SOFTWARE, DATA & PROCESSES TO INCREASE ROAD SAFETY IN CITIES

Timo Hoffmann, PTV Group
2014-02-11

THE TRANSPORTATION CHALLENGES OF TODAY AND TOMORROW

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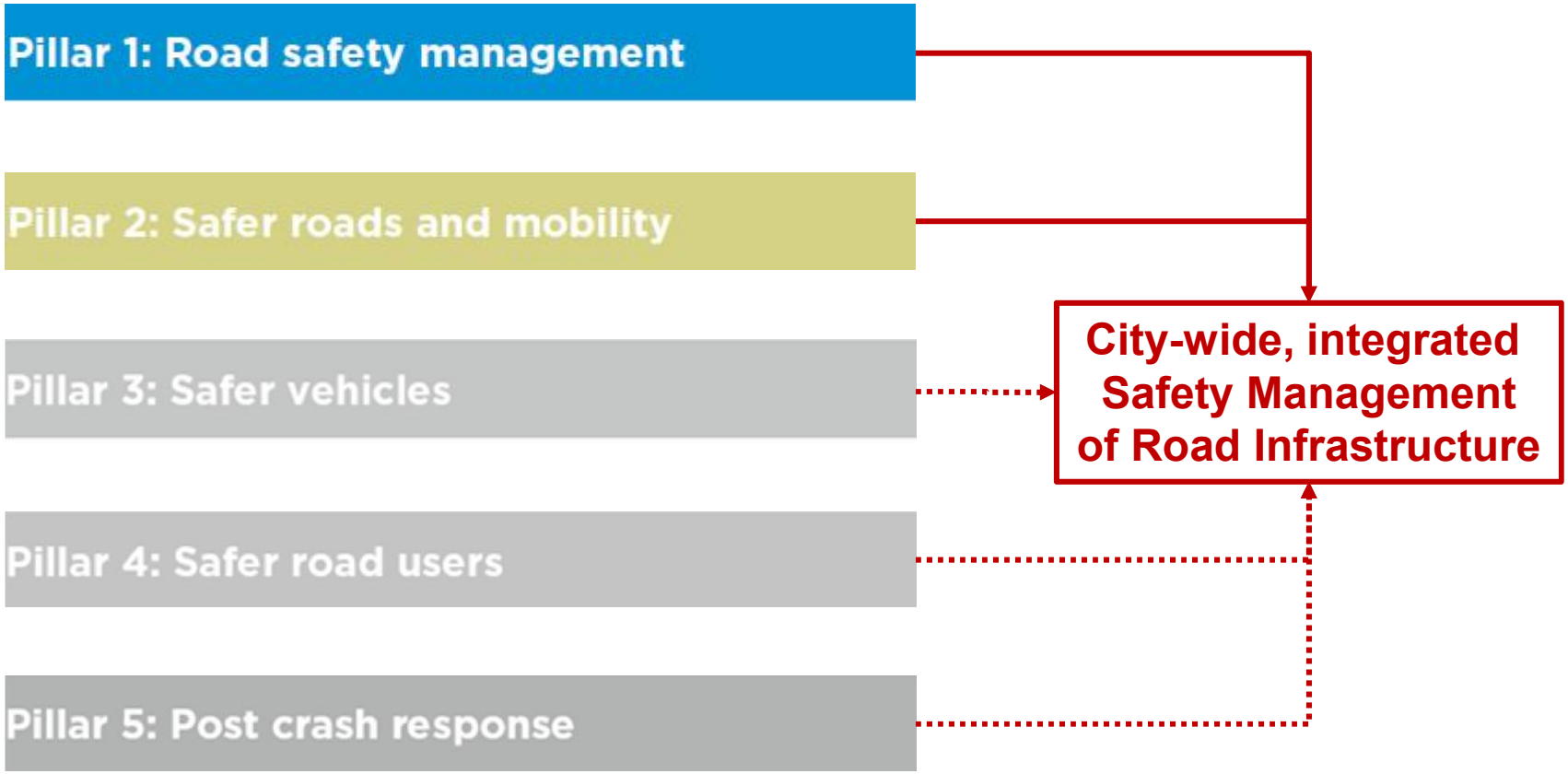
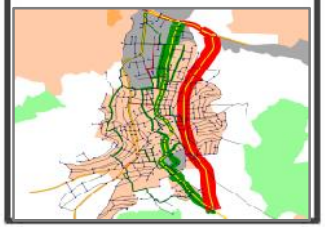
GLOBAL PLAN for DECADE of ACTION for ROAD SAFETY

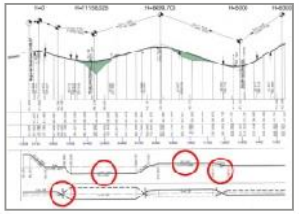


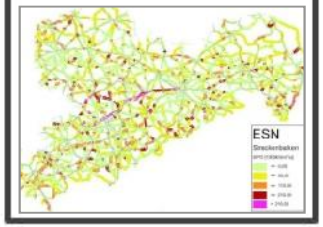
ROAD INFRASTRUCTURE SAFETY MANAGEMENT

EU Directive 2008/EC/96

Road Safety Impact Assessment (RIA)	Road Safety Audit (RSA)	Network Safety Management (NSM)	Black Spot Management (BSM)	Road Safety Inspection (RSI)
New Schemes			Existing Roads	



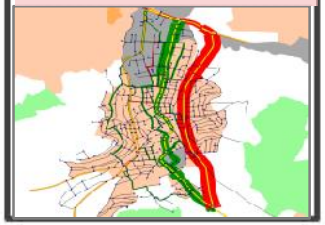




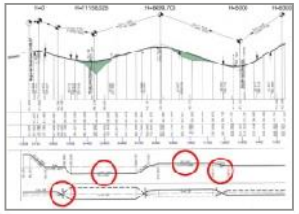
ROAD INFRASTRUCTURE SAFETY MANAGEMENT

Accident Data

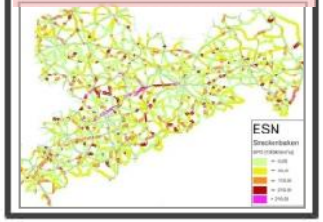
Road Safety Impact Assessment (RIA)



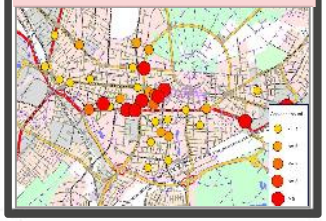
Road Safety Audit (RSA)



Network Safety Management (NSM)



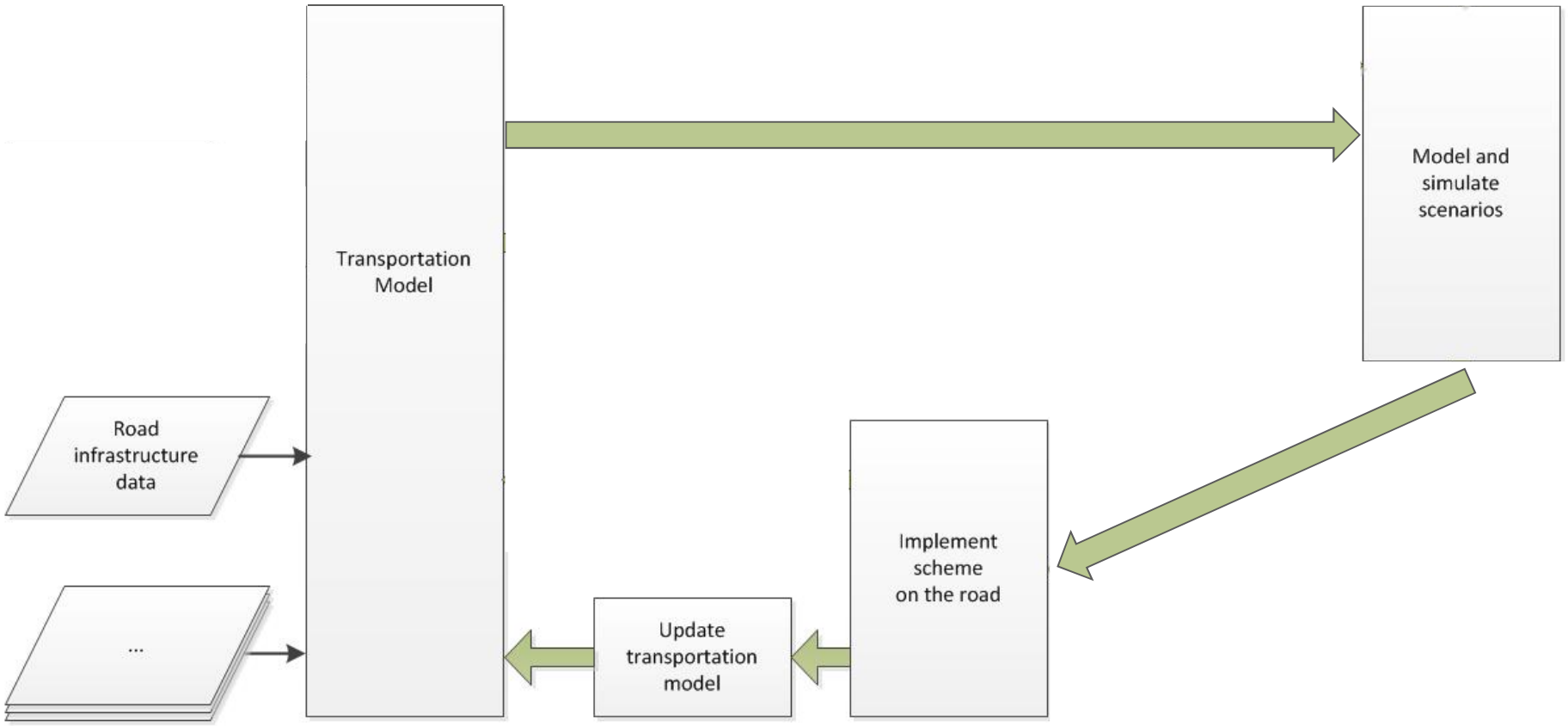
Black Spot Management (BSM)



Road Safety Inspection (RSI)

Application of PTV VISUM Safety

INTEGRATED ROAD SAFETY MANAGEMENT PROCESS



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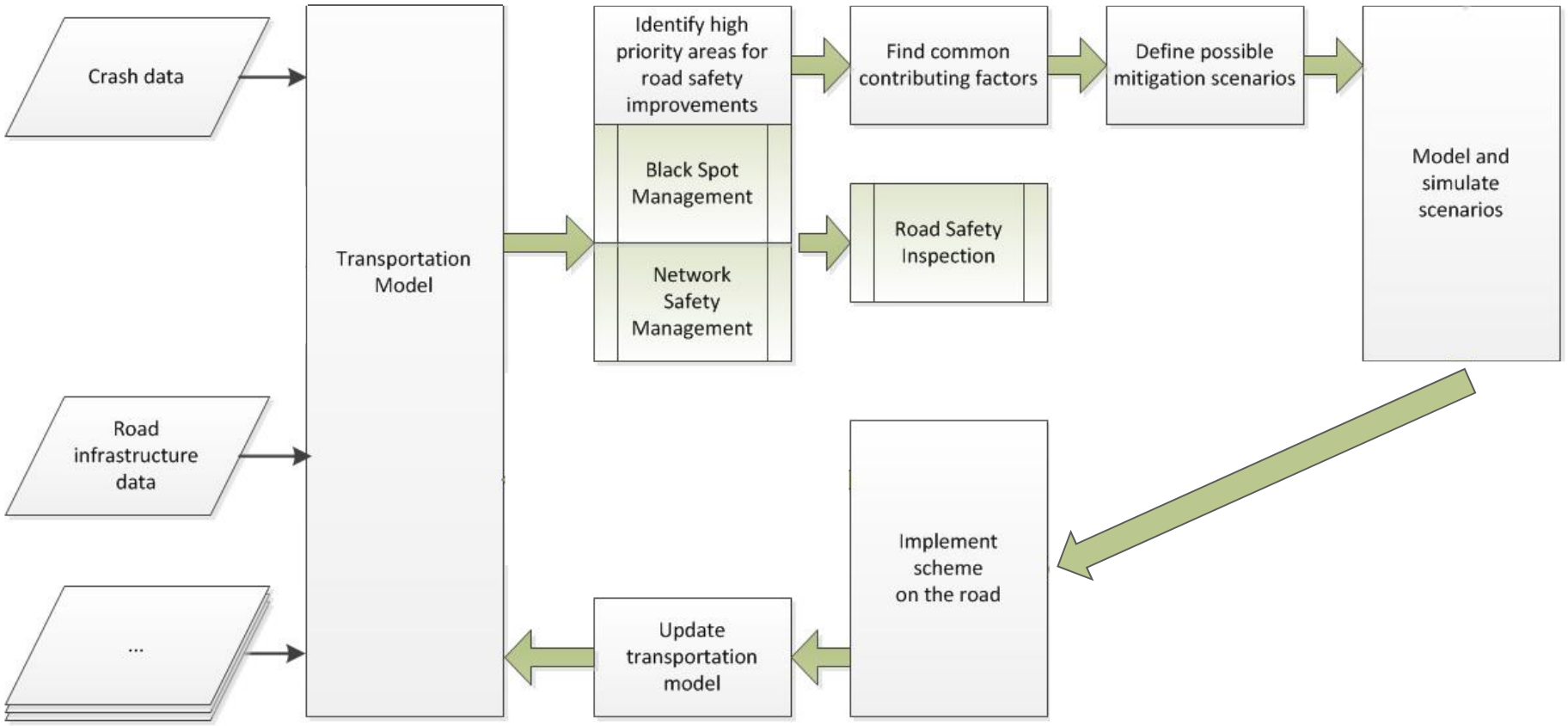

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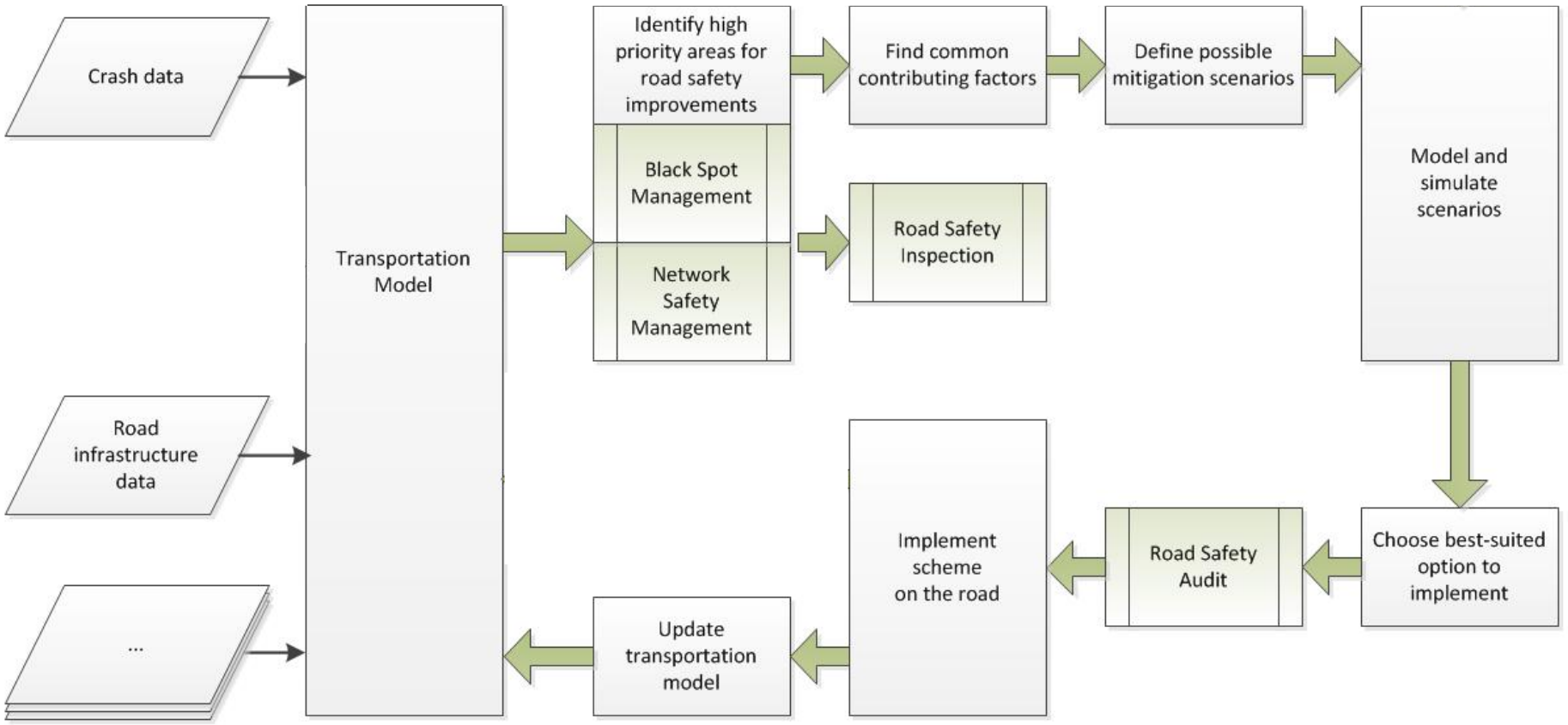

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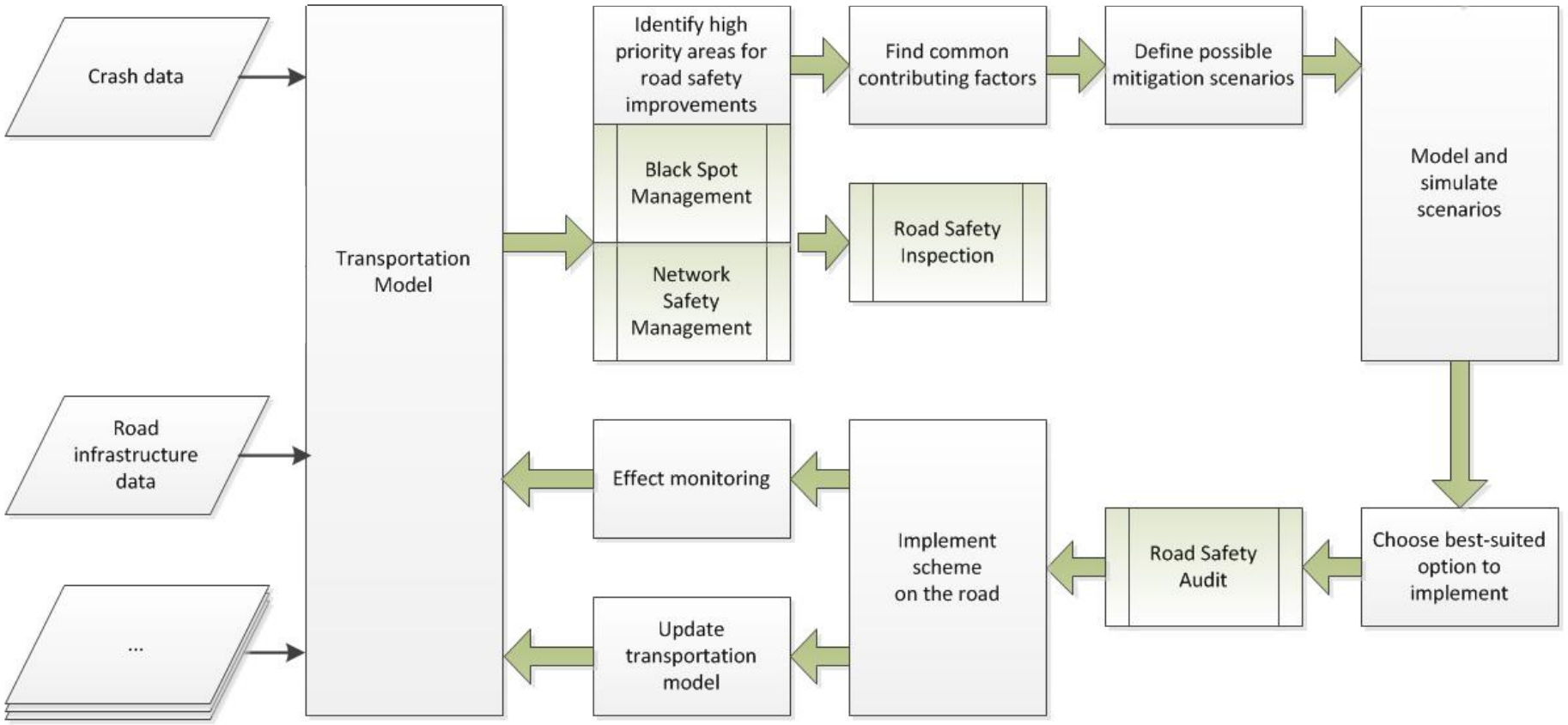

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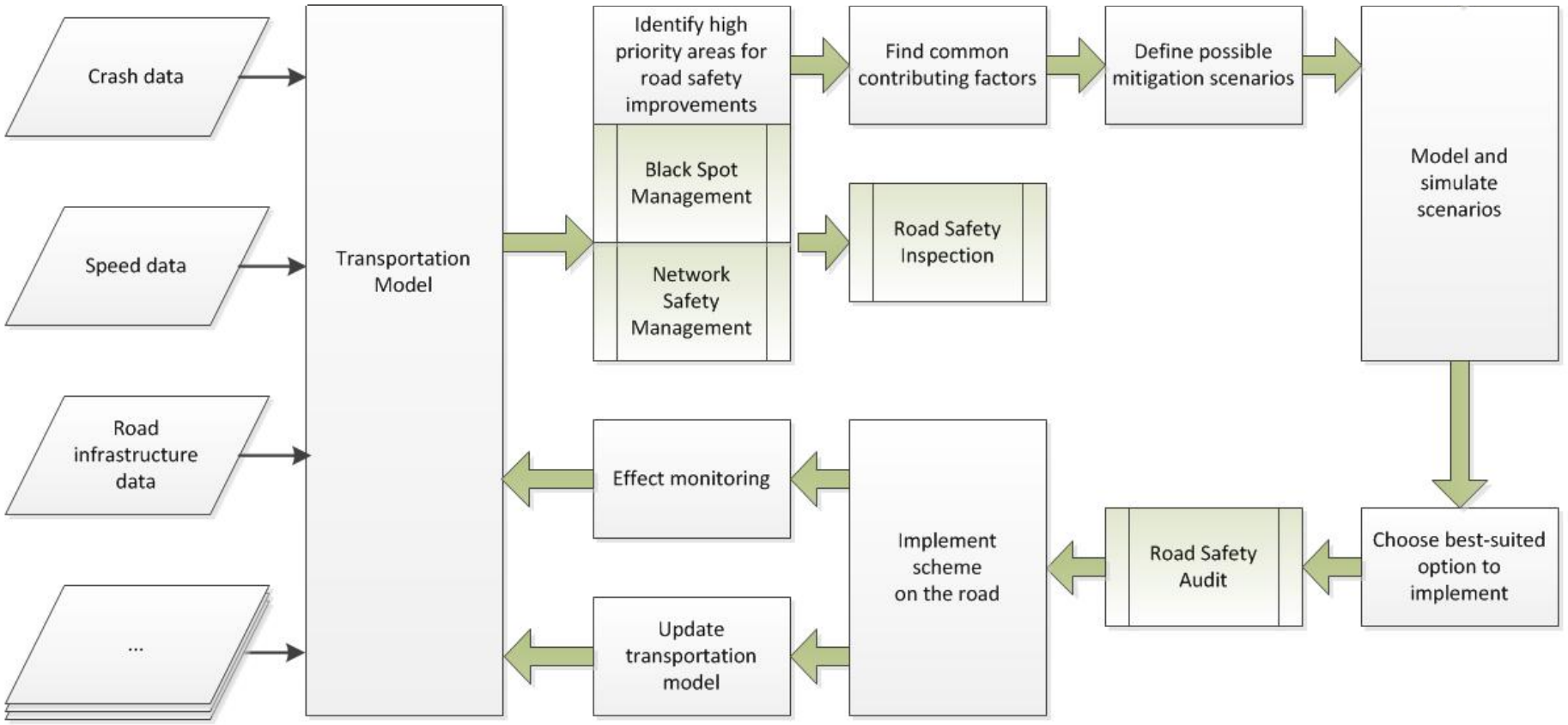

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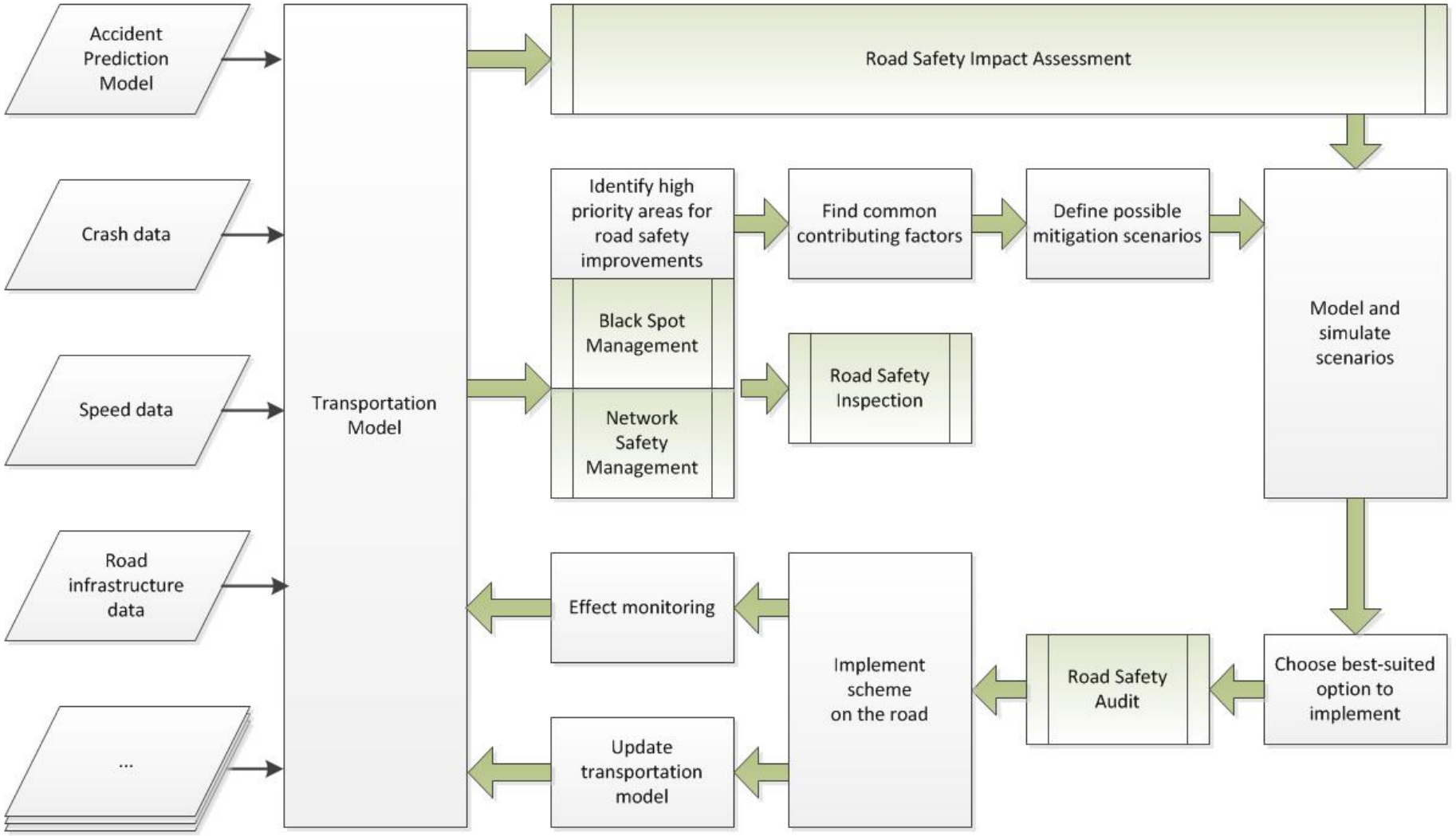

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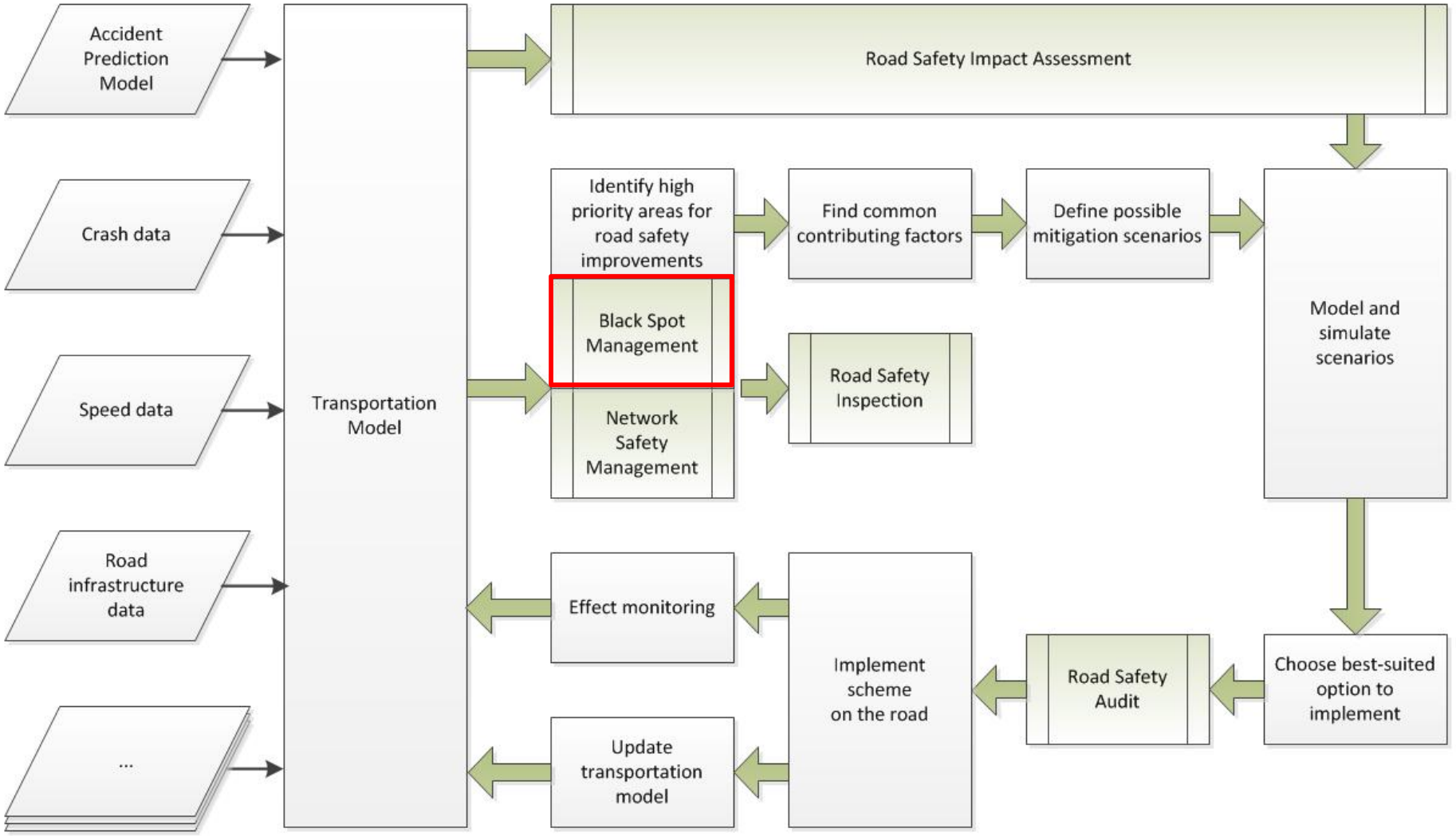
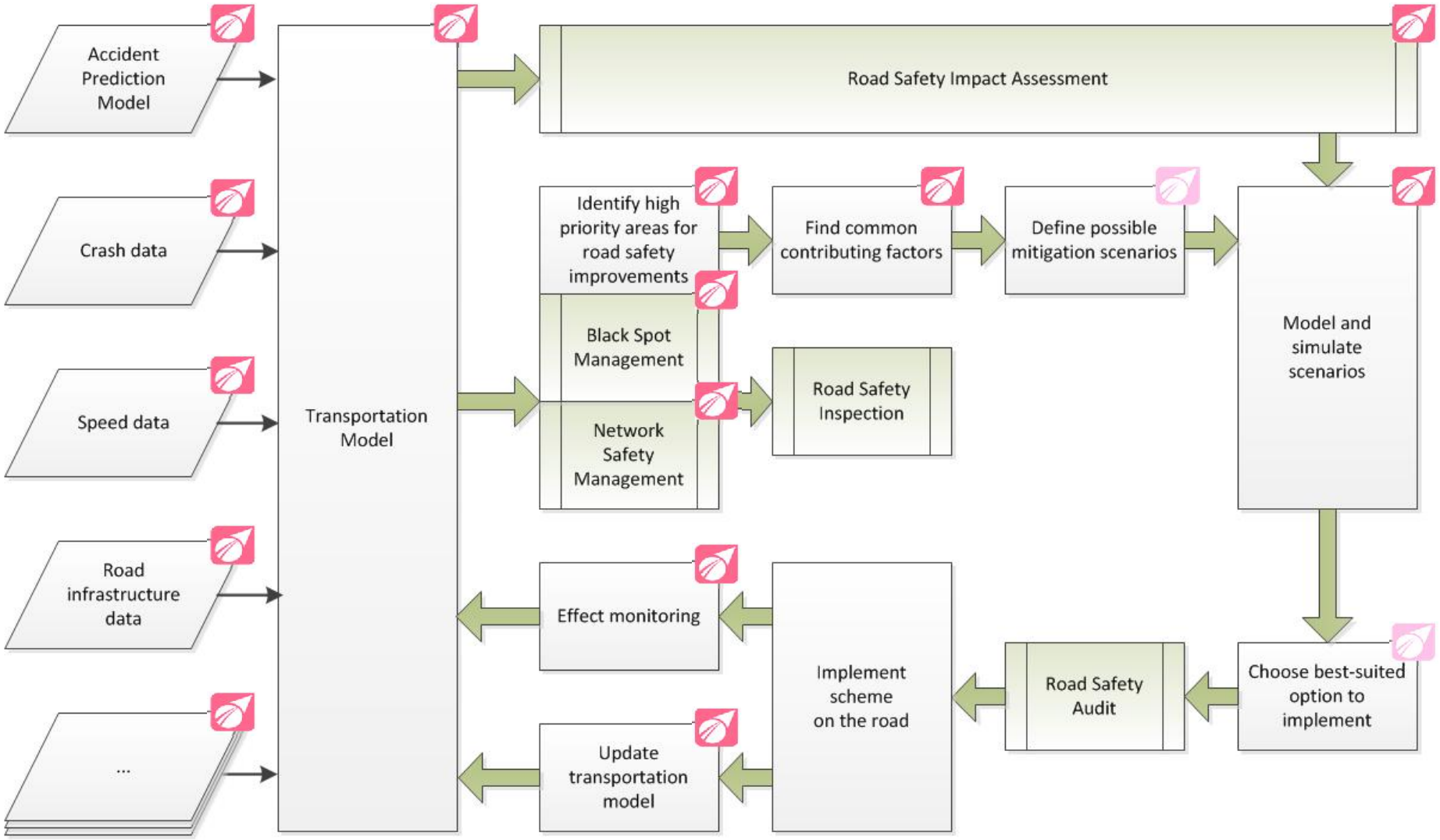


EFFICENCY THROUGH NO DATA- AND TOOL BOUNDRIES



INTEGRATED ROAD SAFETY MANAGEMENT

Road administrations need to take action….

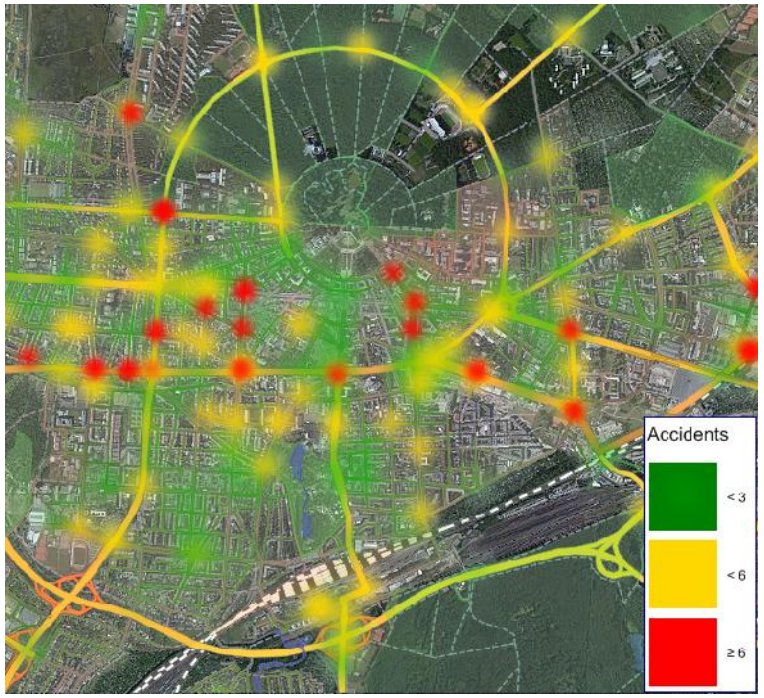
Black Spot Management

(BSM)

- Look for crash accumulations (black spots).
- Analyze similarities.
- Find countermeasures

Workflow requirements:

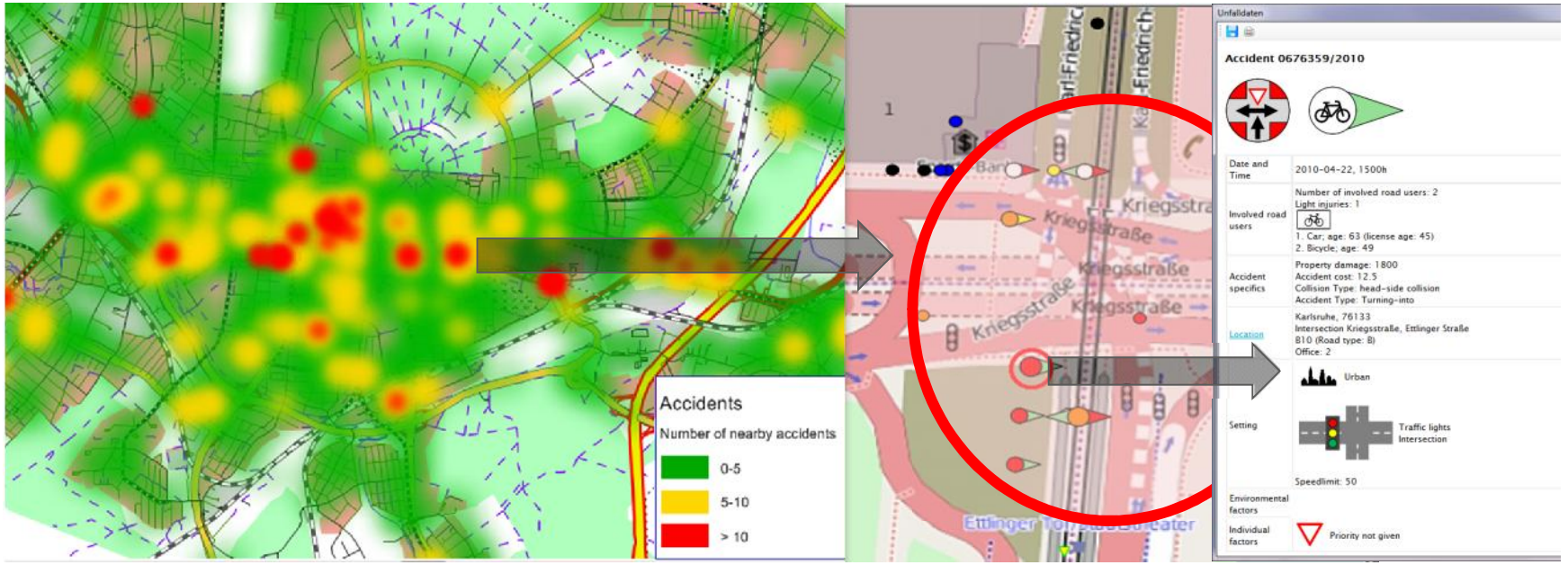
- *Crash data*
- *road network*
- *Analyzing tool*



IDENTIFY HIGH PRIORITY AREAS

Black Spot Management (BSM)

- Macro view
- Small scale high risk sites / hot spots (spots/intersections or lines/road sections)



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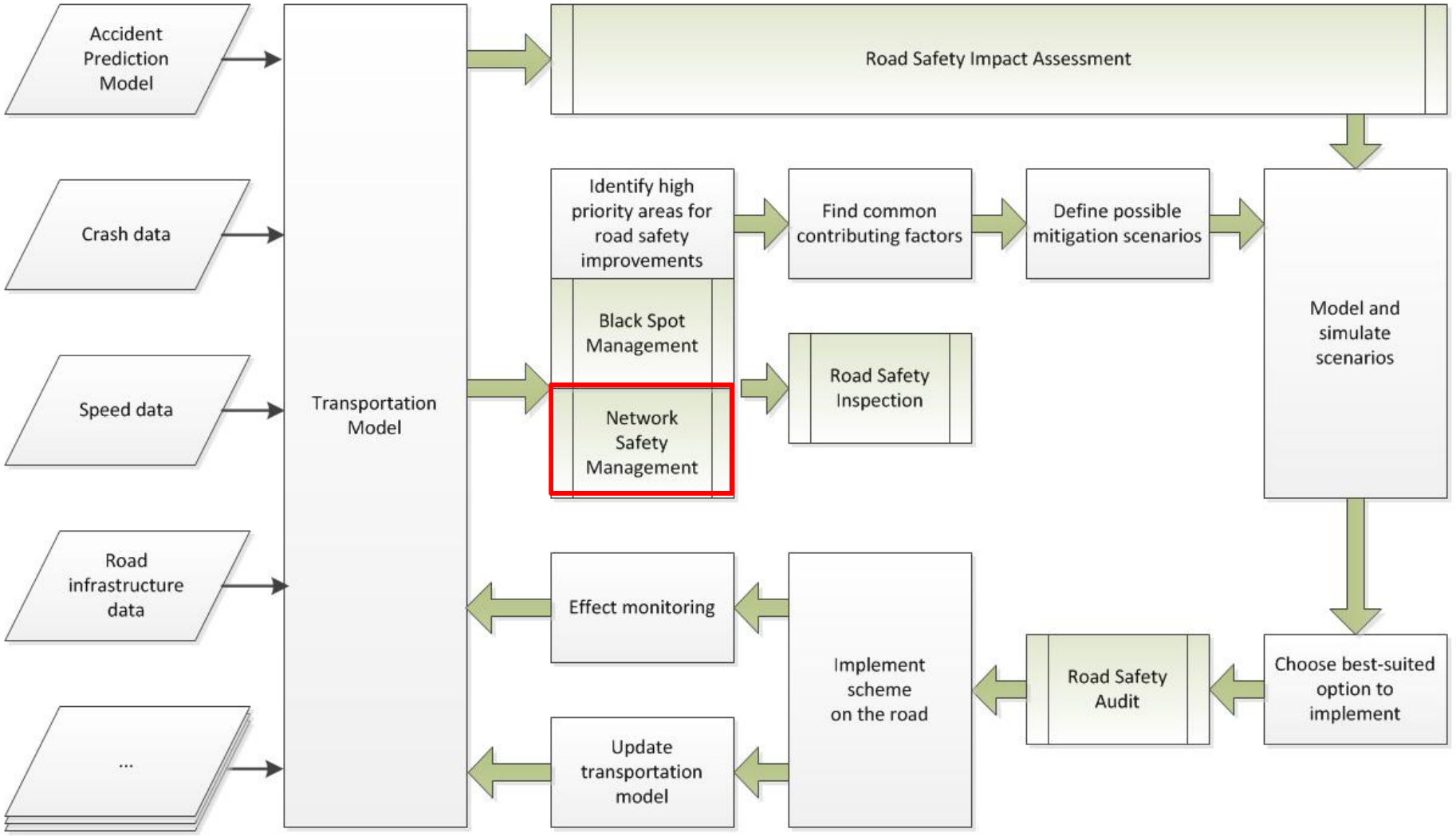
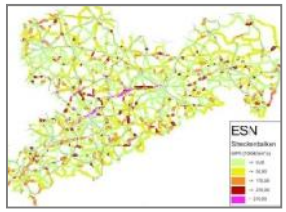


INTEGRATED ROAD SAFETY MANAGEMENT

Road administrations identify “need for action”….

Network Safety Management

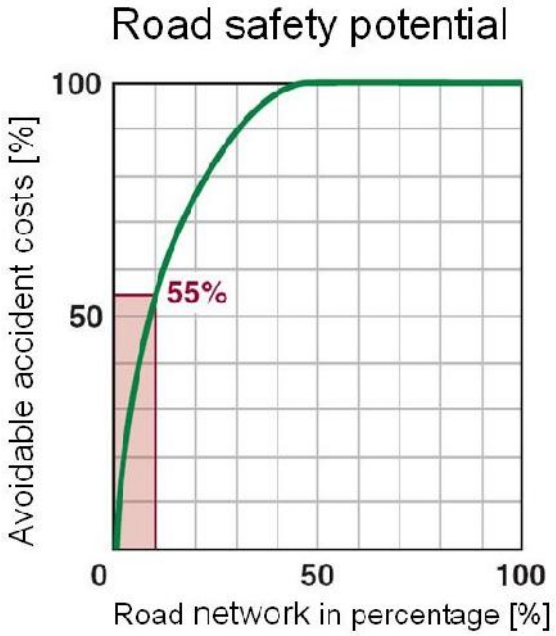
(NSM)

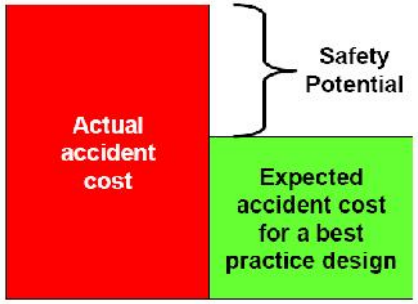


- Road traffic planning based on macroscopic safety situation.
- Ranking of road segments in terms of high risk sections and severity
- Describing safety potential = areas with promising high crash savings .

Workflow requirements:

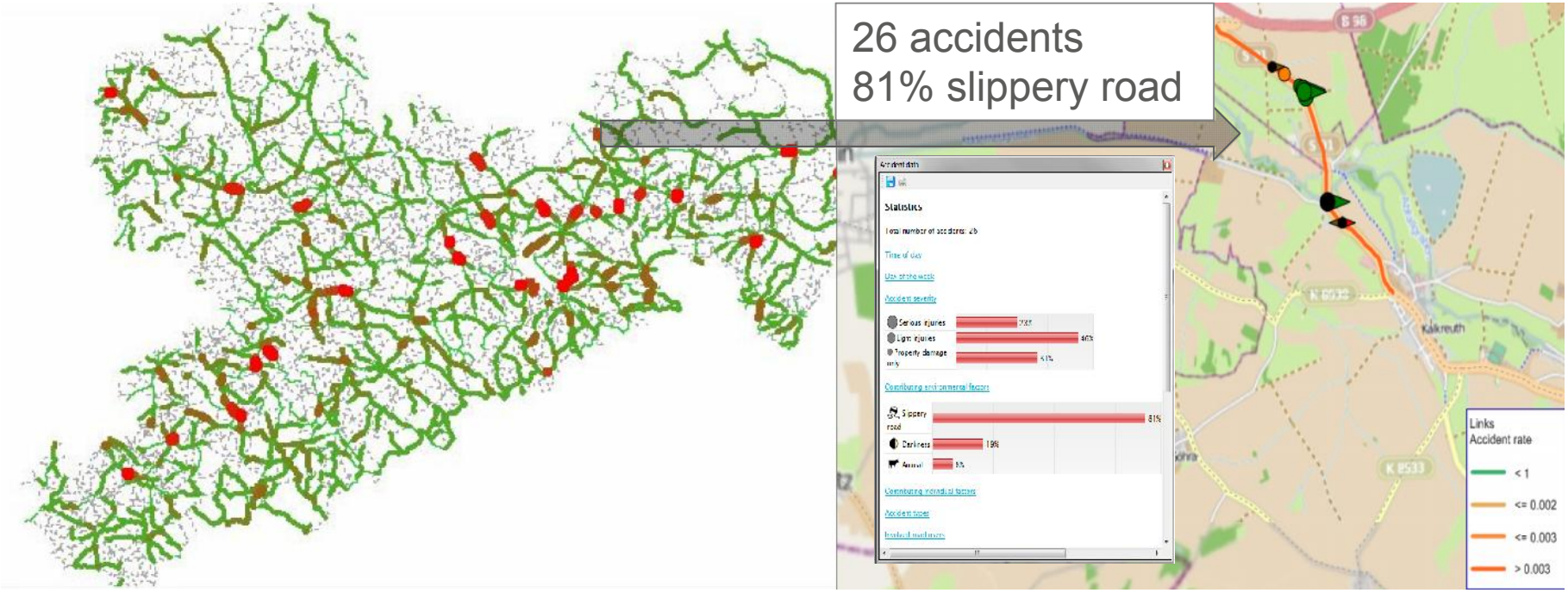
- *Crash data*
- *Road network and model*
- *Analyzing tool*





IDENTIFY HIGH PRIORITY AREAS

- Network Safety Management (NSM)
  - Macroscopic view on the entire network
  - Ranking of high risk sections in the jurisdiction



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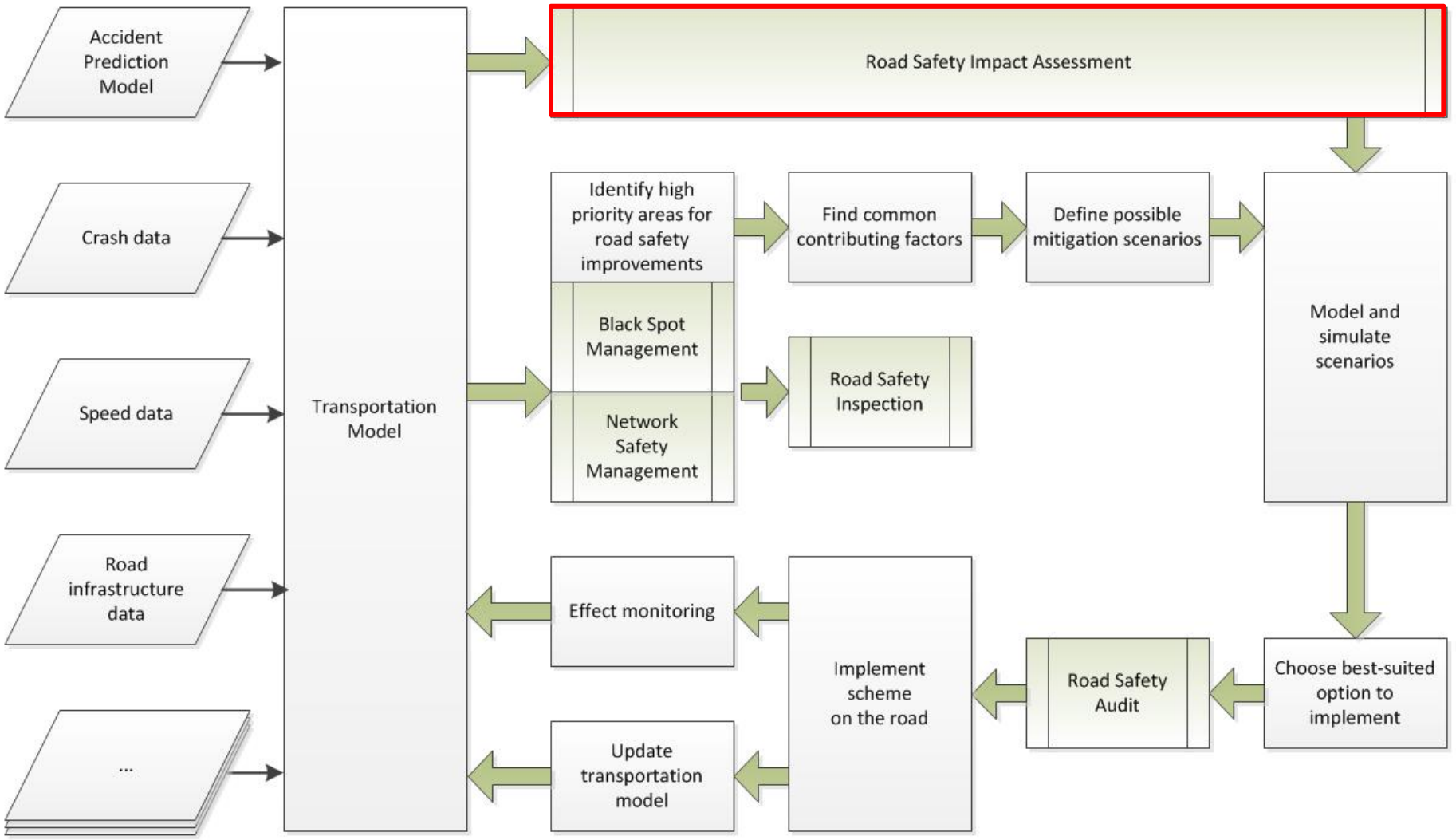
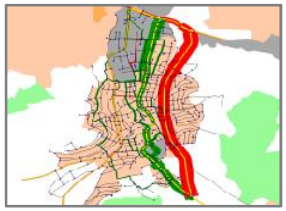


SAFETY PREDICTION IN INTEGRATED ROAD SAFETY MANAGEMENT

Road Safety Impact Assessment

(RIA)



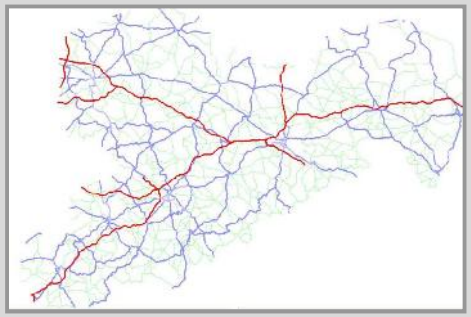
Strategic optimization based on safety forecast

- Assess effects of planning and reconstruction projects on road safety (forecast)
- Enhance traffic demand modeling by accident prediction models (APM)

$$A(P)_s = e^{-20.15} \times L^{1.03} \times AADT^{0.56} \times v_m^{3.82} \times e^{UI}$$

APM

+



Road Network

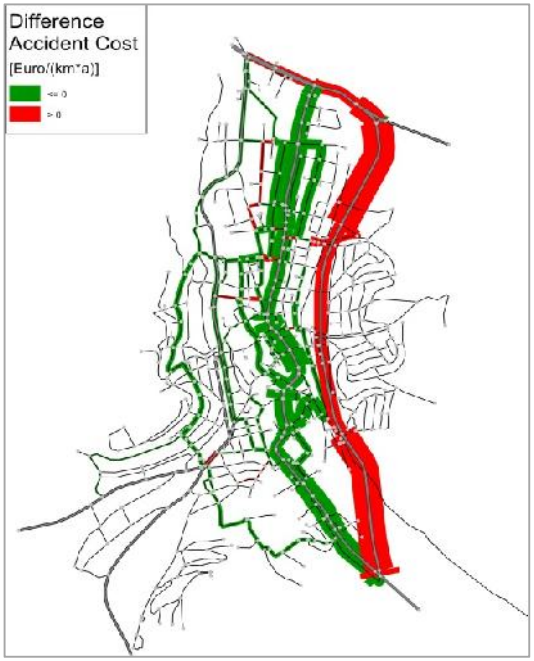
Traffic Forecast

RANKING

(Δ accident cost, cost-benefit-ratio)

	‚do nothing' scenario	Σ xxx.xxx €/a
1.	Δvariant-A	- xxx.xxx €/a
2.	Δvariant-B	- xxx.xxx €/a
3.	Δvariant-C	- xxx.xxx €/a

ROAD SAFETY IMPACT ASSESSMENT (RIA)



Estimation of the effects that changes in the amount and the distribution of traffic volumes have on the road network.

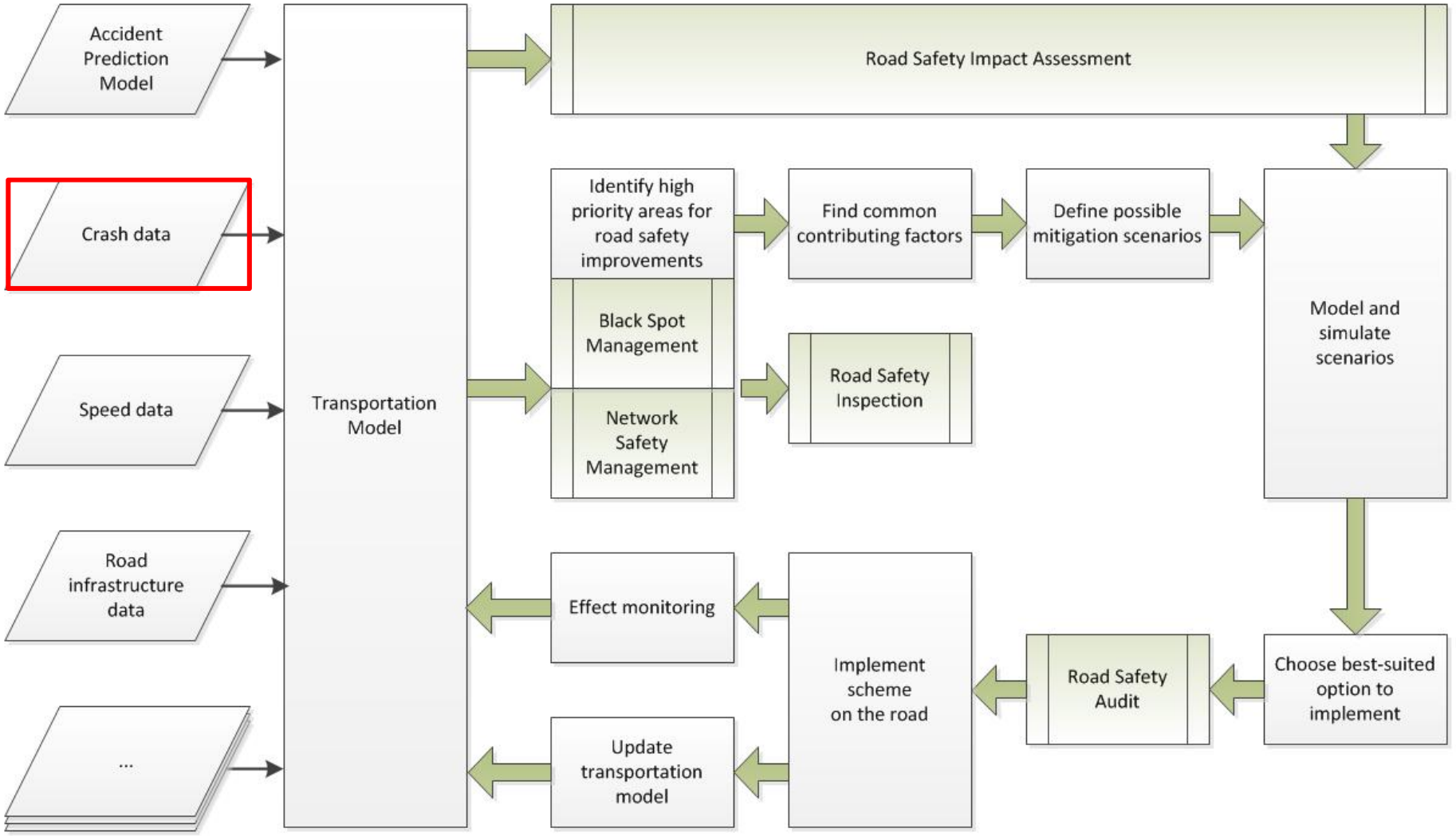
Example of new bypass and the impact on safety:

increase

decrease

of accident costs

INTEGRATED ROAD SAFETY MANAGEMENT PROCESS

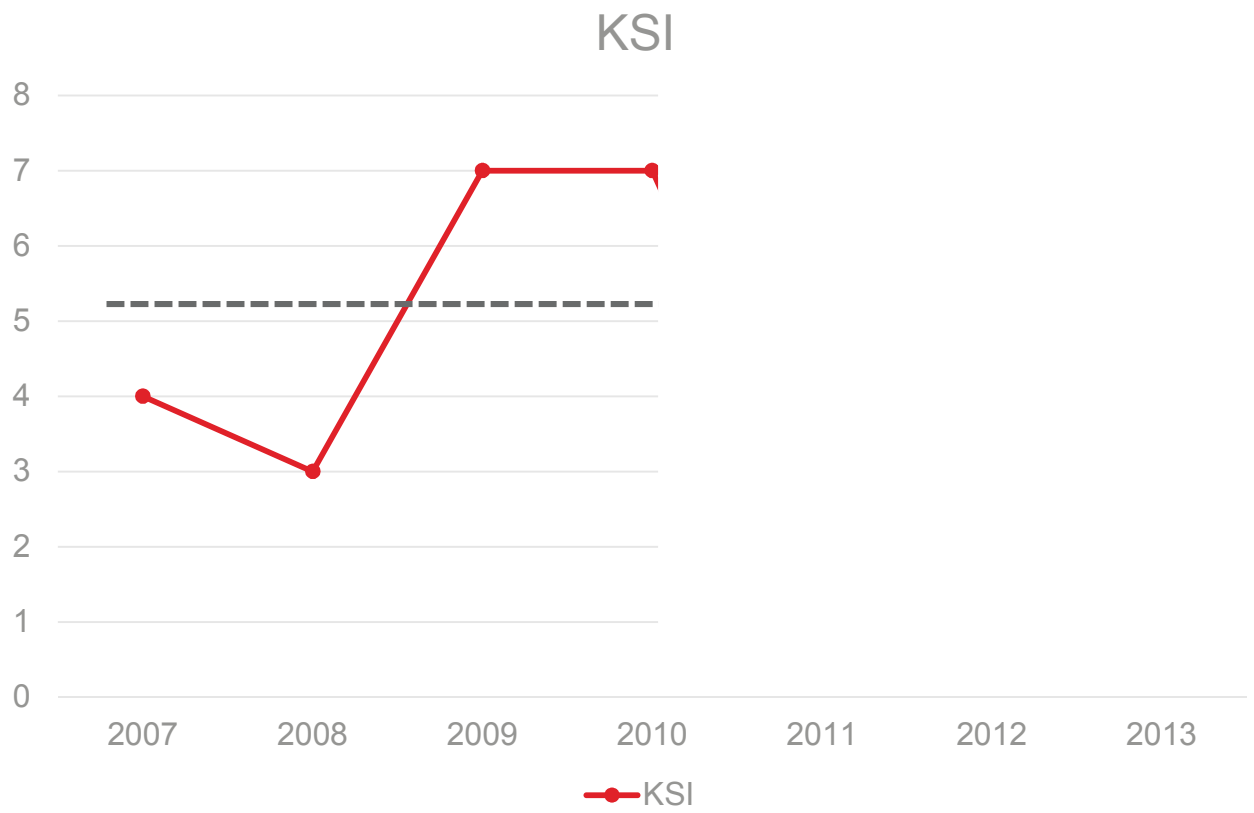


USES OF CRASH DATA FOR ROAD SAFETY

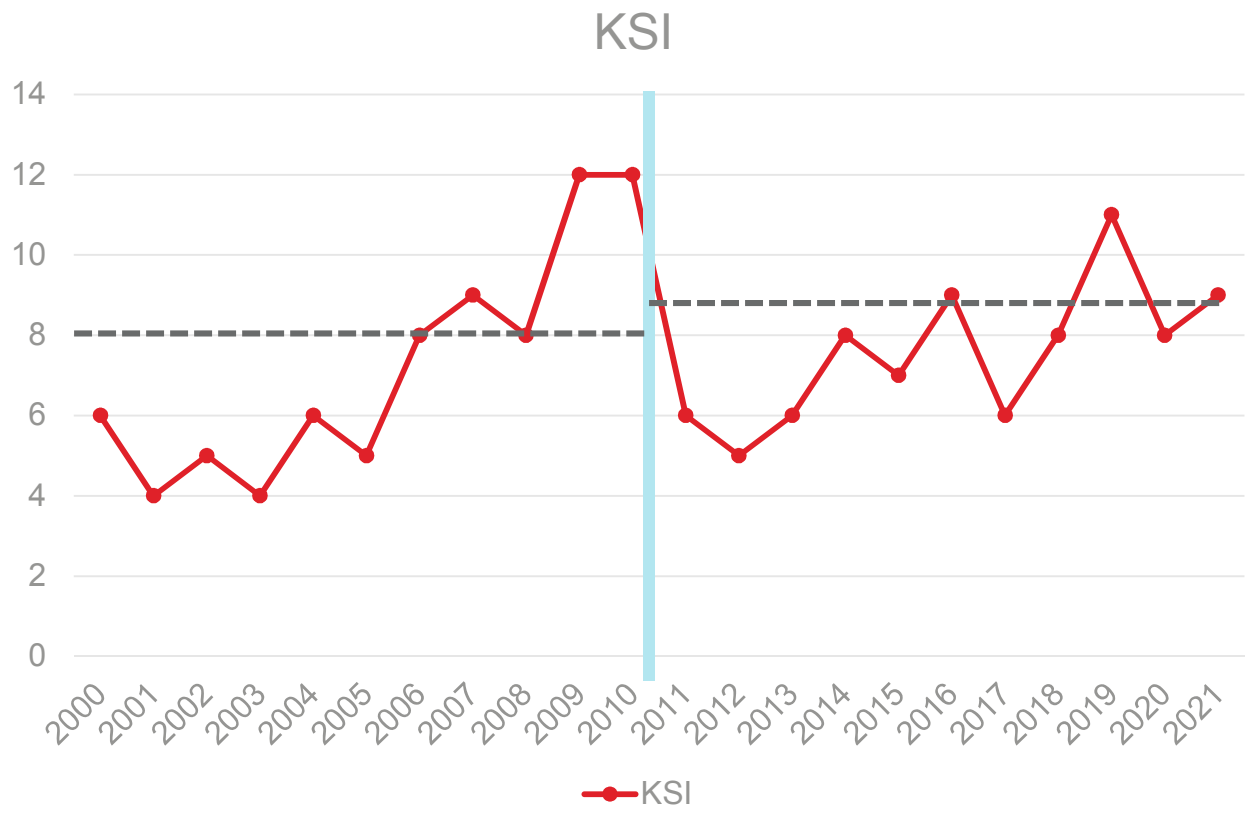
With crash data, the following use cases are possible:

- Black Spot Management
- Network Safety Management
- Consider Safety situation during transportation planning
- Monitor the effects of treatments in terms of road safety
  - …not as easy as it may sound

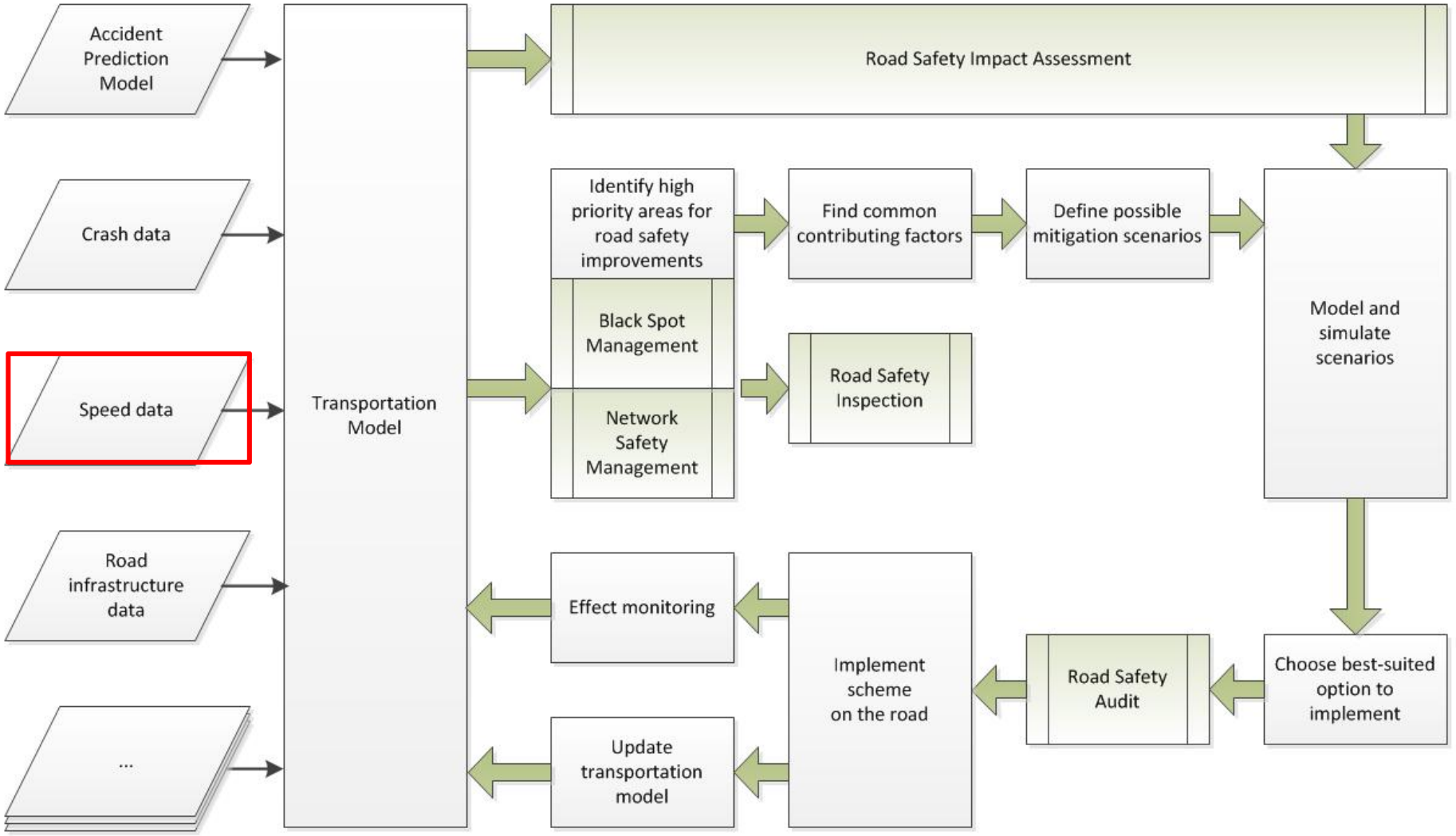
CONSIDERATION OF THE REGRESSION TO THE MEAN EFFECT



CONSIDERATION OF THE REGRESSION TO THE MEAN EFFECT



INTEGRATED ROAD SAFETY MANAGEMENT PROCESS



SPEED DATA AS ADDITIONAL DATA SOURCE FOR ROAD SAFETY INTELLIGENCE

Characteristics of newly available commercial data (“TomTom Custom Travel Times”):

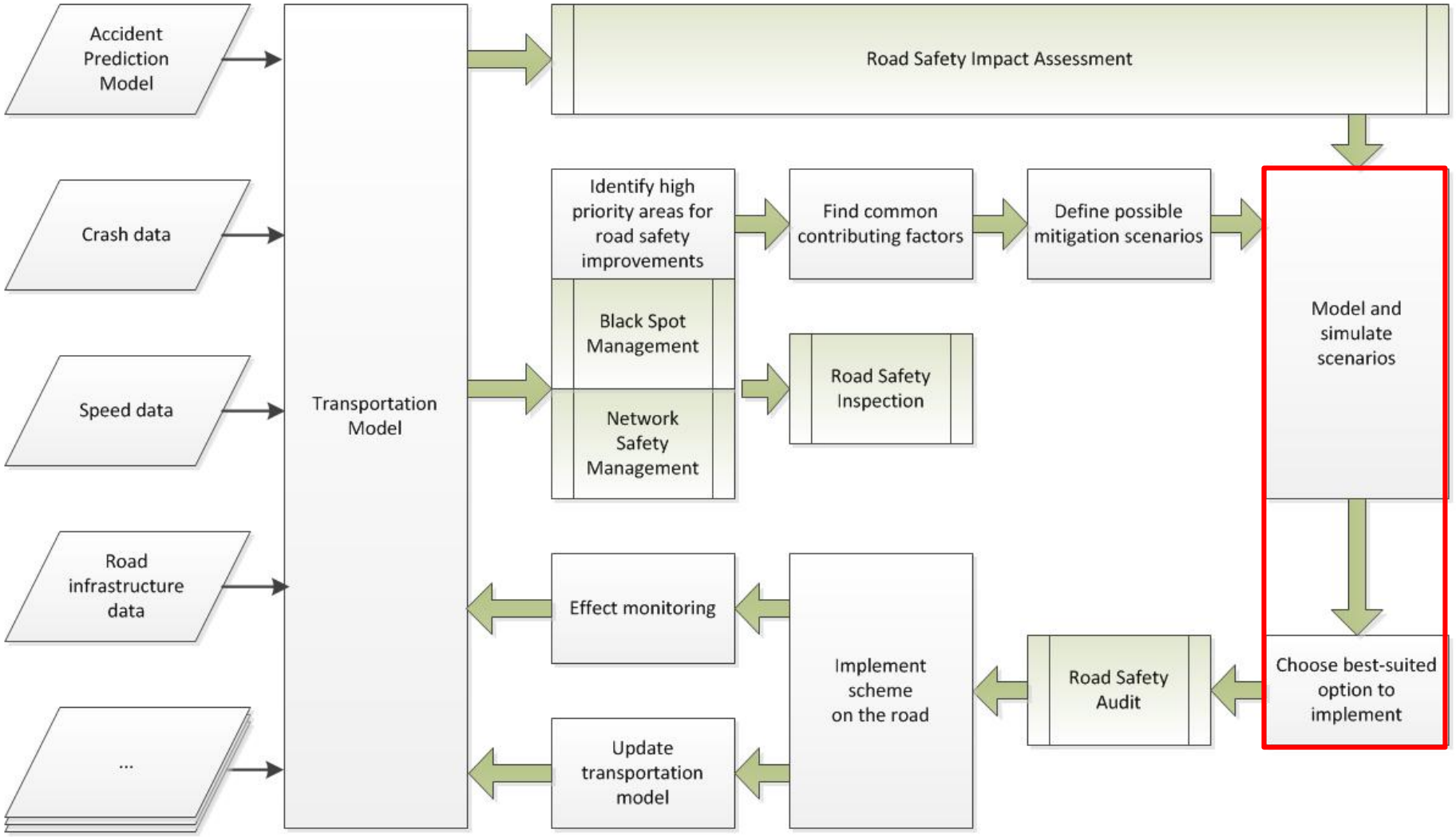
- Coverage: most streets in Europe (“network-wide”) ☑
- Time: 15 minute resolution from ~2008 ☑
- Availability: matter of minutes via web portal ☑
- Ease of use: custom aggregated and analyzed ☑

USES OF CUSTOM SPEED DATA FOR ROAD SAFETY

Possible Use Cases for this kind of speed data for road safety:

- Comparison of design speeds with actual driving speeds
- Assess the effect of road infrastructure changes or speed enforcement tactics on the driving speeds at the site and in its vicinity
- Analyze the general speeding behavior at crash sites where speed is a possible contributing factor
- Check necessity for posting a general speed limit as opposed to time dependent speed limit changes
- Calibration of microsimulations to better model the real driving behavior

INTEGRATED ROAD SAFETY MANAGEMENT PROCESS



MICROSIMULATIONS TO ASSESS SAFETY LEVELS

- Surrogate measures can be used as road safety indicators
  - TTC (time to collision), PET (post encroachment time), deceleration events etc. can be used as surrogates for safety
- Multimodal simulations incl. pedestrians, bikes, busses, trams, heavy goods vehicles etc. possible
- Generate safety comparisons between e.g. intersection design alternatives
- At the same time calculation of regular performance indicators
- PTV Vissim is world market leader

MACROSCOPIC MODELLING TO SUPPORT SAFER PLANING

- Assess the effects of road treatments to increase road safety on overall traffic
- Trend: “new” performance indicators include
  - Safety
  - Walkability
  - “Liveability”
  - Mobility choices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ROAD SAFETY APPLICATION COVERS ALL LEVELS?

RURAL

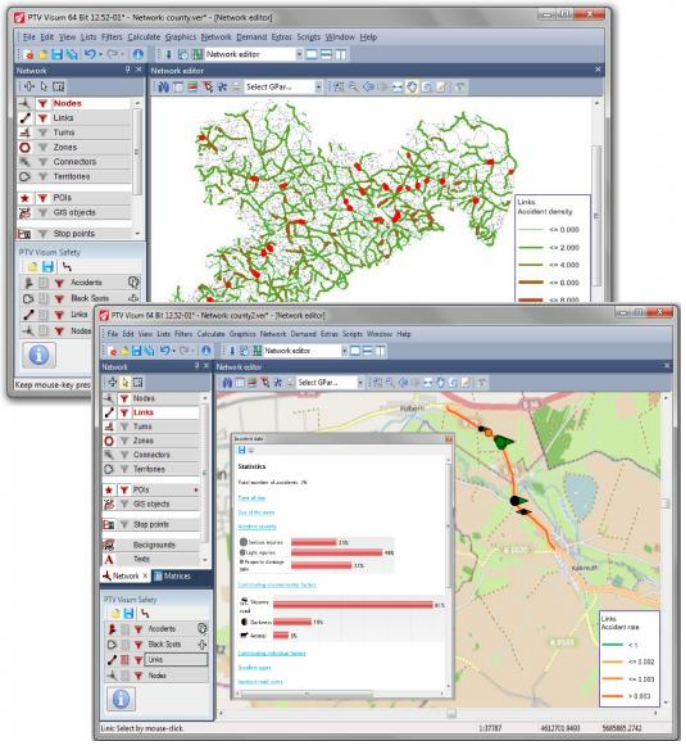
URBAN

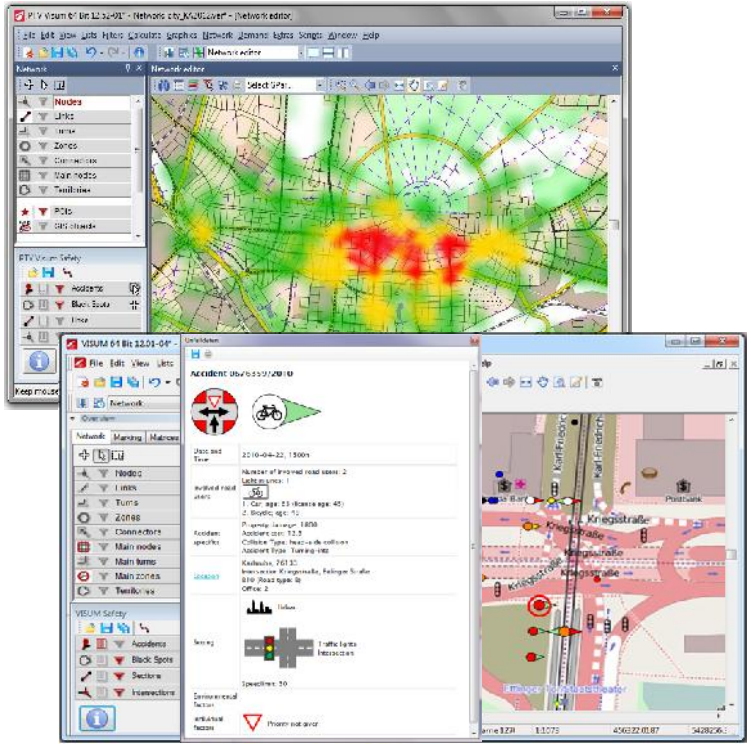
MACROSCOPIC

MICROSCOPIC

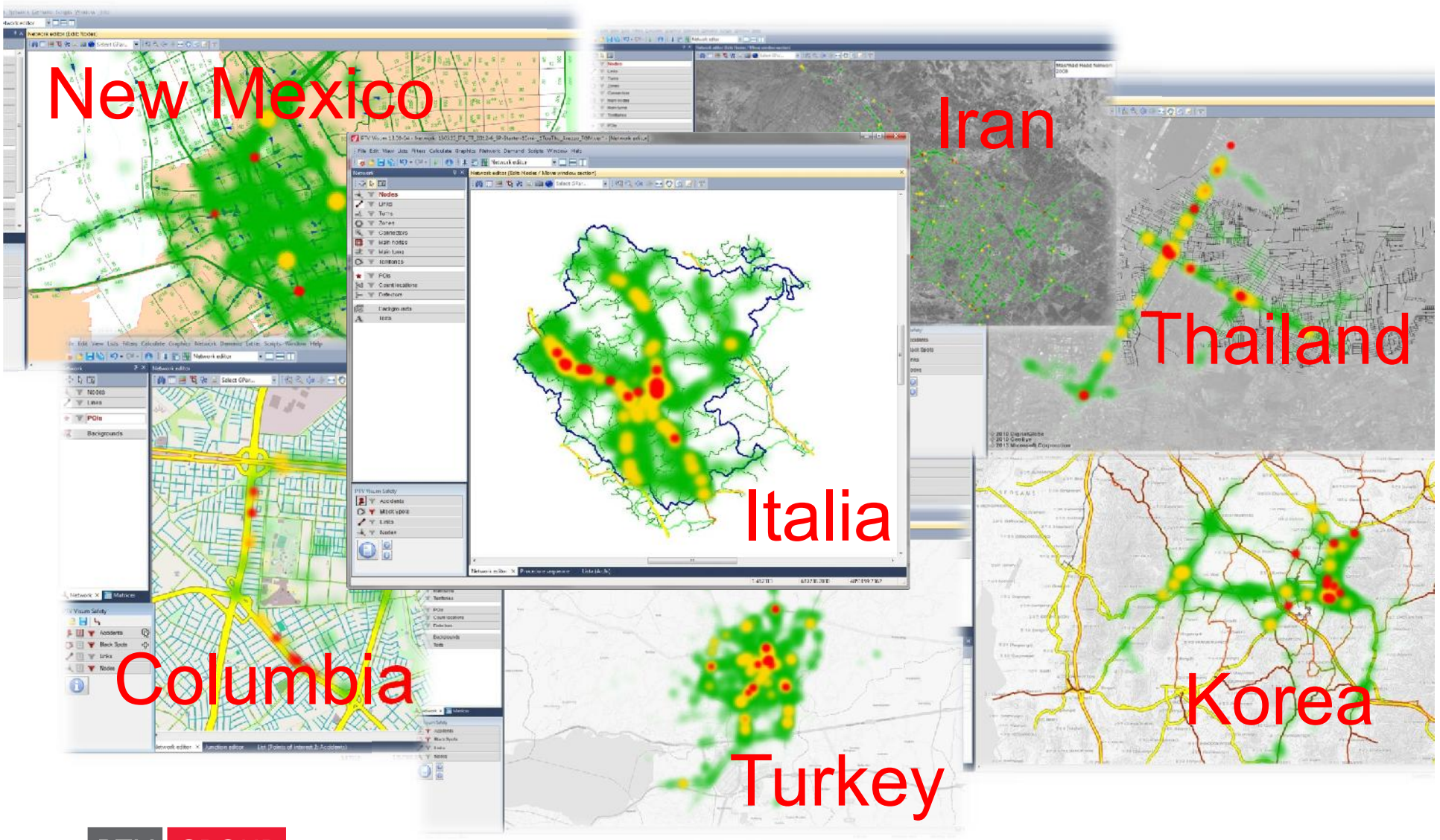
NSM

BSM

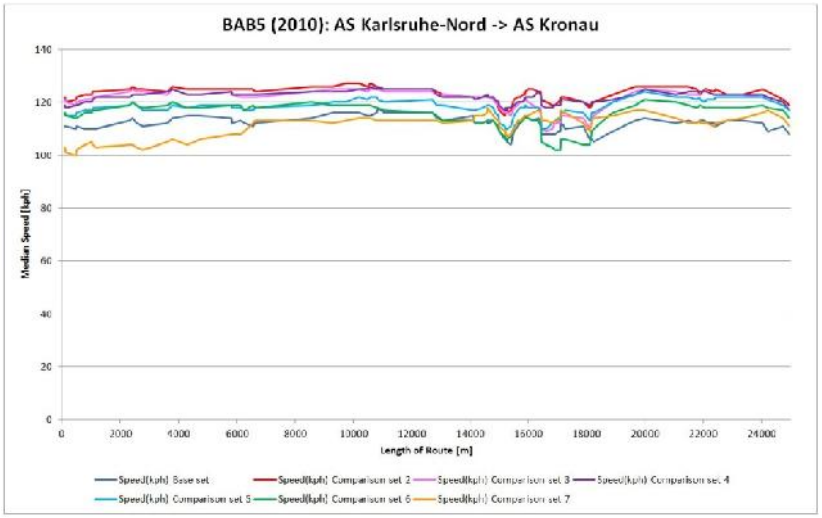


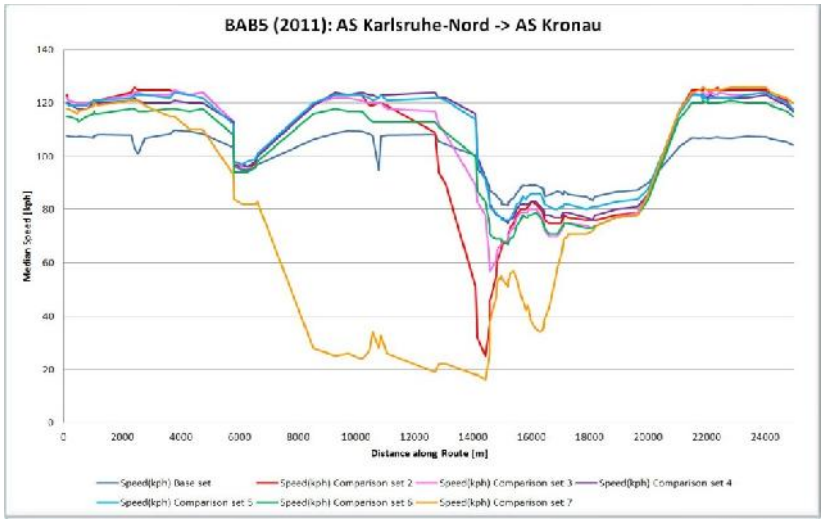


LIBERALIZE ROAD SAFETY INTELLIGENCE WORLDWIDE?

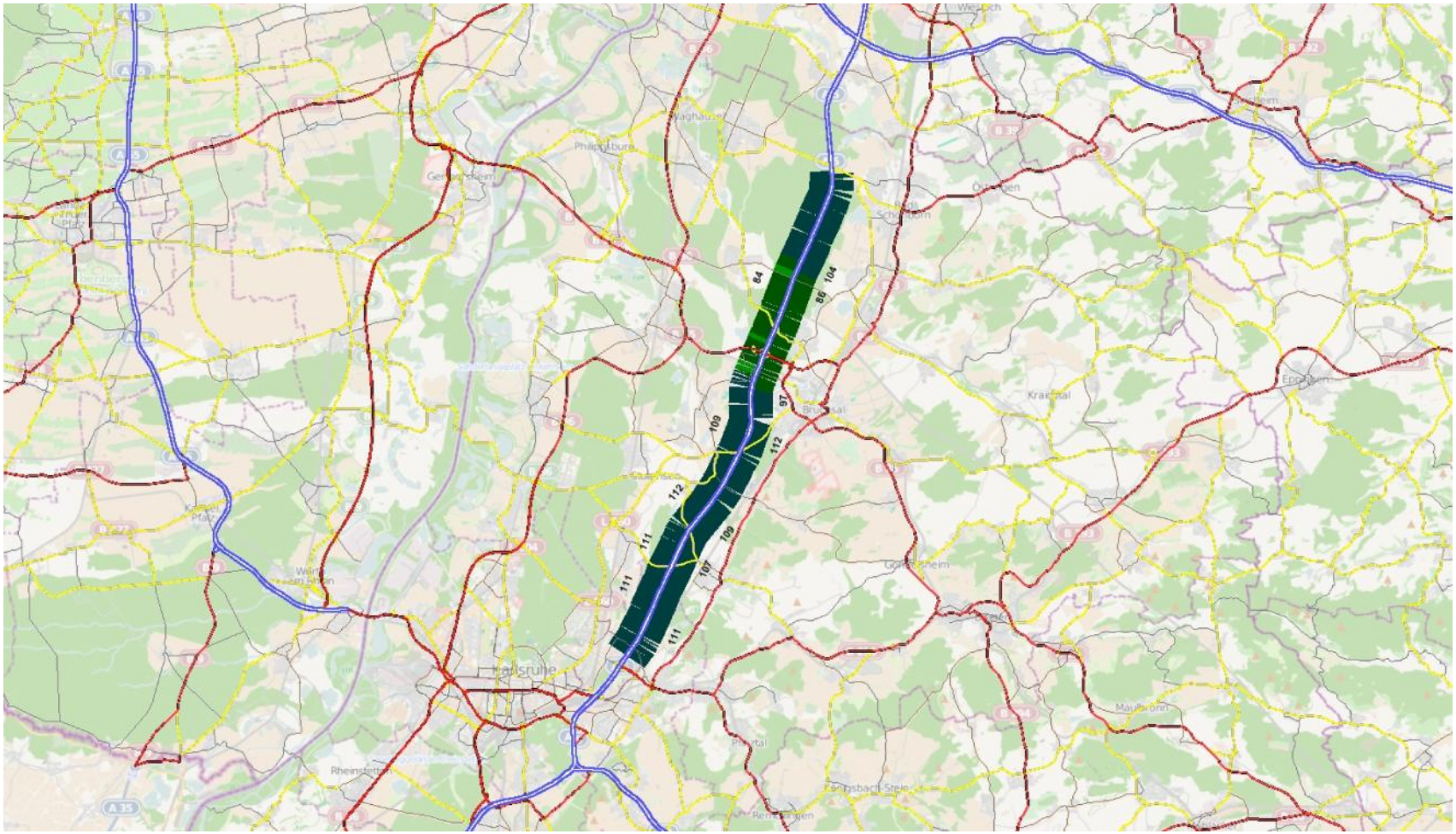


POTENTIAL OF NEWLY AVAILABLE COMMERCIAL SPEED DATA COMPARISONS OF REGULAR VERSUS ROADWORK SITUATION

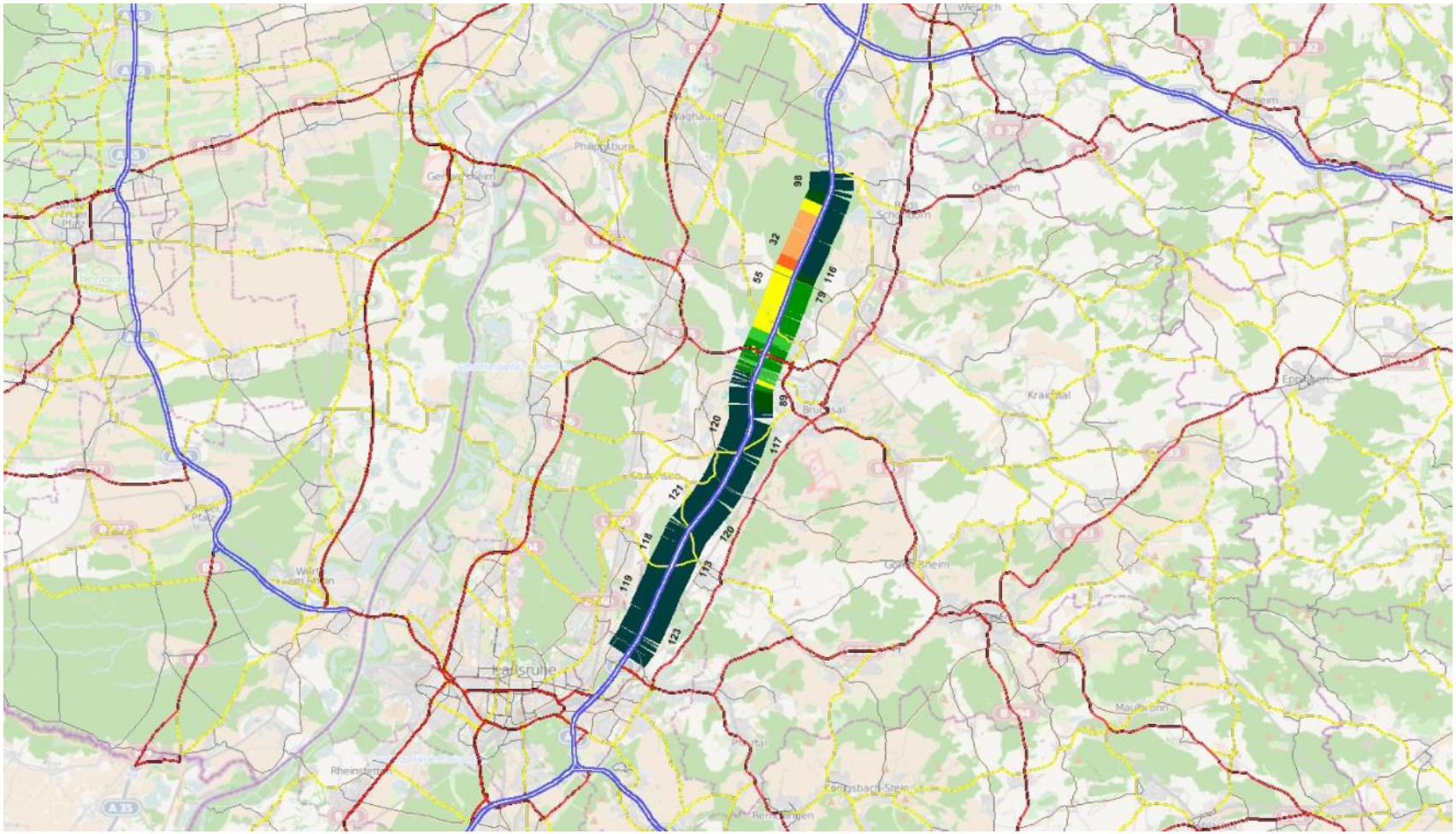




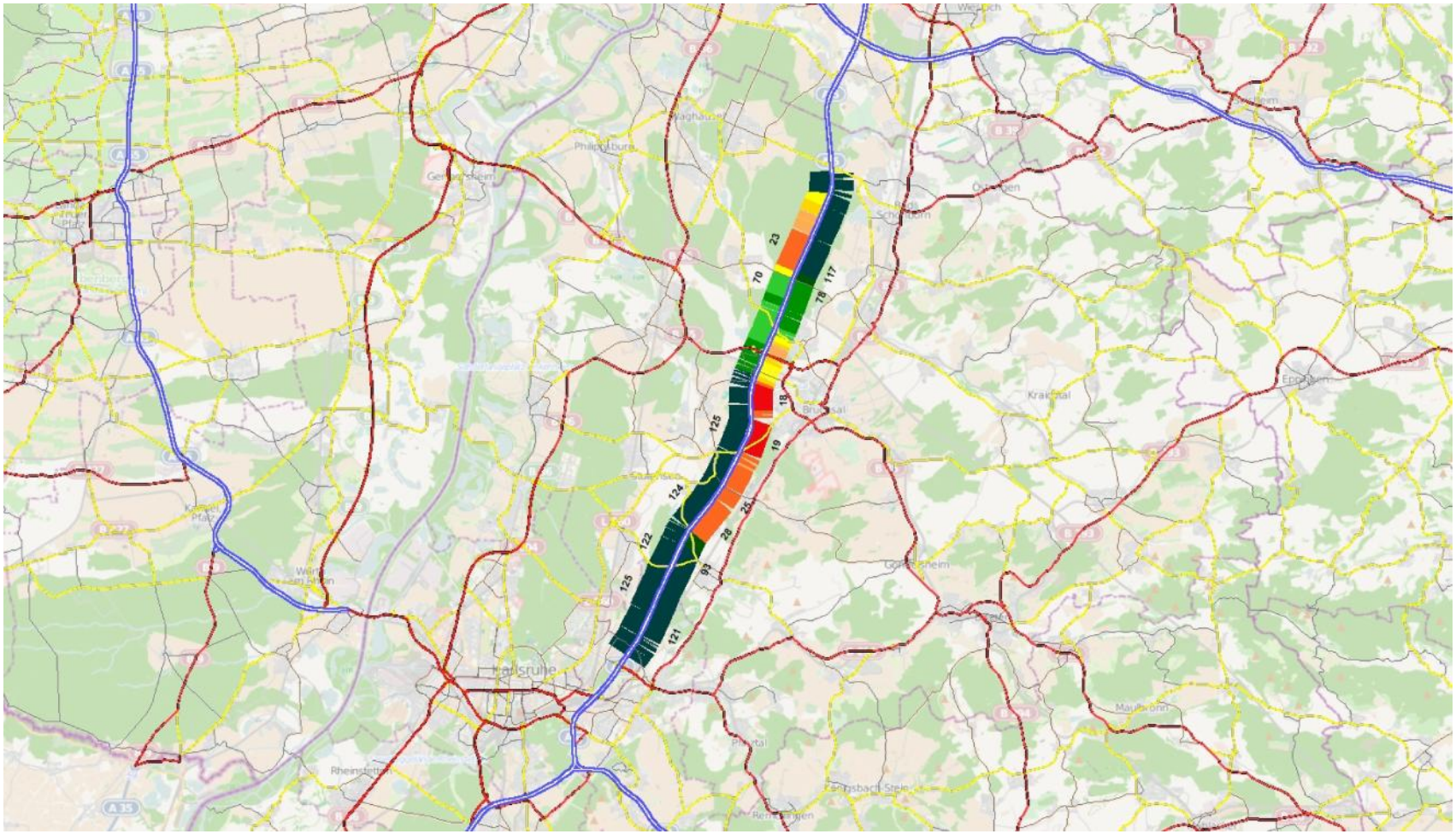
FREE FLOW



WORKING DAY – MORNING PEAK



FRIDAYS – EVENING PEAK



USE OF SPEED DATA FOR CRASH ANALYSIS IN ITALY AREZZO