THE SAFE SYSTEM APPROACH:

"WHAT IS IT AND WHY IS IT GETTING SO MUCH ATTENTION?"

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BRIEF HISTORY AND PURPOSE OF THE SAFE SYSTEMS APPROACH

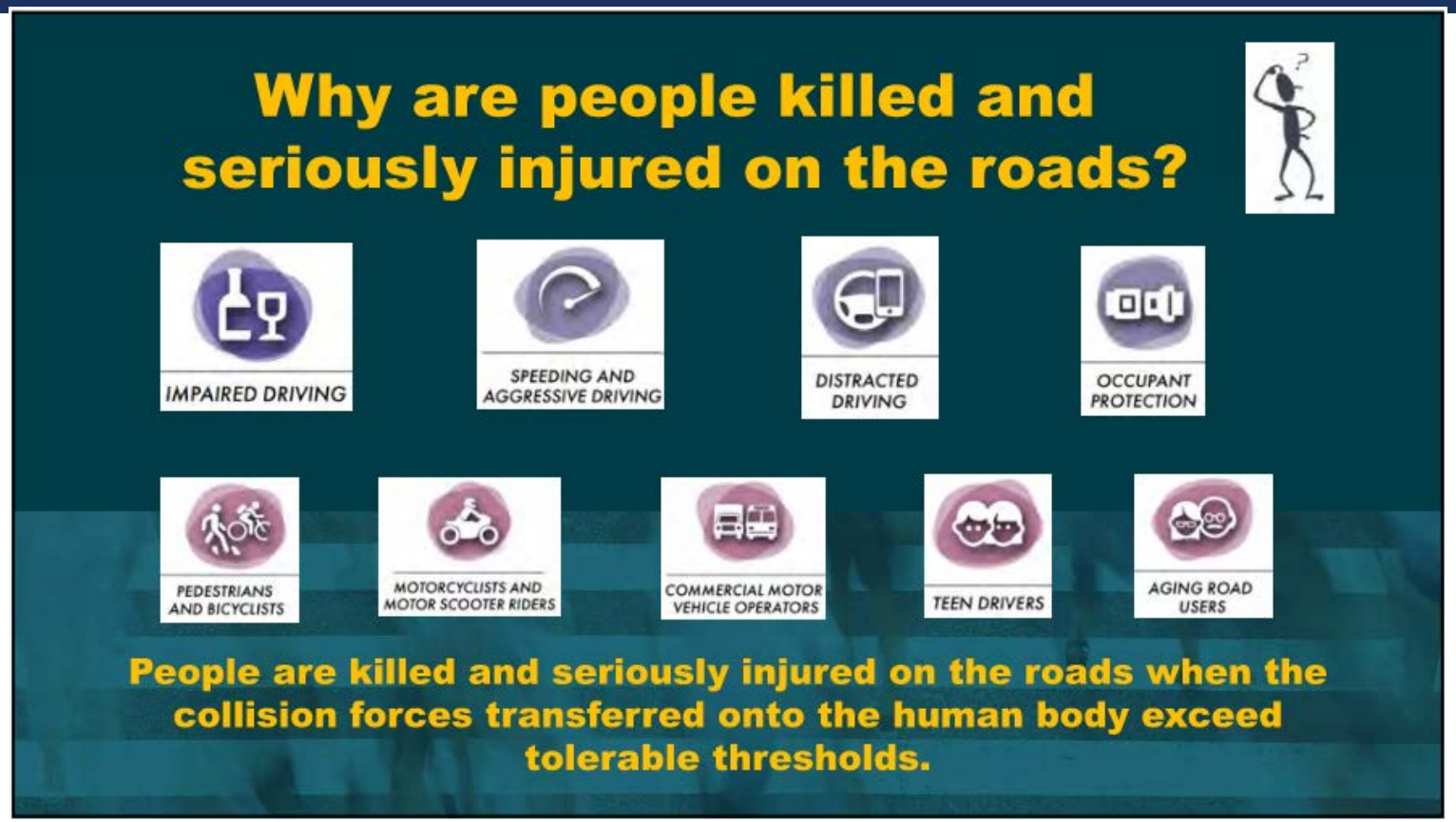
- Began from the ethical standpoint that no one should be killed or suffer a life long injury on our transportation system
- This idea first adopted by Sweden in 1997 as "Vision Zero"
- Reaching zero deaths or serious injuries requires the implementation of the Safe System Approach
- Acknowledgment that humans make mistakes and that human bodies have limited ability to tolerate crash impacts

TOP 3 TAKEAWAYS

- The Safe System Approach is "Principles Based" (6 Principles)
- Achieving a Safe System requires all elements to be strengthened (5 elements)
  - Cannot be achieved just through infrastructure
- Safe Roads is a continuum, not an absolute
  - There is not a perfect catch-all transportation system, but we can reduce risks

- What is covered: What is it? Who is involved? Why is it different?
  - What is not covered: Implementation, Design, Case Studies

"IN ROAD INJURY EPIDEMIOLOGY, KINETIC ENERGY IS THE PATHOGEN" – *ROBERTSON LS, INJURY EPIDEMIOLOGY*



There has been a steady <u>increase</u> nationally of ped/bike/total fatalities since 2011

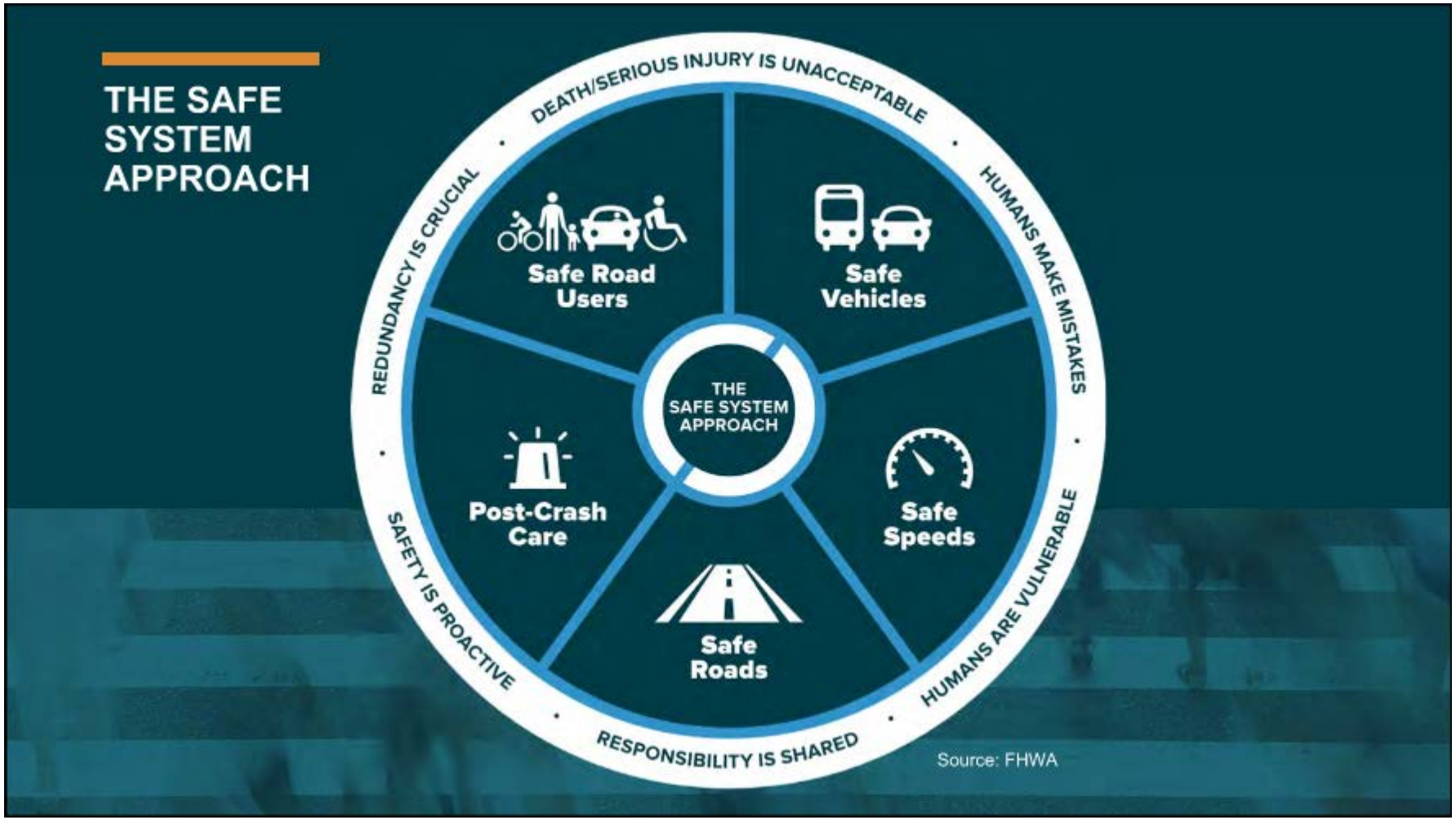
WHAT IS THE SAFE SYSTEM APPROACH?

A different way of thinking about the road safety problem …

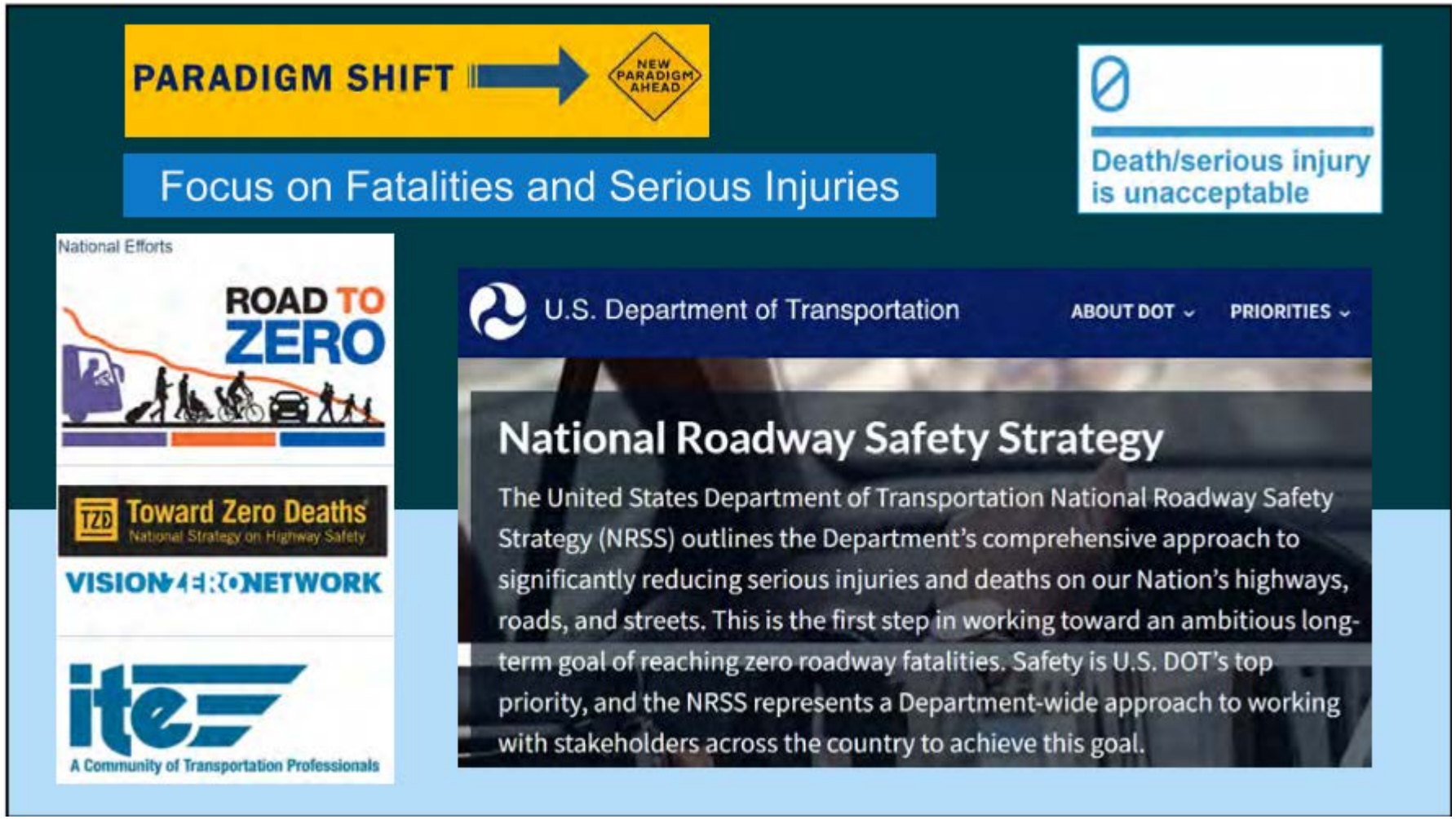
Accommodating human mistakes

Keeping impacts on the human body at tolerable levels

PRINCIPLES AND ELEMENTS



1. DEATH/SERIOUS INJURY IS UNACCEPTABLE



2. HUMAN MAKE MISTAKES

3. HUMANS ARE VULNERABLE

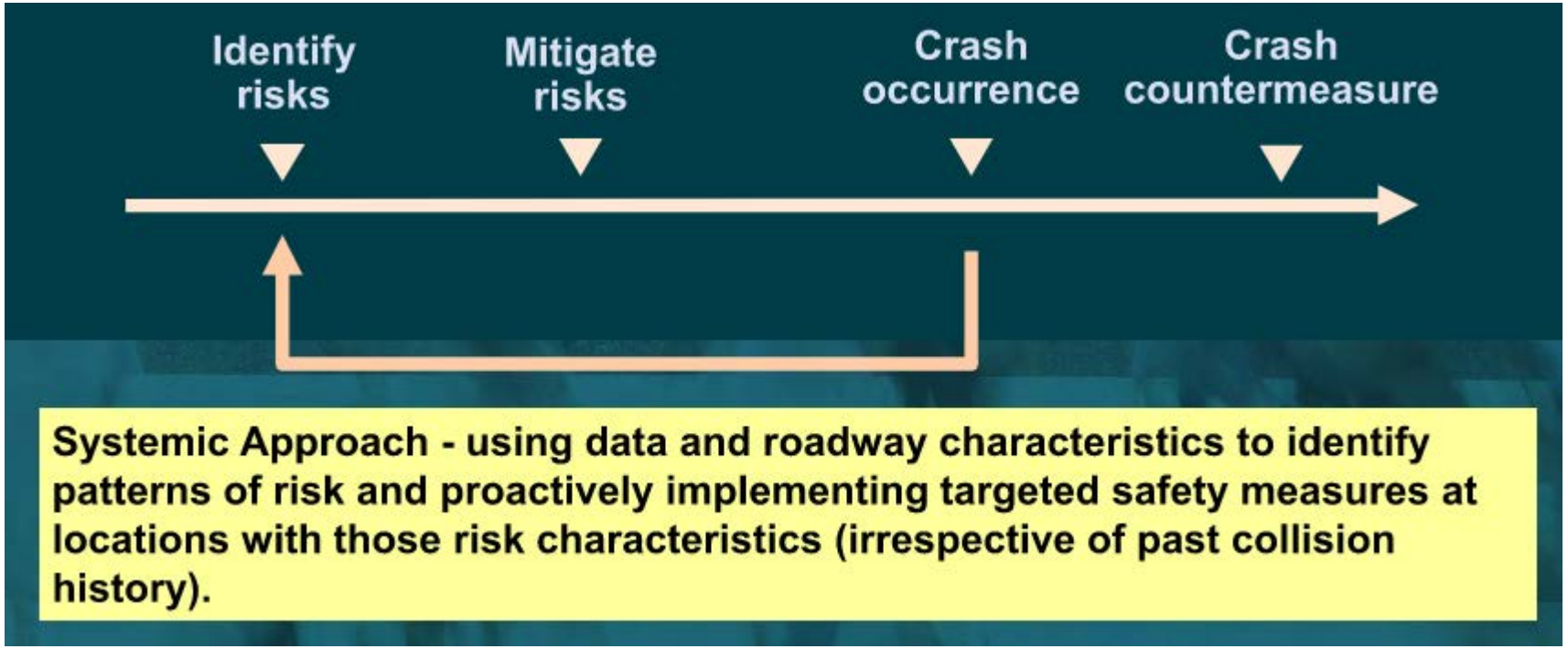
- The human body has a limited physical ability to tolerate crash forces before harm occurs
- Designing safer roads is an exercise of managing kinetic energy
- Speed
- Impact Angle (Changing an impact angle from 90° to 40° reduces energy to about a 20 mph speed reduction)

4. RESPONSIBILITY IS SHARED

- A Safe System cannot be achieved by engineering alone

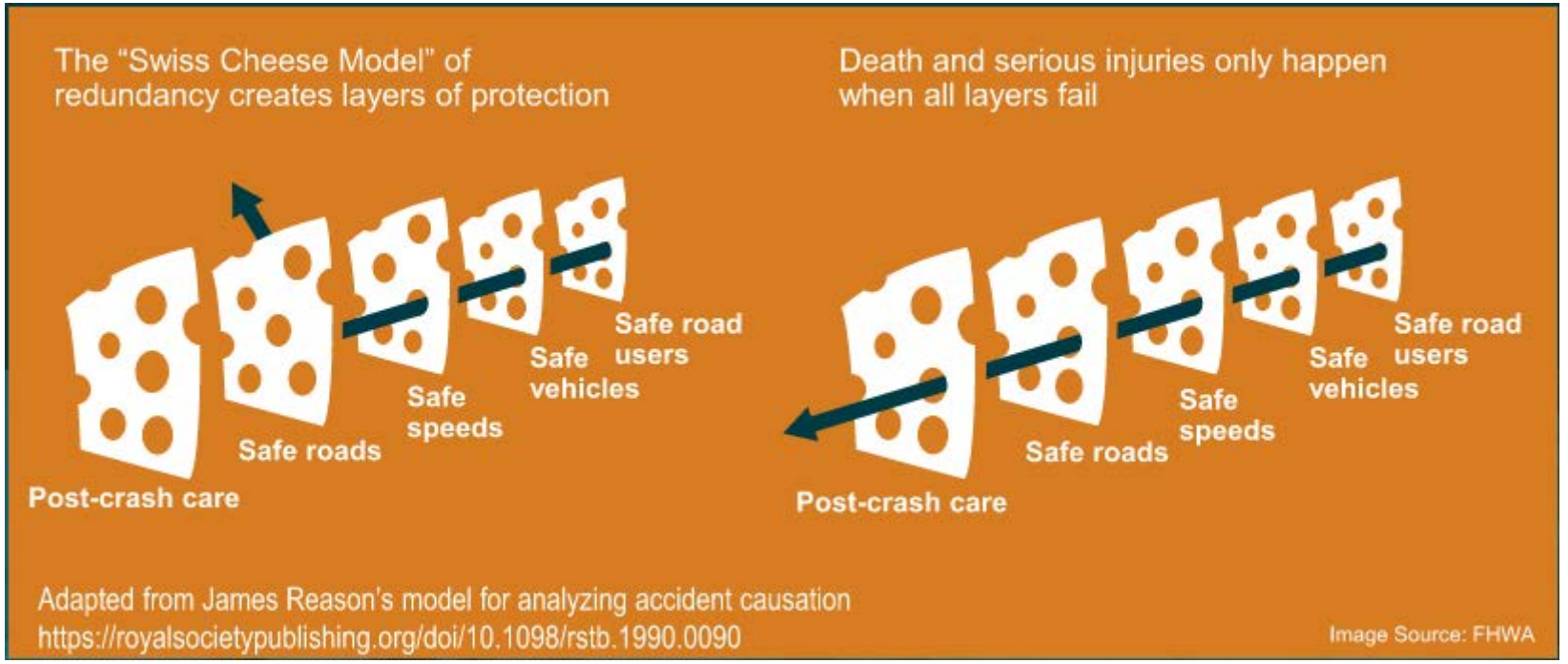
- Also, the road user shares responsibility

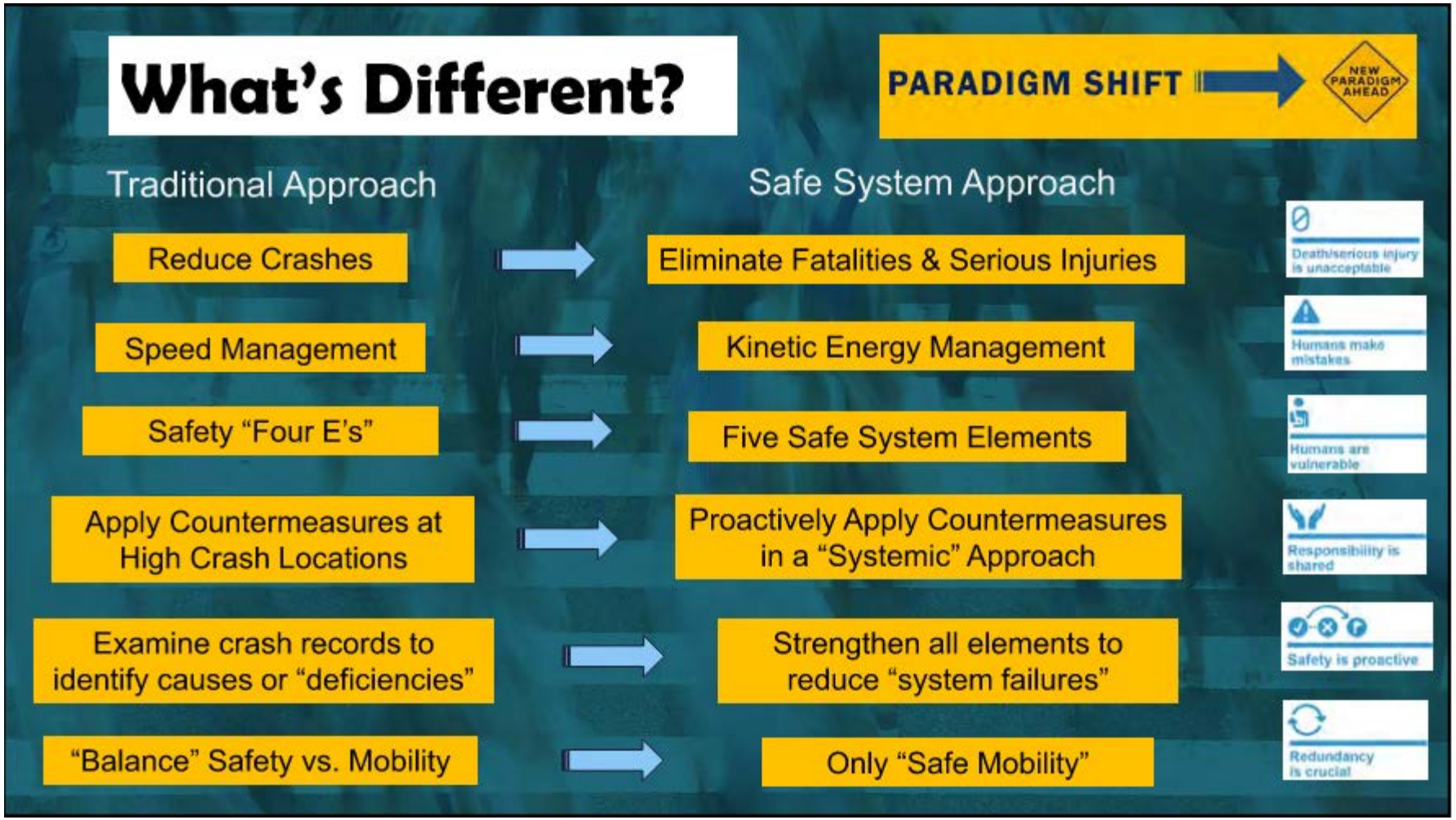
5. SAFETY IS PROACTIVE



…Involves widely implemented improvements based on high-risk roadway features correlated with specific severe crash types

6. REDUNDANCY IS CRUCIAL




What's Different?
PARADIGM SHIFT
NEW PARADIGM AHEAD
Traditional Approach
Safe System Approach
Reduce Crashes
Eliminate Fatalities & Serious Injuries
Speed Management
Kinetic Energy Management
Safety "Four E's"
Five Safe System Elements
Apply Countermeasures at High Crash Locations
Proactively Apply Countermeasures in a "Systemic" Approach
Examine crash records to identify causes or "deficiencies"
Strengthen all elements to reduce "system failures"
"Balance" Safety vs. Mobility
Only "Safe Mobility"
Death/serious injury is unacceptable
Humans make mistakes
Humans are vulnerable
Responsibility is shared
Safety is proactive
Redundancy is crucial


Five Safe System Elements
Safe Road Users
Safe Vehicles
Post-Crash Care
Safe Speeds
Safe Roads
Source: FHWA

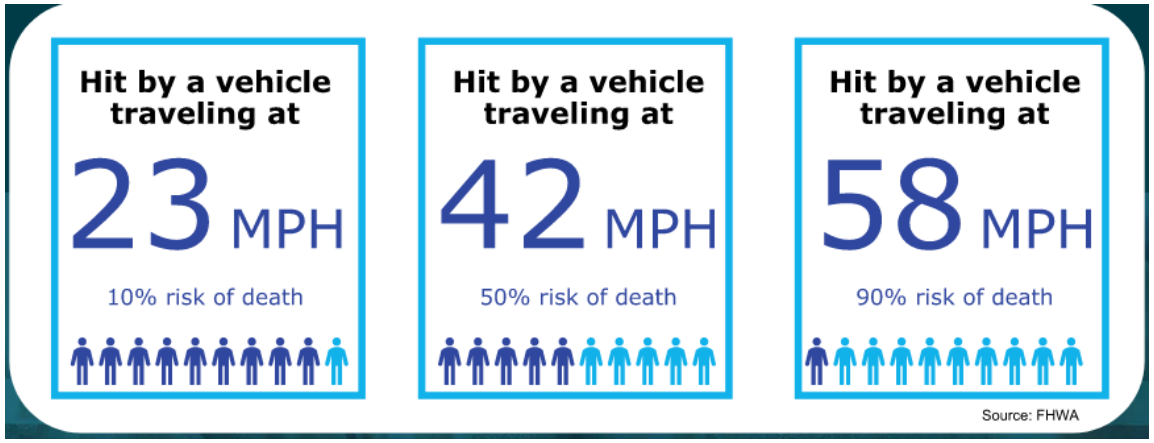
1. SAFE ROAD USERS

- There is an integral role of behavioral safety and road user responsibility in the SSA

2. SAFE VEHICLES

Active Safety	Passive Safety
Reduces the chance of a crash occurring	Protective systems for when crashes occur
• Lane departure warnings • Lane keeping assist • Forward collision warnings • Autonomous emergency braking • Pedestrian detection • Backup camera • Antilock brakes • Electronic stability control	• Seatbelts • Airbags • Crumple zones • Collapsible steering column

3. SAFE SPEEDS



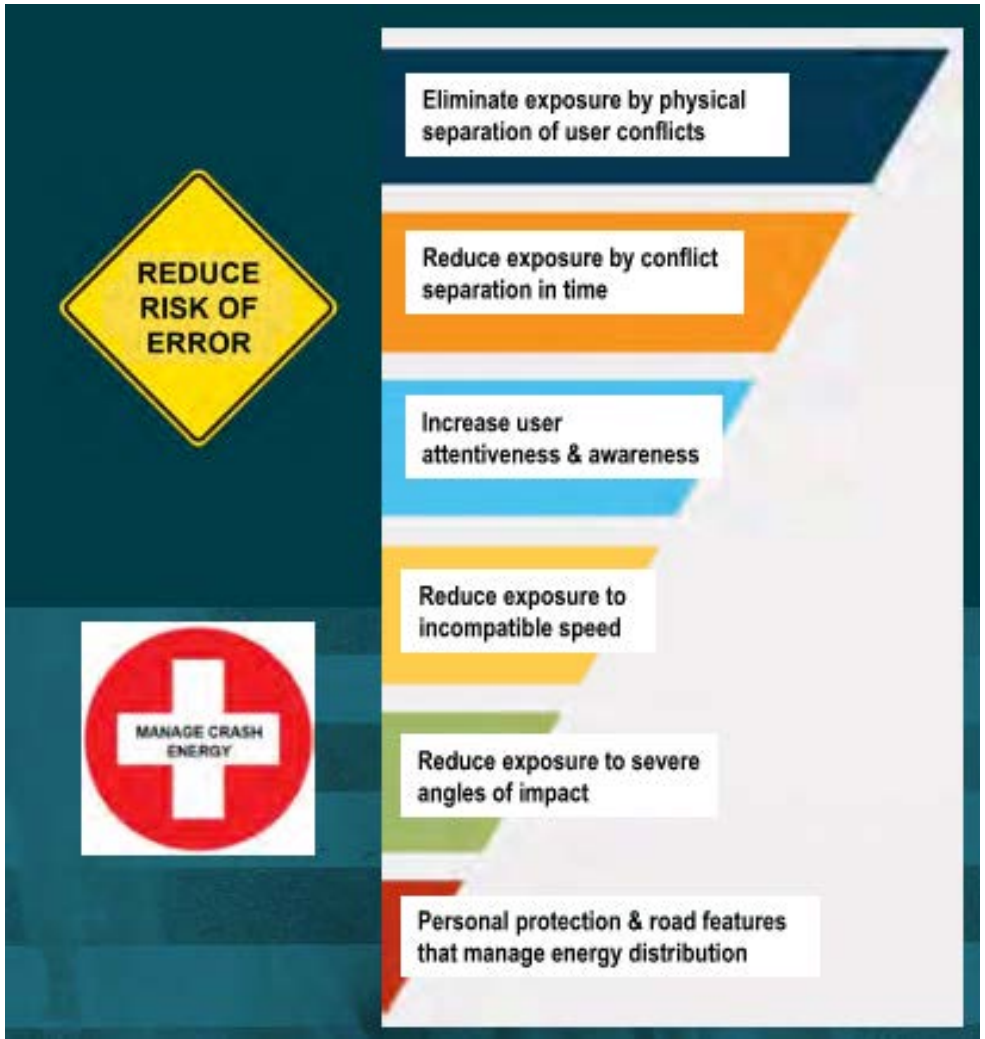
SAFE ROADS – PART I

- "Safe Roads" is a continuum – not an absolute
- The aim is to design and operate roads to continually approach to a Safe System by implementing features appropriate for the intended use

- Reduce the likelihood of error
- Reduce the consequences of error

- Transportation agencies are strongly encouraged to implements " Proven Safety Countermeasures", where appropriate, to accelerate the achievement of safer roads in the SSA.
- https://safety.fhwa.dot.gov/provencountermeasures/pdf/FHWA-SA-21-071_PSC%20Booklet_508.pdf

SAFE ROADS - PART II



SAFE ROADS - PART II

SEPARATING USERS IN SPACE GUIDANCE

Table 14. Recommended Countermeasure Tiers Depending on Traffic Context

Roadway Type (Number of Travel Lanes and Median Type)	Vehicle ADT < 9,000			Vehicle ADT 9,000–12,000			Vehicle ADT 12,000–15,000			Vehicle ADT ≥ 15,000		
	Speed Limit (mph)											
	≤30	35	≥40*	≤30	35	≥40*	≤30	35	≥40*	≤30	35	≥40*
2 Lanes	1	1	2	1	1	2	1	1	3	1	2	3
3 Lanes	1	1	2	1	2	2	2	3	3	2	3	3
4 Lanes with raised median**	1	1	2	1	2	2	2	3	3	3	3	3
4+ Lanes without raised median	1	2	3	2	2	3	3	3	3	3	3	3

Legend:

1 — ***Tier 1:*** Traffic context generally supports motorist yielding; countermeasures are generally less expensive and require less process than other two tiers to implement

2 — ***Tier 2:*** Traffic context generally requires intervention to induce motorist yielding; countermeasures are generally less expensive and require less process than Tier 3 to implement

3 — ***Tier 3:*** Traffic context generally requires intervention to require motorist to stop or to physically separate pedestrians and bicyclists from traffic; often the most expensive and may require extensive public process

* Where the speed limit exceeds 40 mph, Tier 3 should be considered.

** Raised medians must be at least 6 feet wide to serve pedestrians. See the AASHTO *Bicycle Guide* for lengths to serve bicyclists. Where median width is less than these values, review category of 4+ lanes without raised median.

Table adapted from AASHTO *Bicycle Guide* and the FHWA *STEP Guide*

Source: Guidance to Improve Pedestrian and Bicyclist Safety at Intersections (2020); National Cooperative Highway Research Program (NCHRP) Report 926 - http://www.trb.org/Main/Blurbs/180624.aspx

Separating Users in Time

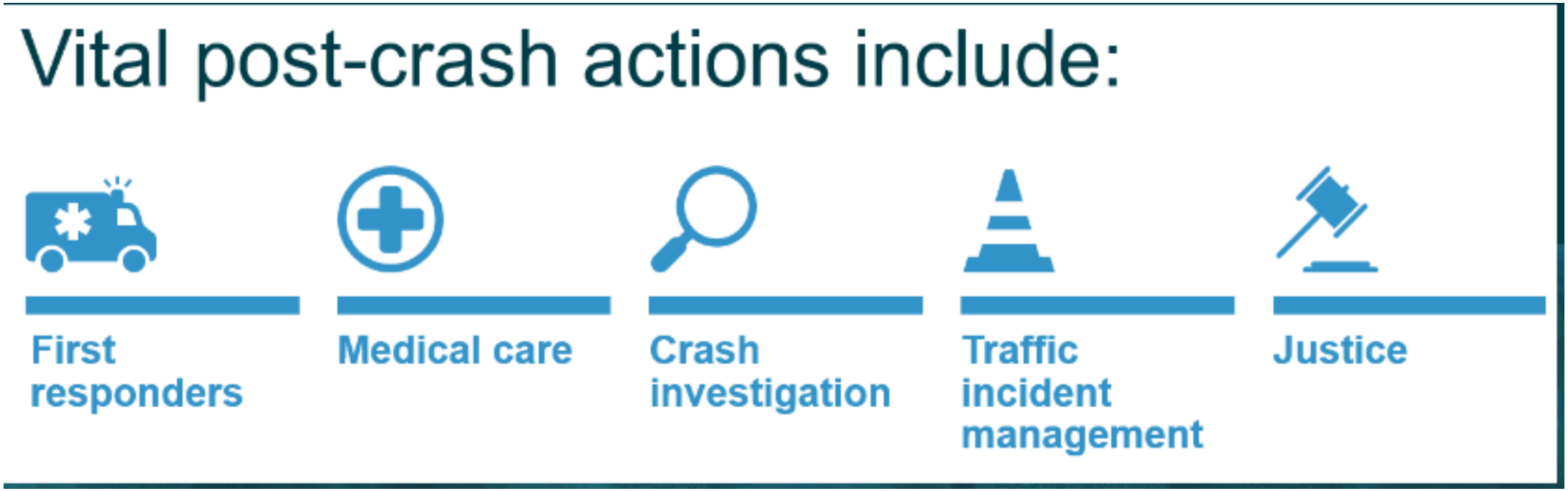
Pedestrian Hybrid Beacons

Leading Pedestrian Interval

All Images
Source: FHWA

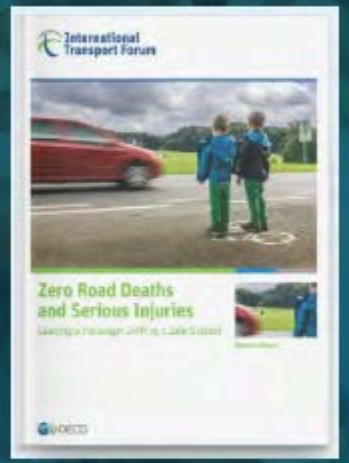
Increasing Users Attentiveness & Awareness

5. POST CRASH CARE



Safe System Approach – What's Next?

"There is no single pathway for the adoption, establishment and implementation of a Safe System. Moving to a Safe System is a learning-by-doing process best described as a journey which presents opportunities, hazards and challenges along the way. The experiences of the pioneering countries show that each follows its own journey, shaped by the cultural, temporal, and local context, but guided by the underlying principles."



Source: Zero Road Deaths and Serious Injuries: Leading a Paradigm Shift to a Safe System; OECD (2016)

http://www.oecd.org/publications/zero-road-deaths-and-serious-injuries-9789282108055-en.htm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