IRTAD / WORLBANK WORKSHOP ON ROAD SAFETY DATA MANAGEMENT

Africa Road Safety Workshop

Safety Performance Indicators

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Overview

- Road safety
  can be assessed
  in terms of social costs
  of accidents and injuries
- Accidents and injuries
  are the result
  of unsafe
  operational conditions
  of the road traffic system

Overview

- However,
  simply counting crashes
  or injuries,
  is often
  an imperfect indicator
  of the level of road safety

Why?

- The number of road crashes and injuries, is subject to random fluctuations
  - a short term change in the recorded numbers does not necessarily reflect a change in the underlying, long-term expected numbers

Why?

- Counting crashes sometimes says nothing about the processes that produce crashes
  - It is, to some extent, a matter of chance whether a hazardous situation or a near miss results in a crash or not

Why?

- In order to develop effective measures to reduce the number of accidents/ injuries it is necessary to understand the **processes** that lead to accidents

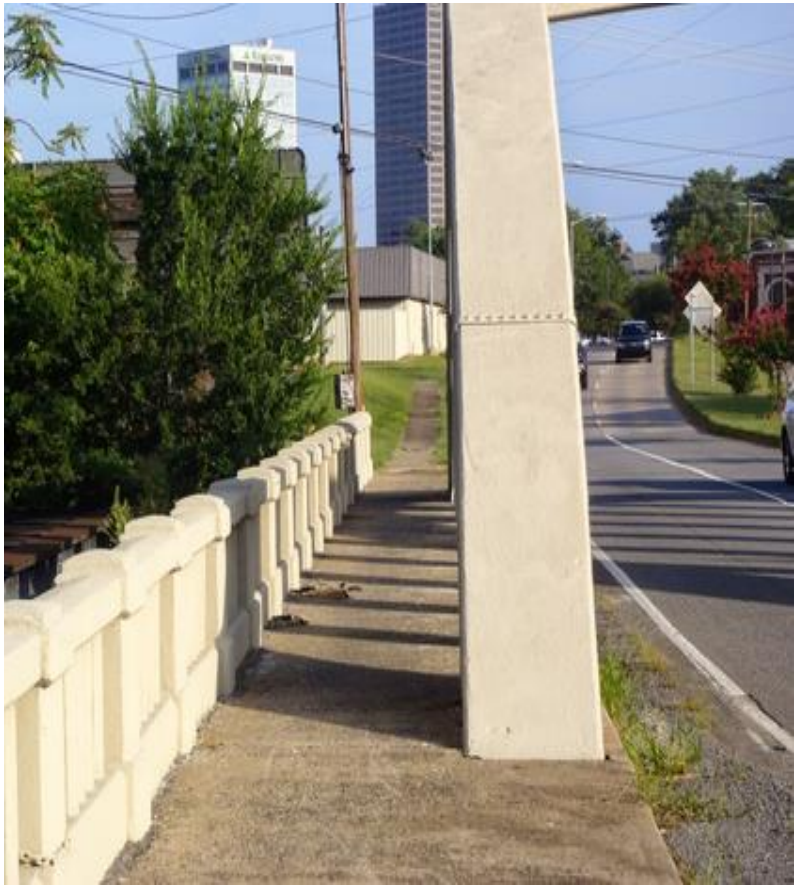
Safety Performance Indicators can serve this purpose

Safety Performance Indicators (SPIs)

- Measurements related to crashes or injuries, used in addition to the figures of accidents or injuries, in order to **indicate** safety performance or **understand** the process that leads to accidents
  - link between the casualties from road accidents and the measures to reduce them

Safety Performance Indicators (SPIs)

- Provide a more complete picture of the level of road safety
- Able to highlight the emergence of developing problems at an early stage, before these problems show up in the form of accidents



Safety Performance Indicators (SPIs)

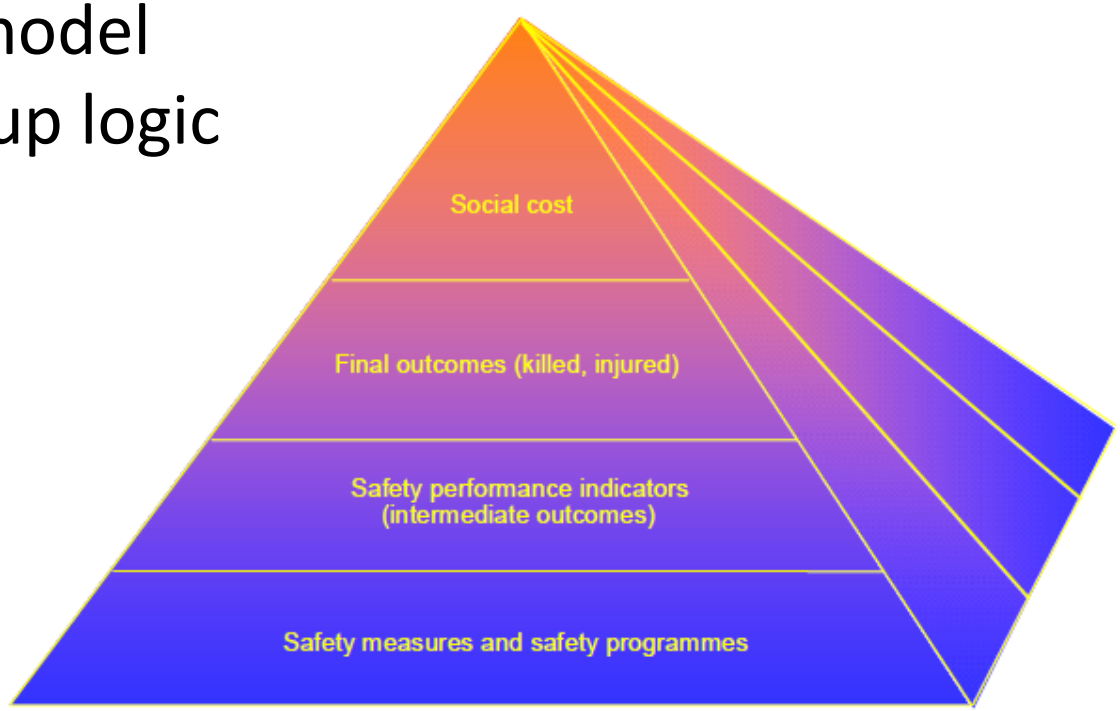
- Provide a means for monitoring, assessing and evaluating the effectiveness of safety actions applied

Safety Performance Indicators (SPIs)

- Utilize qualitative and quantitative information to help determine a program's success in achieving its objectives
- Able to reflect unsafe operational conditions of the road traffic system
  - more general than direct outputs of specific safety interventions

SPIs in Road Safety Management System

- SPIs allocated on the level of intermediate outcomes
- Measure-oriented model following bottom – up logic



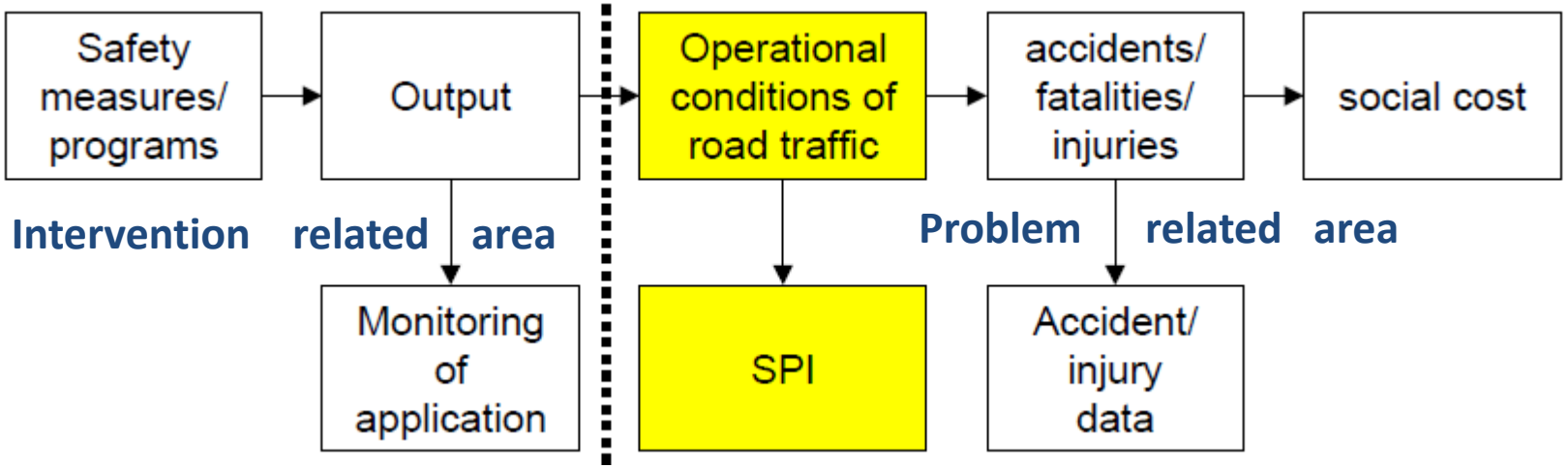
Source: ETSC (2001)

Importance of SPIs

- Large number of potential SPIs can be found
  - not all equally important
  - their importance can be assessed in terms of the **strength** of its relationship with accident occurrence that can be **measured** in many ways
    - e.g. measure the change in accident or injury risk related to a certain change in the value of the indicator

Role of SPIs in Monitoring RSMS

- e.g. case of speeding
  - road safety measure: speed enforcement
  - output: speed cameras in use
  - outcome of the measure: improving the operational conditions (**speeding level - SPI**)
  - improved operational conditions
    → accident/injury reduction → social cost reduction



Quality Levels of SPIs

- Direct measurement of the identified unsafe operational conditions
  - the indicator covers the complete scope of the problem and reacts to all possible interventions

- Direct measurement of the identified problem is not possible
  - the identified problem is a hidden variable and is described by several indirect variables as indicators will bridge this gap
  - normal case in the SPI development
  - the solution should be in searching for several indicators, which are independent from interventions and describing the latent variable

- Considering the expected availability of data and assessing the reasonable effort for data acquisition
  - in some cases it would be difficult or even impossible to develop an SPI independent from interventions
  - bridge the gap by sub-dividing the problem

Considerations in Developing SPIs

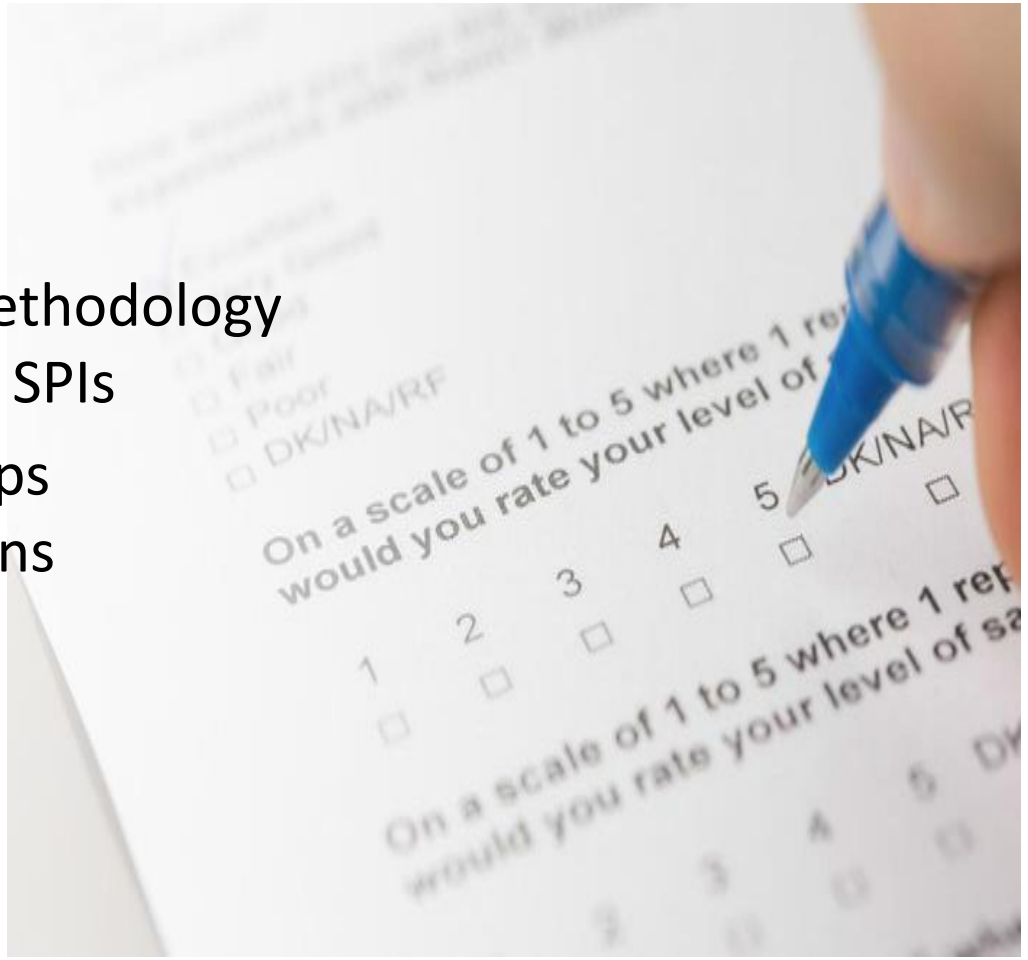
- Target group: Stakeholders
- Sensitive to significant changes in the system's conditions and over time, particularly in response to focused interventions
  - e.g. policy changes
- Invariant and independent from changes of non-focused circumstances
- Cover a meaningful range of changes in the systems' conditions
- Sensitive to the influence of external factors
  - e.g. traffic volumes
- Estimated in a statistically reliable and valid manner and of homogeneous quality
- Comprehensible
  - visualisation of results is important

Limitations in Developing SPIs

- More general SPIs play mostly descriptive and not explanatory roles for "final outcomes“ (accidents/ casualties)
- Comparison of SPIs is applicable for similar conditions only
  - the conditions for which SPIs are estimated should be defined explicitly (e.g. for travel speeds on motorways existing differences in speed limits should be indicated)
- Interrelations between different SPIs are possible
  - e.g. better characteristics of the road system may provide a quicker access for emergency services

Develop Coherent Set of SPIs

- Step – sheet
  - ensures consistency of the process
  - the use of a uniform methodology for the development of SPIs
  - describes the initial steps to be done and questions to be answered



Develop Coherent Set of SPIs

- Case study: Speeding (SafetyNet project)

0	**Level 0**	Describe:
	Key information: Exact definition of the problem; which operational conditions of road traffic are insecure and leading to crashes or fatalities as the „worst case“	- High average speed increases crash rate (considering separate road types) - High variability in speed increases crash rate (considering separate road types)

Develop Coherent Set of SPIs

- Case study: Speeding (SafetyNet project)

1	**Level 1**	
a	Direct measurement possible?	Yes: Go to 1b /No: Go to 2
b	How can the identified problem - the insecure operational conditions - be measured?	The insecure operational conditions can be measured by direct observation of the speed of vehicles
		a) Query of availability. b) If it is predictable, that the data performing this indicator wouldn't be available, go to 2

Develop Coherent Set of SPIs

- Case study: Speeding (SafetyNet project)

2	**Level 2**		
a	Are there suitable indirect indicators to describe the latent variable?	Yes: Go to 2b /No: Go to 3 There is no need for indirect indicators as there is no latent variable present.	
b	Which indirect indicators are suitable to describe the latent variable and how?		
			a) Query of availability. b) If it is predictable that the data performing this indicator would not be available, go to 3

Develop Coherent Set of SPIs

- Case study: Speeding (SafetyNet project)

3	Level 3	
a	Can the problem (level 0) be divided into sub-problems to get handled?	Yes: Go to 3b /No: Go to 4
b	The following questions have to be answered to explain the extent of the SPI referring to the problem (level 0):	
	To which interventions the indicator is related?	The indicator is related to setting maximum speed limits on road segments.
	What should the intervention affect?	The intervention should affect speeding behaviour, i.e. lower the average speed driven on the particular road segment.
	What should be achieved? How should the problem be solved?	A lower average speed should be achieved.
	How should the intervention work?	Knowledge of the speed limit and of the sanction on transgressing the limit should induce behavioural change.
	Which part of the problem is not covered?	The definition of minimum speeds is very uncommon and unpractical. As a consequence, interventions targeted at reducing the variability of speed are not at all easily identified.
	To which interventions does the indicator not react? Justify why this indicator can still be used.	-
	Is one indicator sufficient and why, or do we need more?	There is a need of at least an indicator of average speed and an indicator of spread of speed ⇩ a) Query of availability. b) If it is predictable, that the data performing this indicator wouldn't be available, go to 4

Develop Coherent Set of SPIs

- Case study: Speeding (SafetyNet project)

4	**Level 4**	
a	No suitable SPI is available to indicate the problem (level 0) or the sub-problems (level 3)	Any measurement on a lower level can (only) indicate the application stage of a road safety measure.

SPIs in Practice

- Road user behavior
- Road Infrastructure
- Vehicle
- Quality of post-crash care

SPIs in Practice

- Road user behavior
  - **speeding**, comparison to mean speed, speed variance, speed limit violations
  - percentage of **seat belts', child restraints'** and **helmets'** use
  - incidence of **drinking and driving**
  - incidence of **mobile phone** use
  - failure to stop or **yield** at junctions or at pedestrian crossings
  - inadequate **headways** – close following
  - use of reflective devices for **cyclists** and pedestrians
  - use of **pedestrian** crossing facilities by pedestrians

SPIs in Practice

- Road Infrastructure
  - percentage of road network with unclear **hierarchy functions** (flow, distribution, access)
  - percentage of high speed roads with **incompatible vehicles** in terms of mass
  - length of road sections violating driver's **expectations** and increasing **workload** (lack of consistency – continuity)
  - **pavement friction** mostly in winter and on wet road surfaces

SPIs in Practice

- Vehicle
  - percentage of **new cars** with the top star rating according to EuroNCAP
  - percentage of vehicles with **worn tires**
  - percentage of technically **defective vehicles**

SPIs in Practice

- Quality of post-crash care
  - average time for intervention at the accident scene
  - average casualty transfer time to the hospital
  - average casualty hospitalization duration

Tools for Road Safety - Accountability

Monitoring
ROAD SAFETY
PERFORMANCE INDICATORS
(RSPI)

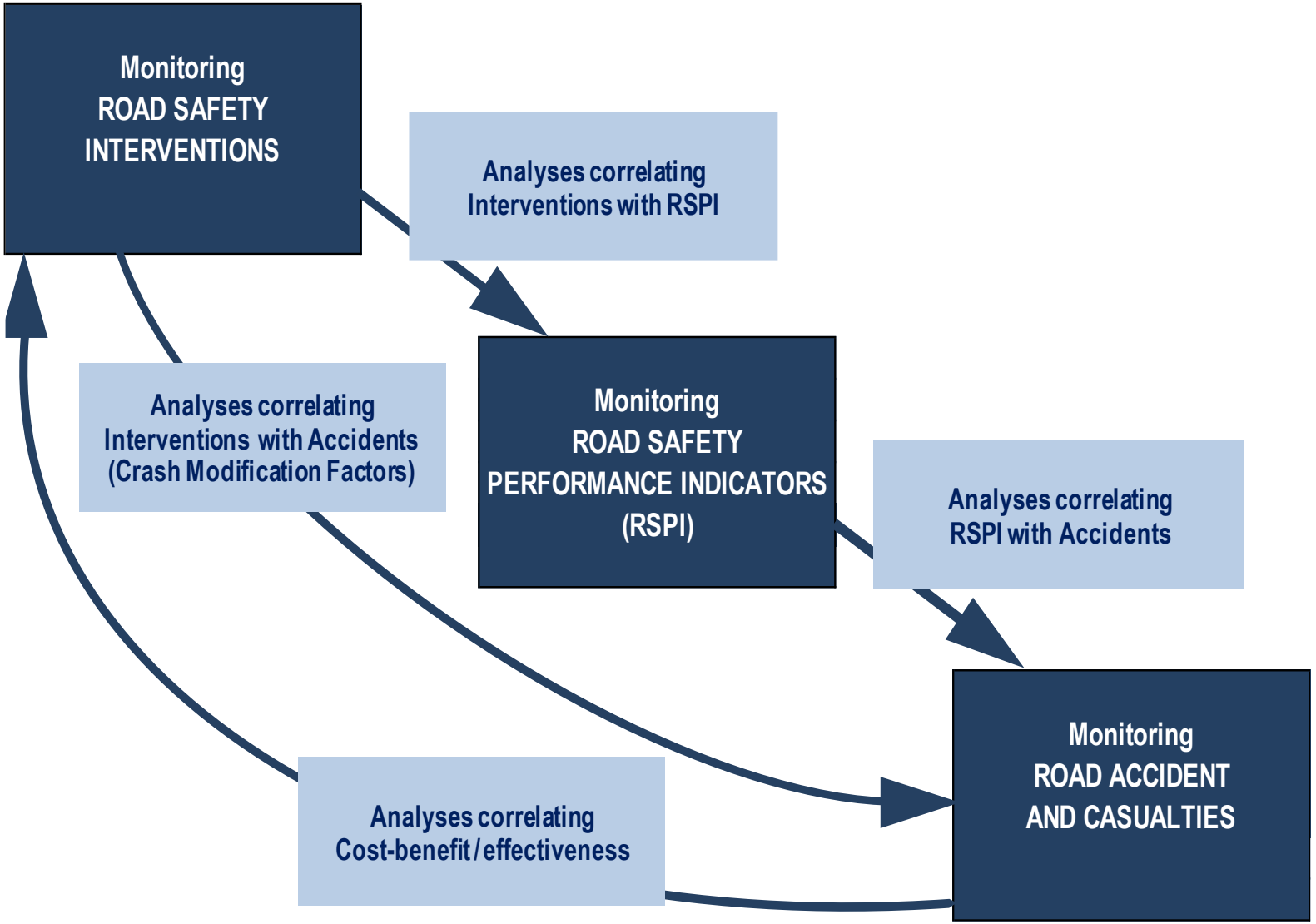
Tools for Road Safety - Accountability

Monitoring
ROAD SAFETY
INTERVENTIONS

Monitoring
ROAD SAFETY
PERFORMANCE INDICATORS
(RSPI)

Monitoring
ROAD ACCIDENT
AND CASUALTIES

Tools for Road Safety - Accountability

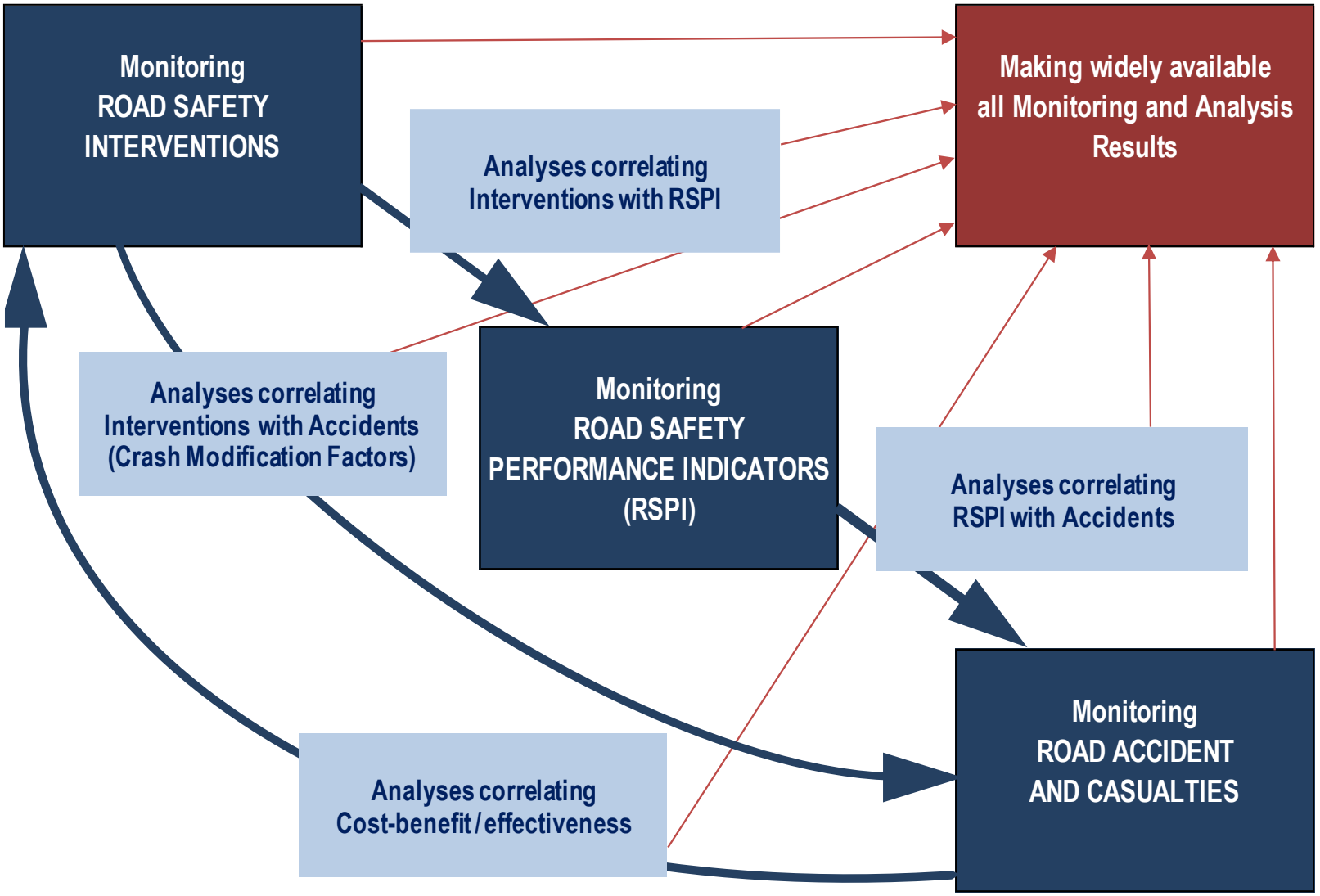


Correlating Road Safety Management and Performance

- Road safety management indicators **do not directly affect** road safety results
- However, they do **affect the operational level** of road safety, as reflected by the SPIs
- Subsequently, higher SPIs have a direct impact on the **decrease of accidents and casualties**

(confirming the SUNflower pyramid)

Tools for Road Safety - Accountability



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