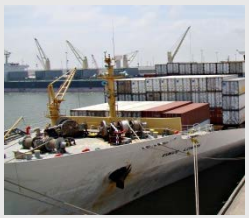
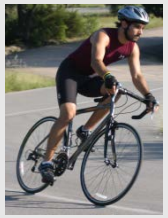
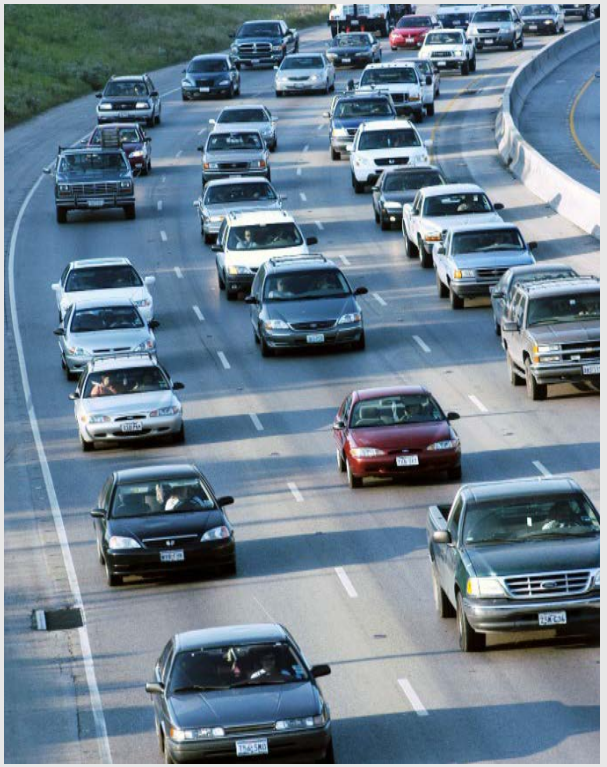





FULL-CYCLE PERFORMANCE-BASED PLANNING AND PROGRAMMING



Peter N. Smith, P.E.

Director, Transportation Planning and Programming

Outline

1. Federal and State Requirements
2. Vision: Full-Cycle Performance-Based Planning and Programming
3. Performance-Based System Needs Prioritization
4. Performance-Based Corridor Project Needs Prioritization
5. Performance-Based Investment Scenarios
6. Performance-Based Project Selection
7. Monitoring and Tracking

1. Federal and State Requirements

MAP – 21 (Moving Ahead for Progress in the 21st century)

Requires states and MPOs to collectively **set performance targets** in TIPs and STIP (passed in 2012)

FAST Act (Fixing America's Surface Transportation Act)

Continues these federal requirements (passed in 2015)

House Bill 20 (passed in 2015)

Requires TxDOT and MPOs to develop and implement performance metrics and measures for the Statewide Transportation Improvement Program (STIP), Rural Transportation Plans (RTP), and the Unified Transportation Program (UTP)

Senate Bill 312 - TxDOT Sunset Bill (passed in 2017)

Plans and policy efforts are to contain system strategies, goals and measurable targets, and related performance measures

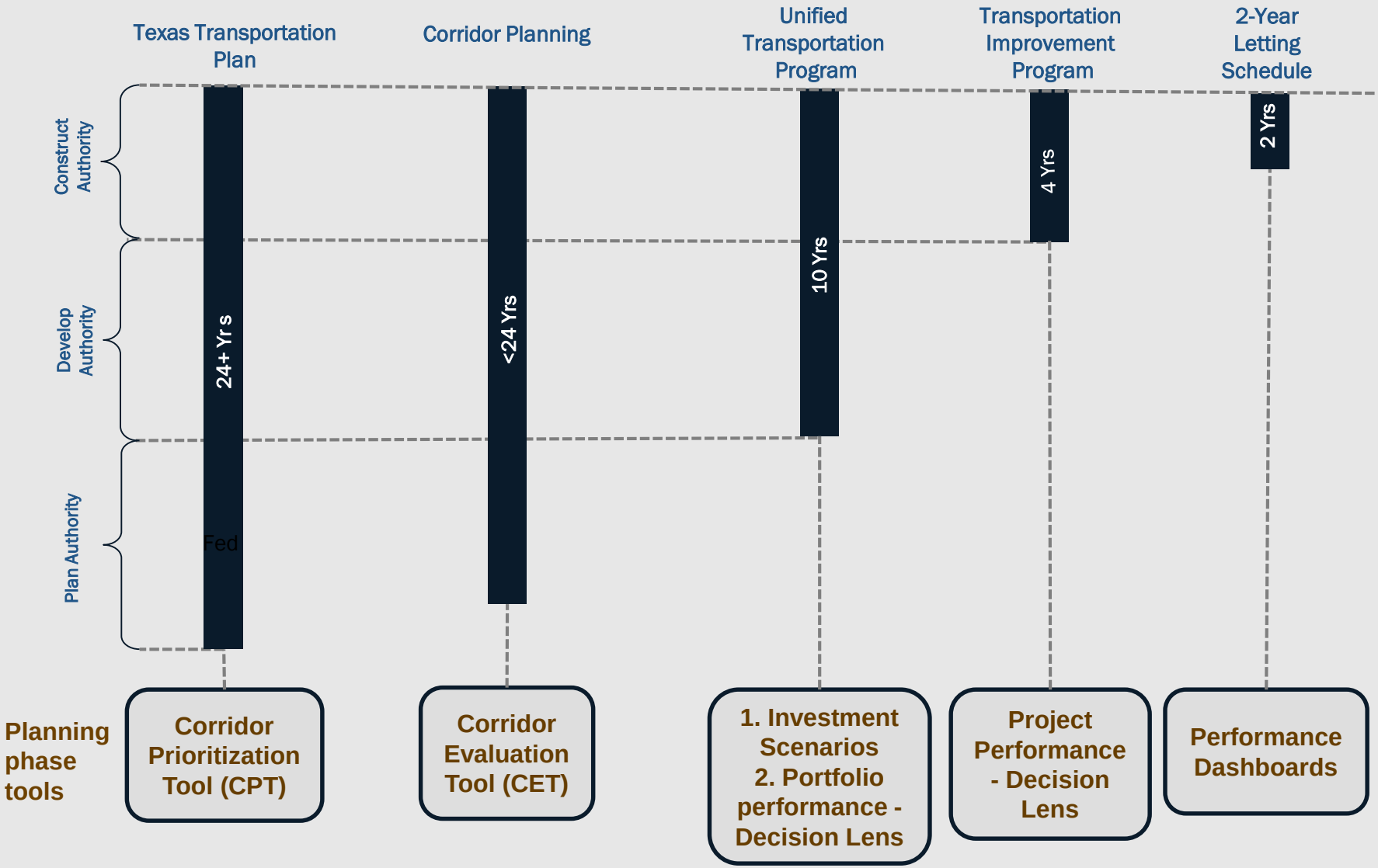
Analyze the effect of funding allocation and project selection decisions on accomplishing goals in the statewide Long-range Transportation Program (LRTP)

For projects in UTP, evaluate projects based on strategic need and potential contribution toward achieving goals prior to considering other criteria such as funding availability and project readiness

2. Vision: Full-Cycle Performance-Based Planning & Programming

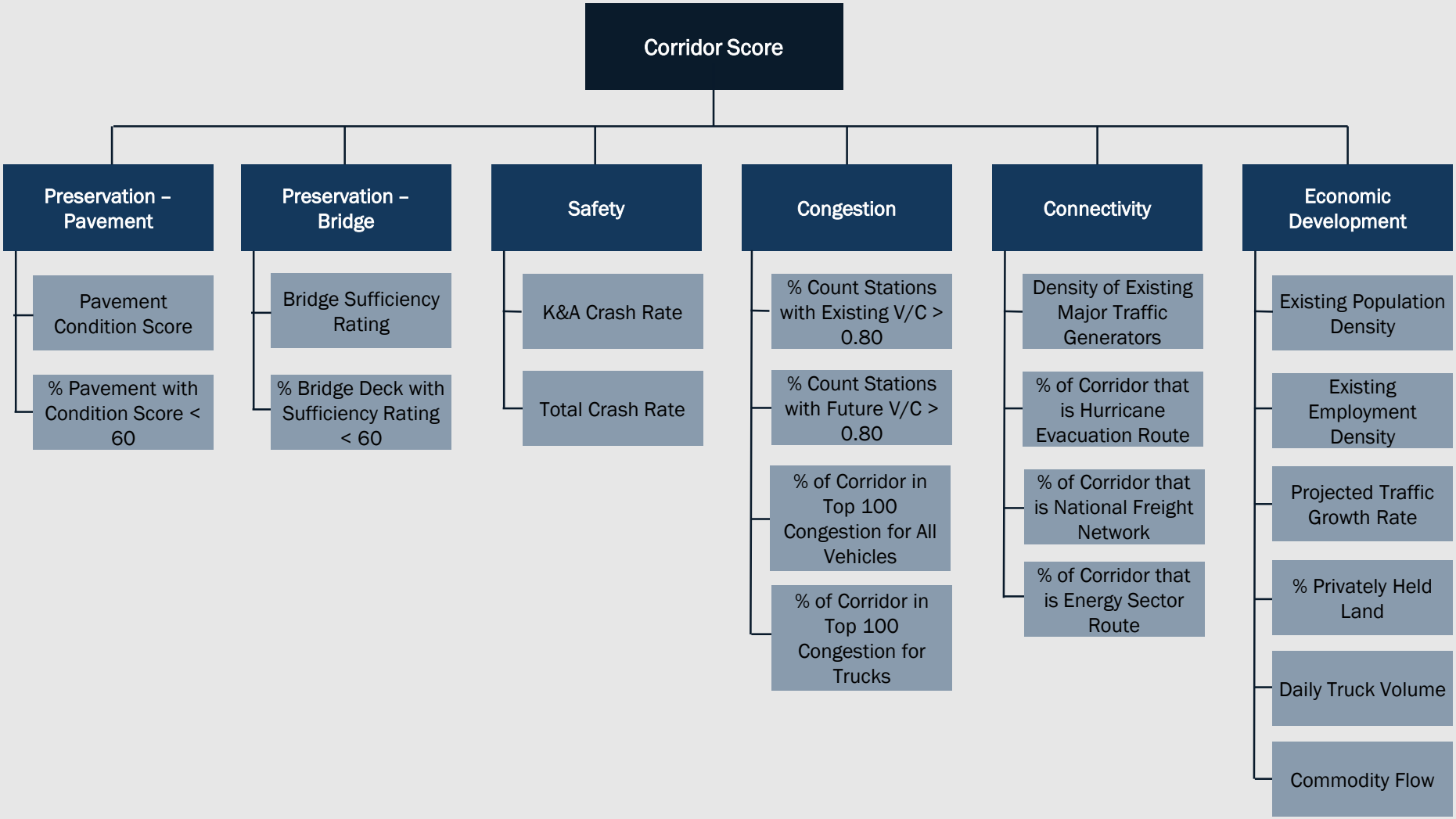
TxDOT will use performance-based planning and programming to help inform decision-making for the life-cycle of programs: statewide funding category investments, system-wide corridor priorities, and project-portfolio priorities.

Transportation Planning: Plans, Programs, & Evaluation Tools



3. **Performance-Based System Needs Prioritization**

Performance Measures



Process Automation

TxDOT Data

Raw Input

Criteria	Performance Measure	Raw Value
	Pavement	
1	Pavement Condition Score	89.8
2	% Pavement with Pavement Condition Score < 60	5.7%
	Bridge	
3	Bridge Sufficiency Score	92.8
4	% Deck Area on Bridges with Suff Rating < 60	0.0%
	Safety	
5	K&A crash rate for entire corridor	3.5
6	Total crash rate for entire corridor	55.3
	Congestion	
7	% Count Stations with Existing V/C > 0.80	0.0%
8	% Count Stations with Future V/C > 0.80	18.5%
9	Texas Transp Institute hot spot list for all	0.0%
10	Texas Transp Institute hot spot list for trucks	0.0%
	Economic Development	
11	Daily Freight Volumes	9,300
12	Commodity Flow	142M
13	Existing employment	157
14	Existing population	349
15	Projected annual traffic growth rate	3.8%
16	% of Privately held land	99.2%
	Connectivity	
17	Provides access to existing multi-modal facilities or major traffic generators	0.44
18	Part of hurricane evacuation route	100%
19	Part of National Freight Network or TxDOT Primary Freight Network	100%
20	Part of Energy Sector Route	99.4%

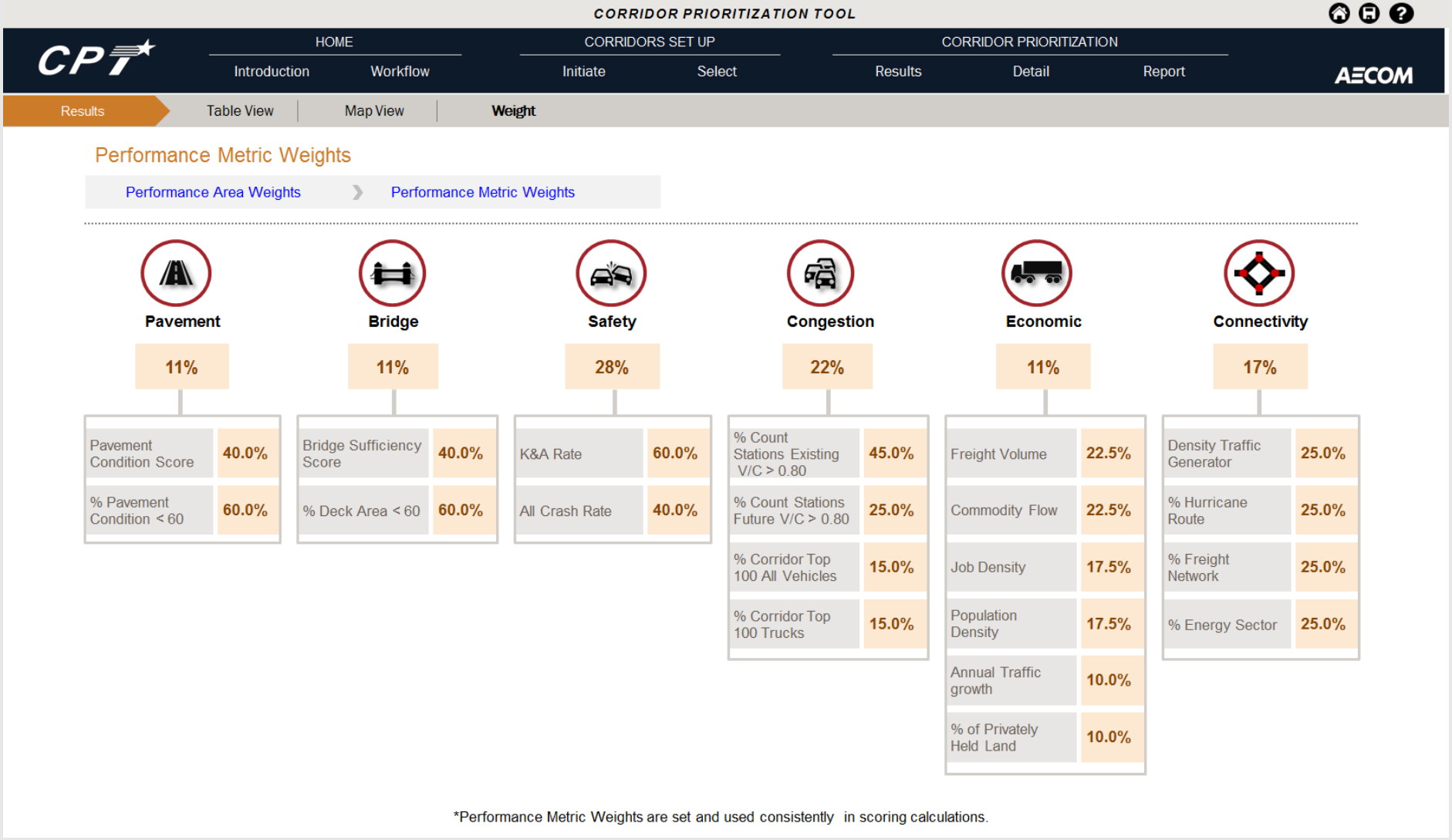
Data Extraction Tool

Score

Criteria	Performance Measure	Score
	Pavement	
1	Pavement Condition Score	5.1
2	% Pavement with Pavement Condition Score < 60	5.7
	Bridge	
3	Bridge Sufficiency Score	1.0
4	% Deck Area on Bridges with Suff Rating < 60	0.0
	Safety	
5	K&A crash rate for entire corridor	3.9
6	Total crash rate for entire corridor	1.3
	Congestion	
7	% Count Stations with Existing V/C > 0.80	0.0
8	% Count Stations with Future V/C > 0.80	2.3
9	Texas Transp Institute hot spot list for all	0.0
10	Texas Transp Institute hot spot list for trucks	0.0
	Economic Development	
11	Daily Freight Volumes	4.8
12	Commodity Flow	4.3
13	Existing employment	5.2
14	Existing population	5.6
15	Projected annual traffic growth rate	6.3
16	% of Privately held land	9.2
	Connectivity	
17	Provides access to existing multi-modal facilities or major traffic generators	2.5
18	Part of hurricane evacuation route	10.0
19	Part of National Freight Network or TxDOT Primary Freight Network	10.0
20	Part of Energy Sector Route	9.6

Corridor Prioritization Tool (CPT)

Corridor Prioritization Tool



*Performance Metric Weights are set and used consistently in scoring calculations.

Sample Corridor Prioritization Results

CORRIDOR PRIORITIZATION TOOL

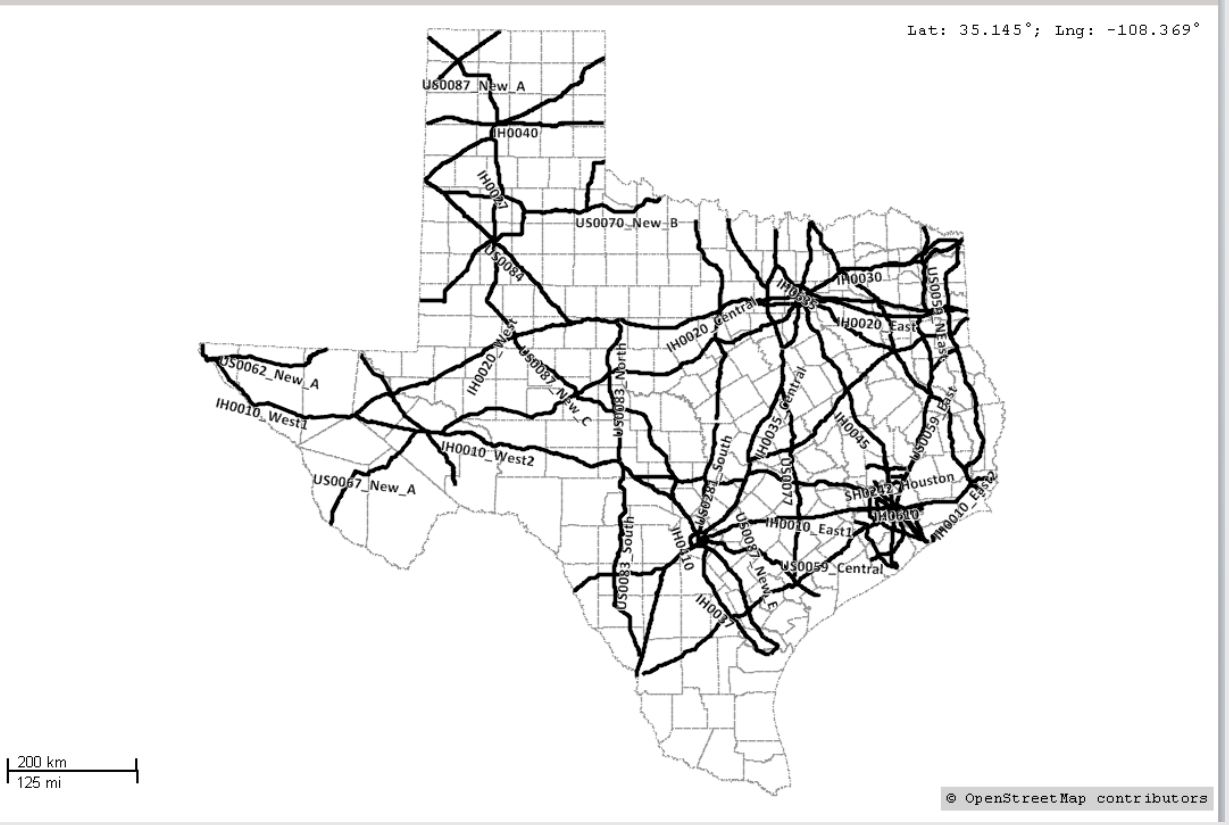
CPT | HOME: Introduction, Workflow | CORRIDORS SET UP: Initiate, Select | CORRIDOR PRIORITIZATION: Results, Detail, Report | AECOM

Results | Table View | **Map View** | Weight

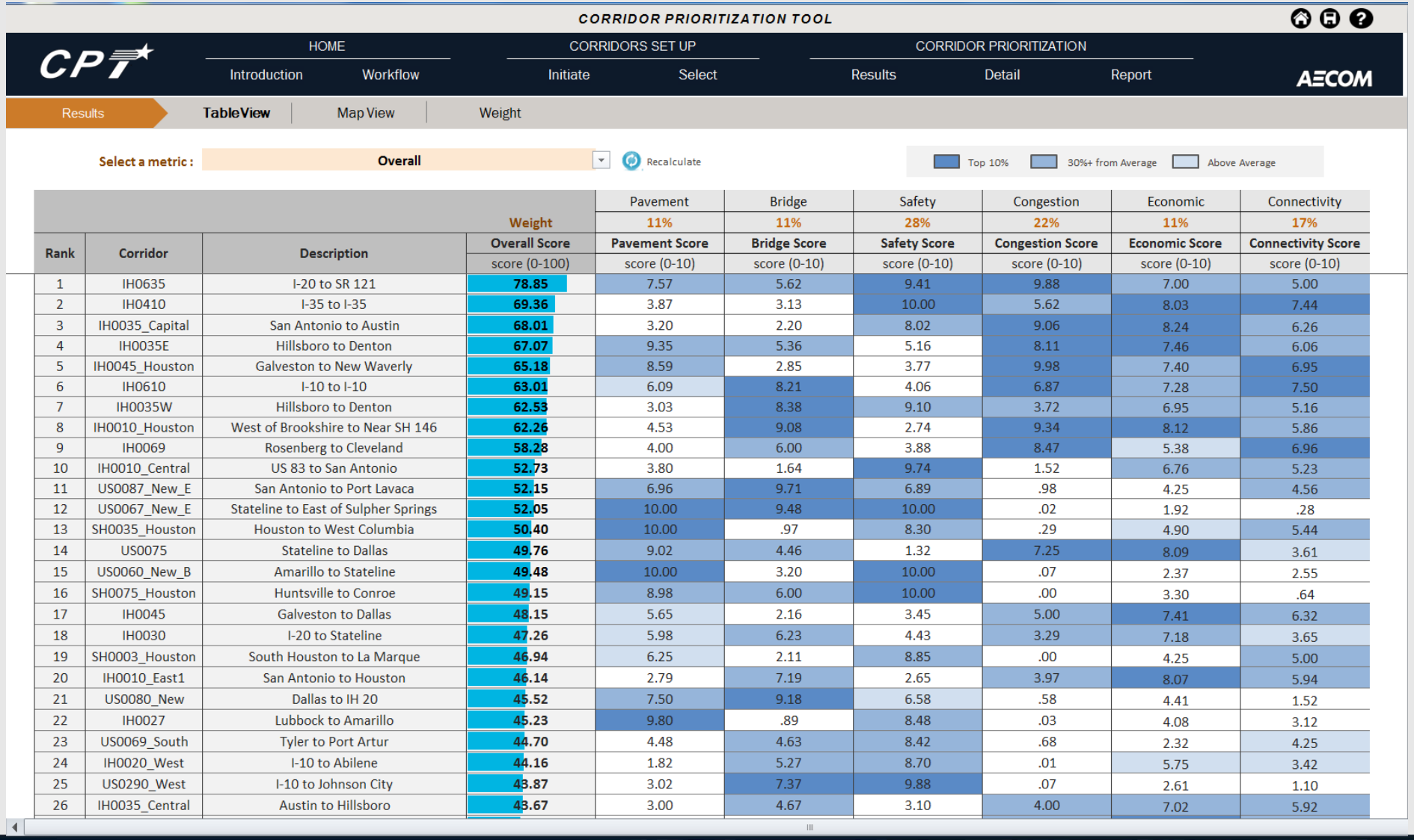
Zoom To State | Clear Selection | Previous | Next

Select a metric : **Overall**

Rank	Corridor	Desprition	Score
1	IH0635	I-20 to SR 121	78.85
2	IH0410	I-35 to I-35	69.36
3	IH0035_Capital	San Antonio to Austin	68.01
4	IH0035E	Hillsboro to Denton	67.07
5	IH0045_Houston	Galveston to New Waverly	65.18
6	IH0610	I-10 to I-10	63.01
7	IH0035W	Hillsboro to Denton	62.53
8	IH0010_Houston	West of Brookshire to Near SH 146	62.26
9	IH0069	Rosenberg to Cleveland	58.28
10	IH0010_Central	US 83 to San Antonio	52.73
11	US0087_New_E	San Antonio to Port Lavaca	52.15
12	US0067_New_E	Stateline to East of Sulpher Springs	52.05
13	SH0035_Houston	Houston to West Columbia	50.40
14	US0075	Stateline to Dallas	49.76
15	US0060_New_B	Amarillo to Stateline	49.48
16	SH0075_Houston	Huntsville to Conroe	49.15
17	IH0045	Galveston to Dallas	48.15
18	IH0030	I-20 to Stateline	47.26
19	SH0003_Houston	South Houston to La Marque	46.94
20	IH0010_East1	San Antonio to Houston	46.14
21	US0080_New	Dallas to IH 20	45.52
22	IH0027	Lubbock to Amarillo	45.23
23	US0069_South	Tyler to Port Artur	44.70



Sample Corridor Prioritization Results



CORRIDOR PRIORITIZATION TOOL

CPT

HOME: Introduction | Workflow

CORRIDORS SET UP: Initiate | Select

CORRIDOR PRIORITIZATION: Results | Detail | Report

AECOM

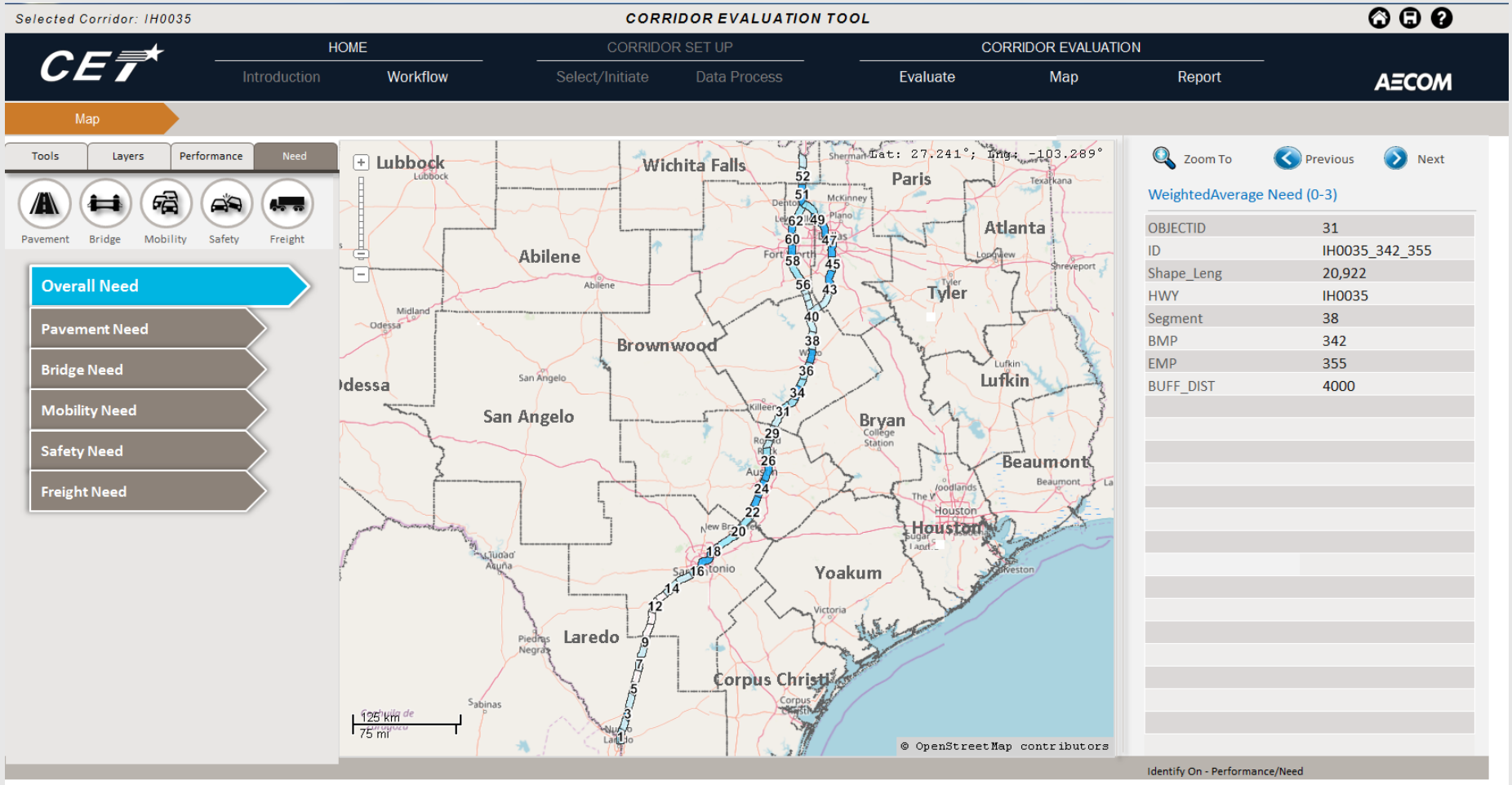
Results | TableView | Map View | Weight

Select a metric : Overall | Recalculate

Top 10% | 30%+ from Average | Above Average

			Weight	Pavement	Bridge	Safety	Congestion	Economic	Connectivity
				11%	11%	28%	22%	11%	17%
Rank	Corridor	Description	Overall Score	Pavement Score	Bridge Score	Safety Score	Congestion Score	Economic Score	Connectivity Score
			score (0-100)	score (0-10)	score (0-10)	score (0-10)	score (0-10)	score (0-10)	score (0-10)
1	IH0635	I-20 to SR 121	78.85	7.57	5.62	9.41	9.88	7.00	5.00
2	IH0410	I-35 to I-35	69.36	3.87	3.13	10.00	5.62	8.03	7.44
3	IH0035_Capital	San Antonio to Austin	68.01	3.20	2.20	8.02	9.06	8.24	6.26
4	IH0035E	Hillsboro to Denton	67.07	9.35	5.36	5.16	8.11	7.46	6.06
5	IH0045_Houston	Galveston to New Waverly	65.18	8.59	2.85	3.77	9.98	7.40	6.95
6	IH0610	I-10 to I-10	63.01	6.09	8.21	4.06	6.87	7.28	7.50
7	IH0035W	Hillsboro to Denton	62.53	3.03	8.38	9.10	3.72	6.95	5.16
8	IH0010_Houston	West of Brookshire to Near SH 146	62.26	4.53	9.08	2.74	9.34	8.12	5.86
9	IH0069	Rosenberg to Cleveland	58.28	4.00	6.00	3.88	8.47	5.38	6.96
10	IH0010_Central	US 83 to San Antonio	52.73	3.80	1.64	9.74	1.52	6.76	5.23
11	US0087_New_E	San Antonio to Port Lavaca	52.15	6.96	9.71	6.89	.98	4.25	4.56
12	US0067_New_E	Stateline to East of Sulpher Springs	52.05	10.00	9.48	10.00	.02	1.92	.28
13	SH0035_Houston	Houston to West Columbia	50.40	10.00	.97	8.30	.29	4.90	5.44
14	US0075	Stateline to Dallas	49.76	9.02	4.46	1.32	7.25	8.09	3.61
15	US0060_New_B	Amarillo to Stateline	49.48	10.00	3.20	10.00	.07	2.37	2.55
16	SH0075_Houston	Huntsville to Conroe	49.15	8.98	6.00	10.00	.00	3.30	.64
17	IH0045	Galveston to Dallas	48.15	5.65	2.16	3.45	5.00	7.41	6.32
18	IH0030	I-20 to Stateline	47.26	5.98	6.23	4.43	3.29	7.18	3.65
19	SH0003_Houston	South Houston to La Marque	46.94	6.25	2.11	8.85	.00	4.25	5.00
20	IH0010_East1	San Antonio to Houston	46.14	2.79	7.19	2.65	3.97	8.07	5.94
21	US0080_New	Dallas to IH 20	45.52	7.50	9.18	6.58	.58	4.41	1.52
22	IH0027	Lubbock to Amarillo	45.23	9.80	.89	8.48	.03	4.08	3.12
23	US0069_South	Tyler to Port Artur	44.70	4.48	4.63	8.42	.68	2.32	4.25
24	IH0020_West	I-10 to Abilene	44.16	1.82	5.27	8.70	.01	5.75	3.42
25	US0290_West	I-10 to Johnson City	43.87	3.02	7.37	9.88	.07	2.61	1.10
26	IH0035_Central	Austin to Hillsboro	43.67	3.00	4.67	3.10	4.00	7.02	5.92

4. Performance-Based Corridor Project Needs Prioritization



Corridor Evaluation Tool: Measures and Data Sources

Category	Performance Measure	Data Source
Pavement	Pavement Index	PMIS/TxDOT OpenData portal; latest available data
	Directional Main lane Distress Score	
	Directional Main lane Ride Score	
	Frontage Road Pavement Condition Score	
	Pavement Failure	
Bridge	Bridge Index	BRINSAP/TxDOT OpenData portal; latest available data
	Bridge Sufficiency	
	Functionally Obsolete Bridges	
	Bridge Rating	
	Culvert Rating	
Safety	Safety Index	CRIS; 5 years of data
	Directional Main Lane Crash Rate	
	Frontage Road Crash Rate	
	Safety Hot Spots	
Mobility	Mobility Index	Volume data from RHINO; Years 2017 and 2038 Capacity calculated using generalized equations based on facility type and data from RHINO (# of lanes, % trucks, etc.)
	Future Daily V/C	
	Peak Hour V/C	
	Frontage Road Existing V/C	
	Frontage Road Future V/C	
	Directional Travel Time Index	INRIX; average over 1 year of data
	Directional Planning Time Index	INRIX; average over 1 year of data
	Interchange Existing V/C	Volume data from RHINO; Years 2017 and 2038 Capacity calculated using generalized equations based on facility type and data from RHINO (# of lanes, % trucks, etc.)
	Interchange Future V/C	
Freight	Freight Index	INRIX; average over 1 year of data
	Truck Directional Travel Time Index	INRIX; average over 1 year of data
	Truck Directional Planning Time Index	INRIX; average over 1 year of data
	Bridge Vertical Clearance	BRINSAP/TxDOT OpenData portal; latest available data
	Bridge Load Ratings	BRINSAP/TxDOT OpenData portal; latest available data

Sample Corridor Evaluation Tool Results

CET Needs Preliminary Results (Segment 1-63).pdf - Adobe Acrobat Pro

File Edit View Window Help

Open | Create | Customize

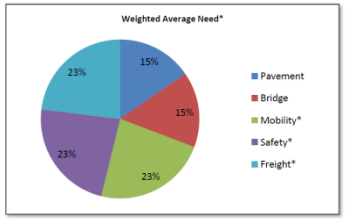
Tools | Fill & Sign | Comment

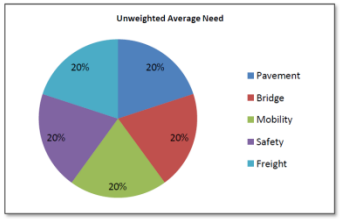
I-35 Corridor Needs Summary - Preliminary Results (Working in Progress)

Seg. #	HWY	BMP	EMP	Length (miles)	Mainline Facility Type	Need							Rank**
						Pavement	Bridge	Mobility*	Safety*	Freight*	Weighted Average Need	Unweighted Average Need	
25	I-35	235	247	12	Urban	0.02	1.96	13.69	1.70	18.78	7.23	8.19	1
24	I-35	222	235	13	Urban	0.10	1.16	12.18	2.09	18.57	6.82	7.77	2
18	I-35	163	174	11	Urban	0.29	0.56	11.04	2.65	14.94	5.90	6.74	3
26	I-35	247	254	7	Urban	0.00	0.78	11.92	1.59	13.56	5.57	6.37	4
17	I-35	152	163	11	Urban	0.92	1.88	7.38	4.26	10.21	4.93	5.47	5
33	I-35	297	303	6	Urban	0.68	1.41	5.14	1.59	8.64	3.49	3.87	6
37	I-35	332	342	10	Urban	1.86	1.75	4.80	4.09	4.41	3.38	3.62	7
3	I-35	19	28	9	Rural	0.21	0.50	1.04	11.35	3.23	3.27	3.71	8
34	I-35	303	313	10	Rural	0.36	0.43	7.28	1.90	6.25	3.24	3.68	9
23	I-35	214	222	8	Rural	0.08	0.27	8.63	0.32	4.66	2.79	3.19	10
19	I-35	174	188	14	Urban	0.11	0.55	3.71	1.15	7.95	2.69	3.06	11
32	I-35	292	297	5	Urban	0.18	1.60	3.83	1.39	5.34	2.47	2.71	12
27	I-35	254	260	6	Urban	0.00	0.92	6.18	0.16	4.84	2.42	2.72	13
36	I-35	319	332	13	Rural	0.10	0.86	6.90	0.24	3.51	2.32	2.60	14
21	I-35	197	206	9	Rural	0.00	0.65	6.59	0.65	3.56	2.29	2.59	15
35	I-35	313	319	6	Rural	0.12	0.05	7.14	0.66	3.23	2.24	2.57	16
22	I-35	206	214	8	Rural	0.13	0.56	5.51	0.39	2.01	1.72	1.93	17
1	I-35	0	11	11	Urban	0.24	0.69	0.93	5.07	1.51	1.69	1.87	18
16	I-35	142	152	10	Rural	0.56	1.53	2.14	1.46	2.2			
51	I-35	468	482	14	Rural	0.12	1.55	3.39	0.82	1.8			
39	I-35	355	364	9	Rural	0.06	0.67	5.90	0.56	0.3			
38	I-35	342	355	13	Rural	0.02	0.02	6.09	0.46	0.0			
20	I-35	188	197	9	Rural	0.03	0.43	4.87	0.47	0.1			
15	I-35	131	142	11	Rural	0.54	0.57	1.83	1.56	1.0			
53	I-35	495	505	10	Rural	0.11	1.53	1.85	0.56	1.4			
52	I-35	482	495	13	Rural	0.02	1.21	2.60	0.00	1.4			
29	I-35	266	277	11	Rural	0.00	0.68	2.37	0.43	1.6			
									0.26	0.0			
									0.43	0.0			
									1.89	0.9			
									0.56	0.1			
									3.46	0.1			

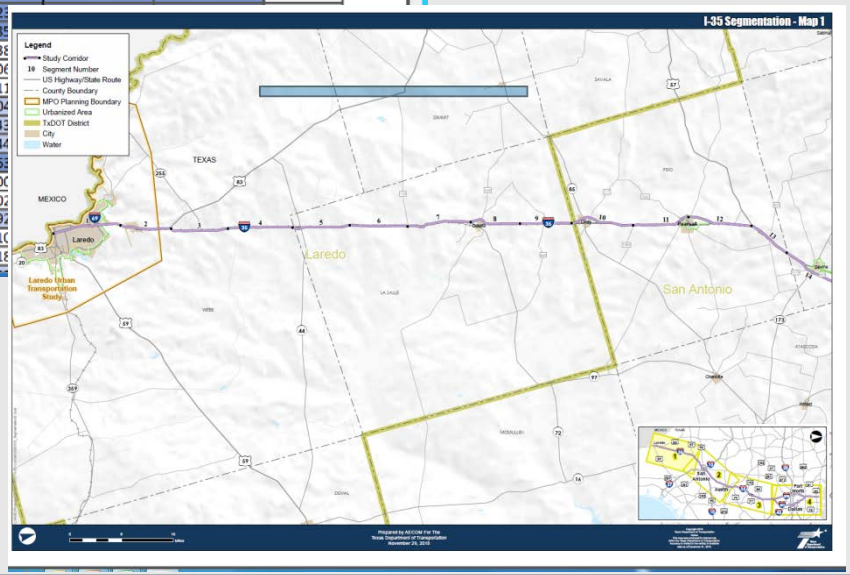
** Ranks are based on Weighted Average Need from highest to lowest.
I-35E and I-35W ranks are to be determined due to missing metric values.

Level of Need	Score
NONE	0 - 0.5
LOW	0.5 - 1.5
MEDIUM	1.5 - 2.5
HIGH	> 2.5

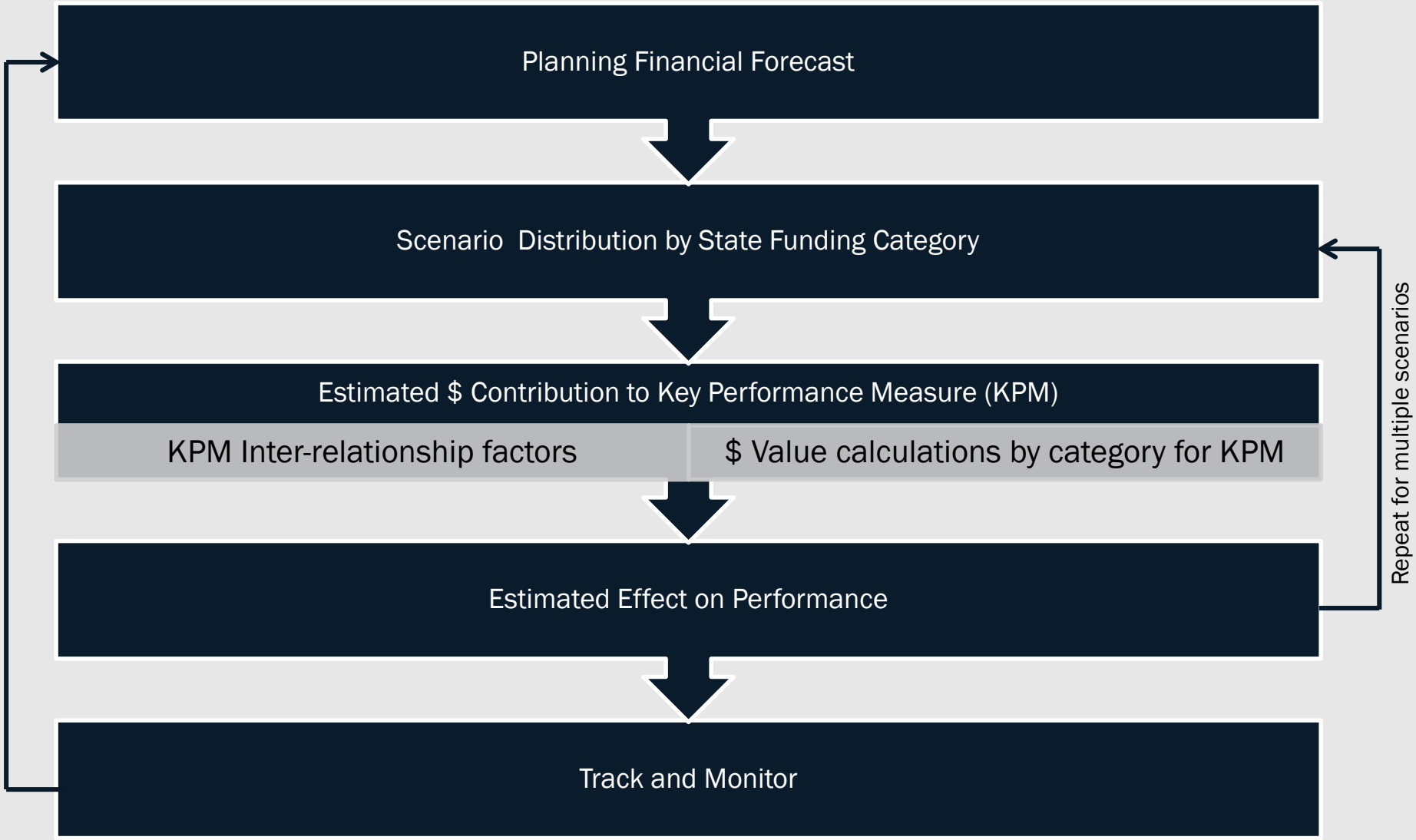




*Emphasis Areas are weighted by a factor of 1.5.



5. Performance-Based Investment Scenarios



Key Measures for TxDOT Investment Performance

- **Safety: Total Fatalities** – Number of fatalities per year.
- **Safety: Fatality Rate** – Number of fatalities per year per 100 million vehicle miles traveled (VMT).
- **Preservation: Statewide Pavement Condition** - Percent of lane miles of pavement in good or better condition.
- **Preservation: Statewide Bridge Condition** - overall condition of our bridge inventory.
- **Congestion Mitigation: Statewide All Urban Travel Time Index** - Ratio of the peak period average travel time to the free flow travel time.
- **Enhanced Connectivity: Statewide Rural Reliability Index** - Estimates 95th percentile delay on specific routes (during the heaviest traffic days).

Sample Investment Scenarios

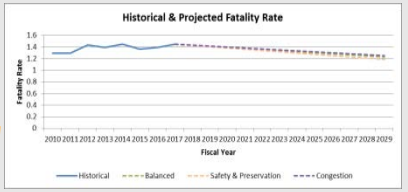
Category Allocations	Balanced Strategy	Maintenance and Safety Strategy	Congestion Strategy
Category 1- Maintenance	$14,080,590,000	$19,218,740,000	$13,736,890,000
Category 2 -Metro and Urban Corridor Funding	$12,992,360,000	$8,741,950,000	$19,580,000,000
Category 4 - Connectivity (Regional)	$6,941,890,000	$4,808,090,000	$2,284,320,000
Category 4 - Connectivity (Congestion)	$5,666,010,000	$3,933,870,000	$4,242,340,000
Category 5 - CMAQ (3 MPOs)	$2,213,510,000	$2,213,510,000	$2,213,510,000
Category 6 - Bridge	$3,586,560,000	$5,174,270,000	$3,698,400,000
Category 7 - Fed STP-MM (Large MPOs)	$4,588,130,000	$4,588,130,000	$4,588,130,000
Category 8 - Safety	$3,432,580,000	$4,435,090,000	$3,170,060,000
Category 9 - TAP	$910,500,000	$910,500,000	$910,500,000
Category 10 - Supplemental Transportation Projects	$550,640,000	$550,640,000	$550,640,000
Category 11 - District Discretionary	$1,096,500,000	$1,484,500,000	$1,084,500,000
Category 11 - Energy Sector	$2,136,880,000	$2,136,880,000	$2,136,880,000
Category 12-Strategic Priority	$8,308,000,000	$8,307,980,000	$8,307,980,000
Category 12-Strategic Priority (Texas Clear Lanes)	$5,000,000,000	$5,000,000,000	$5,000,000,000
Total Allocated Funds	$71,504,150,000	$71,504,150,000	$71,504,150,000
Category 3 - Estimated Non-Traditional and Earmark Funds	$5,400,000,000	$5,400,000,000	$5,400,000,000
Total All Funds	$76,904,150,000	$76,904,150,000	$76,904,150,000

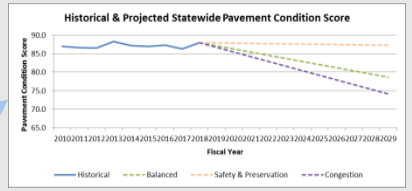
Sample Scenario Investment & Performance Projections

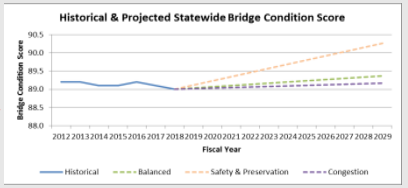
Investment Scenario Distribution → Investment Scenario "Crosswalk" → Performance Projections

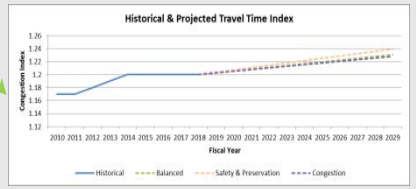
Category Allocations	Balanced Strategy ($B)
Category 1- Maintenance	$14.1
Category 2 –Metro & Urban Corridor	$13.0
Category 3 - Non-Traditional	$5.4
Category 4 - Connectivity (Regional)	$6.9
Category 4 - Connectivity (Congestion)	$5.7
Category 5 - CMAQ	$2.2
Category 6 - Bridge	$3.6
Category 7 - Fed STP-MM	$4.6
Category 8 - Safety	$3.4
Category 9 - TAP	$0.9
Category 10 - Supplemental Projects	$0.6
Category 11 - District Discretionary	$1.1
Category 11 - Energy Sector	$2.1
Category 12-Strategic Priority	$8.3
Category 12-Texas Clear Lanes	$5.0
Total All Funds	$76.9

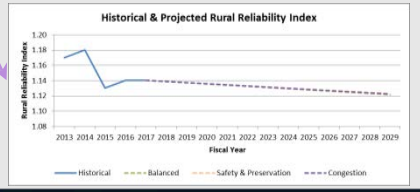
Performance Area	Est. Investment ($B)
Safety	$33.1
Pavement Preservation	$18.5
Bridge Preservation	$5.4
Congestion Mitigation	$39.6
Enhanced Connectivity	$17.7







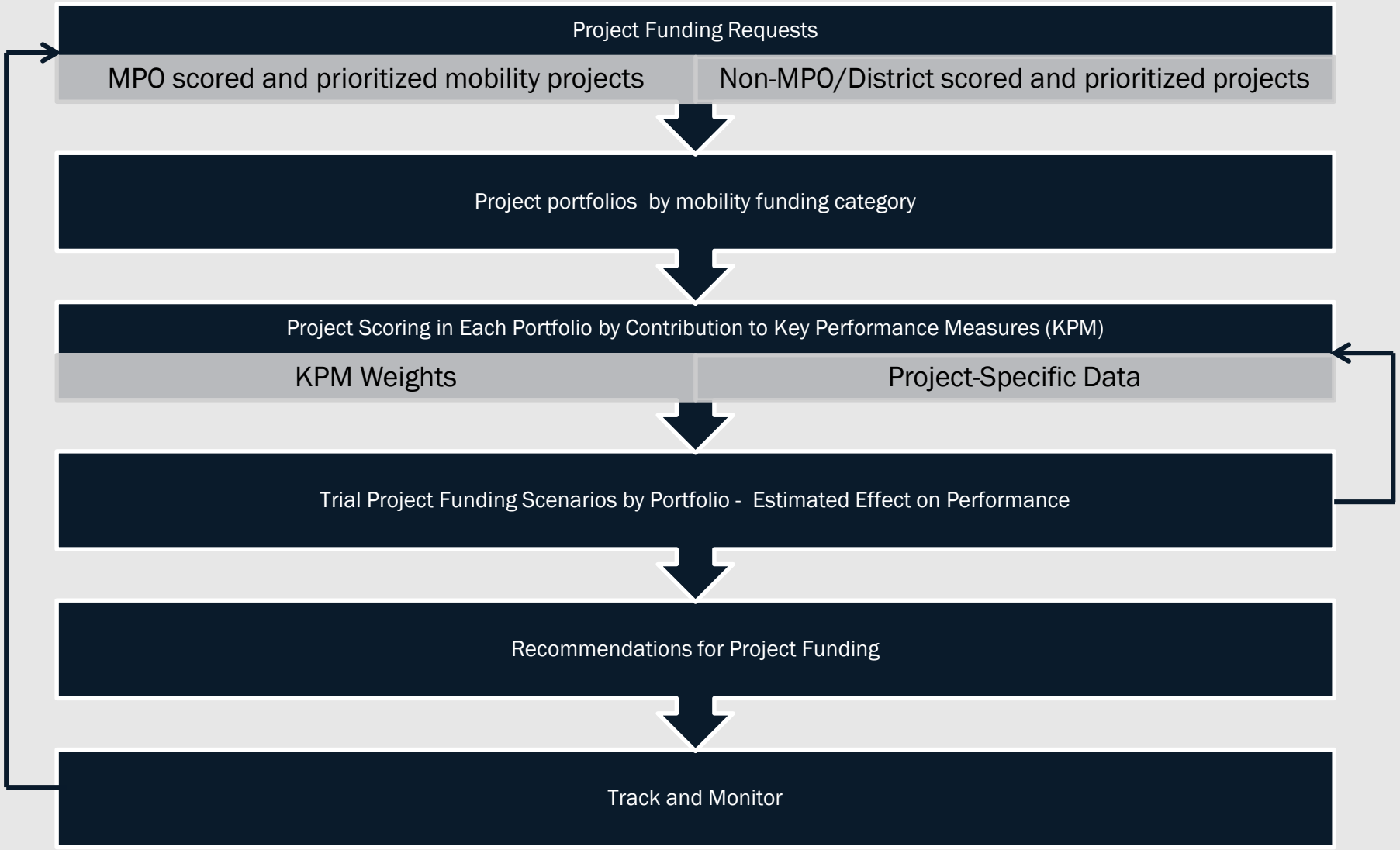




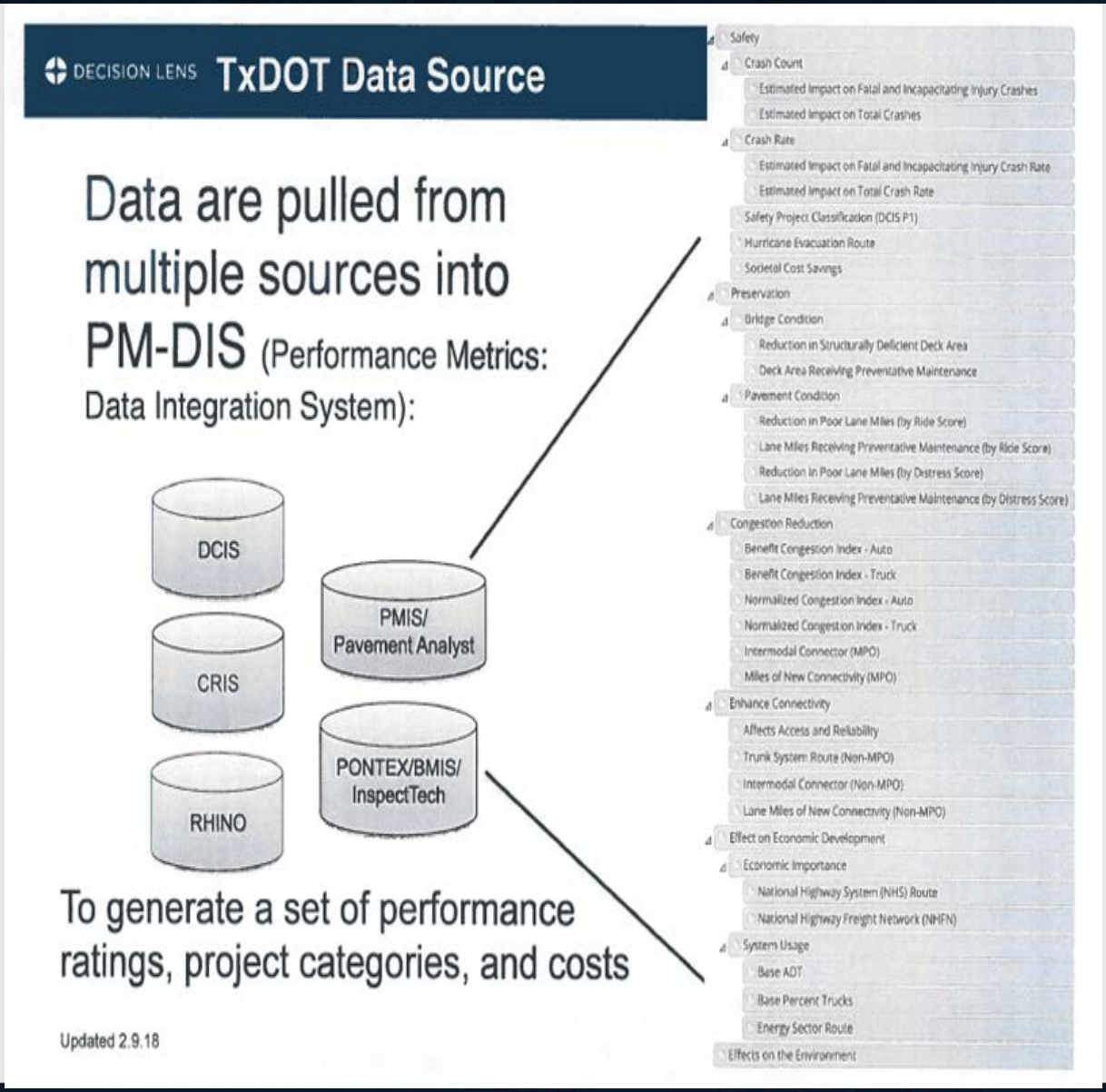
Sample 10-Year Performance Projections versus Targets

Strategic Plan Goal	Performance Vision	Key Performance Measure (KPM)	Projected 2028 Outcomes	2028 Target*
Promote Safety	Reduce crashes and fatalities through targeted infrastructure improvements, technology applications, and education	Safety: Fatalities/Yr	4,957	3,708
		Safety: Fatality Rate/100m miles	1.6	1.16
Preserve our Assets	Maintain and preserve system/asset conditions through targeted infrastructure rehabilitation, restoration and replacement.	Preservation: Pavement Condition	88.5%	90%
		Preservation: Statewide Bridge Condition Score	88.7%	90%
Optimize System Performance	Enhance mobility, reliability, connectivity & mitigate congestion through targeted infrastructure & operational improvements	Congestion: Urban Congestion Index	1.23	1.20
		Connectivity: Rural Reliability Index	1.13	1.12

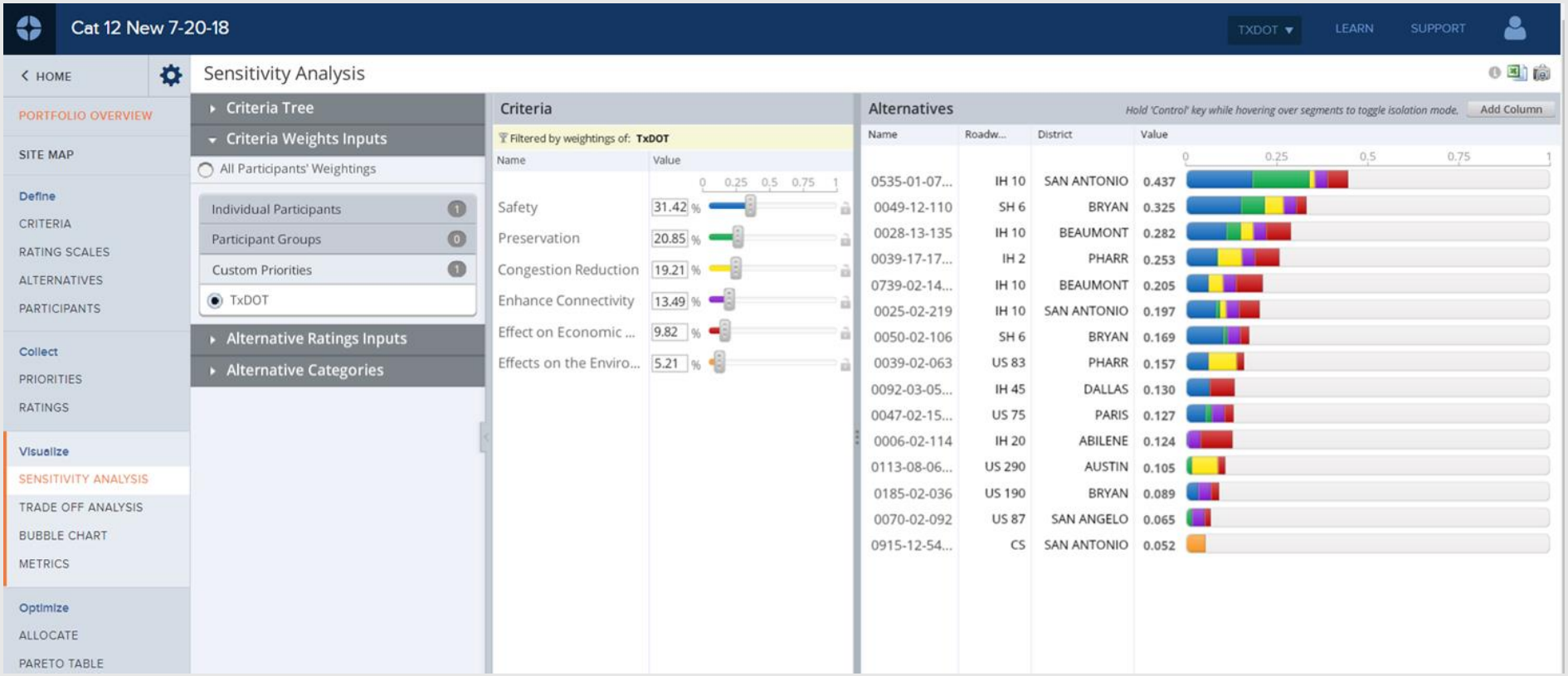
6. Performance-Based Projects Selection



Key Data Sources for Project & Portfolio Performance Assessment



Sample Project Portfolio Scoring in Decision Lens



Sample Summary of Estimated 10-Year Outcomes

Metric	Category 2	Category 4 Regional &Urban	Category 12 Strategic	Category 12 Clear Lanes	Total
Total Project Cost	$2.1B	$2.3B	$0.7B	$1.2B	$6.3B
Total Number of Projects	97	74	12	7	190
Miles of New Capacity	270 lane miles	707lane miles	120 lane miles	147 lane miles	1,144 lane miles
Improve Existing Lane Miles	210 lane miles	112 lane miles	21 lane miles	80 lane miles	423 lane miles
Improve Structurally Deficient Deck Area	4,214 sq. ft.	46,658 sq. ft.	5,922 sq. ft.	459,742 sq. ft.	516,536 sq. ft.
Estimated Impact on Total Crashes	5,385 crashes	3,587crashes	435 crashes	1,856 crashes	11,263 crashes
Cost Savings from Crash Reduction	$1.4B	$1.1B	$130M	$386M	$3.0B

7. Monitoring and Tracking

Key Work in Progress

- Improving project database accuracy
- Improving portfolio performance predictability
- Using historical letting data to improve ability to attribute investments to key performance areas (investment “crosswalk”)
- Developing model to link portfolio performance to statewide KPM outcomes
- Enhancing system-wide and corridor needs prioritization processes and tools
- Enhancing project/portfolio scoring and ranking procedures/tools

Key Challenges

- Accuracy and extent of data
- Predictability of investments and outcome
- Differences between Federal and state measures
- Time needed to develop a history of data to improve confidence levels
- Optics of non-zero fatalities targets, limitations of what we can control
- Consistency between databases, measurement methodologies
- Statewide mobility measures' insensitivity to investment
- Geographic scale and resources required

Full-Cycle Performance-Based Planning & Programming

✓ Implemented

\+ Close to implementation

✗ Not implemented

QUESTIONS & COMMENTS