Considerations for Integration of Infrastructure Resiliency and Asset Management with Long-Range Planning in North Central Texas

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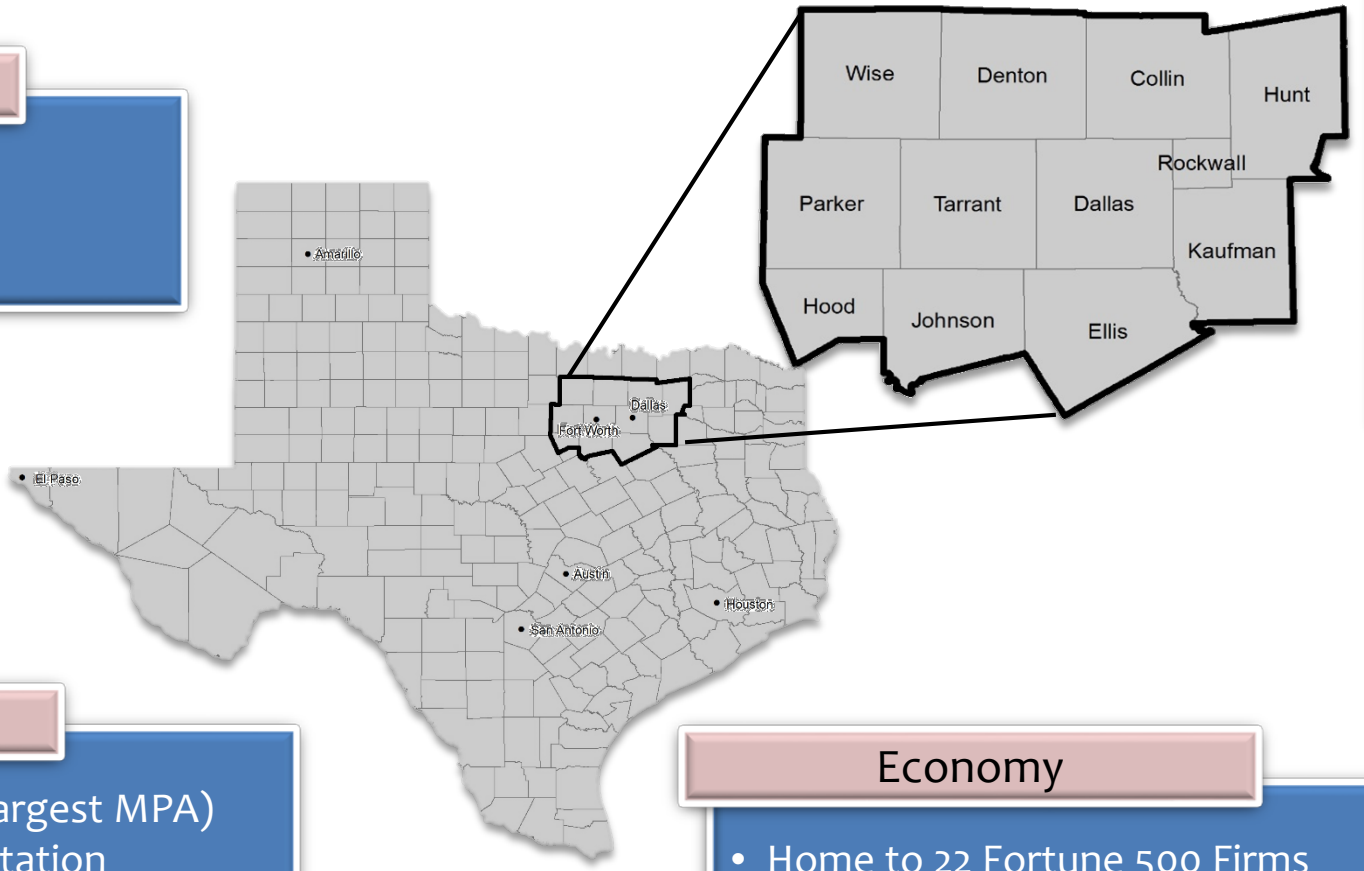
FHWA Workshop (Austin, TX):
Resilience in the Transportation Planning Process Under the FAST Act

NCTCOG – Regional Perspective

12-County Metropolitan Planning Area (MPA)

Population

- 2017: 7.2 million
- 2045: 11.2 million
- 6th Largest MPA



Area

- 12 Counties (3nd Largest MPA)
- Multiple Transportation Providers (TxDOT, CDA, Public)

Economy

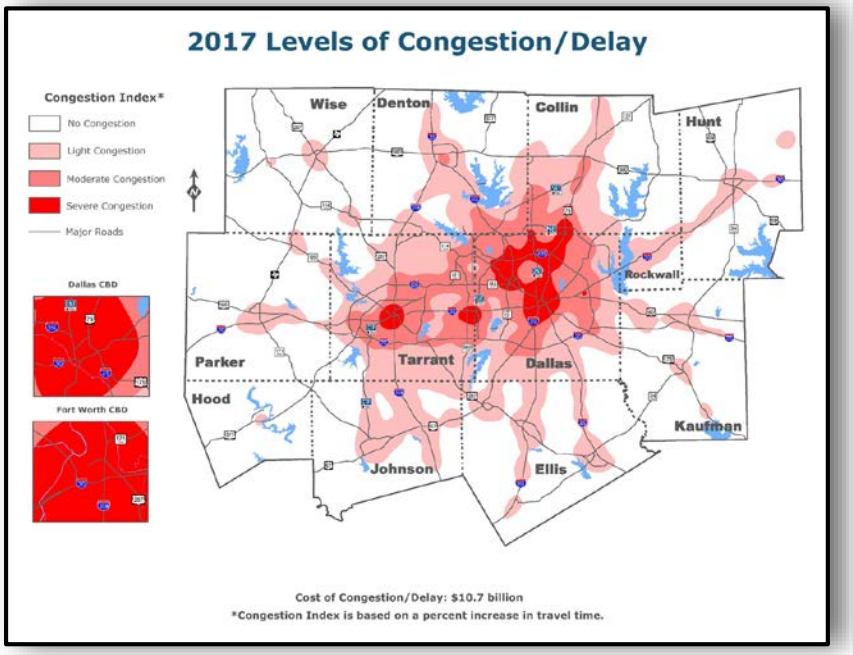
- Home to 22 Fortune 500 Firms
- Represents 1/3rd of Texas GDP

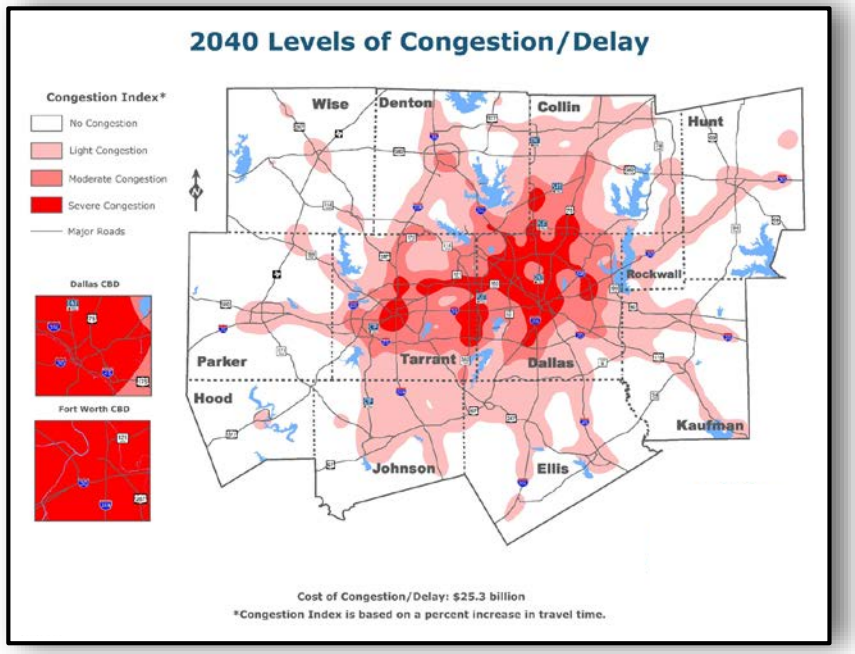
Regional Context for Asset Planning

Dallas-Fort Worth Metroplex – "The Big Picture"

- Population/employment growth nearly 50% through 2040
- Increased vehicle-miles of travel, delay, and congestion costs, while numerous existing infrastructure/system burdens remain
- Mobility 2040 Plan identifies less than 1/3rd funding necessary to eliminate the worst congestion

Mobility 2040 Plan - http://www.nctcog.org/trans/mtp/2040/





Regional Context for Asset Planning *(cont.)*

Setting the Stage for Potential Action Opportunities

- Prior to the Mobility 2040 Plan, improvement options for major facilities were becoming increasingly limited:
  - Revenues from gas/sales taxes
  - Innovative financing/tolls
  - Maintenance needs (exacerbated by extreme weather events)
- Additional federal/state funding was recently approved:
  - Fixing America's Surface Transportation (FAST) Act
  - Proposition One (2014)/Proposition Seven (2015)
  - Ending DPS/DMV gas-tax diversions
- Mobility 2040 Plan identifies **$118.9 billion** for improvements:
  - Existing system maximization strategies **> 27%** compared to previous Plan
  - Increasingly important to address not just mobility, but also preservation, efficiency, and resiliency

Regional Context for Asset Planning *(cont.)*

Climate/Weather Challenges to Mobility & Functionality


Frisco


Palo Pinto County

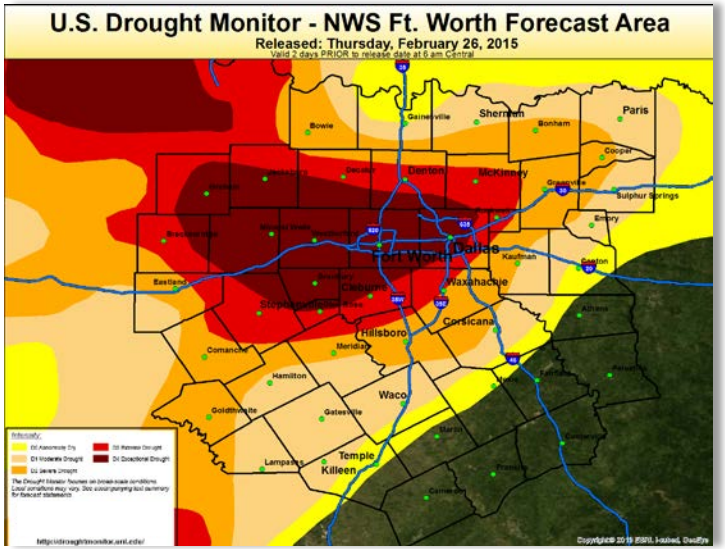

Fort Worth


Euless

2015 NCTCOG Vulnerability Assessment Study

Climate Change/Extreme Weather is a Current Problem

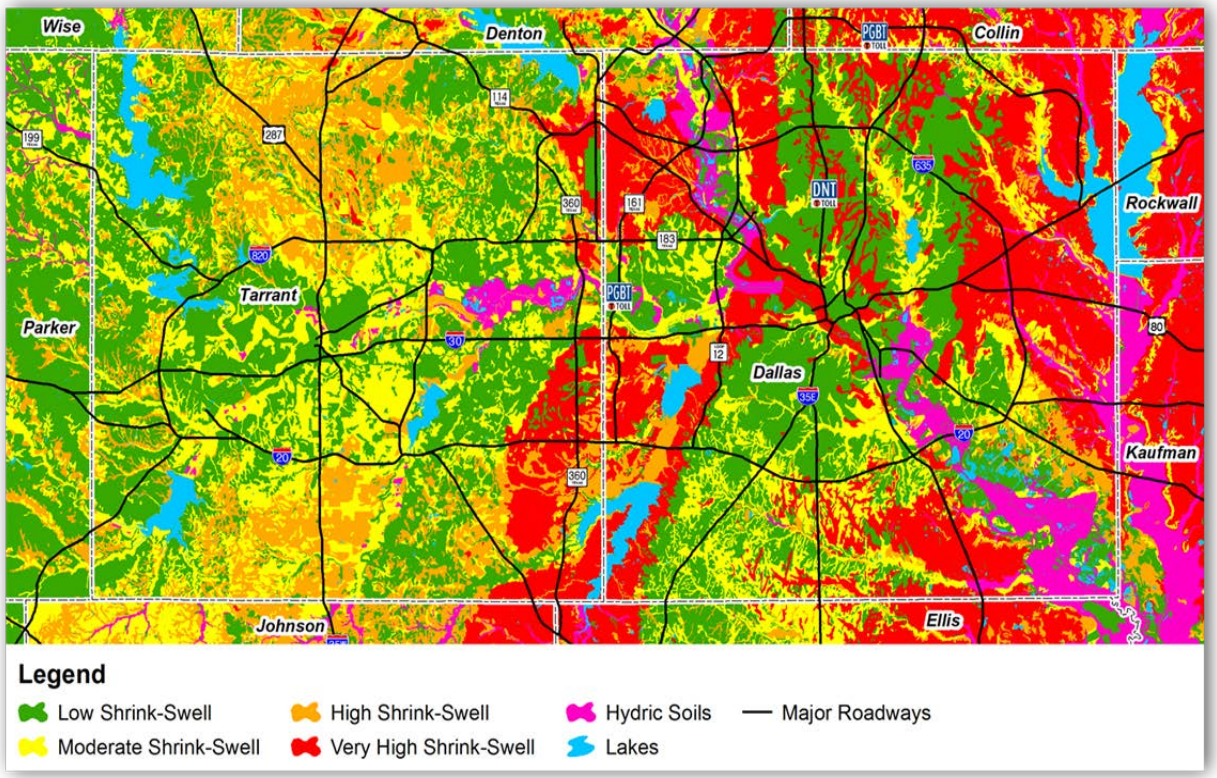
- Nine of the top-10 warmest years in DFW have occurred after 1998:
  - #1 – 2006; #2 – 2012; #3 – 2016
  - Heat concerns at all hours of the day
- Large weather variations:
  - 2011 Summer Heat = 71 days > 100° (average – 18 days)
  - 2014 Precipitation Total = 21.32 inches (fifth year of worst drought since 1950's)
  - 2015 Precipitation Total = 62.61 inches (wettest year on record)



2015 NCTCOG Vulnerability Assessment Study *(cont.)*

Notable Findings – Significant Future Climate Change

- "Business-as-Usual" emissions scenario translates to substantial temperature rises and soil moisture reduction by year 2100:

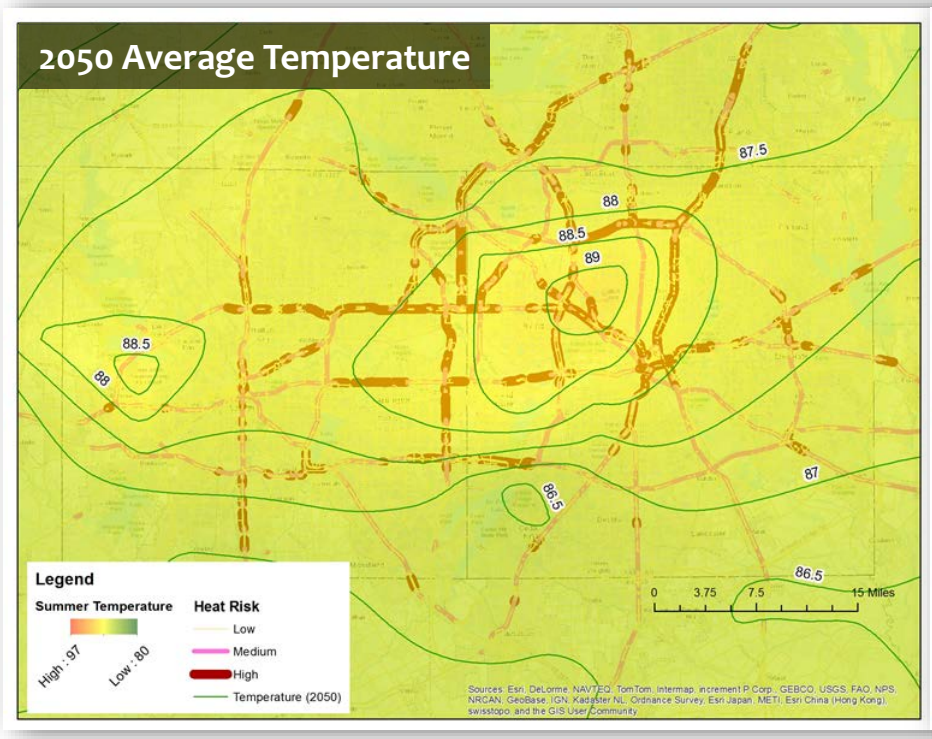


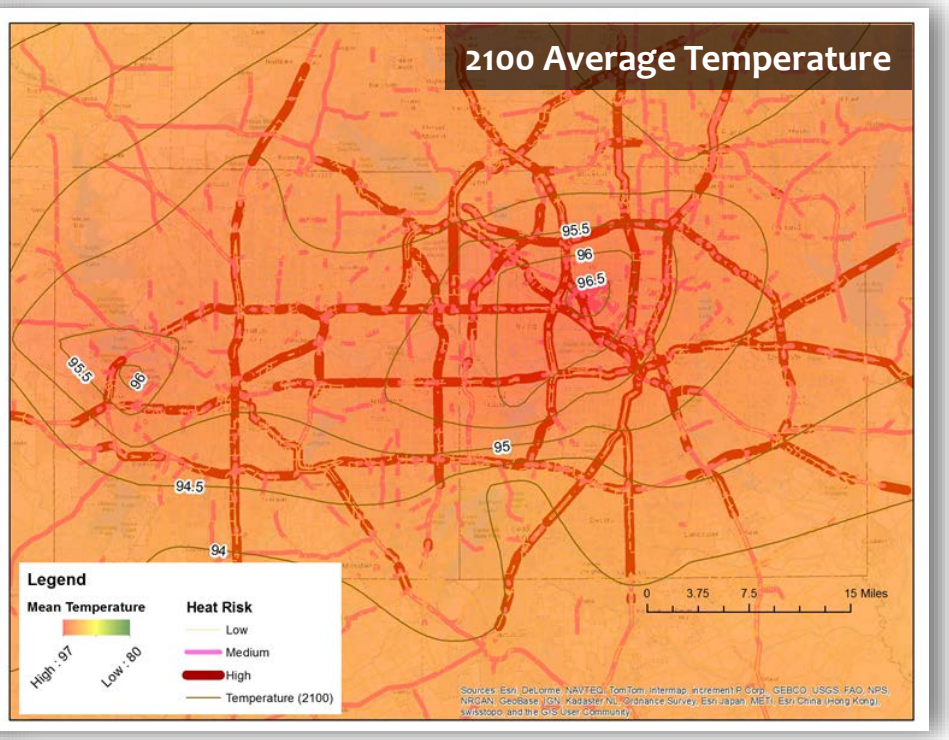
- Mean temperature > 8° F compared to current average (extreme > 13° F)
- Lower annual rainfall, but punctuated by storms of greater intensity
- Effects magnified due to large regional distribution of high-plasticity soils

2015 NCTCOG Vulnerability Assessment Study (FHWA Grant) -
https://www.fhwa.dot.gov/environment/sustainability/resilience/pilots/2013-2015_pilots/

2015 NCTCOG Vulnerability Assessment Study *(cont.)*

Notable Findings – Heat Risks

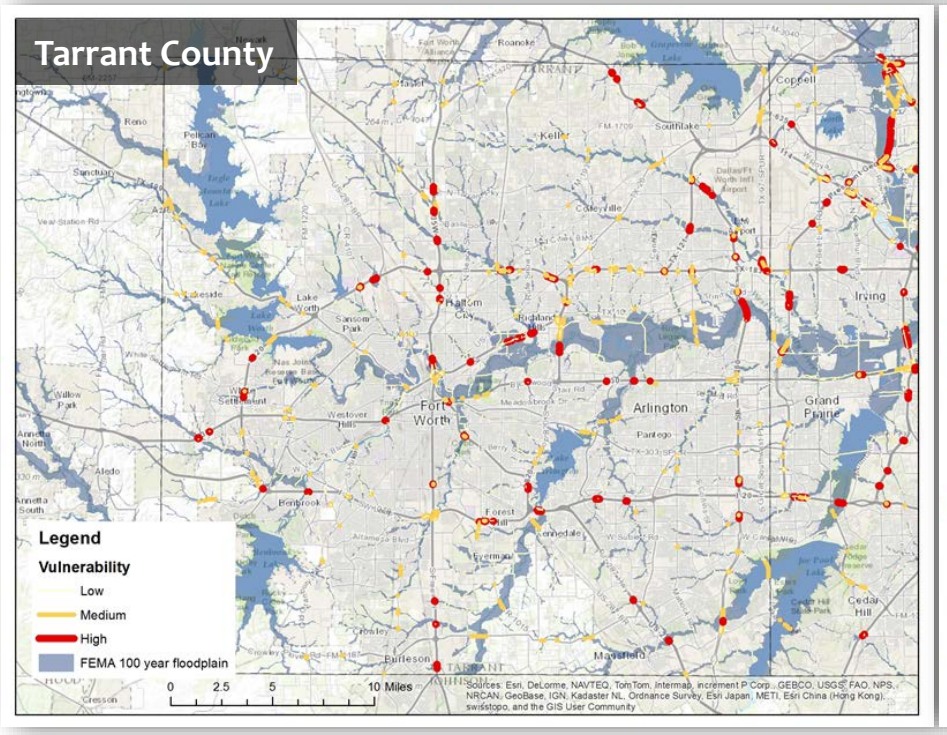


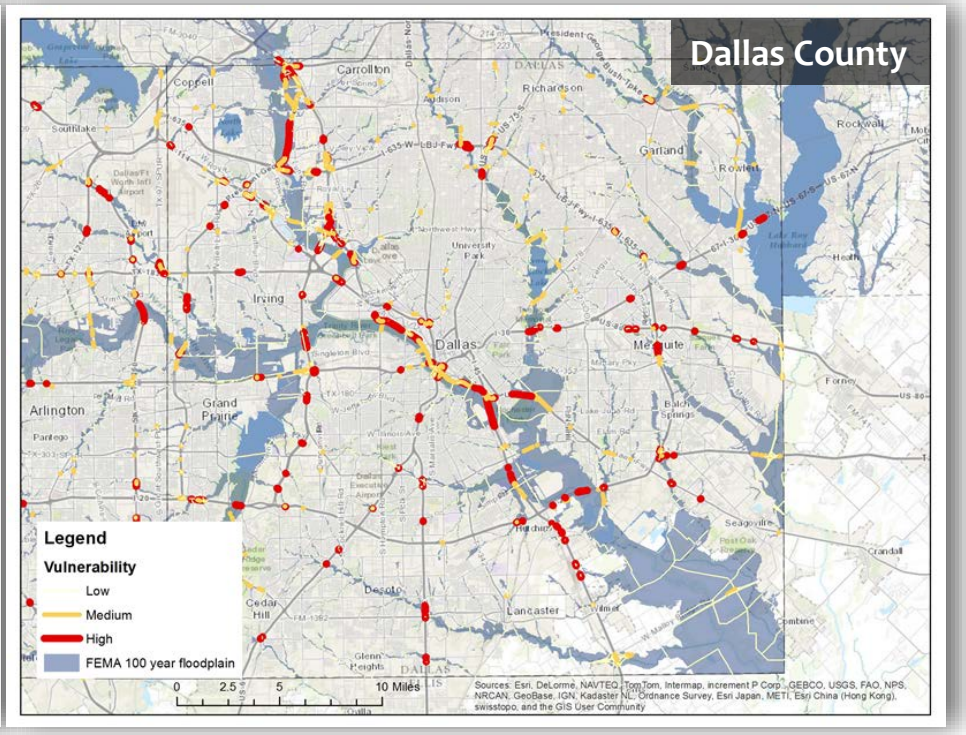


- Significant future temperature increases will accelerate pavement degradation, rutting, joint failures, and utility breaches
- Urbanization growth enhances regional heat island effect which amplifies moisture losses and substructure destabilization

2015 NCTCOG Vulnerability Assessment Study *(cont.)*

Notable Findings – Flood Risks for Critical Roadways





- Many critical roadway segments cross the 100-year floodplain and/or exist in flood-prone or poorly drained areas
- Additional information required (surface elevation, engineering/design details, etc.) to determine overall vulnerability changes over time

Regional Context for Transportation Asset Management (TAM) Program Development

Capability Maturity Model Framework

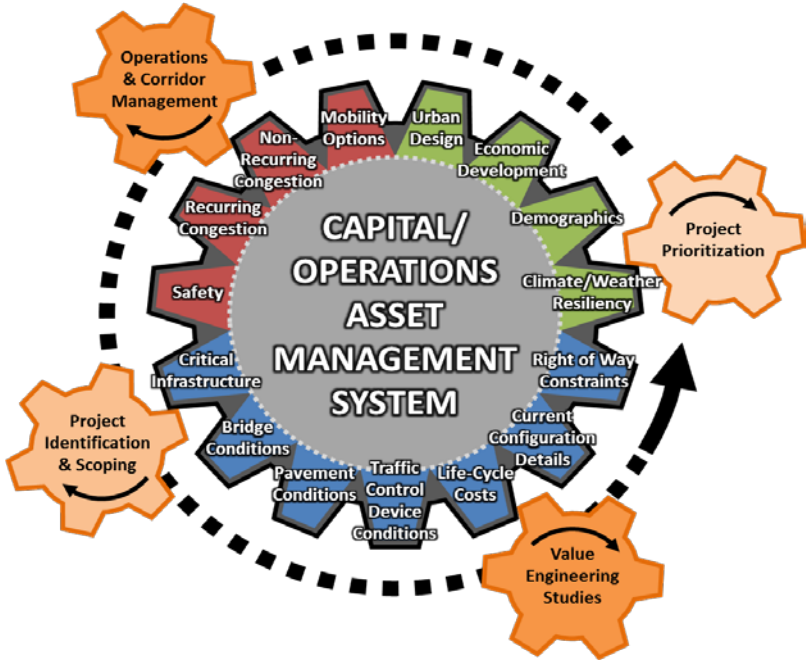
- Built from Congestion Management Process
- Deficiency analysis used to identify regional priority corridors
- Corridor evaluation to identify specific projects
- Inventory of operational assets
- Statewide Pavement Management applied as a model to establish operational asset performance measures
- Asset management training

NCTCOG CMP Update (2013) -
http://www.nctcog.org/trans/cmp/

Current/Ongoing TAM-Related Efforts

CAP/MAIN – Delivering Data-Driven Corridor Solutions

- Applies **asset management** business principles and **performance-based data analysis** tools (***TransFACTS***) to develop more holistic transportation planning and investment strategies
- Corridor deficiencies or performance gaps can be addressed using low/moderate-cost techniques with faster implementation
- Examples of ***TransFACTS*** data:
  - Traffic Volumes/Congestion Levels
  - Crash Data
  - Geometric Issues/Condition of Facilities
  - TDM/TSM Operation & Applications
  - Access/Circulation Preferences
  - Socioeconomic & Environmental Issues
  - Urban Design/Sustainability Efforts

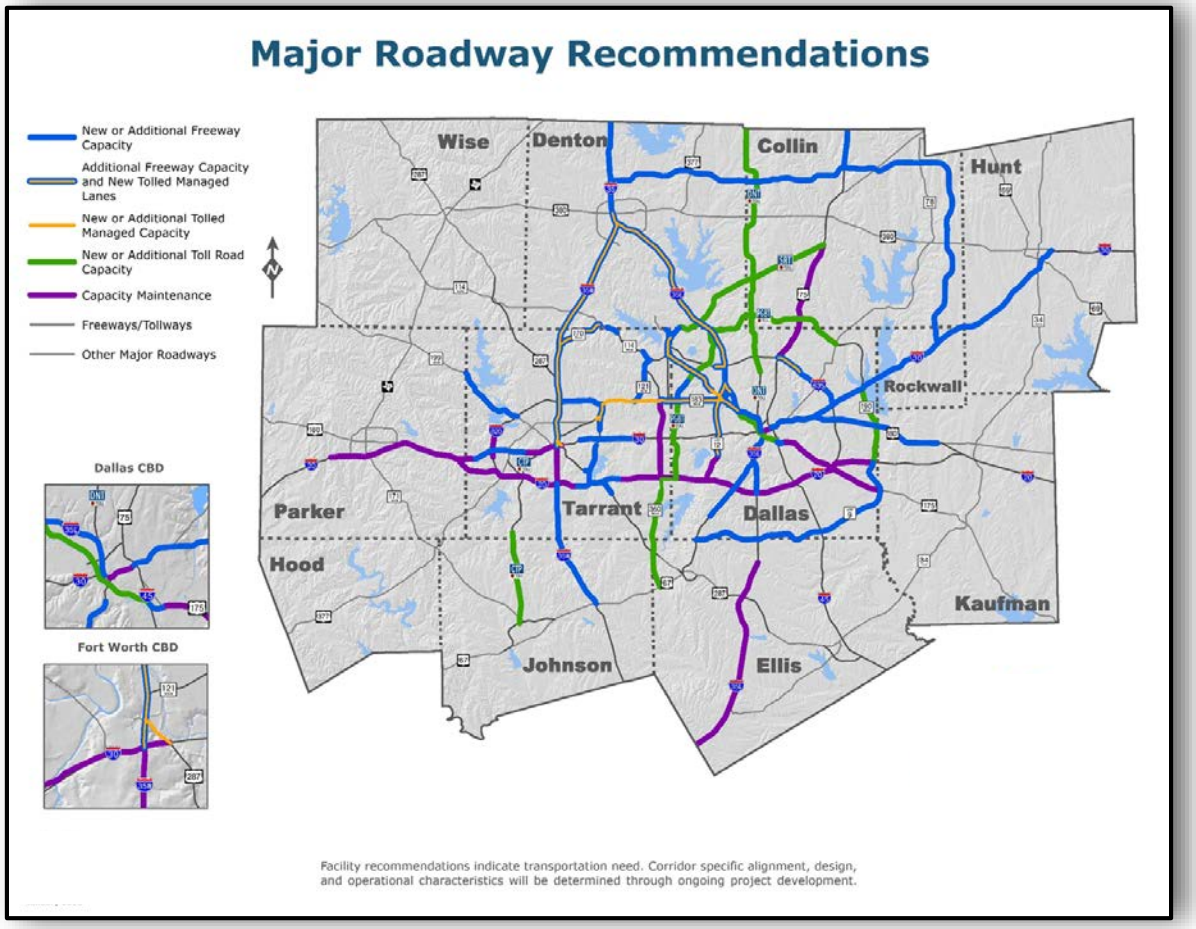


Current/Ongoing TAM-Related Efforts *(cont.)*

CAP/MAIN Pilot Projects & Proposed Study Corridors

- Completed/Under Construction:
  - SH 161 Peak-Period Shoulder-Use Lanes (Irving)
  - IH 35E (Ellis County)
- Ongoing Studies:
  - IH 20/IH 30 (Tarrant/ Parker County)
  - US 75 Peak-Period Shoulder-Use Lanes (Dallas/Collin County)
- Total CAP/MAIN Program – $2.5 Billion

NCTCOG CAP/MAIN Analysis - http://www.nctcog.org/trans/cmp/assets/



Current/Ongoing TAM-Related Efforts *(cont.)*

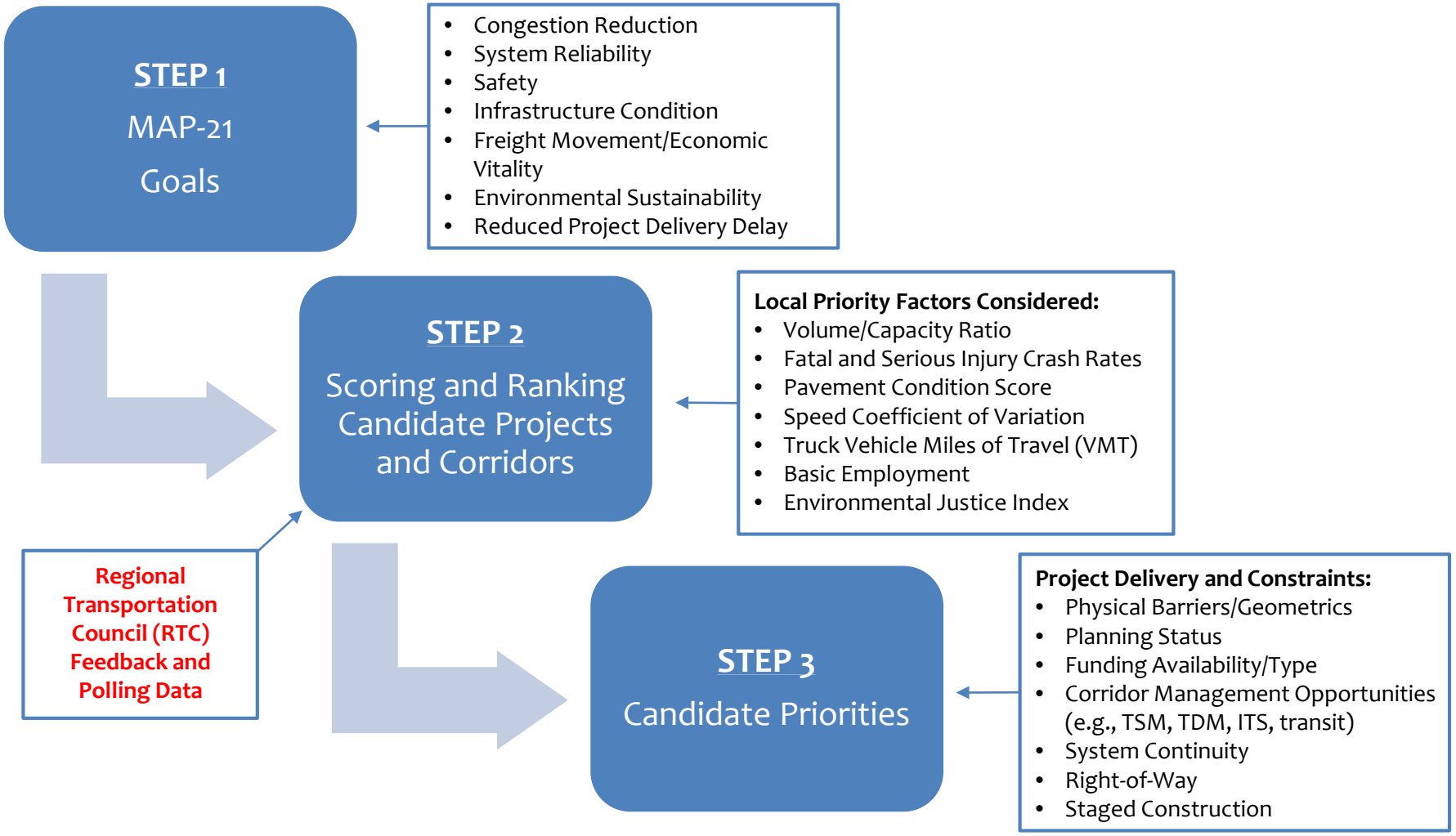
Mobility 2040 Planning – Project Categorization/Ranking

MAP-21 Goal	Performance Measure Criteria	Unit Measure
Congestion Reduction	Traffic Volume/Roadway Capacity	Traffic Volume/Roadway Capacity Ratio
System Reliability	Speed	Variance from Average Speed
Safety	Crash Rate	Fatal and Serious Crashes (per 100 Million Vehicle-Miles of Travel)
Infrastructure Condition	Pavement Conditions	Pavement Condition Score (TxDOT)
Freight Movement and Economic Vitality	Basic Employment	Employment Density
	Number of Trucks	Percentage – Truck Vehicle-Miles of Travel
Environmental Sustainability	Environmental Justice Index	Environmental Justice Population Density
Reduced Project Delivery Delay	Planning Status, Funding Availability, Constraints, and System Continuity	Information Purposes Only (Coordination with Regional Transportation Providers)

- Candidate projects scored based on MAP-21 goals/measures and weighted by Regional Transportation Council (RTC) feedback
- Weighted absolute scores determine project categorization
- Relative scores within category determine project prioritization
- Evaluate ongoing/future project delivery factors/impacts

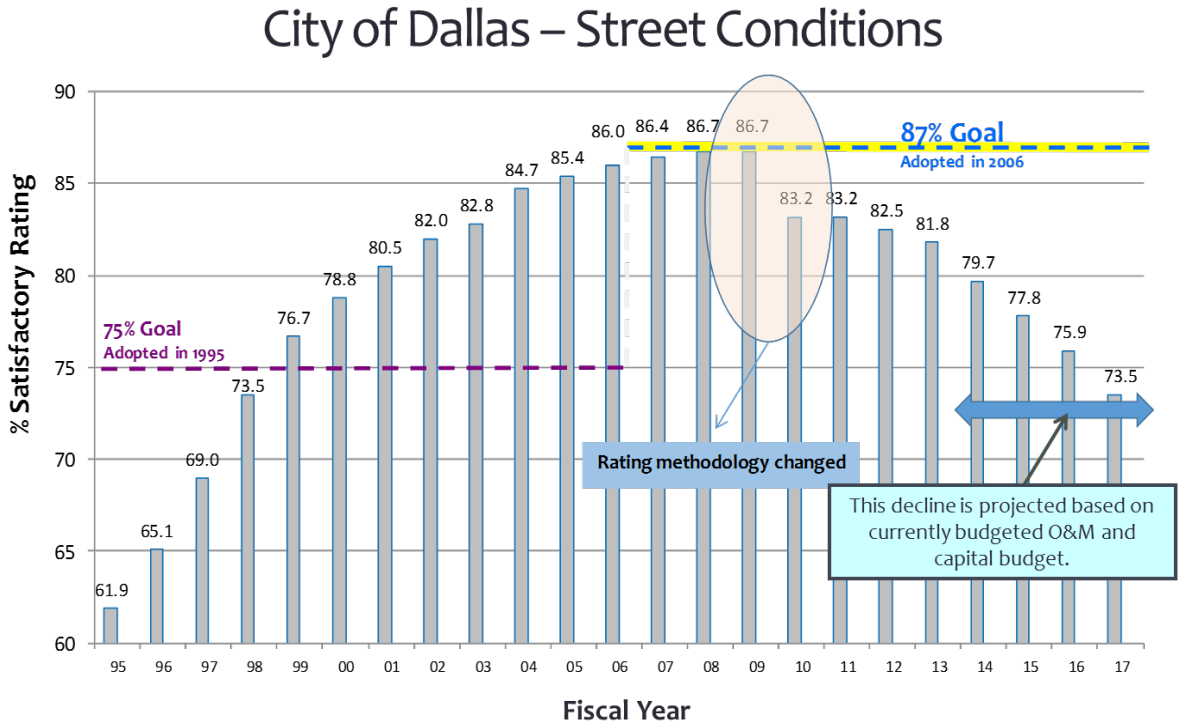
Current/Ongoing TAM-Related Efforts *(cont.)*

Mobility 2040 Planning – Emphasizing Project Delivery



Current/Ongoing TAM-Related Efforts *(cont.)*

Regional Coordination and Data Management Needs



- Numerous forms of asset data collected by multiple entities
- Data can address specific questions, but not all vital concerns
- Ensuring consistent linkages with minimal duplication and maximum cross-agency interest execution is the optimum goal

Current/Ongoing TAM-Related Efforts *(cont.)*
Emphasis on Operational/Technology Applications

- Many assets in operation, but are they working as they should, and are they optimally maintained?
- More than just transportation operations, but also maximizing incident detection and enhancing potential alternate routes
- Identify all at-risk locations and apply technology to notify when weather events occur, such as flooding at low-water crossings
- Technology use/management to become a greater issue with advancement of connected and/or autonomous vehicles

NCTCOG Regional Ecological Framework

Preliminary Screening Tool for Environmental Impacts

NCTCOG **Regional Ecological Framework (REF)** composed of 10 ecological layers:

Green Infrastructure	Water Considerations	Ecosystem Value
• Wildlife habitat • Natural areas • Agricultural land	• Impaired water segments • Flood zones • Surface water quantity • Wetlands	• Rarity • Diversity • Ecosystem sustainability

Created one-stop shop for region-specific environmental data

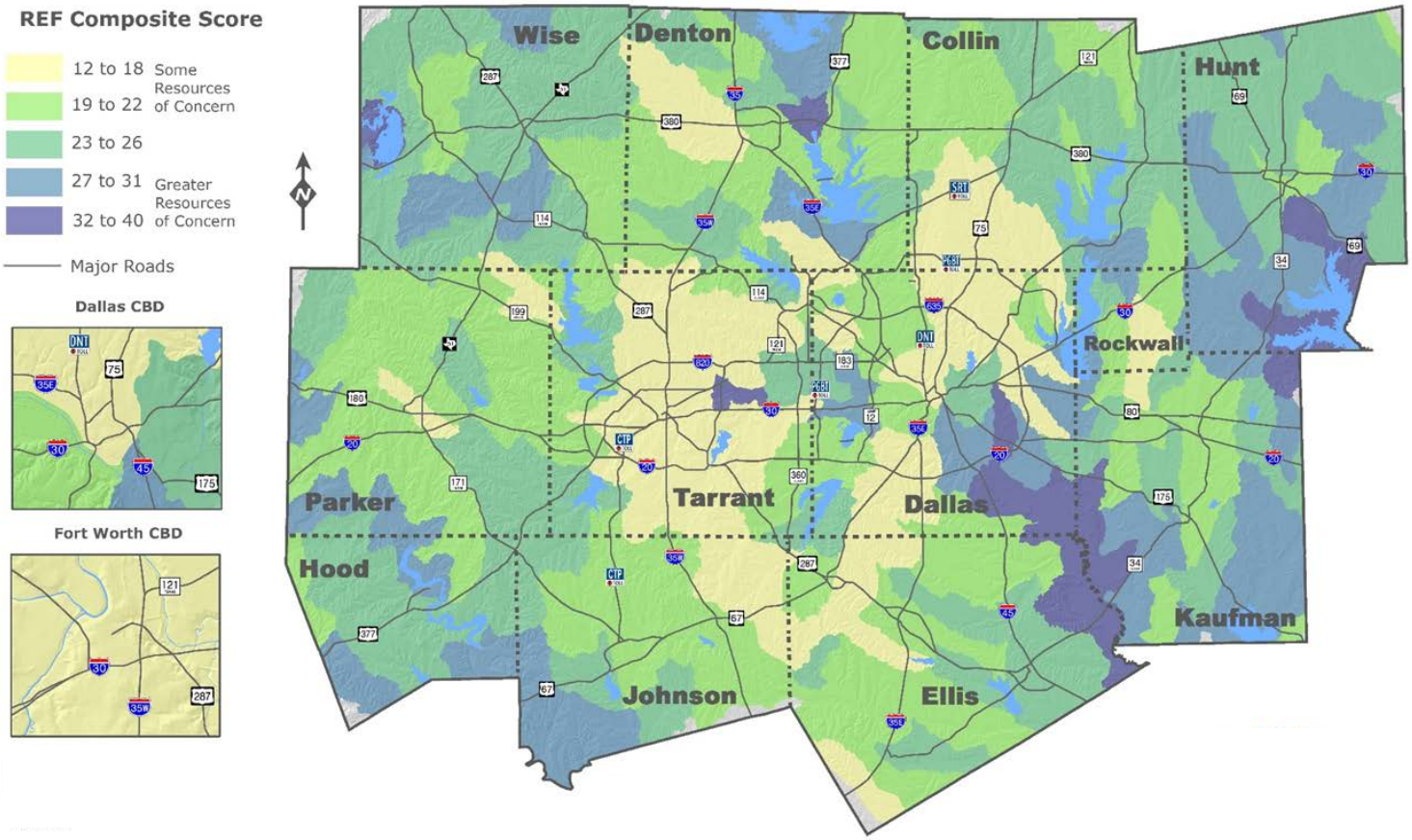
Built partnerships with non-traditional agencies

Impetus for applications using common spatial data to benefit both planning and NEPA

Process expandable to outline effects and mitigation strategies for extreme weather events

NCTCOG Regional Ecological Framework *(cont.)*

MPA Composite Map

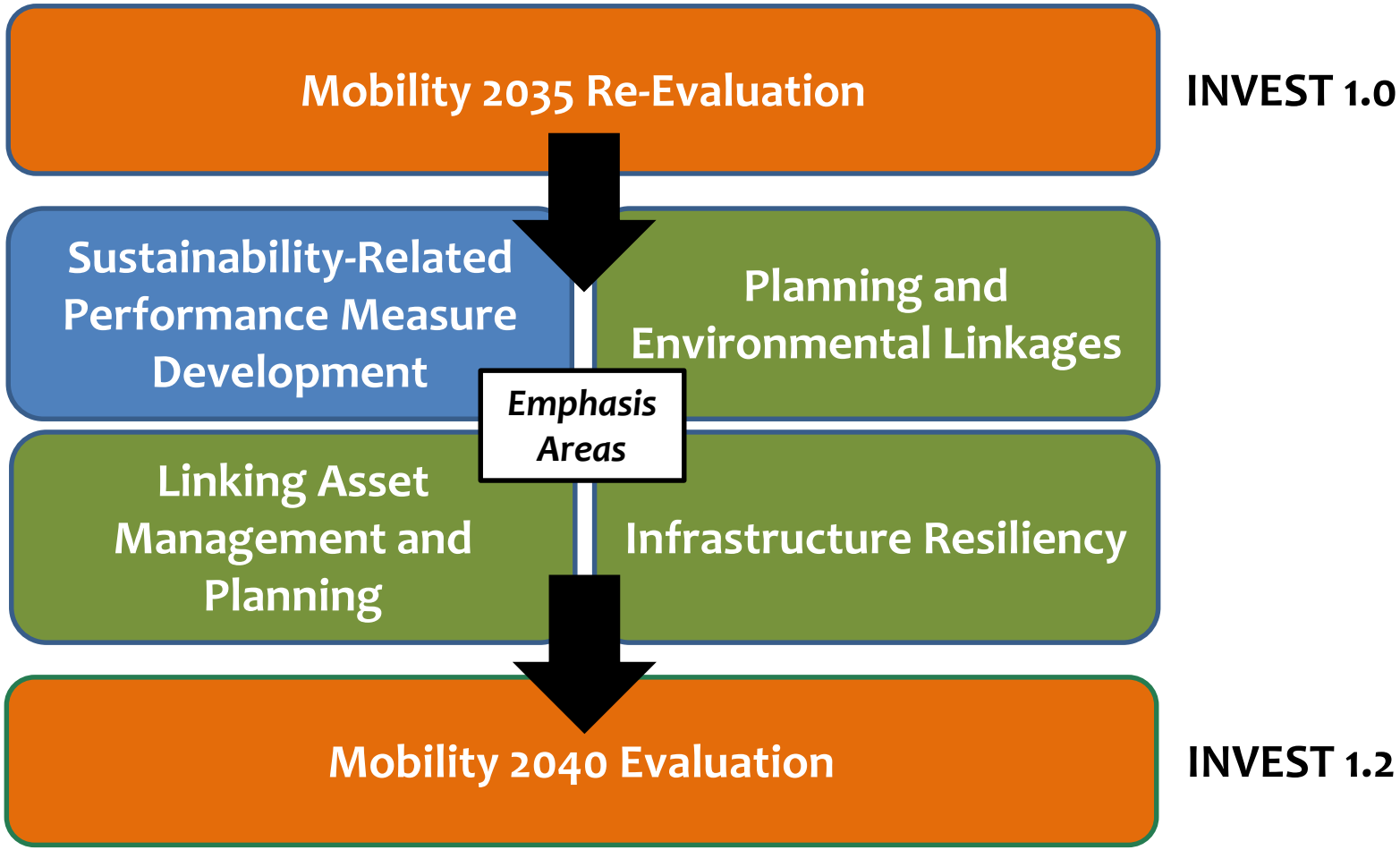


The Regional Ecosystem Framework: Composite score represents the combined score of all 10 REF layers. A higher score indicates that resources of relatively high concern may be present and that additional review, documentation, and consultation with the applicable agency may be needed. The REF layers include: Green Infrastructure (Wildlife Habitat, Natural Areas, Agricultural Land); Water Quality and Flooding (Impaired Water Segments, Flood Zones, Surface Water Quantity, and Wetlands); and Ecosystem Value (Rarity, Diversity, and Ecosystem Sustainability). Data sources include the Texas GRID and EPA Region 6 Regional Ecosystem Assessment Protocol data. This information has been developed for the Dallas-Fort Worth MPA for use in long-range planning. These scores are meant to be used as a preliminary screening tool for potential impact identification. For more information on the calculations for this layer, please visit www.nctcog.org/REF.

NCTCOG Regional Ecological Framework - http://www.nctcog.org/traces/Ref.asp

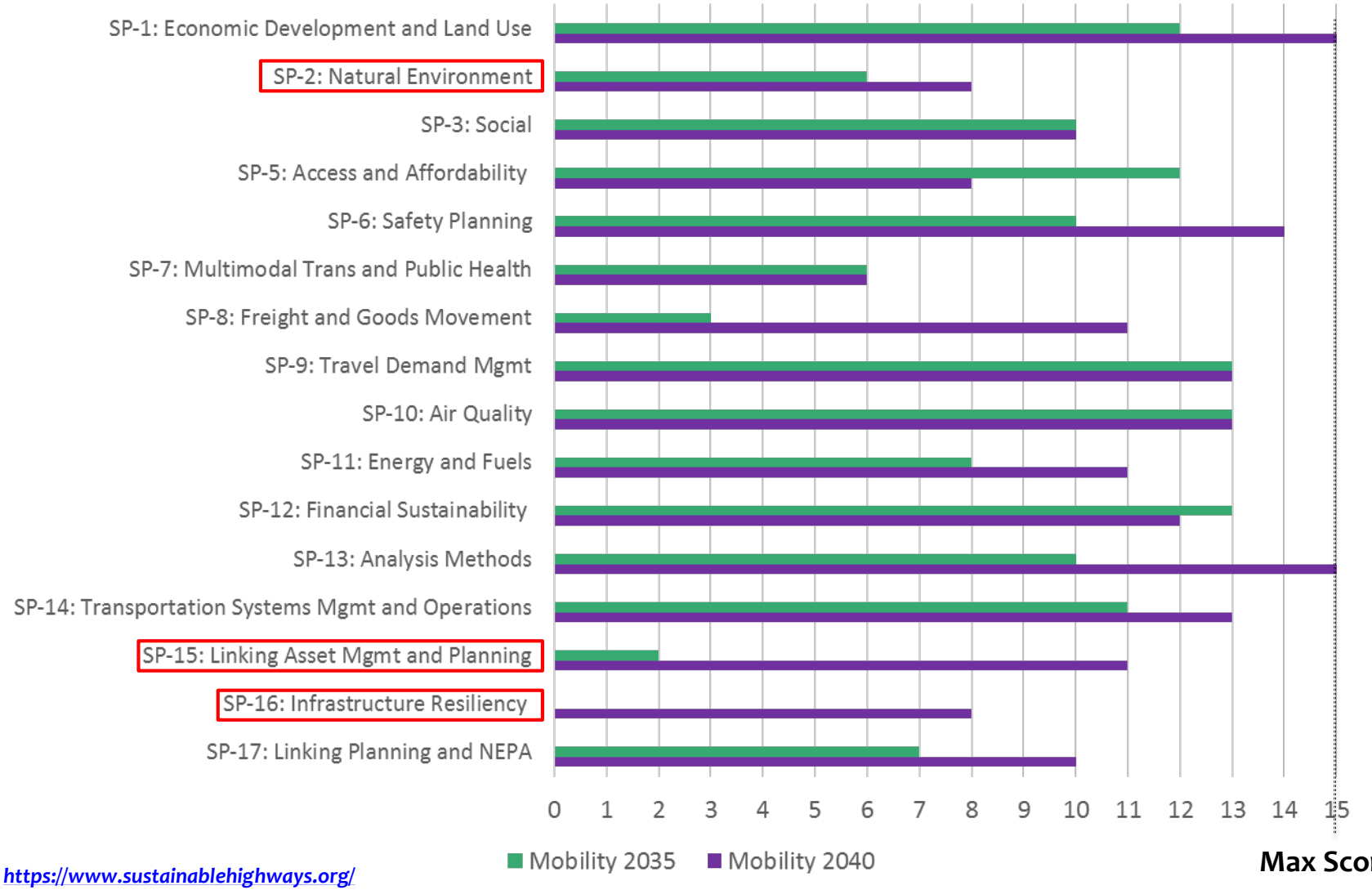
INVEST Applications @ NCTCOG
(Infrastructure Voluntary Evaluation Sustainability Tool)

2013-2016: INVEST Implementation



INVEST Applications @ NCTCOG *(cont.)*

Mobility 2035 vs. Mobility 2040 Scoring Results



INVEST - https://www.sustainablehighways.org/

Future TAM Needs/Considerations

Pursuing Mutual Benefits for Capacity & Resiliency

- USDOT final rules regarding State DOT Transportation Asset Management Plan (TAMP) development:
  - Schedule, frequency, and projected revenue distribution
  - MPO assistance with NHS-facility data collection/analysis and reporting
- Texas House Bill 20 (2015):
  - Implement performance-based planning/programming that provides progress indicators toward attaining TxDOT goals/objectives
  - 10-year MPO plan required to dictate project/program funding allocations
- Critical planning linkages require extensive agency coordination and comprehensive data-sharing program (Decision Lens)
- Emphasis on data that addresses extreme weather impacts to more readily adapt infrastructure while maintaining MTP goals

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