

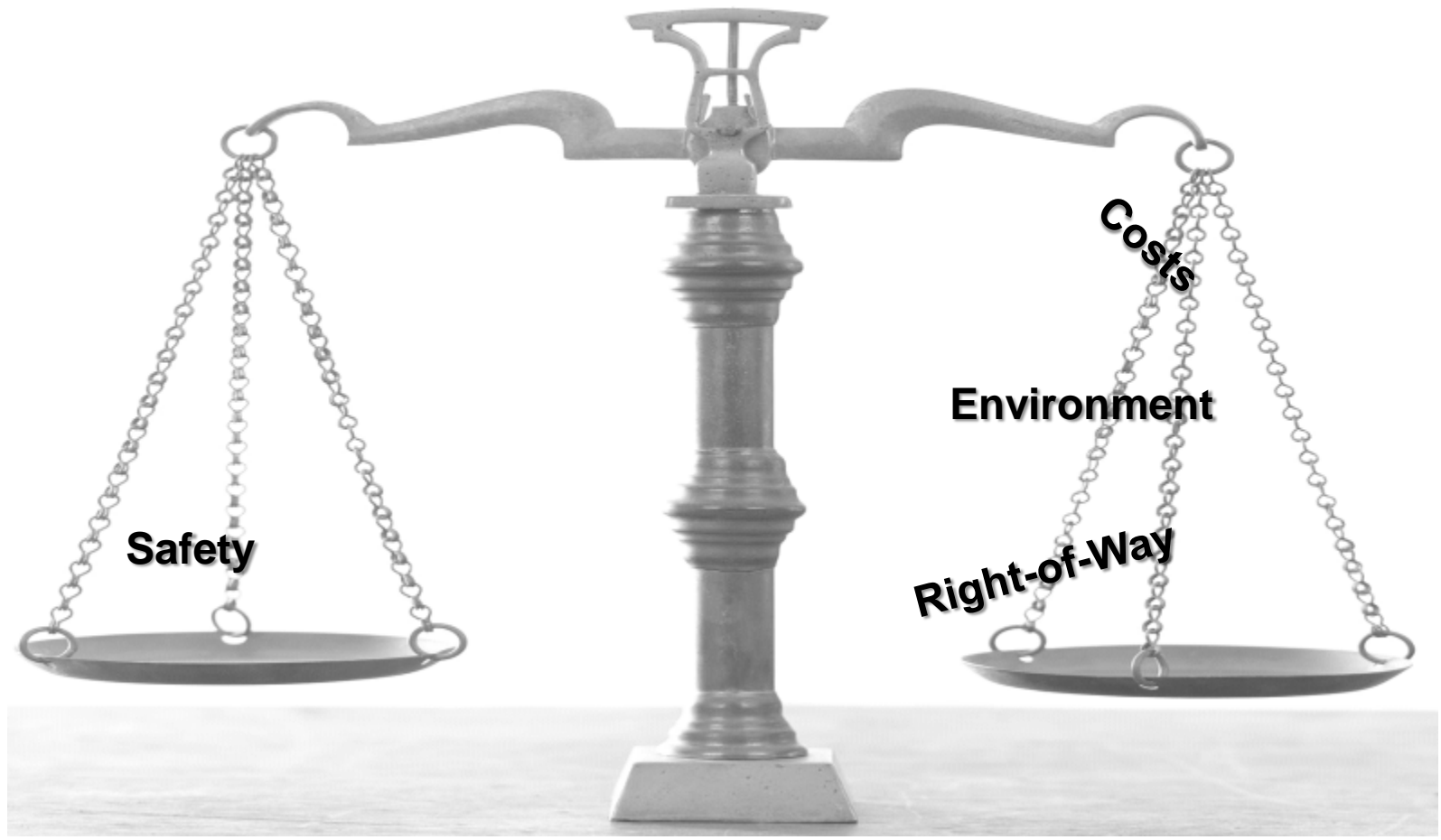
AN INTRODUCTION TO THE NEW AASHTO HIGHWAY SAFETY MANUAL

Ohio Transportation Engineering Conference
October 19-20, 2010

Cindy Juliano, PE
CH2M Hill



Do you ever find yourself trading safety off against something else?



What do you do?



Need

Integrate safety
into
transportation
decision-making
processes



How

Quantify effect of
decisions on
crashes

Accountability/
Performance
Measurement



Why

Limits of available
resources, science
& technology

Meet legislatively
mandated
priorities



Where

State

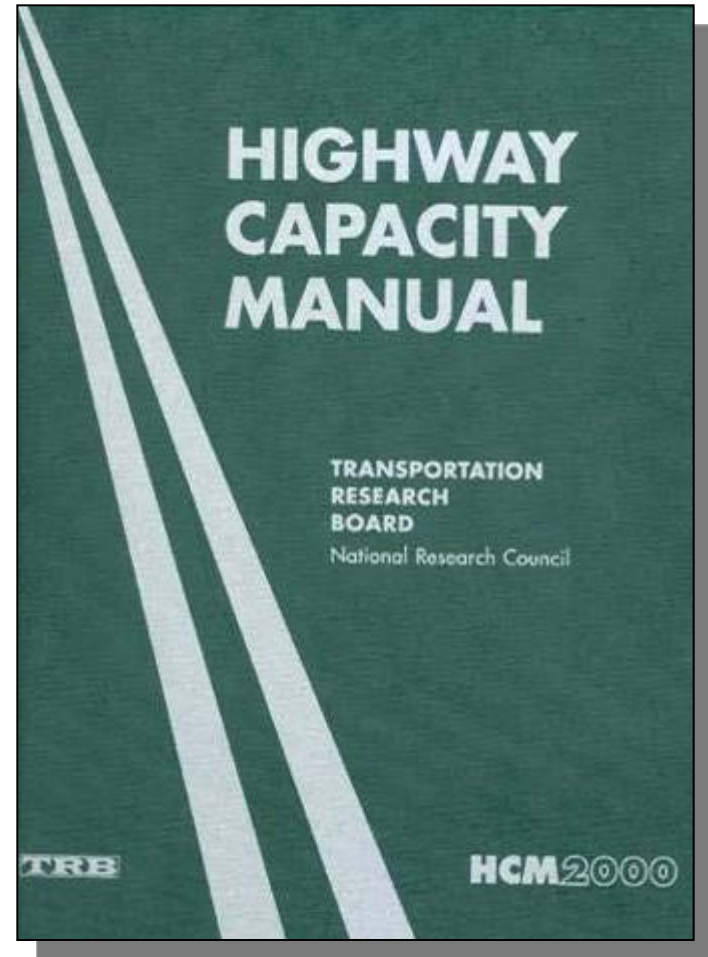
County

Metropolitan
Planning
Organization
(MPO)

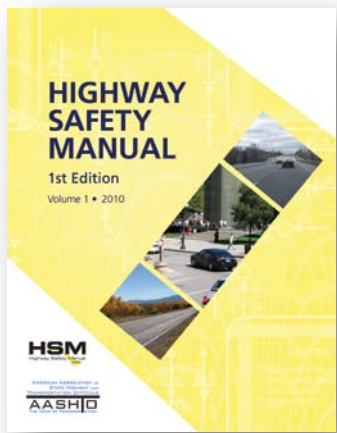
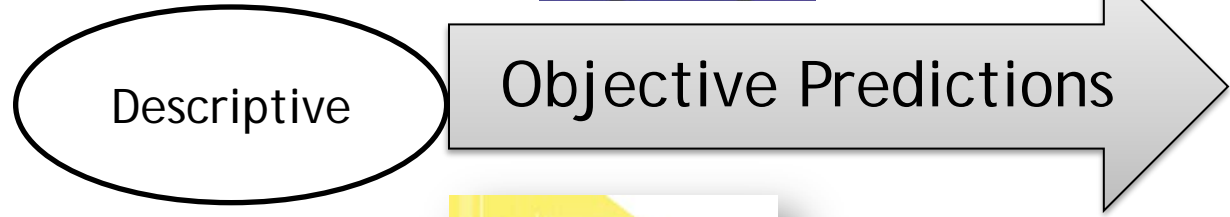
Local level

The Vision of the HSM - A Document Akin to the HCM

- 1** Definitive; represents quantitative 'state-of-the-art' information
- 2** Widely accepted within professional practice of transportation engineering
- 3** Science-based; updated regularly to reflect research



Advancements in Safety Knowledge

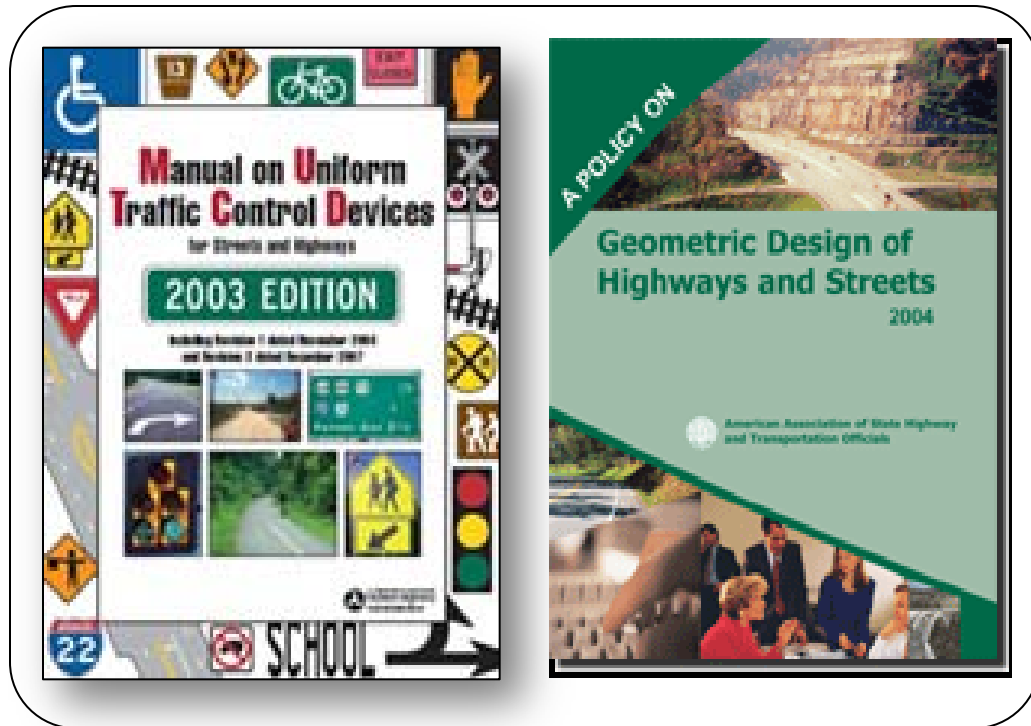


Significant effort and professional support produced the HSM

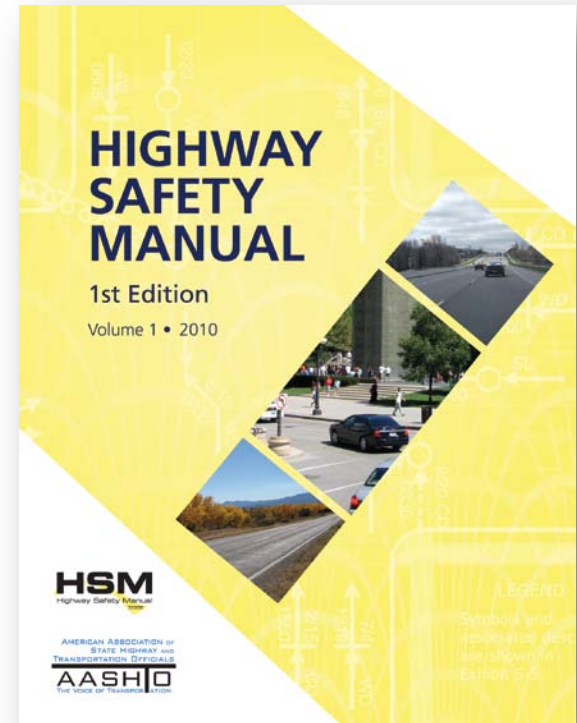
- Joint Subcommittee (now Task Force) sponsored by 7 TRB committees
- 10 years in development
- Thousands of hours of volunteer effort
- Multi-million dollar, multi-year research program funded by NCHRP, AASHTO & FHWA



The HSM and other Project Development 'Tools'



VS.





The HSM does not

establish a legal standard of care

create a public duty

set requirements or mandates

establish design/operation best practices

contain warrants or standards

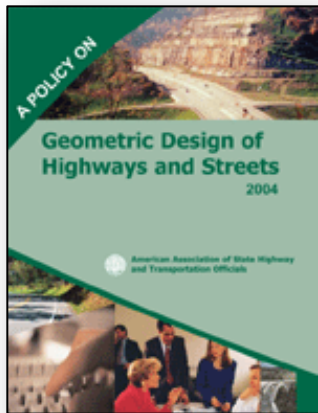
supersede other publications

It does not force or require the user to do anything; but merely helps you do a better job

The HSM helps change how we think about Safety

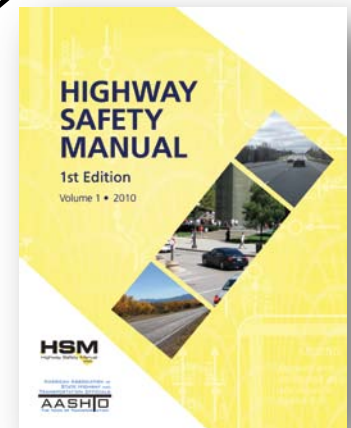
*Nominal
Safety*

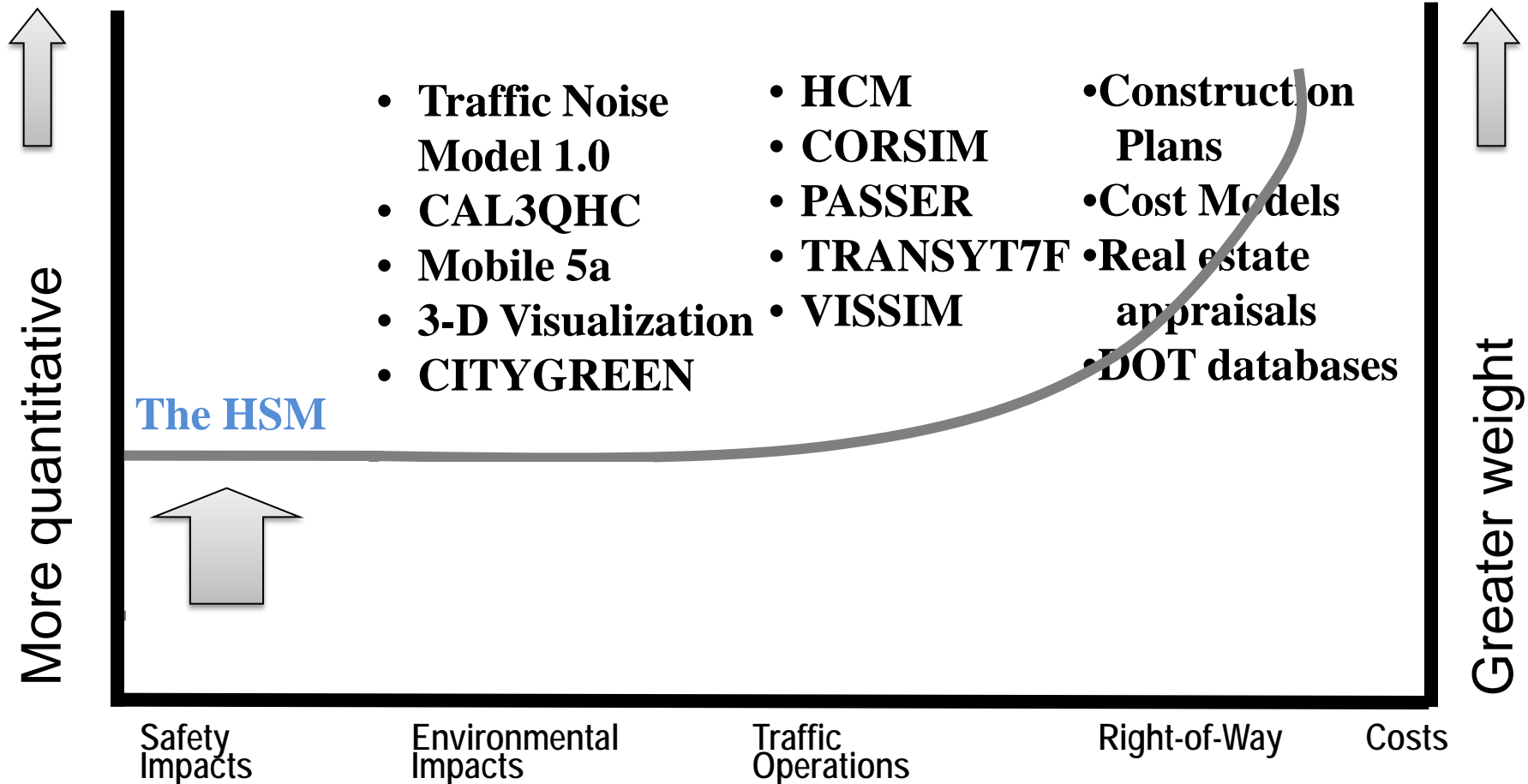
*Substantive
Safety*



Examined in reference to compliance with standards, warrants, guidelines and sanctioned design procedures

The expected or actual crash frequency and severity for a highway or roadway

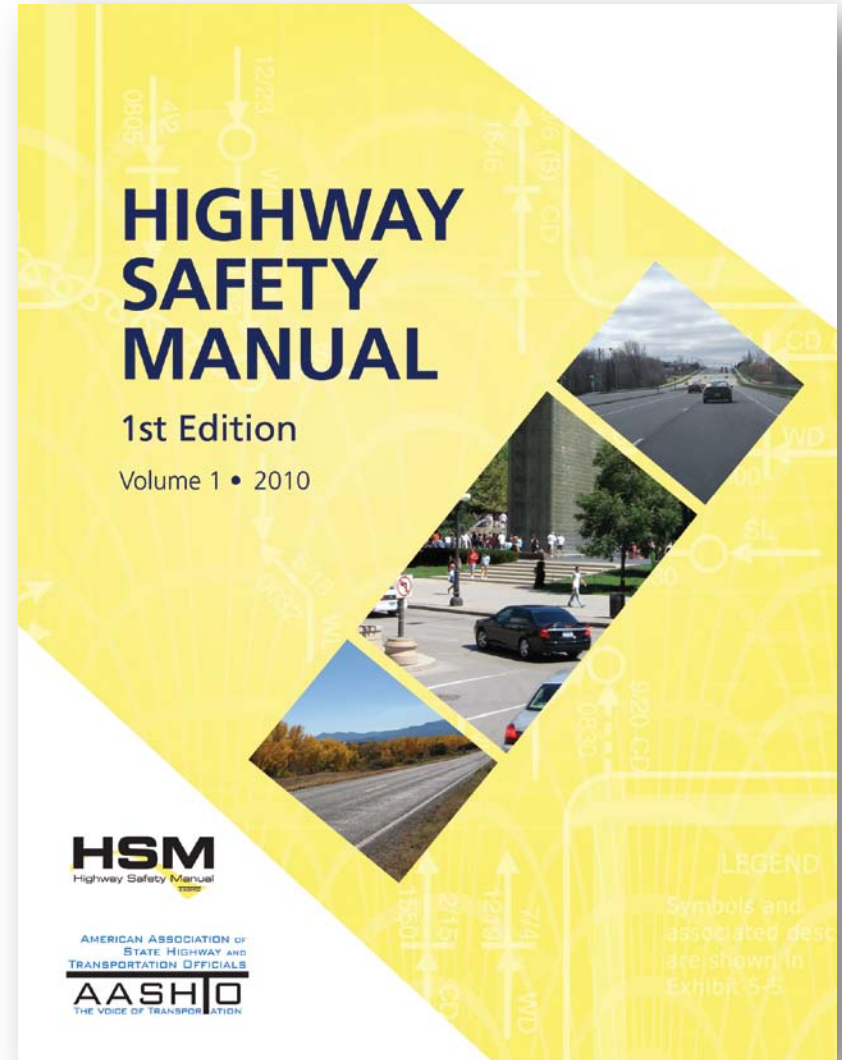




**We're Interested in Other Impacts for Project Level Decisions
- What About Substantive Safety?**

HSM

Content & Structure





Part A

Introduction
Human Factors
Fundamentals

Part D

Crash Modification
Factors (CMFs)



Part B

Roadway Safety
Management
Process

Part C

Predictive Method



Part
A

Part
B

Part
C

Part
D

1. Introduction & Overview
2. Human Factors
3. Fundamentals

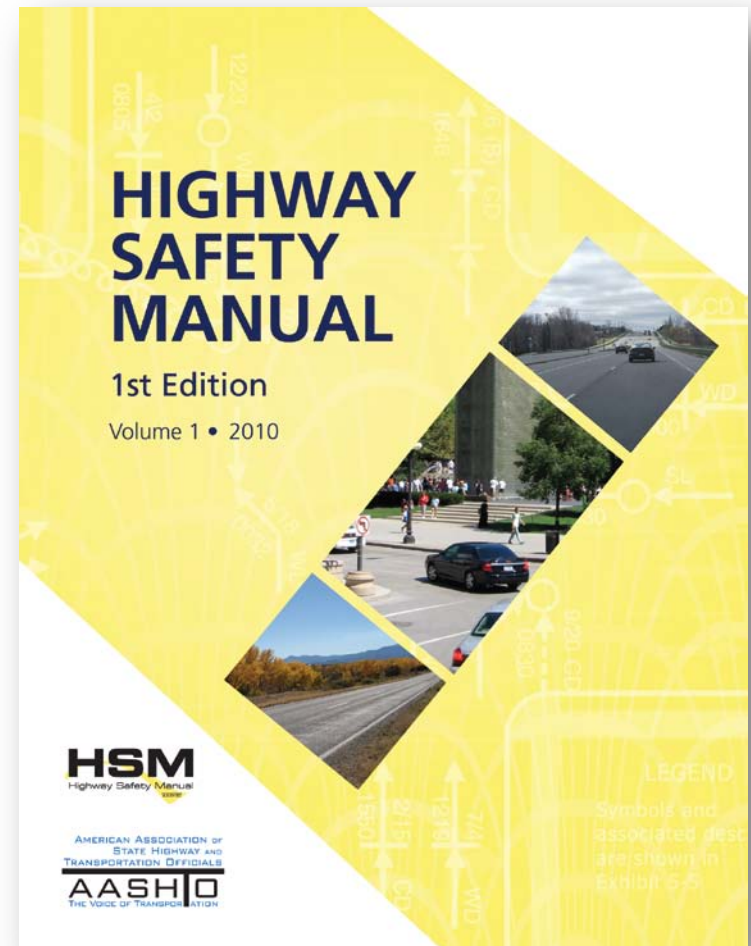
What is Safety?

The HSM uses
crashes as a
measure of safety



The HSM introduces new 'science based' terms to the profession

- 'Crash Frequency' (not rate)
- 'Negative Binomial Distributions'
- KABCO (Crash severity scale)
- 'Safety Performance Functions'
- 'Crash Modification Factors'
- 'Standard Error'
- 'Regression to the Mean'
- Empirical Bayes (EB) Procedures





Road Safety Management Process

Part
A

Part
B

Part
C

Part
D

Network Screening




Diagnosis & Countermeasure Selection



Economic Appraisal & Prioritization



Safety Effectiveness Evaluation



Part
A

Part
B

Part
C

Part
D

Predictive Methods

- Part C Methodology
 - ‘Safety Performance Functions’
 - ‘Crash Modification Factors’
 - ‘Calibration’
- Applications
- Example problems
- References



Part
A

Part
B

**Part
C**

Part
D

Facilities Included in Part C

10. Rural Two-lane
Roads



11. Rural Multi-lane
Roads



12. Urban Suburban
Arterials





Part
A

Part
B

Part
C

Part
D

Crash Modification Factors (CMFs)

- Estimate the expected influence of a specific countermeasure or condition
- Describe the safety-effectiveness of countermeasures or treatments
 - Roadway Segments
 - Intersections
 - Interchanges
 - Special Facilities and Geometric Situations

Crash Modification Factor

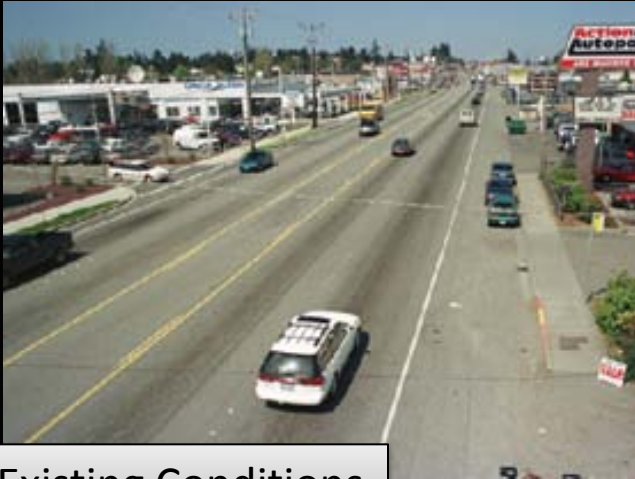
CMF

Expected crashes
=CMF*(base condition
crashes)

"M is for multiply"

$$CMF = \frac{\text{Expected average crash frequency with condition ' b' }}{\text{Expected average crash frequency with condition ' a' }}$$

Project Development



Existing Conditions



Alternative 1



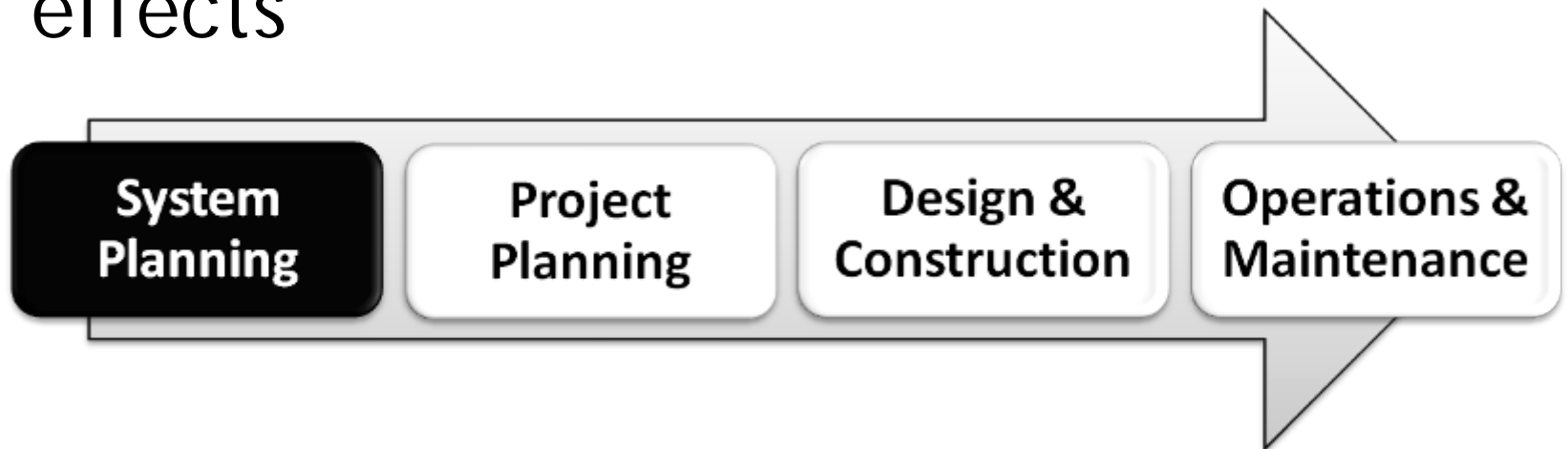
Alternative 2



Alternative 3

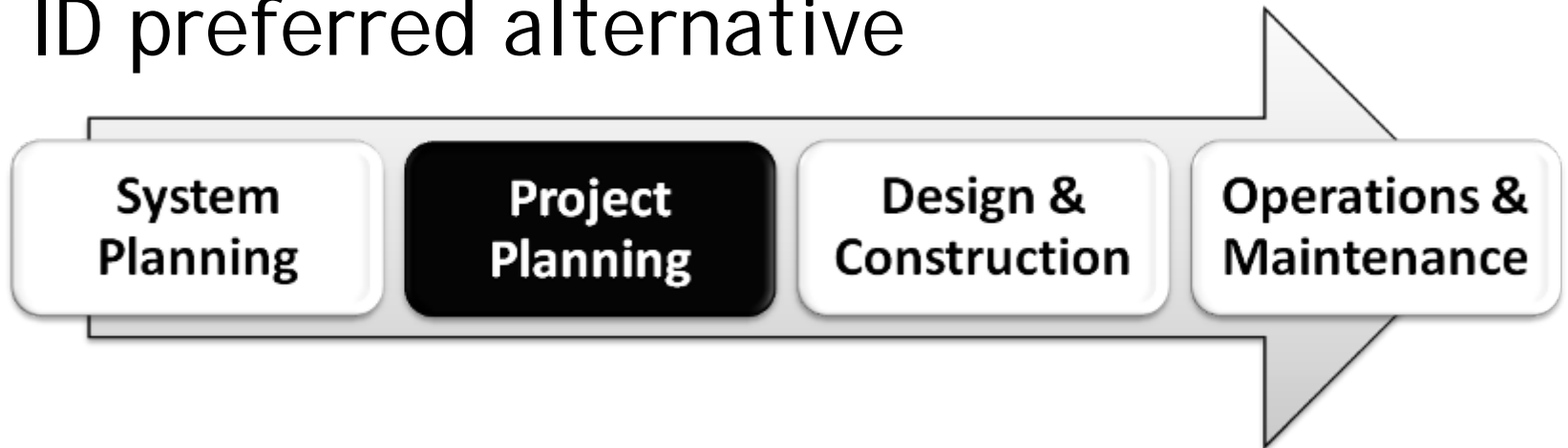
System Planning and Programming

- Assess system needs & identify projects/studies
- Program projects
- Evaluate programs system-wide safety effects



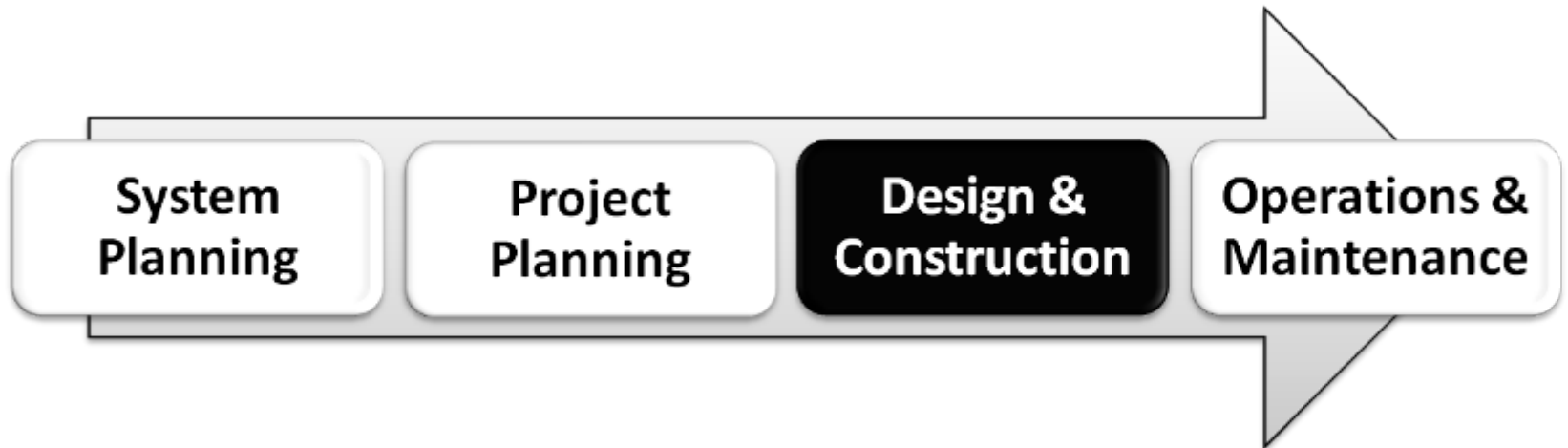
Planning

- Define problem(s) /assist scoping
- Identify potential solutions
- Evaluate alternatives & expected quantitative safety effects
- ID preferred alternative



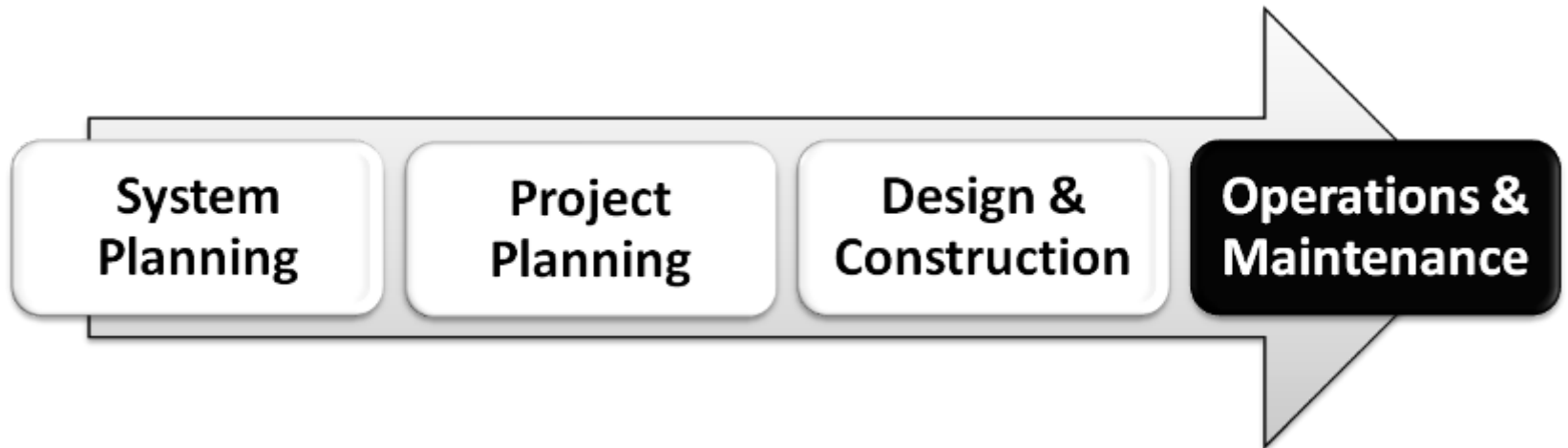
Design and Construction

- Evaluate safety of alternative designs
- Review & document design exceptions, variances and waivers
- Inform construction decisions



Operations and Maintenance

- Monitor operations balance - safety, mobility and access
- Evaluate improvement effectiveness



Research Results Digest 329

HIGHWAY SAFETY MANUAL DATA NEEDS GUIDE

This digest presents a summary of the data needed to use the methodologies in Part C of the 1st edition of the *Highway Safety Manual*. The TRB Task Force on Development of the Highway Safety Manual initiated and guided the work. Douglas W. Harwood, Midwest Research Institute, conducted the project.

SUMMARY

The purpose of this guide is to help potential users of the 1st edition of the *Highway Safety Manual* (HSM) anticipate the data needs for using the HSM. The guide focuses on the data needed to use the HSM Part C methodologies for rural two-lane highways, rural multilane highways, and urban and suburban arterials. The guide provides information for HSM users to assess whether their existing data sources contain the data needed to apply the HSM safety prediction methodologies to highways of interest.

HSM OVERVIEW

The HSM represents an effort to identify and assemble the best currently available information on safety and the provision of measures of performance, prediction, and evaluation of highway safety. The information in the HSM is intended to assist highway agencies in all aspects of safety decisionmaking during policymaking, planning, programming, project development, construction, maintenance, and operational activities.

Recent advancement in the science of safety analysis, safety impact prediction, and improved understanding of the statistical nature of crashes has led to significant gains in safety knowledge. Coupled with

new analytical tools, these advancements make it possible to produce usable estimates of the impact of geometric design elements, safety-related planning, and traffic operations on the frequency and severity of crashes.

The HSM provides analytical tools that facilitate the inclusion of safety considerations in roadway planning, design, operational, and maintenance decisions based on intended safety performance. While highway safety information changes on a continual basis, the HSM is intended to provide accepted knowledge, methods, and processes usable by the highway safety community at the time of publication.

The HSM will consist of four parts:

- Part A: Introduction and fundamentals;
- Part B: Roadway safety management process;
- Part C: Predictive methods—tools for safety prediction of rural two-lane highways, rural multilane highways, and urban and suburban arterials; and
- Part D: Accident modification factors.

The HSM is designed for a wide audience of users and does not override or supersede state and local design manuals or any other related guidance documents in use by transportation authorities. Information, processes, and procedures contained

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

DATA NEEDS GUIDE



Companion Software

HSM Part	Supporting Tool
PART B: Roadway Safety Management Process	SafetyAnalyst www.safetyanalyst.org
PART C: Predictive Methods	IHSDM www.ihsdm.org
PART D: Crash Modification Factors	FHWA CRF/CMF Clearinghouse www.cmfclearinghouse.com



The HSM will evolve and grow

- CMF research continues
- Additional predictive chapters are planned
 - Freeways and Interchanges (NCHRP Project 17-45)
 - Roundabouts
 - Other facility types
- TRB Committee on Highway Safety Performance is newly formed



The Value of the HSM

- Provides a proven and vetted science-based approach to quantifying the safety effects of decisions we make and actions we contemplate
- Provides a common knowledge base, language and basis for reasoned judgments about safety
- Allows incorporation of safety to the same level of importance as other factors
- Does not increase risk of tort liability



QUESTIONS

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