



System Measure Usefulness – Going Beyond Airport Performance Measures

Tara Ramani, Texas Transportation Institute
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Overview

- **NCHRP Report 708 - A Guidebook for Sustainability Performance Measurement for Transportation Agencies**
 - Emphasizes the need for holistic, context-specific performance measures for transportation agencies
 - Basic concepts of the performance measurement framework
 - Applications of performance measures
 - Lessons learned/applicability for airports/aviation sector

Project Goal

- **To develop guidance for state departments of transportation (DOTs) and other transportation agencies to understand and apply concepts of sustainability through performance measurement to enhance their planning, operations, and decision making.**

Project Team

- **Project Lead -Texas Transportation Institute (TTI)**
- **Partners:**
 - Cambridge Systematics
 - CH2MHill
 - High Street Consulting
 - Dr. Steven Muench (University of Washington)
 - Dr. Henrik Gudmundsson (DTU)
 - Dr. Ralph Hall (Virginia Tech)
 - Dr. Greg Marsden (University of Leeds)

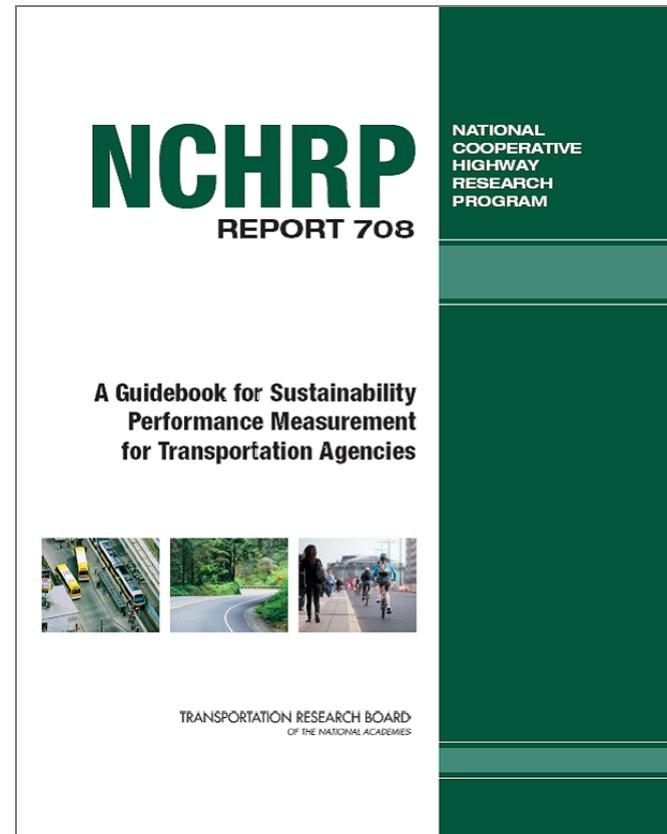
Research Approach

- **Literature review**
- **Case studies/interviews**
- **Generally applicable framework**
- **User-friendly guidebook**
- **Compendium of performance measures**
- **Future research needs and avenues for dissemination**

Research Products

- **NCHRP Report 708 – A
*Guidebook for
Sustainability
Performance
Measurement for
Transportation Agencies***
- **Spreadsheet-based
“compendium” of
performance measures**
- **Research report**

<http://www.trb.org/Main/Blurbs/166313.aspx>



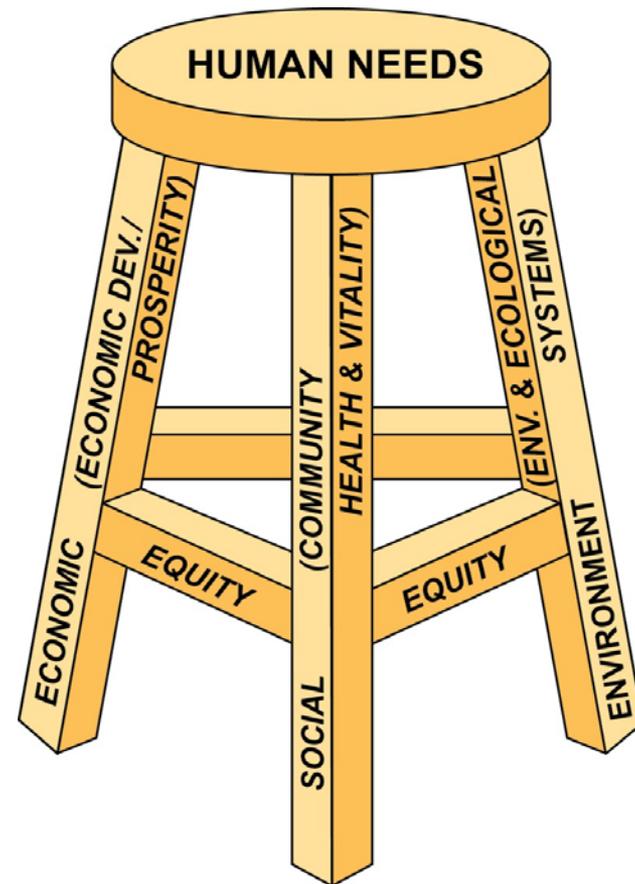
Spreadsheet-Based Compendium

Goal 1. Provide a safe transportation system for users and the general public.

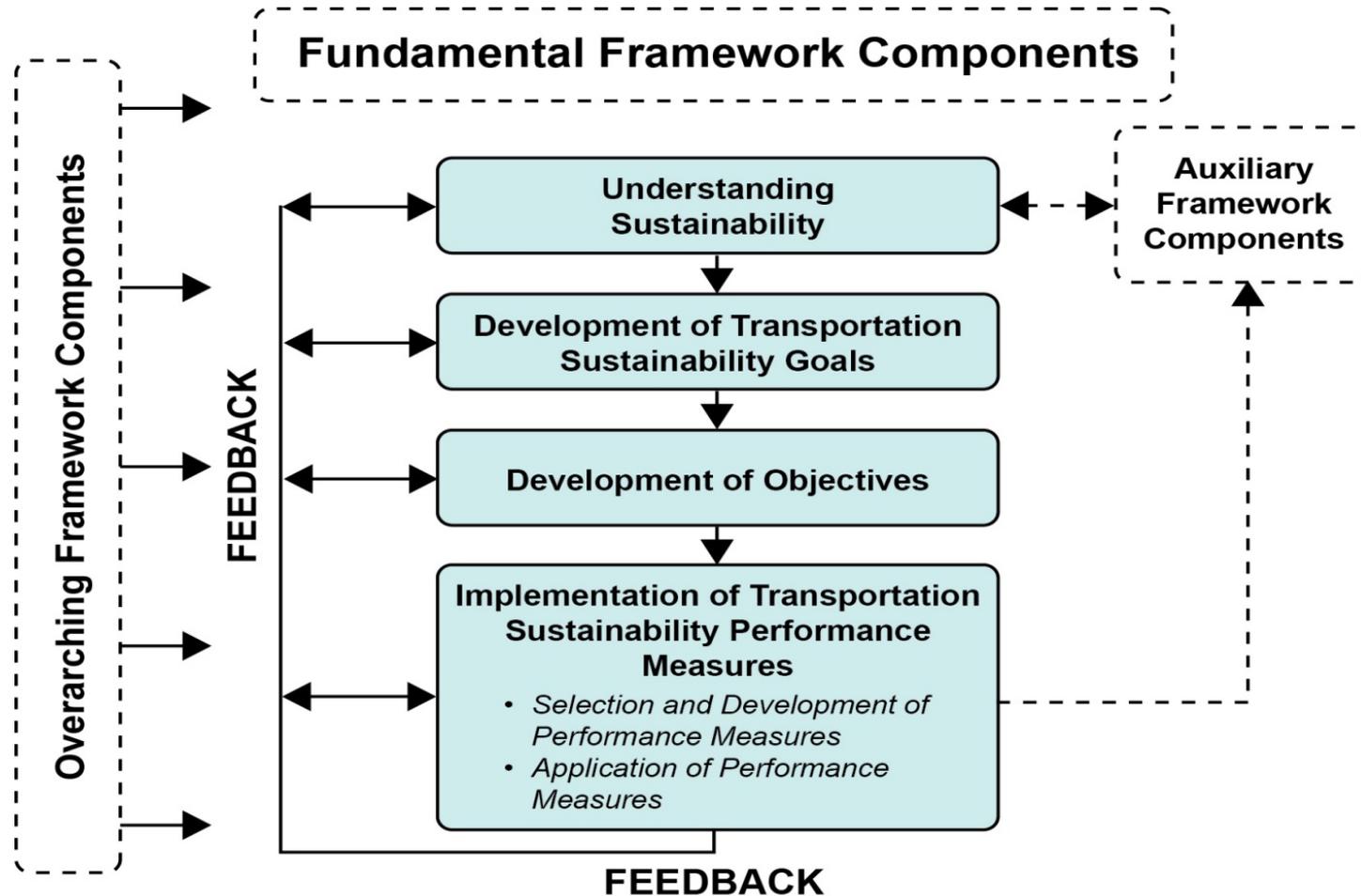
#	Objectives	Measure A	Measure B	Measure C
<i>Focus Area 1: Planning</i>				
1.1	Reduce the number and severity of crashes	Change in the number and severity of crashes	Change in the number of crashes by crash type and contributing factor	Change in the number and severity of truck crashes
1.2	Ensure safety considerations are addressed for all modes	Change in the number and severity of crashes by user type (e.g., pedestrian, bicycle, transit user, freight)	Change in the number of grade crossing collisions/incidents	
1.3	Ensure safety is considered early in project planning	Change in percentage of projects where safety of a project was reviewed in each of the project development stages by a multidisciplinary review team	Change in the percentage of projects implementing predictive methods of the AASHTO Highway Safety Manual	

Principles of Sustainability

- ***Sustainability entails meeting human needs for the present and future, while:***
 - *preserving and restoring environmental and ecological systems;*
 - *fostering community health and vitality;*
 - *promoting economic development and prosperity; and*
 - *ensuring equity between and among population groups and over generations.*



Performance Measurement Framework



Sustainability Goals

- ***Safety***
- ***Basic Accessibility***
- ***Equity/Mobility***
- ***System Efficiency***
- ***Security***
- ***Prosperity***
- ***Economic Viability***
- ***Ecosystems***
- ***Waste Generation***
- ***Resource Consumption***
- ***Emissions and Air Quality***

Linking Goals to the Principles

Goal	Principle			
	Environmental and Ecological Systems	Community Health and Vitality	Economic Development and Prosperity	Equity
Safety				
Basic Accessibility				
Equity/Equal Mobility				
System Efficiency				
Security				
Prosperity				
Economic Viability				
Ecosystems				
Waste Generation				
Resource Consumption				
Emissions and Air Quality				

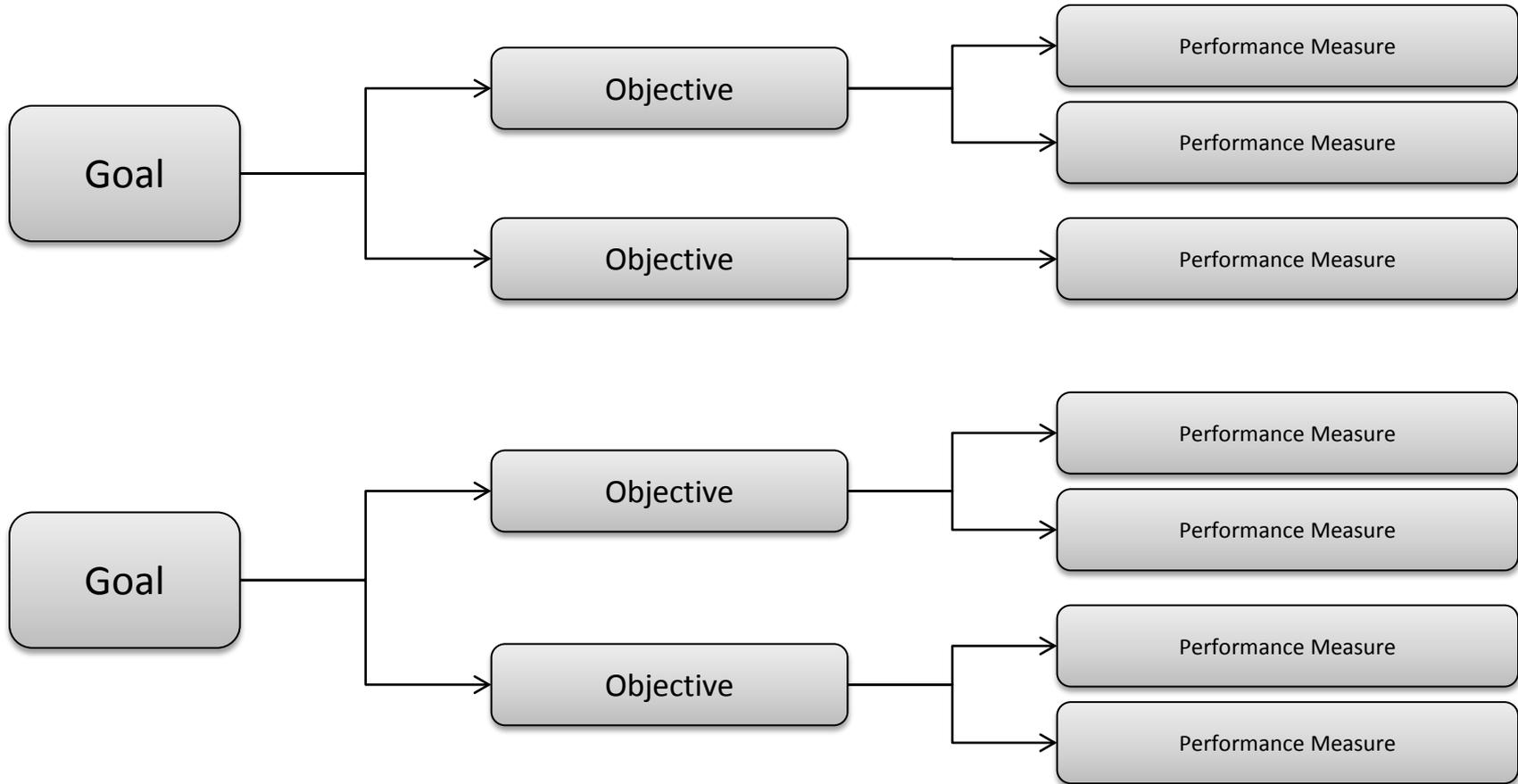
Development of Objectives

- **Objectives – linked to goals**
- **Specific to particular “focus areas” –**
 - Planning
 - Programming
 - Project development
 - Construction
 - Operations
 - Maintenance

Performance Measures

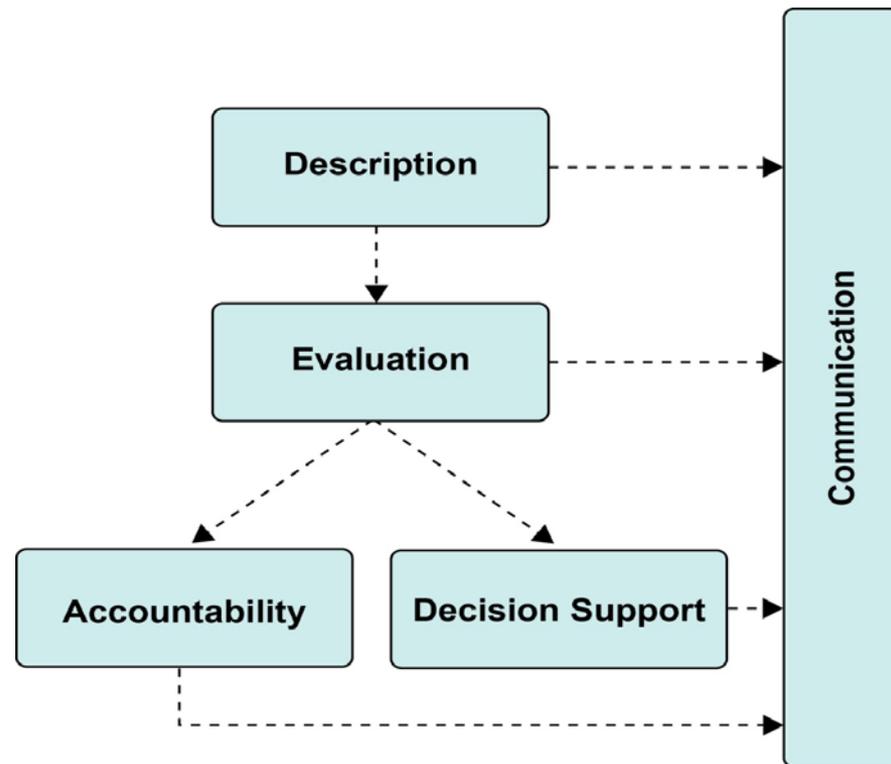
- **Performance measures (or indicators)** – quantifiable criteria derived from objectives
- **Sustainability performance measures**
 - Support sustainability goals/objectives
 - No single measure is a “sustainability measure”
- **Uses**
 - Track system performance or trends, evaluate alternatives, project selection, internal/external communication

Final Goal-Objective-Performance Measure Hierarchy



Applying Performance Measures

- **Application level**
 - Focus areas/business units
 - Whole agency
- **Application type**
 - Describe
 - Evaluate
 - Accountability
 - Decision Support
 - Communication

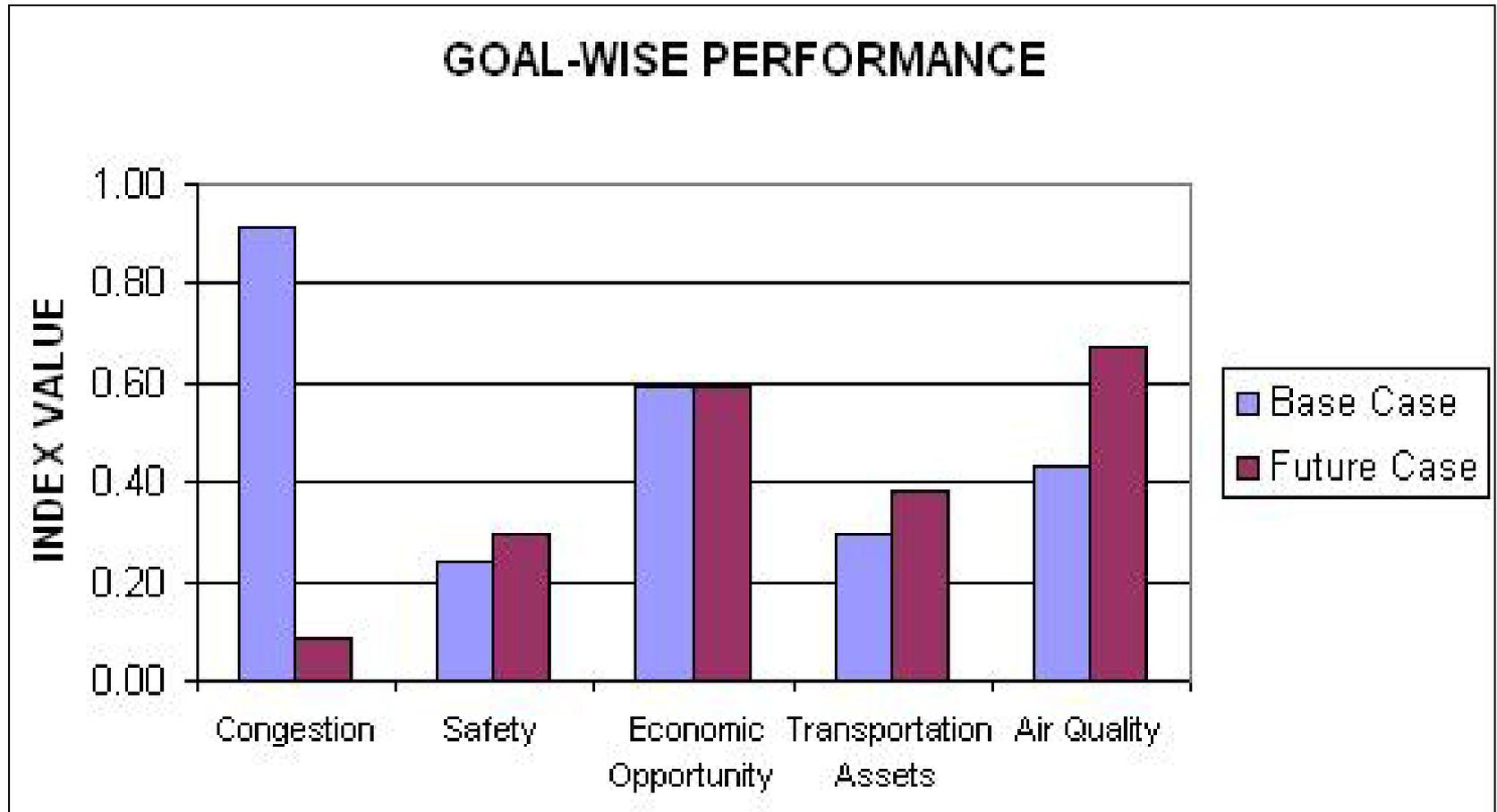


Example Highway Corridor-Level Sustainability Evaluation

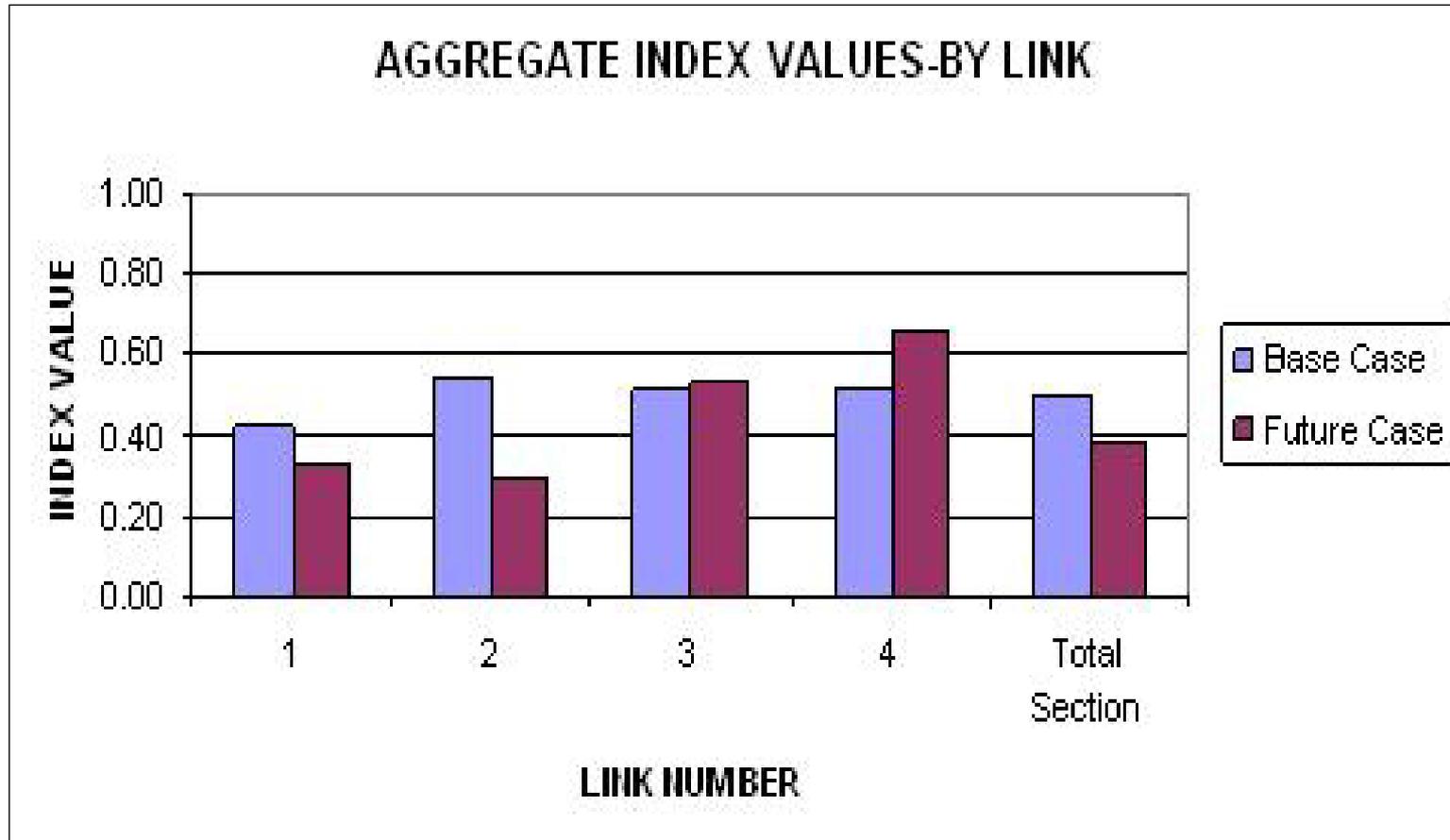
- 15-mile section of US-281, San Antonio



Goal-Wise Results

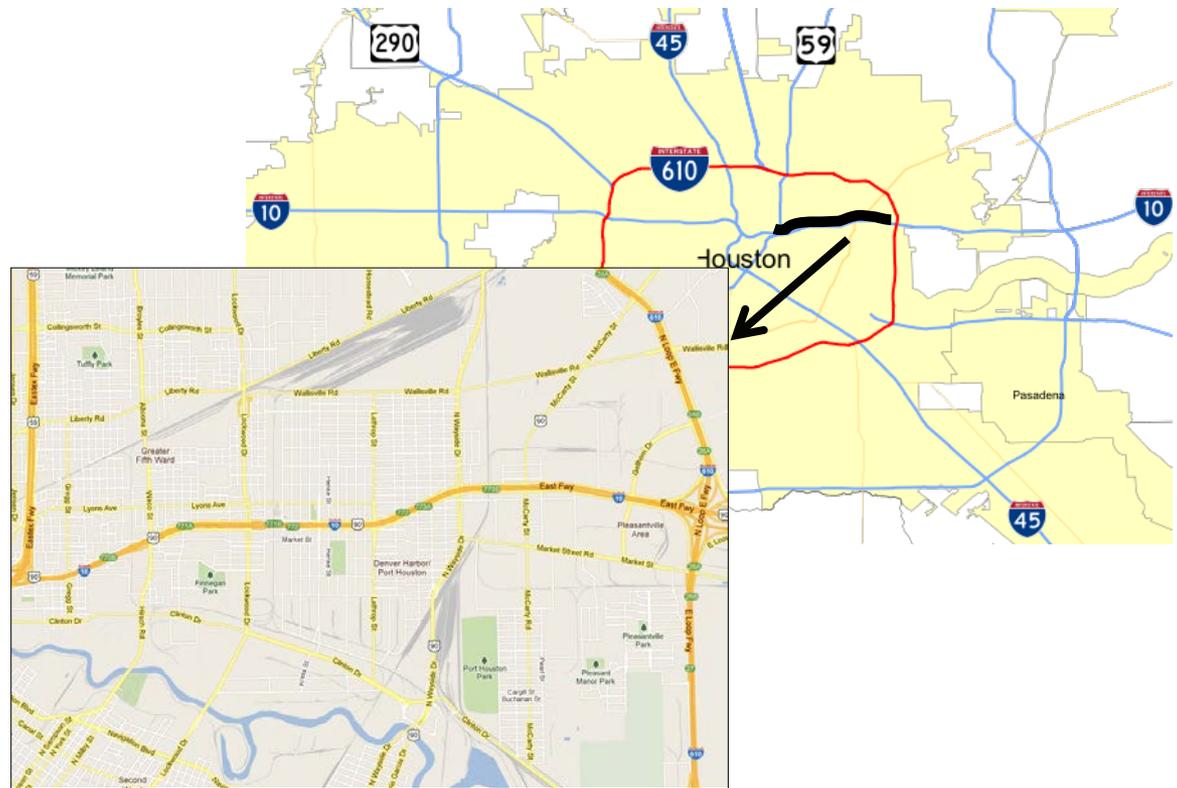


Link-Wise Results



Case Study Example - Freight Corridor

- **5-mile section of I-10 in Houston**



Performance Measure	Quantification Results			
	Measure	Scaled	Goal Index	Overall Index
Annual fatal accidents per truck-mile	0.16	0.84	0.89	0.62
Annual HAZMAT accidents per mile	0.00	1.00		
Truck throughput efficiency	44,779	0.24	0.72	
Average cargo weight per truck, annual	15	1.00		
Travel time index	1.12	0.88		
Buffer index	0.24	0.63		
Number of intermodal facilities along the section	1	1.00		
Average truck age	7	1.00	0.24	
Daily grams per mile (PM)	50,950	0.00		
Daily grams per mile (ozone precursor)	1,329,129	0.00		
Percentage of trucks complying with the second most recent emissions standards (PM)	15%	0.85		
Percentage of trucks complying with the second most recent emissions standards (ozone precursor)	7%	0.93		
Daily grams of CO ₂ eq per mile	285×10 ⁶	0.00		
Number of sensitive areas (schools/hospitals) within 1 mile from the road	19	0.00		
Population residing within 1 mile from the road	7083	0.00		
Number of sensitive environmental areas within 1 mile from the road	0.00	1.00		

Conclusions

- **Emphasizes the need for holistic view, with context-specific performance measures**
- **Framework for sustainability based on goals, objectives and performance measures**
- **Broad range of applications of performance measures**
- **NCHRP guidebook – consolidates for transportation sector**