Envisioning Futuristic Safe System and Vision Zero Strategies

Leveraging Technological Innovations for communities

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AGENDA

US- Total Number of Fatal Crashes
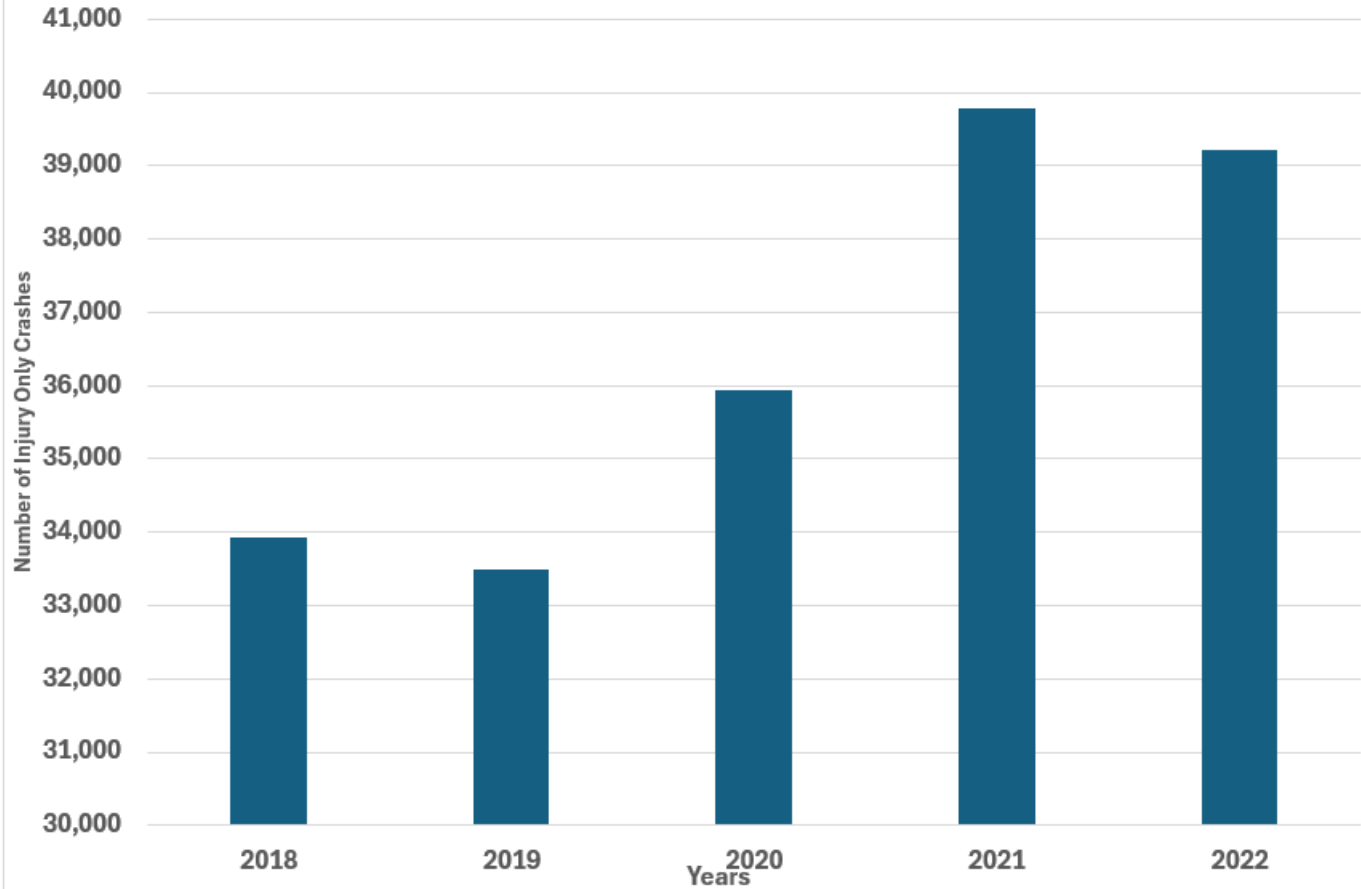
Fatal Crashes in Texas
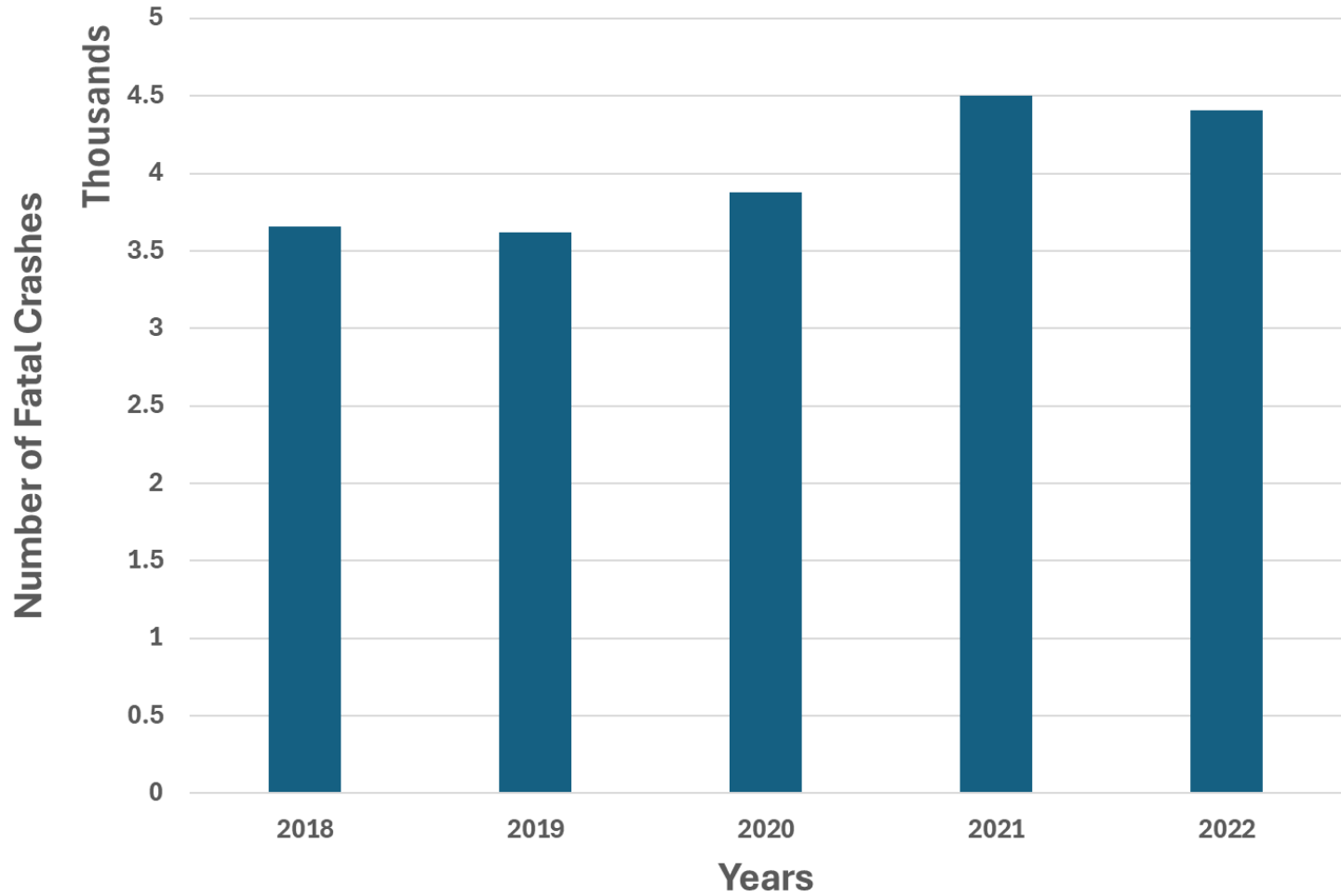
Injury Crashes in Texas

Texas Fatal Crash Rates

Fatal Crash Rates per 100 Million Miles Travelled
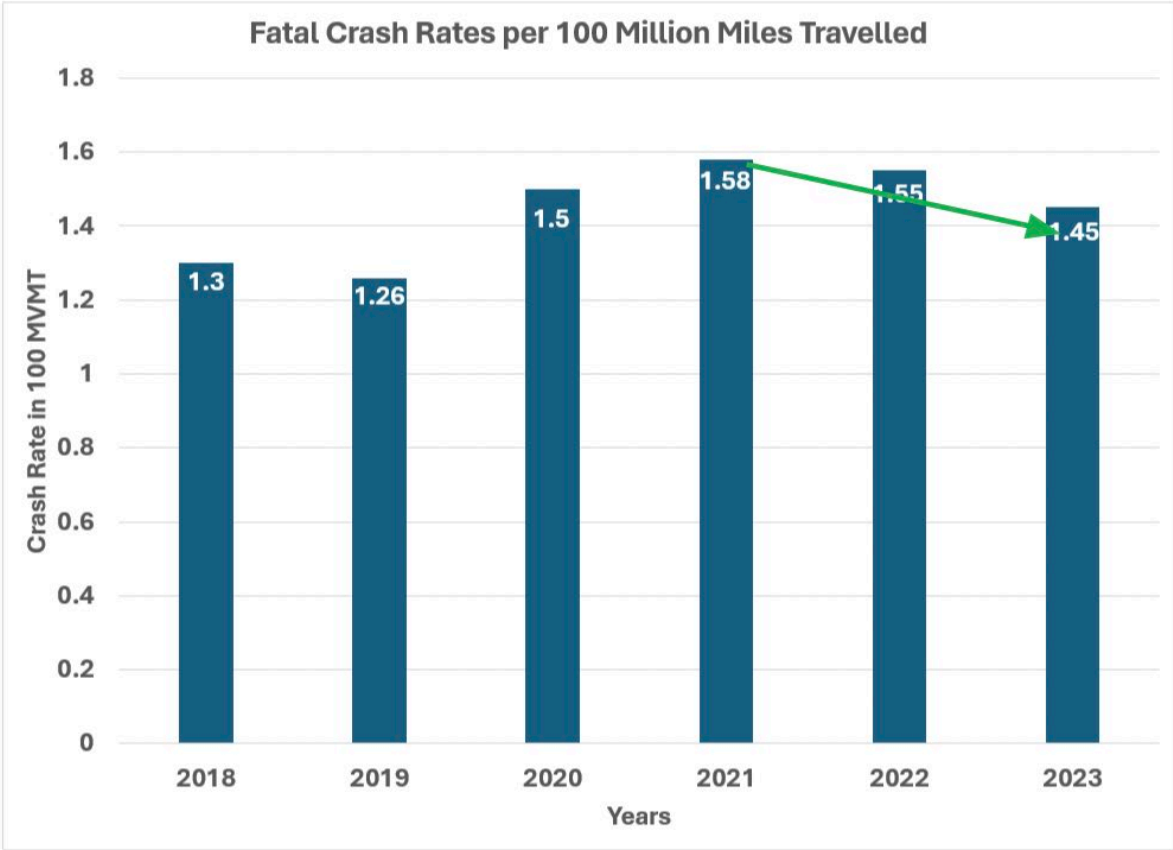
CRASH FACTORS
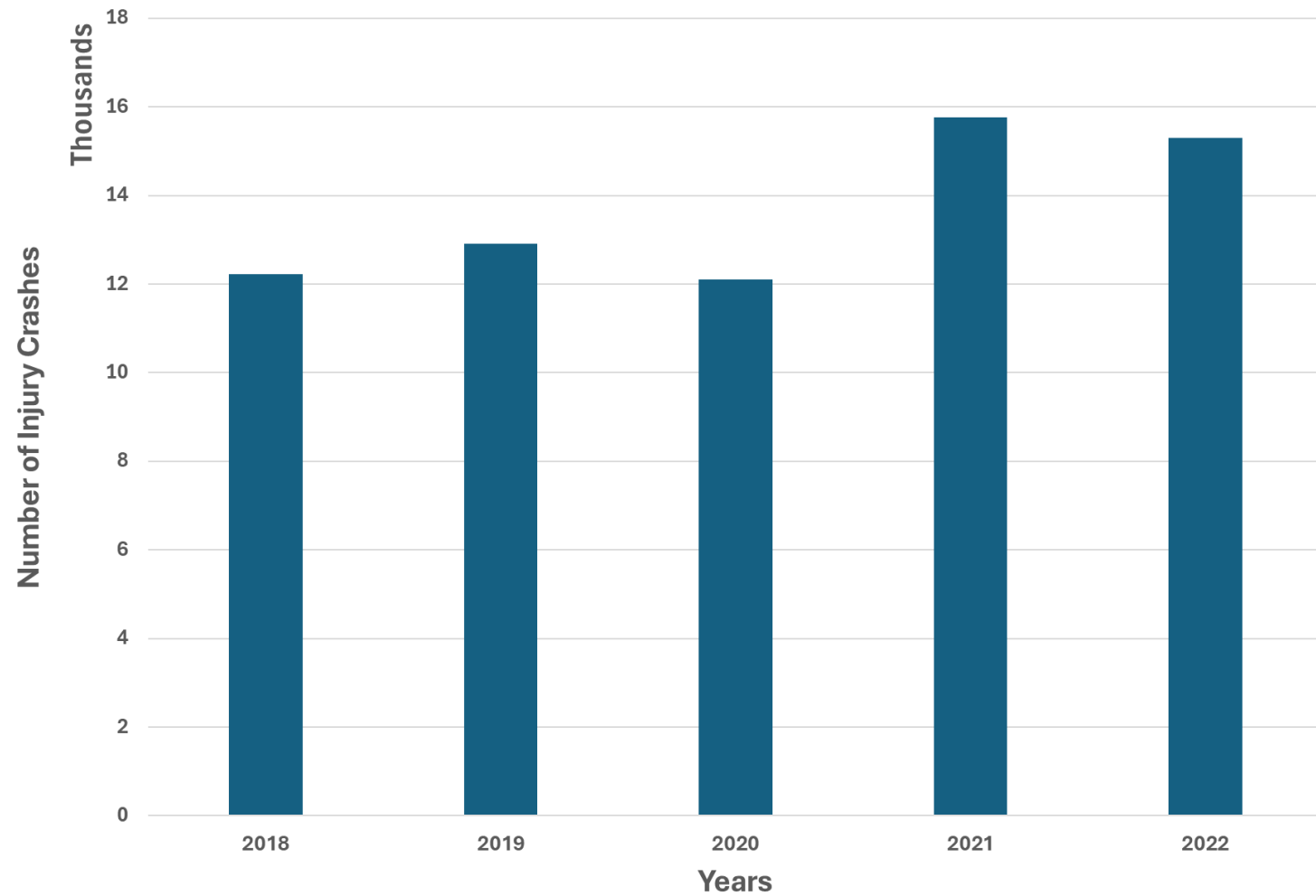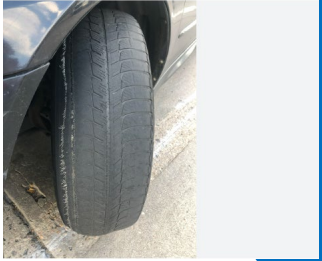

VEHICLE

- Mechanical Failure
- Vehicle Design
- Vehicle Maintenance

ROAD

- Roadway Design
- Road Surface Condition
- Road Layout
- Lighting and Signage
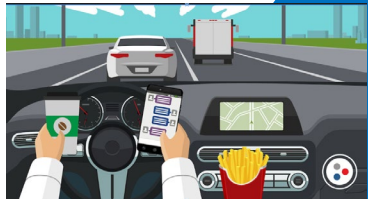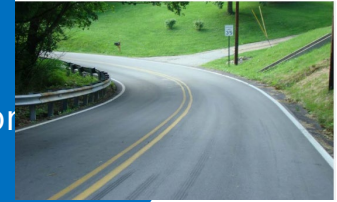
HUMAN

- Distracted Driving
- Impaired Driving-
Aggressive or Risky
Behavior
- Inexperience

ENVIRONMENTAL
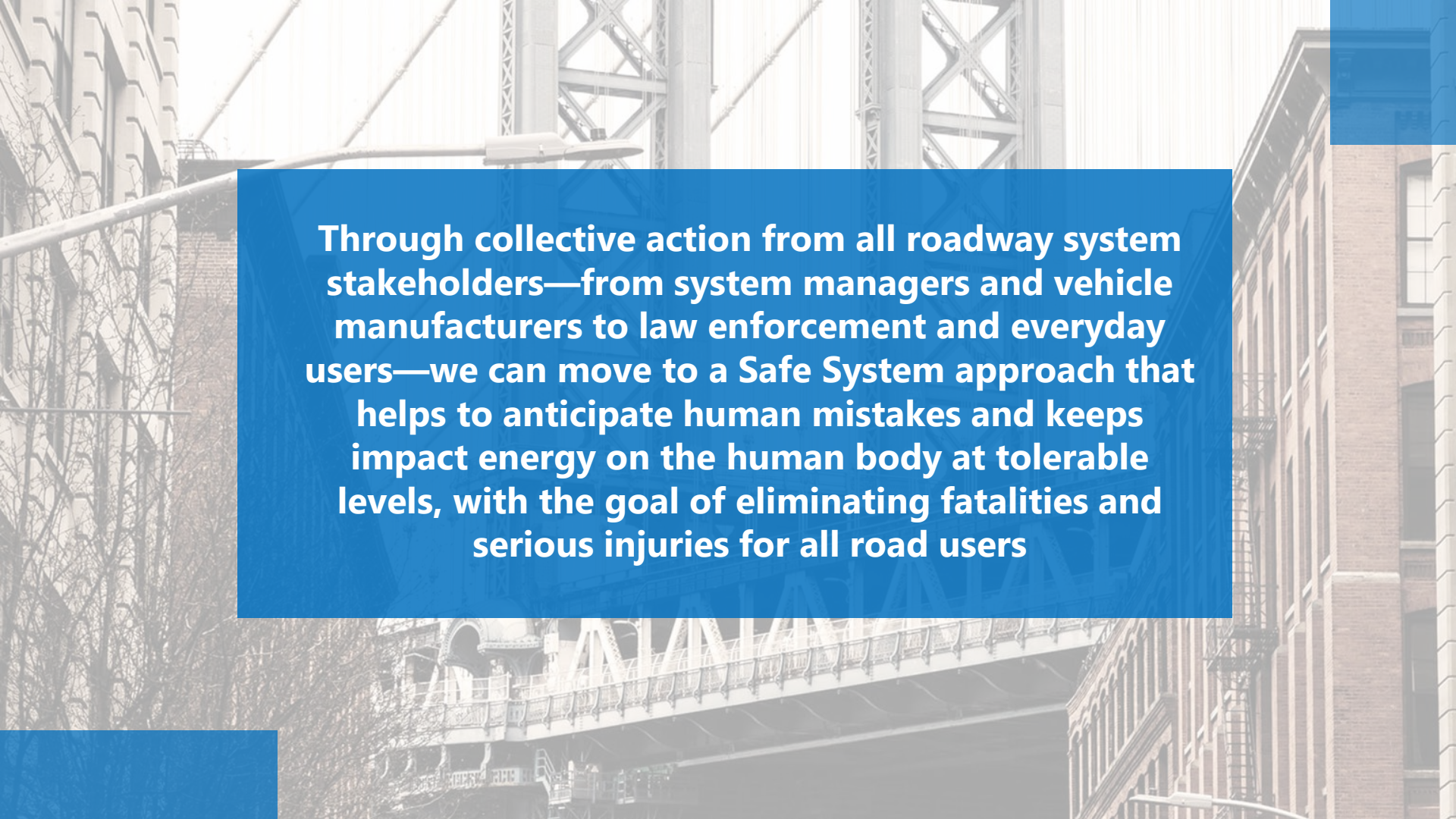
- Rain
- Snow and Ice
- Fog
- Wind
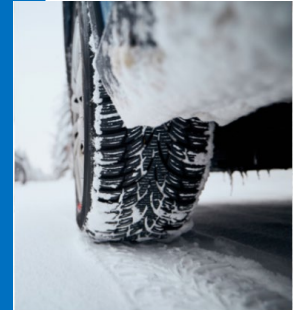
SAFE SYSTEM APPROACH

The Safe System approach assumes that errors are inevitable. It aims to create a resilient system that mitigates the consequences of human mistakes rather than relying solely on human compliance with rules and behaviors. This proactive, holistic approach ensures that all elements of the road system work in tandem to prevent serious harm.

Source: https://www.transportation.gov/NRSS/SafeSystem

Through collective action from all roadway system stakeholders—from system managers and vehicle manufacturers to law enforcement and everyday users—we can move to a Safe System approach that helps to anticipate human mistakes and keeps impact energy on the human body at tolerable levels, with the goal of eliminating fatalities and serious injuries for all road users

A VISION ZERO CITY

1. Policy Commitment
2. Strategic Action Plan
3. Safe Road Design and Infrastructure Improvement
4. Speed Management
5. Community Engagement and Education
6. Data-Driven Decision Making

VISION ZERO NETWORK

Vision Zero Community

Bellevue
Seattle
Oregon Metro
Portland
Eugene

Minneapolis
Madison
Ann Arbor
Chicago

Somerville
Cambridge
Boston

Bethlehem
Harrisburg
Lancaster
Philadelphia

New York City
Jersey City

Boulder   Denver
Denver Regional
Council of Governments

Columbus

Columbia

Louisville

Montgomery County
Washington, D.C.

Arlington
Alexandria

Richmond

Berkeley   Sacramento
San Francisco   Alameda
Fremont
San Jose   Watsonville
Monterey   Santa
           Barbara
San Luis Obispo
Los Angeles

Kirkwood

La Mesa
San Diego

Tempe   Albuquerque

Durham
Charlotte

Atlanta
Macon

Austin
San Antonio   Houston

Anchorage

Laredo

Tampa
Hillsborough County

Orlando
West Palm Beach
Fort Lauderdale

Map update: February 2024

https://visionzeronetwork.org/resources/vision-zero-communities/

ITS Applications to Improve Safety

1. Collison Avoidance Systems
2. Dynamic Message Signs
3. Variable Speed Limits
4. Ramp Metering
5. Intersection Collision Warning Systems
6. Automated Incident Detection
7. Adaptive Traffic Control
8. Road Weather Information Systems (RWIS)
9. Pedestrian Detection and Warning systems

Benefits of ITS Technology Applications

Improved Safety

Reduced Congestion

Environmental Benefits

Enhanced User Experience

ARTIFICIAL INTELLIGENCE

Artificial Intelligence (AI) is a field within computer science focused on creating systems capable of performing tasks typically associated with human intelligence.

HOW AI WORKS

01 DATA COLLECTION

02 DATA PREPROCESSING

03 CHOOSING THE MODEL & ALGORITHM

04 TRAINING THE MODEL

05 EVALUATION

06 DEPLOYMENT & IMPROVEMENT

AI Challenges

Large datasets provide AI models with the information needed to identify patterns, make predictions, and improve performance over time.

Big data is a powerful enabler of AI but also brings forth challenges in terms of **quality, privacy, and resource requirements**. Balancing these factors is essential for responsible and effective AI development.

AVAILABLE BIG DATA

- Large historical database in the form of crashes CRIS and CAT both are GIS based
- Large historical database containing traffic volumes, road geometry, routes, O-D are available at various vendors like Replica, INRIX, RITIS
- Large Road Data geometry, lane configurations are available through various sources and are used in defining the High Injury Network, and High-Risk
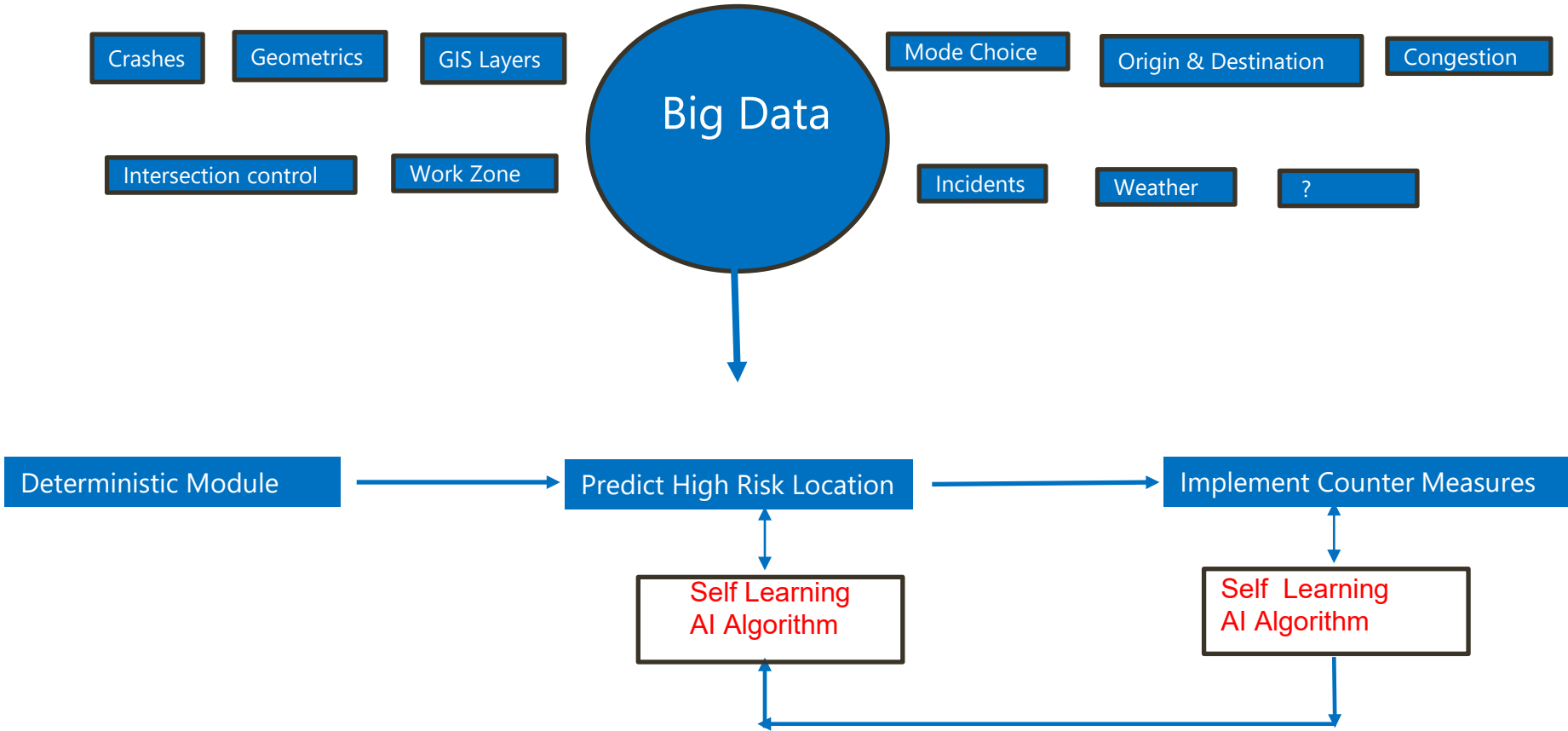
Deterministic Approaches

- High Injury and High-Risk Networks for City of San Antonio, and High Injury Network for Harris County Toll Road Authority

- Miovision uses near miss technology to identify potential crashes before they happen

- TSMO with the help of ITS applications keeps captures of multitude of events with traffic operations

Missing Wide-Spread Use of AI

An AI-driven framework for automated prediction and self-learning enables proactive actions. This system functions as an AI-based Decision Support System, providing recommendations to help decision-makers take preventive measures, thereby reducing risks, preventing panic situations, and minimizing potential loss of life or serious injuries.

Envisioning Future Safe System and Vision Zero Strategies

Crashes

Geometrics

GIS Layers

Mode Choice

Origin & Destination

Congestion

Big Data

Intersection control

Work Zone

Incidents

Weather

?

Deterministic Module → Predict High Risk Location → Implement Counter Measures

Self Learning AI Algorithm

Self Learning AI Algorithm

Questions?