



# SAFE SYSTEM

## APPROACH

Zero is our goal. A Safe System is how we get there.



U.S. Department of Transportation  
**Federal Highway Administration**



**Safe Roads for a Safer Future**  
*Investment in roadway safety saves lives*

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## NOTE TO PRESENTERS

This train-the-trainer presentation was developed with FHWA perspective for FHWA staff to provide an overview of the Safe System Approach.

Others are welcome to use it in whole or in part as appropriate to their purposes.

Thank you.

**Imagine our country as a place where  
*nobody* has to die from vehicle crashes.**



Source: Fehr & Peers

# Presentation Overview

**1**

**Introduction**

**2**

**Safe System Principles**

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**Safe System Elements**

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**Case Studies**

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**Conclusion & Resources**



# Introduction

Assessment of our current situation and introduction to the Safe System approach

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## OUR CURRENT REALITY

Traffic fatalities are a public health crisis affecting all road users.

**1.25M**

Lives lost globally each year from traffic crashes

Source: World Resources Institute

**36,835**

Lives lost on US roads in 2018

Source: NHTSA

**6,283**

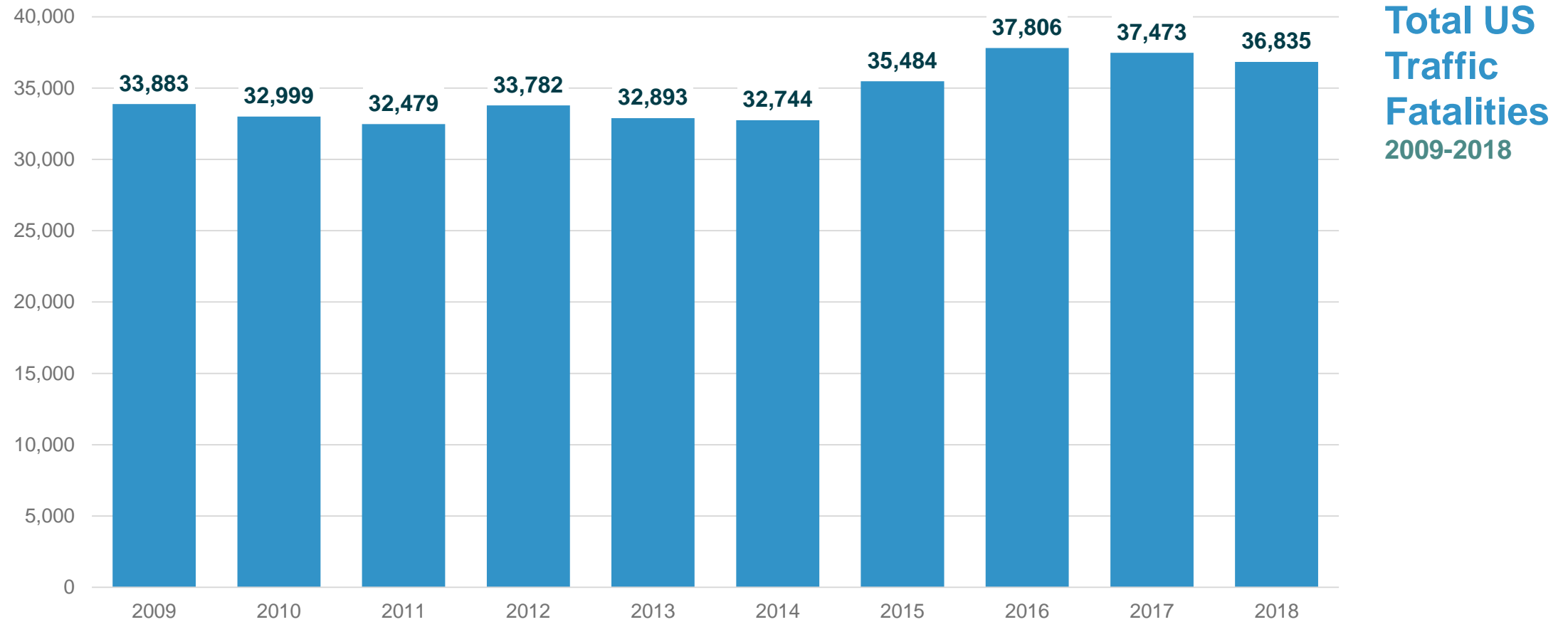
Pedestrians killed in US traffic crashes in 2018

Source: NHTSA

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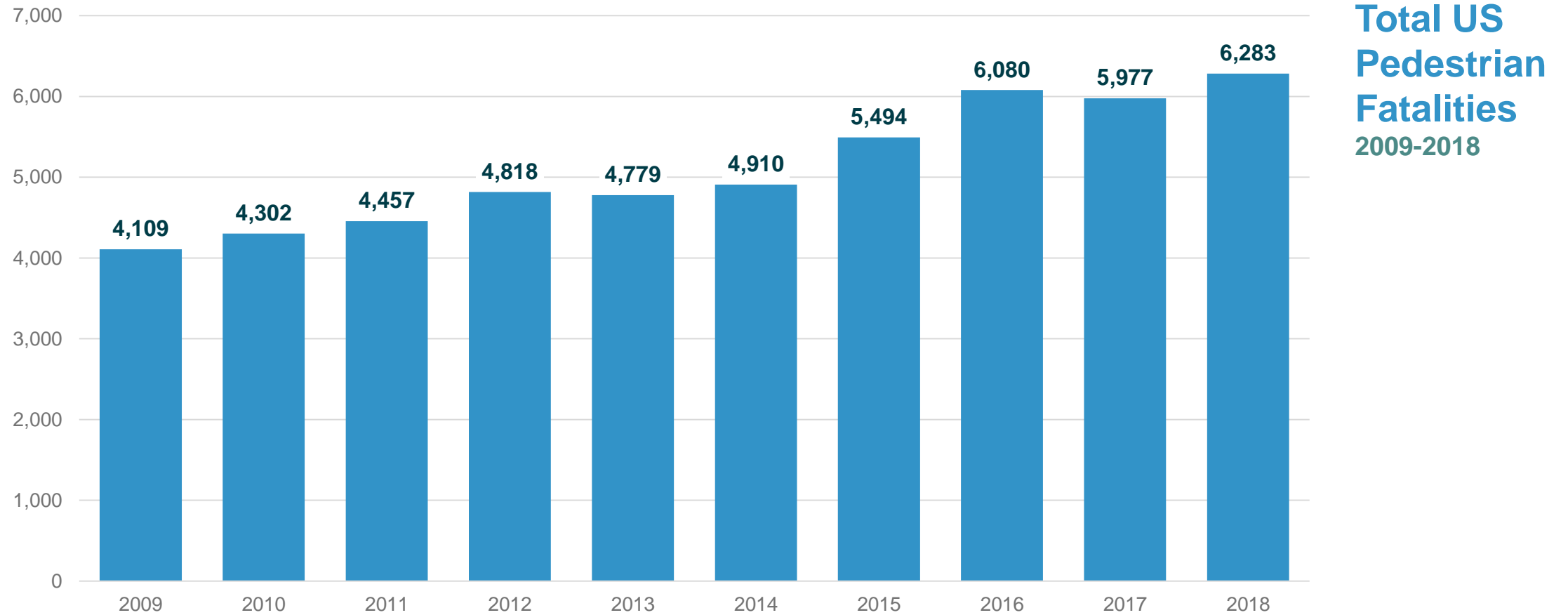
## BEHIND THE NUMBERS

# THOUSANDS OF LIVES ARE LOST EACH YEAR





# PEDESTRIAN DEATHS ARE INCREASING



# How does the United States *reach zero deaths?*



Source: Fehr & Peers

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## A NEW DIRECTION

The Safe System approach aims to eliminate fatal and serious injuries for all road users by:



**Accommodating  
human mistakes**



**Keeping impacts on the human  
body at tolerable levels**

## SUCCESSFUL SAFE SYSTEM ADOPTERS



### Sweden

Vision Zero

**60-70%**

Reduction in fatalities  
1994-2015

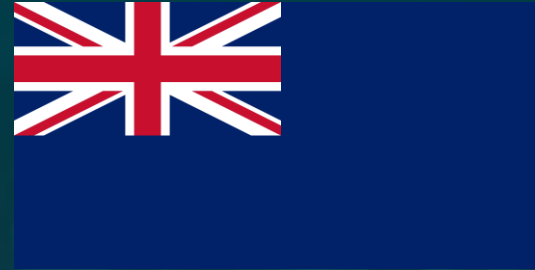


### Netherlands

Sustainable Safety

**50-60%**

Reduction in fatalities  
1994-2015



### Australia

Safe System

**50-60%**

Reduction in fatalities  
1994-2015



### New Zealand

Safer Journeys

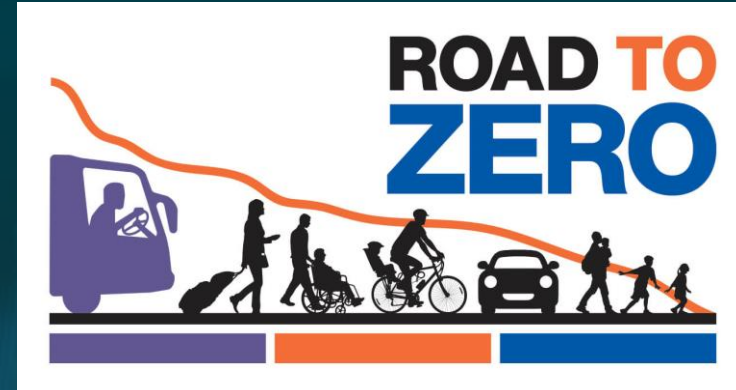
**50-60%**

Reduction in fatalities  
1994-2015

Source: World Resources Institute



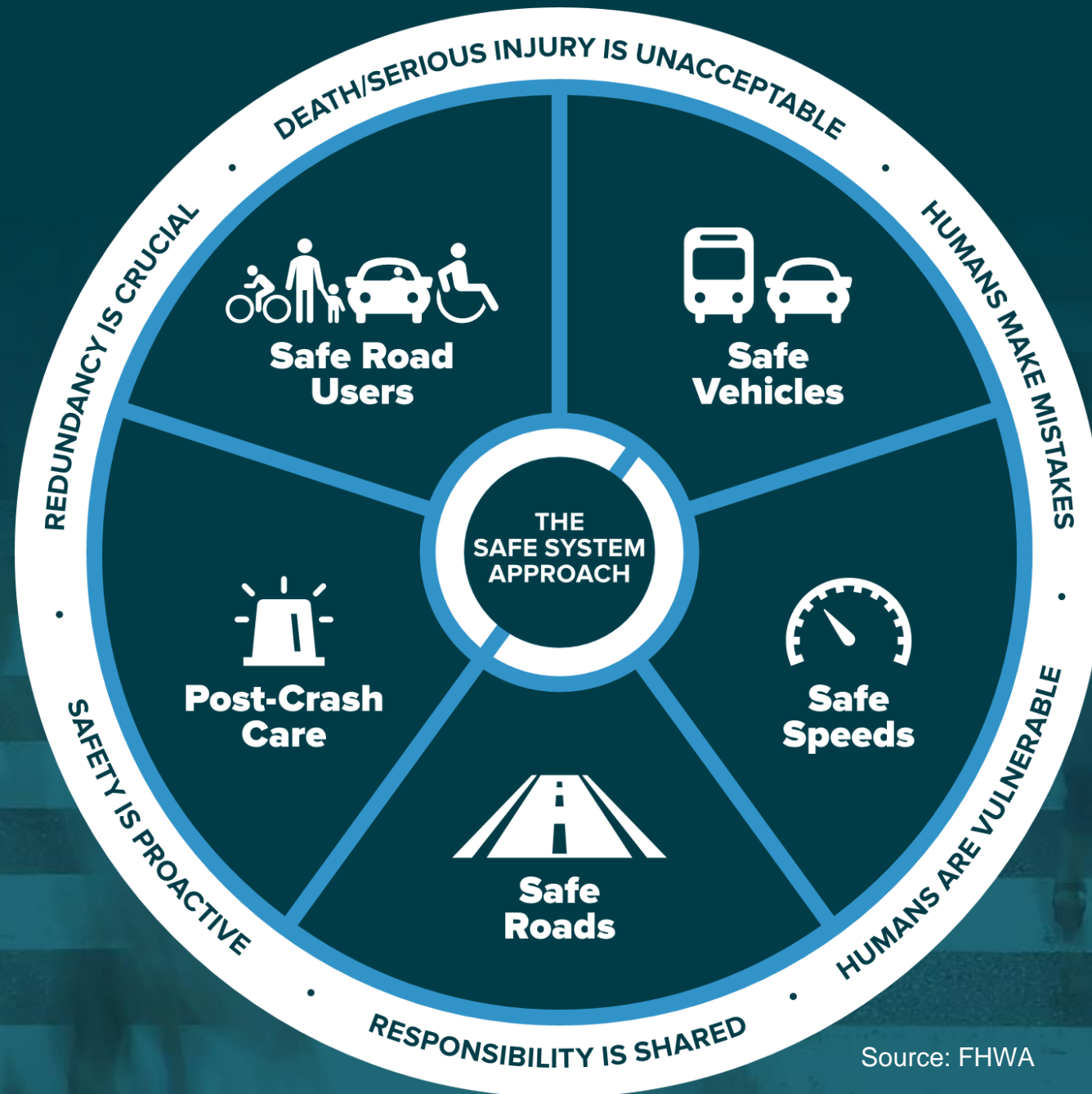
# SAFE SYSTEM IN THE UNITED STATES



**Toward Zero Deaths<sup>®</sup>**  
National Strategy on Highway Safety

**VISION 4 ERONETWORK**

# THE SAFE SYSTEM APPROACH



Source: FHWA



# THE 6 SAFE SYSTEM PRINCIPLES



Source: FHWA

# THE 5 SAFE SYSTEM ELEMENTS



Source: FHWA

# Safe System Principles

Overview of the 6 principles of the Safe System approach

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# THE 6 SAFE SYSTEM PRINCIPLES



**Death/serious injury  
is unacceptable**



**Humans make  
mistakes**



**Humans are  
vulnerable**



**Responsibility is  
shared**



**Safety is proactive**



**Redundancy  
is crucial**



# DEATH/SERIOUS INJURY IS UNACCEPTABLE



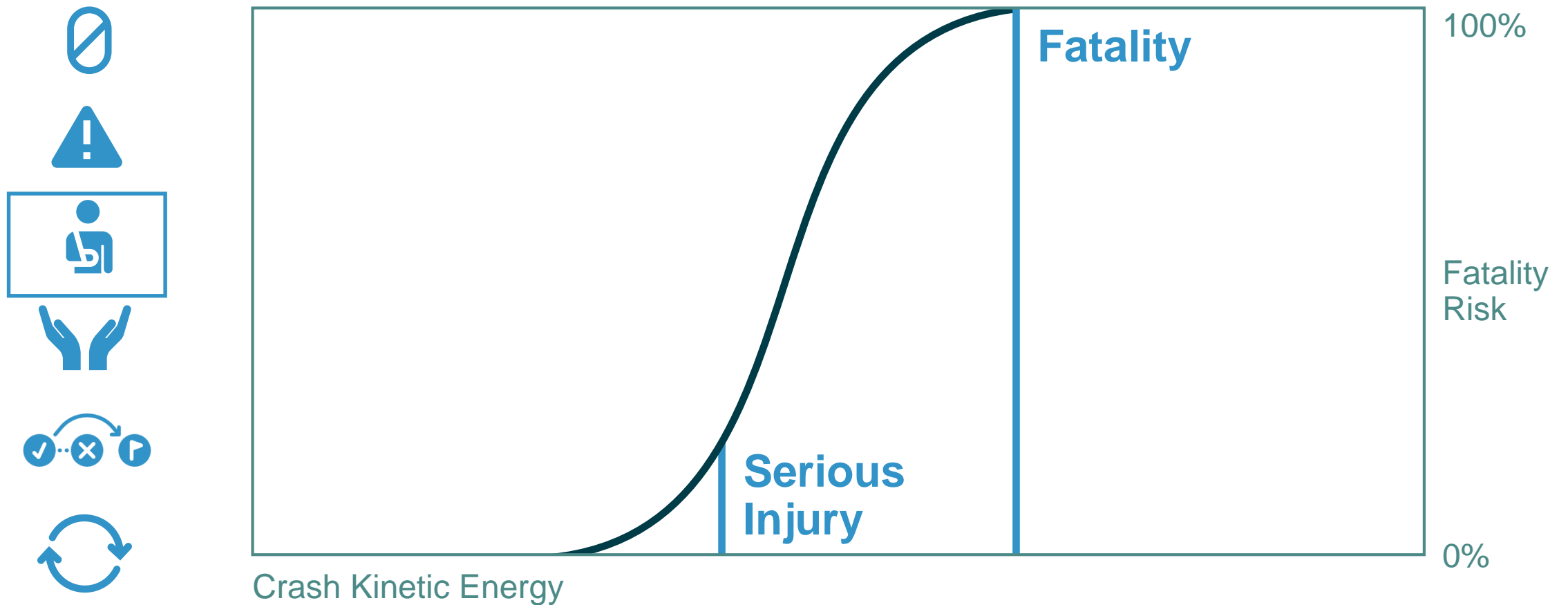


# HUMANS MAKE MISTAKES





# HUMANS ARE VULNERABLE



# RESPONSIBILITY IS SHARED



## System managers

Planners, designers, builders, operators,  
maintenance workers



## Vehicle manufacturers



## Law enforcement personnel

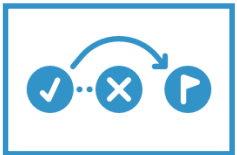
## Post-crash personnel



## System users



# SAFETY IS PROACTIVE

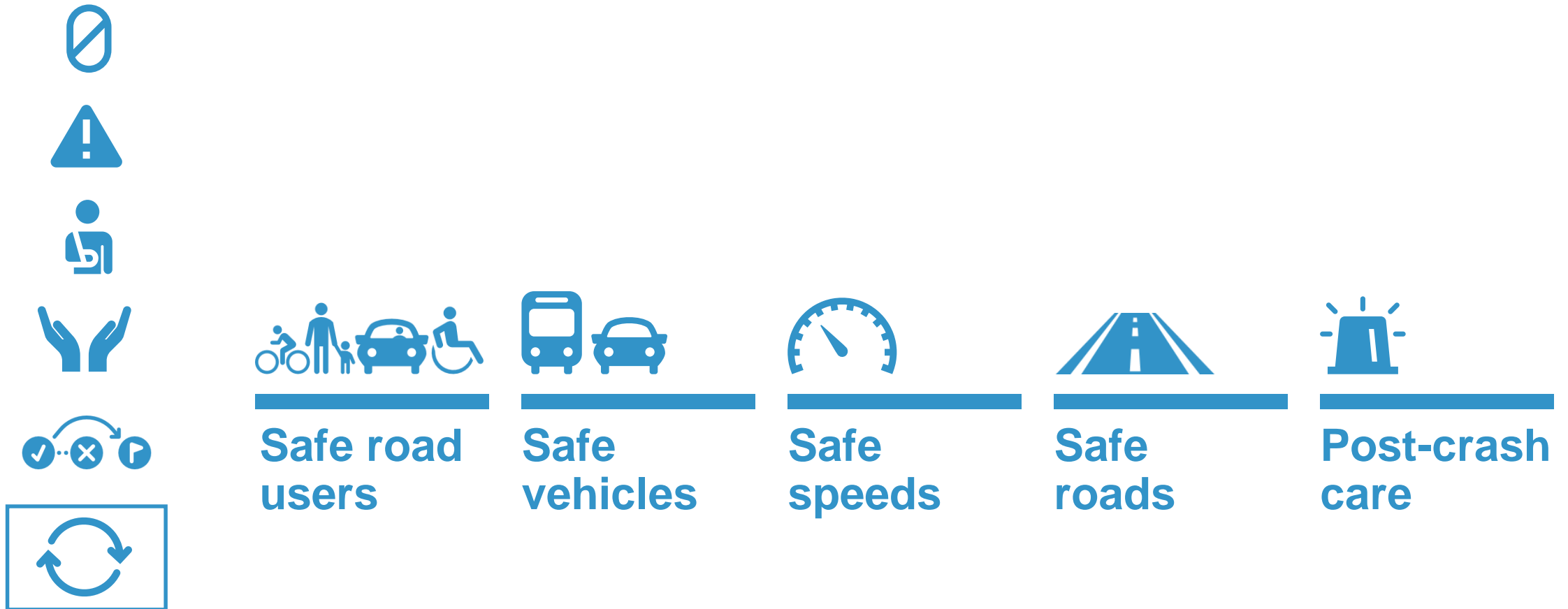


**Identify risks**



**Mitigate risks**

# REDUNDANCY IS CRUCIAL



# Safe System Elements

Overview of the 5 elements of the Safe System approach

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# THE 5 SAFE SYSTEM ELEMENTS



**Safe road users**



**Safe vehicles**



**Safe speeds**



**Safe roads**



**Post-crash care**



# SAFE ROAD USERS



**Walk**



**Bike**



**Drive**



**Transit**

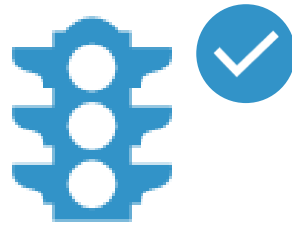


**Other**

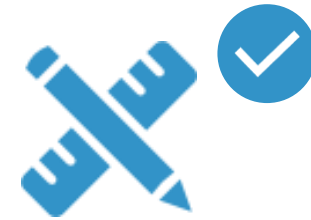
## SAFE ROAD USERS – CONTINUED



**Not distracted  
or impaired**

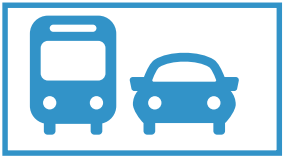


**Follow rules**



**Act within the  
limits of the  
road design**

# SAFE VEHICLES



## Active safety

Measures to reduce the chance of a crash occurring

- Lane departure warning
- Autonomous emergency braking

## Passive safety

Protective systems for when crashes do occur

- Seatbelts and airbags
- Crash-absorbing vehicle crumple zones

## SAFE VEHICLES - CONTINUED



### Other road user safety

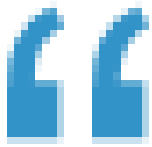
Measures that protect other road users

- Bicyclist and pedestrian detection
- Vehicle size and design

### New technology

Leveraging connected and automated vehicle (CAV) technology to improve safety

# SAFE SPEEDS



Speed is at the heart of a forgiving road transport system. It transcends all aspects of safety: without speed there can be no movement, but with speed comes kinetic energy and with kinetic energy and human error come crashes, injuries, and even deaths.”

Organisation for Economic Co-operation and Development

## SAFE SPEEDS: REDUCING PEDESTRIAN FATALITIES

Hit by a vehicle  
traveling at

23

MPH

10% risk of death



Hit by a vehicle  
traveling at

42

MPH

50% risk of death



Hit by a vehicle  
traveling at

58

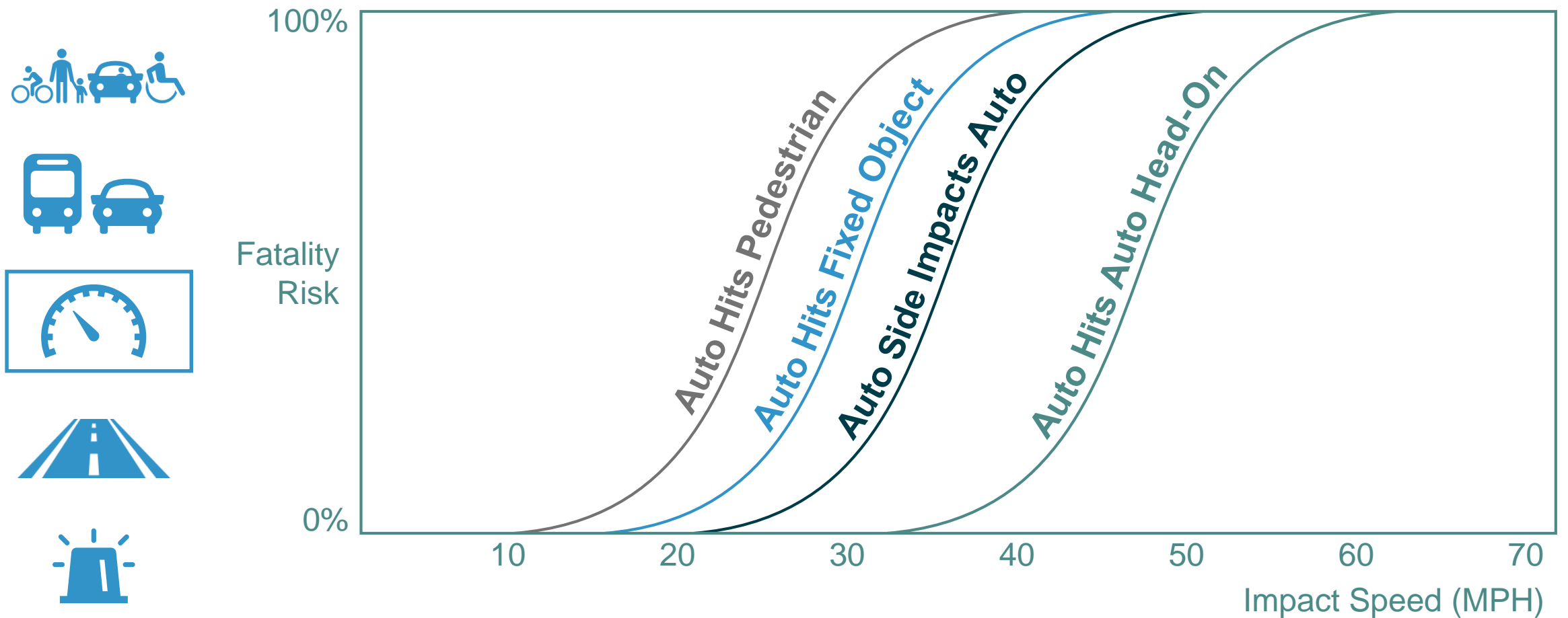
MPH

90% risk of death





# SAFE SPEEDS: FATALITY RISKS



# SAFE SPEED: TREATMENTS THAT MINIMIZE INJURIES

Speed through typical intersection



Source: Fehr & Peers

Speed through Safe System intersection



Source: City of Carmel, IN



# SAFE ROADS



Safe roads are designed and operated to:

1. **Prevent crashes**
2. **Keep impacts on the human body at tolerable levels**

# SAFE ROADS: AVOIDING CRASHES



## Avoiding crashes involves:



**Separating  
users in space**



**Separating  
users in time**



**Increasing  
attentiveness  
and awareness**

# SAFE ROADS: CRASH KINETIC ENERGY



Managing crash kinetic energy involves:



**Managing  
speed**



**Manipulating  
mass**



**Manipulating  
crash angles**

# SAFE ROADS: ALL ASPECTS OF THE ROADWAY SYSTEM



Safe roads include all aspects of the roadway system:



Design



Construction



Maintenance



Operation



# POST-CRASH CARE



Vital post-crash actions include:



First  
responders



Medical care



Crash  
investigation



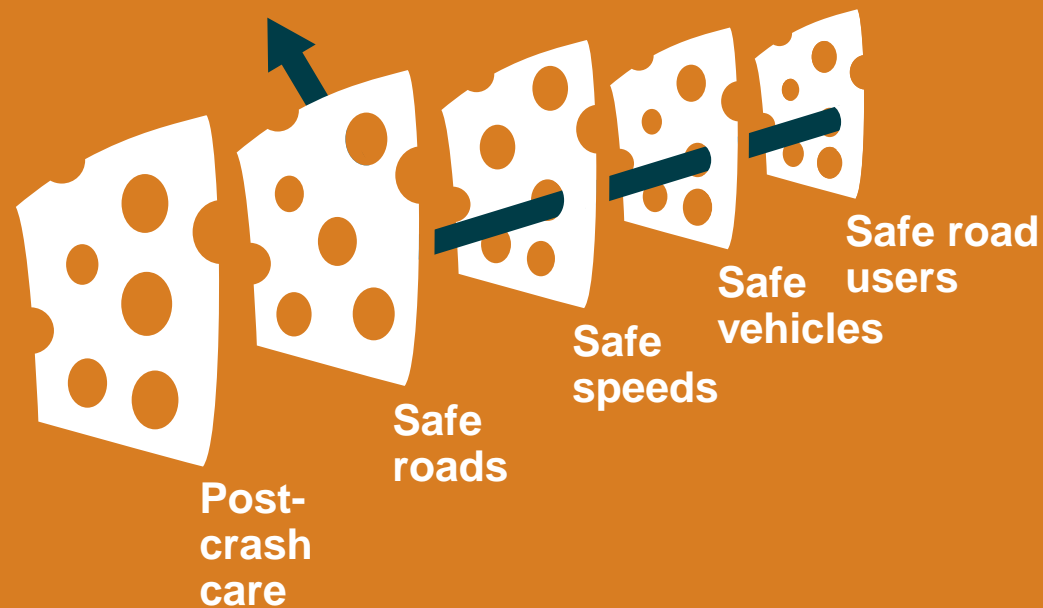
Traffic  
incident  
management



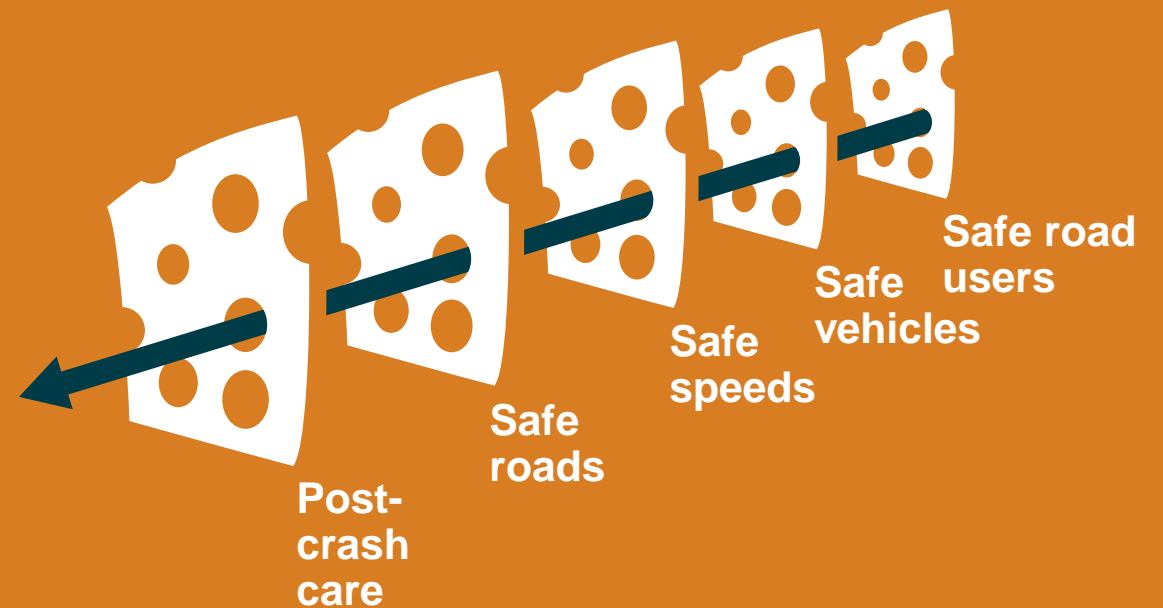
Justice

# THE 5 SAFE SYSTEM ELEMENTS CREATE REDUNDANCY

The “Swiss Cheese Model” of redundancy creates layers of protection



Death and serious injuries only happen when all layers fail



# Implementing the Safe System approach is our shared responsibility, *and we all have a role.*



Source: Fehr & Peers



Source: Arlington County, VA



Source: Fehr & Peers



Source: Fehr & Peers

**Zero is our goal.  
A Safe System is how we get there.**

**Questions?**