tomorrow (SHIFT) for this purpose that has evaluated projects based five core variables — congestion, safety, benefit-cost ratio, asset management, economic growth. However, SHIFT has not explicitly addressed pedestrian/bicycle improvements in its scoring formula. A method of scoring proposed pedestrian and bicycle improvements for SHIFT—2024 was developed allocating 5% for pedestrian improvements and 5% for bicycle improvements from the current scores. In addition to the new scoring component, this effort proposed a list of general project categories that can be used to classify pedestrian/bicycle improvements.

Keywords: *Pedestrian, bicycle, project scoring.*

1. Introduction

Most design practices prior to the late 1990s focused on addressing the mobility needs of motorists and paid little to no attention to the needs of pedestrians and bicyclists. This resulted in roadway projects that had minimal if any, facilities to address non-motorized user needs. State Departments of Transportation (DOTs) have traditionally prioritized the movement of motor vehicles. A greater emphasis has been placed in recent decades through legislation that focuses on delivering multimodal projects. The Intermodal Surface Transportation Efficiency Act (ISTEA) was the first such effort that dedicated funds to expand walking and bicycling.

A resurgence in walking and biking trips in the US has also been noted. The 2009 National Household Travel Survey estimated that walking and biking trips accounted for roughly 11.9 percent all trips, higher than the 9.5 percent in 2001 (USDOT 2010). A review of recent trends also indicates an increase in the share of bicycles as a transport mode. Between 1977 and 2009, the share of bicycle trips as a percentage of total trips almost doubled from 0.6% to 1.0%.

Behavioral studies have also confirmed an increase bicycle ridership, with over 40% of people reporting they use a bicycle more often than in the past (NHTSA 2013). Interestingly, most of these trips are not

recreational (Pucher et al. 2011). A review of bicycle facilities and policies in 14 cities found large increases in bicycling mobility following the adoption of comprehensive packages of interventions. (Pucher et al. 2010). Thus, public policy can play a critical role in increasing bicycle travel.

With many projects typically competing for limited state funding, state DOTs are increasingly looking for a balanced approach that weighs pedestrian and bicycle facility needs and demands against the needs and demands of motorists. Because not everyone can drive or access transit, people must recourse to walking and bicycling, and there are obvious benefits to non-motorized modes as a choice. Therefore, establishing a process to evaluate the needs of pedestrians and bicyclists and identifying projects that could fulfill those needs is timely and important.

The Kentucky Transportation Cabinet (KYTC) developed the Strategic Highway Investment Formula for Tomorrow (SHIFT) process to systematically evaluate projects and identify those with the greatest potential to improve the state roadway network. SHIFT is a data-driven approach that (mainly) objectively compares capital improvement projects and prioritizes them so that limited funds can be used effectively. Five attributes are used to score projects — safety, asset management, economic growth, congestion, and benefit-cost ratio. Each factor has specific objectives that are examined in relation to a project's goals, and points are calculated for each. Scores can also be increased through a metropolitan planning organization (MPO) and District "boost" process comprising up to 30 points of a project's score.

KYTC has replaced its 2002 *Pedestrian and Bicycle Travel Policy* with the *Complete Streets, Roads, and Highways Manual* (KYTC 2022a) that shifts from an auto centric approach to one more focused on the multimodal transportation needs of communities. The manual offers guidance on design solutions that support motorists, bicyclists, pedestrians, transit users, and freight carriers. An accompanying *Bicycle and Pedestrian Master Plan* (2022b) provides a framework for advancing pedestrian and bicycle projects within various Kentucky agencies and guidance for existing pedestrian bicycle facilities to determine which ones need improvement. An important part of this effort is identifying available funding and programs for future projects. Goals for supporting the Master Plan focus on safety, connectivity, equity, health/ environment, and thriving communities. A framework for accomplishing these goals is defined, and specific actions and practices discussed.

Previously, SHIFT only incorporated metrics based on motorized users (automobile and freight). As such, KYTC desired to update SHIFT to include a scoring mechanism for pedestrian and bicycle projects. This study was therefore undertaken to provide insights on the best way of incorporating the transportation needs of non-motorized users and related projects and/or project components into SHIFT.

2. Scoring Approach Development

SHIFT's process for evaluating projects as well as the availability of pedestrian and bicycle project data were reviewed to identify methods for evaluating and scoring their costs and benefits. Although previous SHIFT data contained a field to indicate whether a project includes a bicycle- or pedestrian-related component, project definitions lacked specific information on project type and extent. Previous data did not detail whether any proposed pedestrian or bike facility would be added along an entire project corridor or only part of it. Without this information, projects could not be systematically analyzed or evaluated using a data-driven approach.

This research proposed an explicit scoring component in SHIFT– 2024 to address bicycle and pedestrian projects. Under the proposed component, projects can be awarded up to five (5) points for pedestrian projects and five (5) points for bicycle projects. A list of detailed project categories was also proposed that would support the systematic evaluation of projects.

Several agencies have developed data-driven prioritization processes that score and rank individual projects. North Carolina (NCDOT 2019) and Virginia (VDOT 2021) are leaders, and both have unique

approaches the research team thought SHIFT could benefit from. North Carolina DOT scores bicycle and pedestrian projects using information on safety outcomes, accessibility and connectivity, demand and density, and cost-effectiveness. The Virginia DOT approach does not explicitly score bicycle and pedestrian projects. Rather, it considers their impacts indirectly through safety, accessibility, environmental quality, and economic development criteria.

2.1 Project Type

The proposed method of scoring bicycle and pedestrian projects takes cues from the Virginia and North Carolina approaches but draws more heavily on the latter because it offers clarity on the benefits of specific improvement types. Under the proposed scoring system for SHIFT–2024, a project can earn points for various bicycle and pedestrian improvements as shown in Table 1.

Table 1: Proposed Scoring for SHIFT–2024 Bicycle and Pedestrian Facilities

| Bicycle Project | Pedestrian Project | Points |
|---|---|--------|
| New bicycle multi- or shared-use path, buffered bicycle lane, separated bicycle lanes, rail-trail | New pedestrian multi- or shared-use path, sidewalk or trail | 5 |
| New bicycle lane | Sidewalk improvement (widening, major repair/replacement of discontinuous or poor condition); Trail improvement | 4 |
| Improve bicycle facility (create buffer on existing lanes, widen bicycle lanes, pave shoulder, extend bicycle lanes...) | Crossing island, curb extensions, streetscape | 3 |
| Signalization for bicycles; Sharrows | Signalization improvements | 2 |
| Bicycle amenities (parking, signing, etc.) | Wayfinding | 1 |
| No project defined | No project defined | 0 |

2.2 Existing Facilities

It is also important for KYTC to consider existing facilities when rating projects. Existing facilities can be identified through agency databases or Google Maps. Scoring for existing facilities is done using a five (5) point scale as well and is based on the level of infrastructure available for pedestrians and bicyclists, with high scores indicating that a facility is present throughout the project corridor in both directions and in good condition, while low scores are given when limited portions of the corridor is serviced by bicycle or pedestrian facilities. Table 2 summarizes the scoring criteria used for existing pedestrian and bicycle facilities. Bicycle and pedestrian facilities are evaluated individually using the same scale, resulting in two scores.

Table 2: Scoring Criteria for Existing Pedestrian and Bicycle Facilities

| Points | Facility Condition |
|--------|---|
| 5 | Facilities are present and in good condition |
| 4 | Facilities are present and in poor condition (improvement); some facilities are present for $\geq 75\%$ of project length |
| 3 | Some facilities are present for $< 75\%$ of project length |
| 2 | Some facilities are present for $< 25\%$ of project length; project length ≤ 1 mile |
| 1 | Some facilities are present for $< 25\%$ of project length; project length > 1 mile |
| 0 | No facilities |

3. Methodology

Using the proposed scoring mechanism, data for all 1182 SHIFT–2022 projects were evaluated, focusing on projects that included pedestrian and/or bicycle improvements (274 in all). Taking a closer look at the setting of each project, it was found that 31 involved building a new road (i.e., there was no existing road). Of these, 26 lacked information on existing or affected highways. As such, they were excluded from the study leaving 248 for analysis.

After using the KYTC Interactive Statewide Traffic Counts Map to identify project locations, the team virtually drove each project using the State’s video log to analyze data on location, context, land use, potential attractions for pedestrian and bicyclist activities, speed limit, and existing pedestrian and bicycle facilities by mile points. Google maps was also used to obtain some information. Annual average daily traffic (AADT) data were obtained from the KYTC data inventory. For those projects where video log virtual drive data were not available, the team used Google Street View.

Most of the 248 remaining projects focused on improving the motorized vehicle network and lacked information on what should be improved for non-motorized users. To score projects, detailed information on project being proposed is needed. Twenty randomly selected projects were reviewed to check on the availability of this information. The review found there was not enough information to clearly define what pedestrian and/or bicycle project types were to be implemented. Efforts to contact KYTC districts for more information proved mostly fruitless as people who may have more information either could not be identified, had retired, or moved to another position and could not be reached. In some cases, project sponsors did not specify specific improvement types as they might be unknown until project scoping and engineering could take place.

With input from the KYTC State Bicycle and Pedestrian Coordinator and the Assistant Director of Planning, project types and potential improvements that may have been proposed were identified. The review process helped establish a method for determining potential pedestrian and/or bicycle project types for the remaining projects. It was decided that each project should be evaluated in a manner that accounts for pedestrian and/or bicycle improvements. After evaluating the 20 sample projects, another 40 projects were examined to determine the pedestrian and/or bicycle project type and requested KYTCs feedback. This step allowed to further refine the team’s approach for identifying pedestrian and/or bicycle project type. Ultimately, all 248 projects were scored based on (1) existing facilities and (2) proposed project type. This resulted in four scores: (1) existing pedestrian facilities, (2) existing bicycle facilities, (3) proposed pedestrian projects, and (4) proposed bicycle projects. The SHIFT–2022 approach funding allocations being tied to project rankings within each region was adopted. Table 3 gives the regional distribution of projects by proposed project type. Many projects received scores of zero (0), indicating there was no information available on the proposed project or no judgment could be reached based on available data.

Table 3: Number of Projects by Proposed Project Type Score and Region

| Score | East | | North | | West | | South | |
|-------|------------|---------|------------|---------|------------|---------|------------|---------|
| | Pedestrian | Bicycle | Pedestrian | Bicycle | Pedestrian | Bicycle | Pedestrian | Bicycle |
| 5 | 0 | 0 | 17 | 1 | 17 | 1 | 2 | 1 |
| 4 | 1 | 1 | 14 | 27 | 6 | 10 | 1 | 2 |
| 3 | 0 | 1 | 5 | 26 | 3 | 9 | 1 | 0 |
| 2 | 2 | 0 | 27 | 0 | 9 | 0 | 2 | 0 |
| 1 | 0 | 0 | 9 | 5 | 6 | 2 | 2 | 0 |
| 0 | 14 | 15 | 64 | 77 | 28 | 47 | 16 | 21 |
| Total | 17 | 17 | 136 | 136 | 70 | 70 | 24 | 24 |

Next, the scoring system was adjusted so that each project would have one score for pedestrian improvements and one score for bicycle improvements. Three approaches were considered:

1. Subtract the existing facilities score from the proposed project type score.
2. Calculate the average score of existing facilities and proposed project type scores.
3. Use only the score for the proposed project type.

Option 2 — using the average score — was dismissed because projects that replace facilities would generate higher scores than projects that lack existing facilities; it also fails to account for system improvements. The disadvantage of Option 3 — using only the score for the proposed project type — is that it fails to consider existing facilities. As such, a facility that is an in-kind replacement would receive the same score as a brand-new facility.

Option 1 — subtracting existing facility scores from the proposed project type score — was ultimately used as this yields a single value for each pedestrian and bicycle component. This approach captures relative system changes and can reward projects that advance pedestrian and bicyclist mobility. One issue with this method is the problems raised by lack of information. For example, a project with existing facilities but with no information on the project type would result in a negative score. This requires (1) assuming that all projects will at least replace existing pedestrian and/or bicycle facilities with in-kind facilities, or (2) developing a way to handle negative scores. In the first case, the score would simply be zero (0) and could be used directly in scoring. The second scenario produces negative scores, but SHIFT does not otherwise allow negative scores. Because in-kind replacement does not advance the overall state of the pedestrian and bicycle system, assigning a score of zero (0) was deemed the most appropriate.

The team decided to use the difference between proposed and existing facilities to calculate relative change. The first step in developing the scoring system was to determine the number of points that could be allocated to pedestrian and bicycle projects from the existing pool of points. At the regional level, SHIFT awards up to 100 points — 70 points go toward congestion, safety, benefit-cost ratio, asset management, and economic growth. The remaining 30 points are evenly distributed between MPO and District subjective “boosts” (15 points each).

Three scenarios for scoring pedestrian/bicycle improvements were developed. Scenarios 2 and 3 reallocate up to 10 points for pedestrian and bicycle projects from boost scores. Scenario 1 reallocates up to 2.5 points for pedestrian and 2.5 for bicycle projects from District boost scores.

- Scenario 1: Reduces the District boost by 10 while retaining all 15 points for the MPO boost
- Scenario 2: Reduces each of the MPO and District boosts by 5 points
- Scenario 3: Reduces the District boost by 5 points and retains the 15 MPO boost points

To determine the impact of each scoring scenario, all SHIFT–2022 projects with available data were scored. Projects were divided into regions and each region was evaluated separately to account for local variability — East (204 projects), North (388 projects), South (245 projects), West (293 projects), and Statewide (52 projects).

Each project was scored using SHIFT’s current scoring method and the new scoring scenarios. Next, each project was ranked under the three scoring approaches and for each region. Projects with pedestrian and/or bicycle improvements were identified so they could be tracked under each scenario to understand how the scoring method impacted rankings. Differences in rank were calculated for each scenario by subtracting the new scoring rank from the rank under the current system. Negative scores indicate a drop in ranking, while positive scores indicate a higher ranking. For example, a project that ranked 6th under the current system and 10th under a proposed scenario would have fallen four positions (-4). The average change in rank order for each scoring scenario was calculated once all rank changes were defined.

After computing the rank difference for all five regions and the three new scenarios, it was found that no project moved up or down within the Statewide region rankings because there were no District or MPO boosts. As such, these projects were omitted from further consideration. Analyses focus entirely on projects in the North, South, East, and West regions. Each analytical scenario is presented below.

Analysis 1: This analysis compared project rankings under each new scoring scenario to scores calculated under the current system (which does not award points for pedestrian and/or bicycle components). First, the projects ranked in the top 50% under the current system were identified. Next, it was determined if any projects with pedestrian and/or bicycle components ranking in the top 50% under the current system remained in the top 50% under the new scoring scenarios. Finally, project ranks under the current system and proposed scenarios were compared to determine how many had a higher, lower, or the same rank under each scenario.

Analysis 2: Focusing again on projects that ranked in the top 50%, changes in ranking for all project types (i.e., regardless of whether they were identified as pedestrian and/or bicycle projects) were determined. Again, the rank order for projects under the current system to rankings under each new scenario were compared.

Analysis 3: The third analysis investigated sensitivity of quintile rank to the proposed scoring mechanism. Analyses 1 and 2 assumed that only 50 percent of the projects in a region have a chance to receive funding. But while approximately 50 percent of prior SHIFT cycles were recommended for funding, this may not hold true as funding becomes more competitive. To evaluate the sensitivity of each scenario, projects ranked in the top 10th, 20th, 30th, 40th, and 50th percentiles were examined. The same methods used for Analyses 1 and 2 were followed, including calculating the percentage of projects that remained within each percentile under the current system and under the proposed scenarios.

For Analyses 1 and 2 Spearman's rank-order correlation test was performed to identify the statistical relationship between ranks under the current system and ranks under each new scenario. A correlation coefficient close to zero (0) indicates a significant difference in ranks between the current system and the scenario tested, whereas a correlation coefficient close to 1 denotes no significant difference in ranks.

4. Results

The results of the analyses conducted are summarized here. In addition to the three scoring scenarios identified above, two more scoring scenarios were explored, which intended to address potential shortcomings of the first three scenarios.

4.1 Analysis 1- Pedestrian/Bicycle Projects

- Correlation analysis found a strong, positive relationship between project rankings under the current system and rankings under the three scenarios. Except for one comparison, Spearman's ρ coefficients were > 0.90 . Scenario 3 Spearman's ρ coefficients were the highest, which is understandable because it applies the smallest change to the total boost score (5 points).
- Across all regions, Scenarios 1 and 2 produced the largest average change in rankings. Scenario 2 generated the most significant average increase in ranking, with an average increase of between 8 and 25 positions. With respect to changes in rank, Scenario 2 also generated the highest total average score, and among projects that fell in ranking had a lower average decline in position.
- Under Scenario 2 more pedestrian and/or bicycle improvements achieved a higher ranking and potentially have a higher chance of being funded.

4.2 Analysis 2 – All Projects

- Correlation analysis found a strong, positive relationship between project rankings under the current system and rankings under the three scenarios. All Spearman's ρ coefficients were ≥ 0.89 . Scenario

3 Spearman's ρ coefficients were the highest, which is intuitive because it applies the smallest change to the total boost score (5 points).

- Relative to the current scoring method, under Scenario 3 all regions retained the greatest number of projects in the top 50%. Other scenarios excluded 1–3 projects.
- The most common average change in rank was zero (0). Nominal average changes in rank under Scenario 1 (North and West regions) and Scenario 2 (West region) were observed.
- Scenario 2 had largest average increases in rankings, with average increases of between 7 and 24 positions.

4.3 Analysis 3 - Percentile-Based Analysis

- *Pedestrian and/or Bicycle Projects:* For each percentile under analysis, the number of projects included under the current system and each scenario, and the average change in ranking under each scenario were evaluated. Relatively good alignment in project numbers and rankings across regions and scenarios for all percentile is observed. Generally, smaller percentages of projects were retained at the lower percentiles (10th, 20th). And typically, no more than 2–3 projects fell off under any scenario, although a little more variability in the average change in rankings was detected, especially for Scenarios 1 and 2, which is consistent with findings from the previous analyses as Scenario 3 produces results nearest to the current scoring system.
- *All Projects:* Reasonable agreement between project numbers and rankings across regions and scenarios for all percentiles was observed. The most noticeable general — but not universal — trend was that smaller percentages of projects were retained at lower percentiles (10th, 20th) than at higher percentiles. But this was not the case in the South region. Except for the East region, Scenario 3 produced rankings that were closest to the current scoring system, while Scenarios 1 and 2 showed greater divergence, especially at lower percentiles. Average changes in rankings were modest across all scenarios and for all percentiles. The average change in rank for most percentile – scenario combinations was $< +/- 5$, however, the North region, which is the most urbanized area in the state, had a couple outliers.

4.4 New Scoring Scenarios

Deducting facility scores from the proposed project type score can negatively impact the scoring of projects with pedestrian/bicycle improvements. This is problematic because it may reduce their likelihood of being funded. The analysis of pedestrian/bicycle projects found that several projects wound up with lower rankings than they do under the current scoring system. For example, in the North region, 33 of the 102 (50th percentile evaluation) projects with pedestrian/bicycle improvement projects received at least one of the boost scores, and 26 received both. Among these projects, 14 garnered lower rankings under all three scenarios due to the reduction in boost scores. A more drastic change was observed for projects with low overall scores in SHIFT's five major categories (congestion, safety, benefit-to-cost ratio, asset management, economic growth) but with a boost score. Boost scores were initially utilized to allow for providing local input to the project's importance. Therefore, they have an inordinate power for adjusting ranks of projects while the other five scores are objectively developed. In these cases, reducing boost scores by 10 points while at the same time pedestrian/bicycle projects did not receive a similar score resulted in large rank changes and sometimes dropped projects below the 50th percentile score.

To resolve these issues, a new scoring method was evaluated that involves lowering the number of available points for the five main SHIFT elements and reallocating these to pedestrian and bicycle improvements. With this method, MPOs and Districts can award points as they see fit to advance local issues and promote projects that address their needs. As such, pedestrian and bicycle improvements would be placed on equal footing with other SHIFT elements. Two scenarios were assessed:

- Scenario 4: Reduces available points for the five main SHIFT elements by 10. Retains 15 points for the MPO and District boosts, respectively. Allocates 5 points for pedestrian and 5 points for bicycle improvements.
- Scenario 5: Reduces available points for the five main SHIFT elements by 5. Retains 15 points for the MPO and District boosts, respectively. Allocates 2.5 points for pedestrian and 2.5 points for bicycle improvements.

To analyze these scenarios, the same approaches used before were leveraged. That is, focusing on the top 50% of projects, first the impact of each scenario on (a) pedestrian and/or bicycle improvements only and (b) all projects was assessed. Next, attention was focused on how these scenarios play out for the number and rankings of projects in the 10th – 50th percentiles.

The key findings from the new scoring are as follows:

- *Pedestrian and/or Bicycle Projects*: Except when Scenario 4 was applied to the North region, all projects were retained under the updated scoring methods. Average changes in rankings were very modest, with all scenarios logging average change in position less than 4.
- *All Projects*: Applying Scenarios 4 and 5 to all projects resulted in the retention of most projects in the top 50%. The number of projects that fell out of the top 50% varied by region and scenario, but in no case was > 3. Except for Scenario 4 for the West region, the overall average change in ranking was zero (0). As with other analyses examined, the overall average tends to wash out average increases and decreases. Scenario 4 confers the greatest benefits to projects with pedestrian/bicycle improvements. It retained the most projects in the top 50% and resulted in the most significant upward movement in rankings.
- *Percentile for Pedestrian and/or Bicycle Projects*: In most cases, Scenarios 4 and 5 retained the same, or nearly the same, number of projects with pedestrian/ bicycle improvements. In a few cases, a small number of projects were not retained (e.g., East and North regions in the 20th and 30th percentiles). Scenario 4 tended to generate slightly more pronounced changes in rank, but on the order of 1–2 more positions than Scenario 5. Across all four regions, the fewest changes were observed in the 40th and 50th percentiles, both in terms of projects retained and their rankings.
- *Percentile for All Projects*: In most cases, Scenarios 4 and 5 retained the same or a similar number of projects. A few outliers were observed. For example, the North region's 40th percentile recorded a significant drop in projects (-10 under Scenario 4 and -5 under Scenario 5) relative to the current scoring system. Typically, the number of projects not retained was < 5, and overall Scenario 5 had a higher retention rate than Scenario 4. Average change in ranking across all scenarios, projects, and regions was zero (0). Except for the East region's 30th percentile, all changes in average rank were +/- 1.

5. Conclusions

There is a need to provide adequate and safe pedestrian and bicycle facilities in the state of Kentucky to allow people to have modal choices for completing their mobility needs. To increase the number of pedestrian and bicycle facilities and to grow the number of people using those facilities, there is a need to prioritize and fund those projects. The Kentucky SHIFT program is a data-driven approach that evaluates and prioritizes projects in the state, but its prior focus has been auto-centric. The purpose of this study was to develop and evaluate a scoring approach that could be implemented into SHIFT and aid in the prioritization of the pedestrian and bicycle projects.

The SHIFT– 2022 pedestrian and bicycle projects were utilized in evaluating different scoring scenarios. Scores for pedestrian and/or bicycle projects were developed for the existing facilities and the proposed facility type separate for each mode. A composite score was developed by subtracting the score of the proposed type from the existing facility score. Five scoring scenarios were developed and evaluated to identify the one that would be more meaningful for inclusion in SHIFT. Three analyses were conducted

to identify the impact of each scenario on project selection as well as the scenario that would have the most positive impact on pedestrian and bicycle projects. Since the number of projects to be selected is unknown, it was decided to assume first that 50 percent of the projects in a region could be funded and then considered different percentiles of projects selected for funding. The analysis was conducted at the region level.

Overall, scenarios 2 and 3 had the largest number of projects in the top 50 percent of the projects retained from the existing approach for both pedestrian and/or bicycle projects only and all projects. For the sensitivity analysis, i.e., varied percentile of projects selected, the results showed that for pedestrian and/or bicycle projects and all the projects for all four regions and all three new scoring scenario the most change (i.e., lowest retention of projects from the existing scoring method) occurred in the 10th, 20th, and 30th percentile. The least changes occurred for the 40th and 50th percentile, which means that most of the projects from the existing scoring stayed in the top 40th to 50th percentile with the new scoring method.

Scenarios 4 and 5 were developed to address the point allocation to a more equitable approach among the five main SHIFT components. The respective analyses showed that Scenario 4 results in the greatest benefits to projects with pedestrian and/or bicycle improvements. In all three analyses, such projects were more frequently retained in the top 50 percent and resulted in the most significant upward movement in rankings. Scenario 4 tended to generate slightly more pronounced changes in rank in the percentile analysis.

Based on this analysis, ideally, it is recommended that the SHIFT–2024 scoring formula allocate 5 points for pedestrian improvements and 5 points for bicycle improvements (for a total of 10 points). Structuring the allocation in this manner ensures that projects are awarded points even if they only include either a pedestrian or bicycle improvement. Dedicating fewer than 10 points will have less impact on scoring and rankings and constrain KYTC’s efforts to account for pedestrian/ bicycle improvements in its funding decisions. Under the proposed SHIFT–2024 scoring formula, the 10 points for pedestrian/ bicycle improvements could be made available by reducing the number of points allocated to each of SHIFT’s five main components (congestion, safety, benefit-cost ratio, asset management, and economic growth) by 2 points each. Reducing the number of available points for SHIFT’s main components keeps available points for the MPO boost and District boost unchanged at 15 points apiece. This gives MPOs and Districts the chance to allocate points to projects in a way that addresses local issues. A revised scoring approach is also proposed to address issues noted from scoring existing projects (Table 4) and proposed improvements (Table 5).

Table 4: Revised Scores for Existing Pedestrian and Bicycle Facilities

| Bicycle Facilities | Pedestrian Facilities | Points |
|---|---|--------|
| Bicycle lanes in both sides or path is present and in good condition | Sidewalks in both sides are present and in good condition | 5 |
| Bicycle lanes in both sides or path is present and in poor condition | Sidewalks in both sides are present and in poor condition | 4 |
| Bicycle lanes in both sides or path is present for <75% of project length | Sidewalks in both sides are present for <50-75% of project length | 3 |
| Bicycle lane or path is present for <50-75% of project length | Sidewalk is present in one side | 2 |
| Sharrows are present | Sidewalks in both sides are present for <50% of project length | 1 |
| No facilities | No facilities | 0 |

Table 5: Proposed Methods for Scoring Pedestrian and Bicycle Improvements in SHIFT–2024

| Bicycle Project | Pedestrian Project | Points |
|---|---|--------|
| New bicycle multi- or shared-use path, protected bicycle lanes, rail-trail, bicycle signalization | New pedestrian multi- or shared-use path, sidewalk or trail | 5 |
| New buffered or separated bicycle lane | Sidewalk improvement (widening, major repair/replacement of discontinuous or poor condition); Trail improvement | 4 |
| Improve bicycle facility (create buffer on existing lanes, widen bicycle lanes, pave shoulder, extend bicycle lanes...) | Crossing island, curb extensions, streetscape, adding enhanced crosswalks | 3 |
| New bicycle lane (no separation) | Signalization improvements | 2 |
| Bicycle amenities (parking, signing, etc.); Sharrows | Wayfinding | 1 |
| No project defined | No project defined | 0 |

Information regarding the specific type of pedestrian and/or bicycle facilities to be implemented for the projects marked as having pedestrian and/or bicycle improvements is critical to this approach. However, the lack of this information in the SHIFT-2022 projects could have impacted the analysis conducted here. The project documents provided had minimum to no project description on what type of pedestrian and/or bicycle facility will be implemented on the project corridor. This required assumptions on what potential projects could be implemented for each project, and this could be completely different than what the original proposal. It must be noted that all assumptions were based solely on the research team’s understanding of the project, review of the project corridor, and suggestions from KYTC representatives. Having more detailed descriptions makes it easier to account for the benefits and costs of facilities, establishes a foundation for systematically evaluating projects, and, if needed, offers a path forward to refine the SHIFT process. A proposed list of general project categories is shown in Table 6.

Table 6: Proposed Pedestrian/Bicycle Project Types for SHIFT–2024

| | |
|--|---|
| • New shared use path (off road) | • Add sharrows |
| • New shared path (on road) | • Add bike amenities (e.g., parking, signing) |
| • New bike path (off road) | • New pedestrian trail |
| • New bike lane (buffered) | • New sidewalk |
| • New bike lane (separated) | • Improve sidewalk (e.g., add buffer, repair condition/ connectivity, widen, add curb extensions) |
| • New bike lane (shoulder) | • Add crossing island or streetscape |
| • Improve bike facility (e.g., add a buffer, widen the lane, pave shoulders, etc.) | • Add signalization for pedestrians |
| • Add signalization for bikes | • Add pedestrian amenities (e.g., wayfinding, signing) |

As a part of a continuous improvement effort of SHIFT, it will be important to examine how the proposed scoring methods influence SHIFT–2024 project rankings. Because uncertainties related to project types will be resolved, KYTC and KTC researchers will have the chance to revisit the list of projects in Table 6 and determine if it should be modified. Another issue that merits consideration is factoring economic benefits of pedestrian and bicycle facilities into scoring. Some research has

demonstrated these benefits can be significant. Integrating this form of economic analysis into SHIFT could help the Cabinet more exhaustively account for the costs and benefits of proposed projects.

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