European Transport Safety Council

Road Safety Performance Index Annual Conference 2024

LABORATÓRIO NACIONAL DE ENGENHARIA CIVIL

SELF-EXPLAINING ROADS AND FORGIVING ROADSIDES

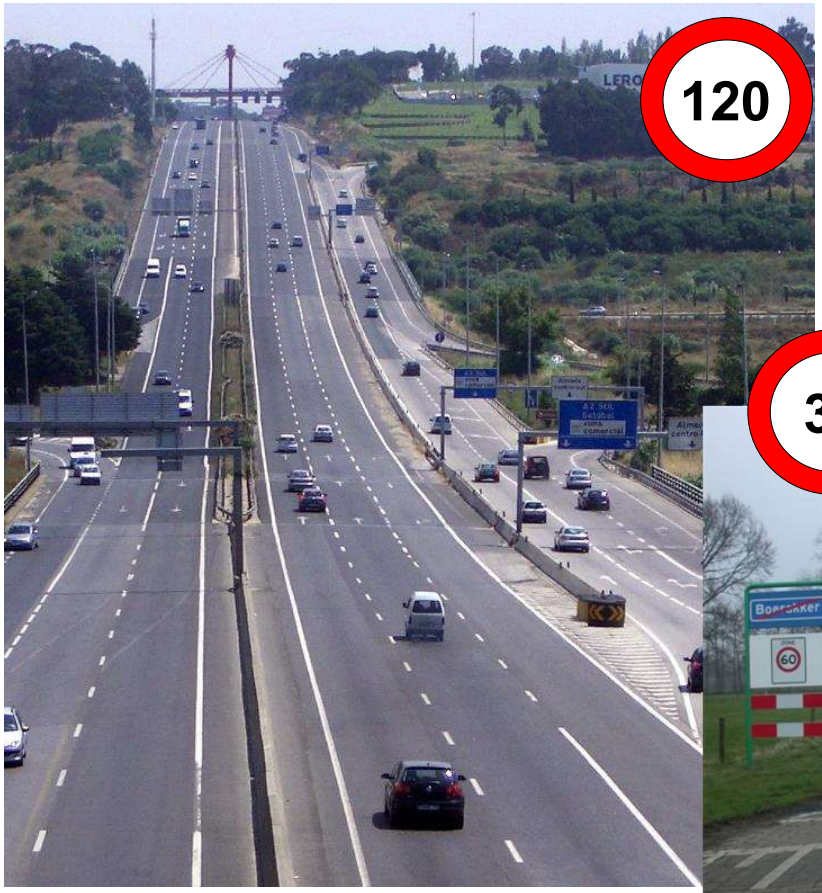
João Lourenço Cardoso
(Laboratório Nacional de Engenharia Civil)

Definitions

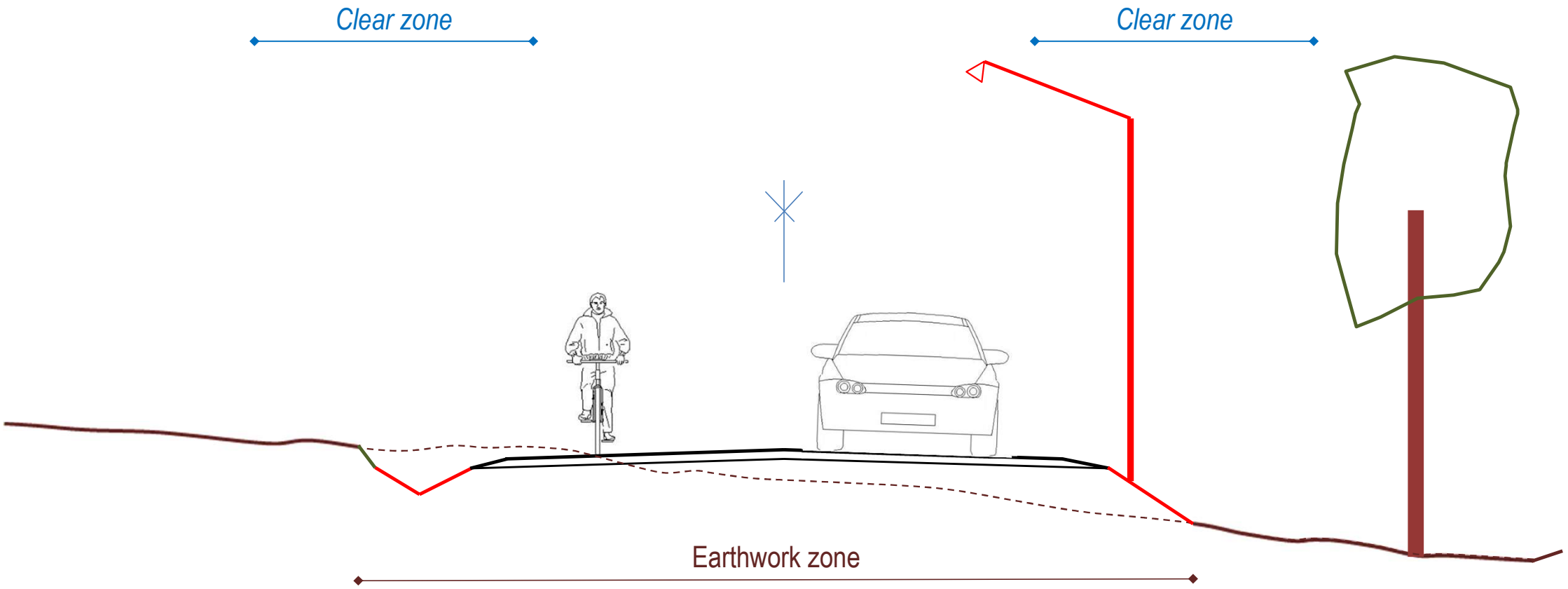
- Self-explaining roads
  - Road system in which road users' expectations created by each road environment are implicitly in line with the safe and appropriate behaviour for each road.

- Forgiving roadsides
  - Roadside environment (and median, on dual carriageway roads) does not contain dangerous elements (e.g., trees, poles and steep embankment or cut slopes) that will seriously injure or kill road users in the case their vehicles have unplanned trajectories off the carriageway.

Self-explaining roads

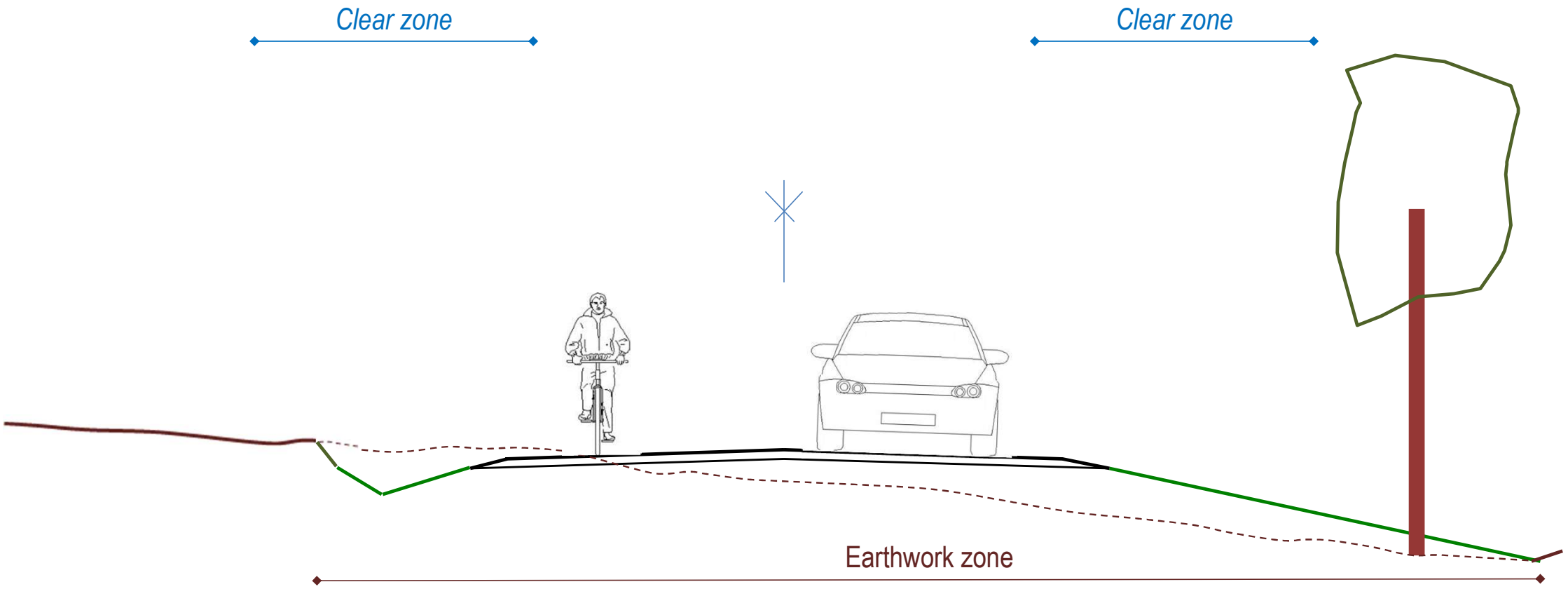


Forgiving roadsides
Improvable normal situation



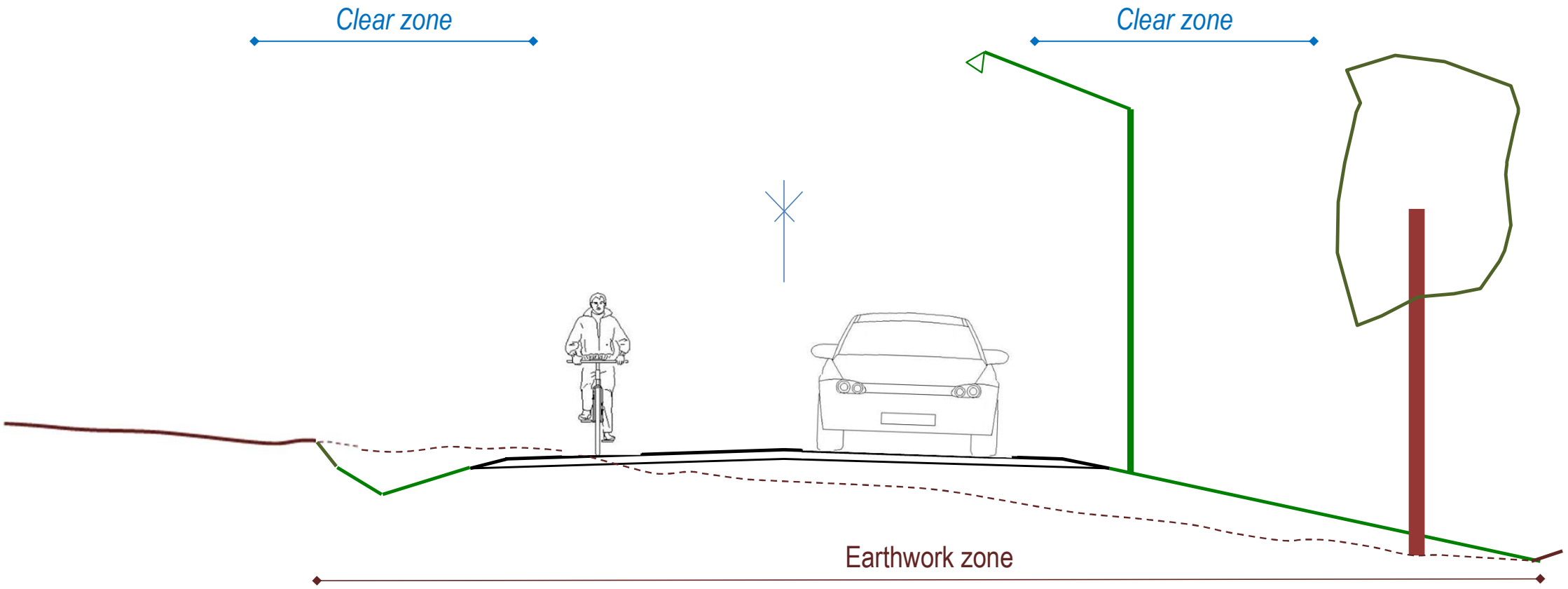
Forgiving roadsides interventions

Remove obstacles – gentle slopes and no obstacles on *clear zone*



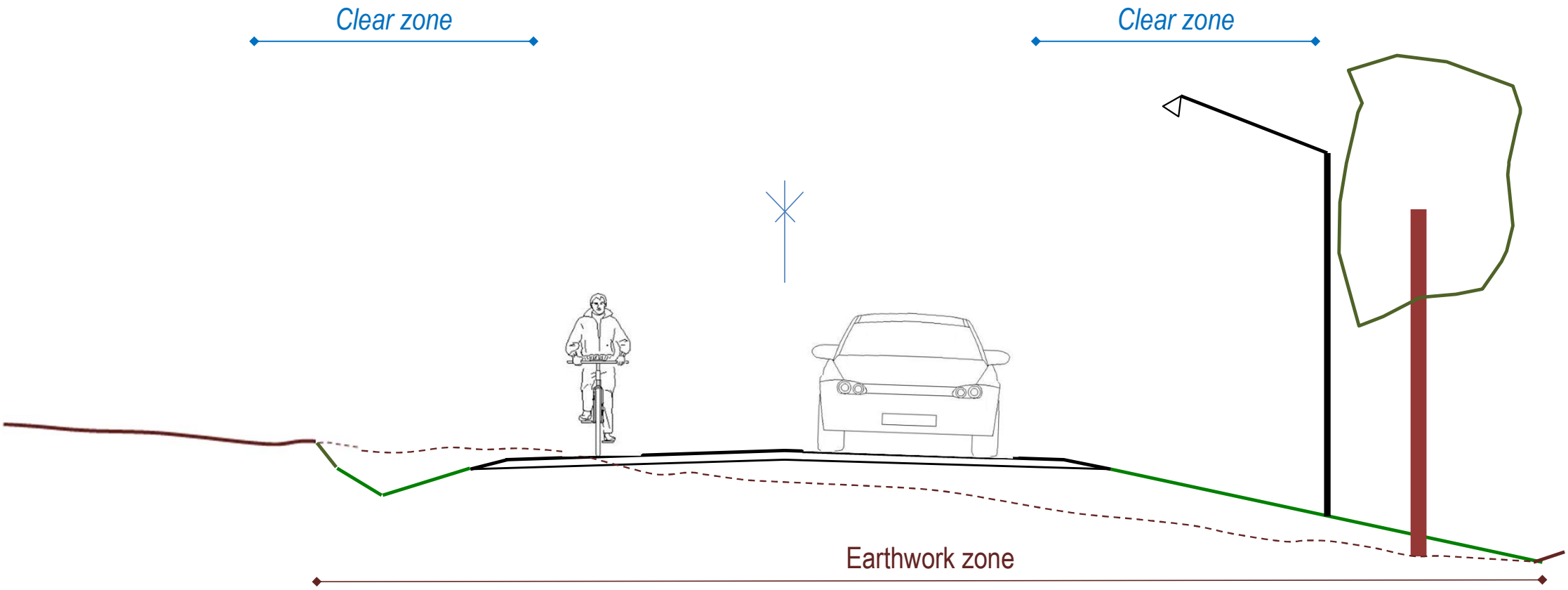
Forgiving roadsides interventions

Substitute dangerous obstacles by passive safe ones



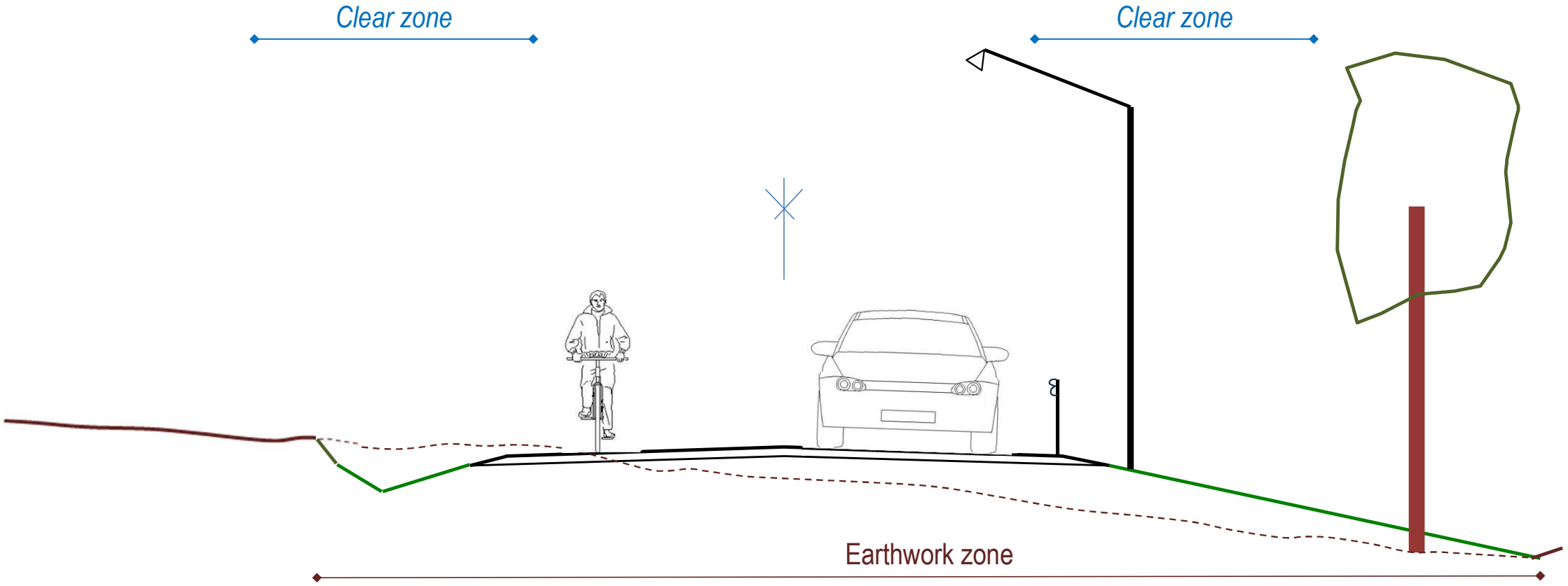
Forgiving roadsides interventions

Move dangerous obstacles out of *clear zone*

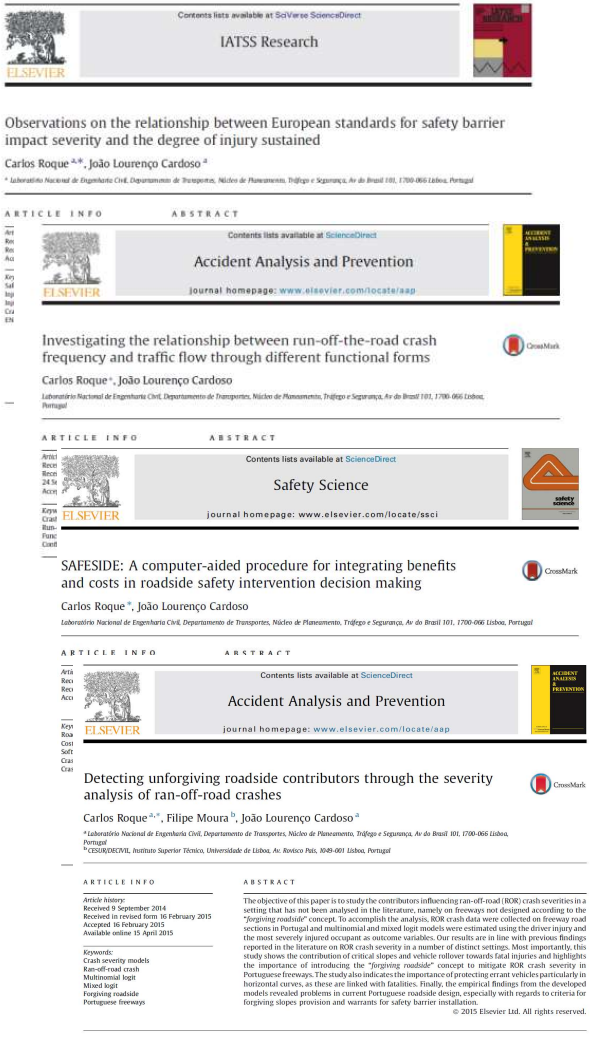


Forgiving roadsides interventions

Protect road users with a standardized road restraint system



Forging roadsides



Contents lists available at SciVerse ScienceDirect

IATSS Research

Observations on the relationship between European standards for safety barrier impact severity and the degree of injury sustained

Carlos Roque [a,*], João Lourenço Cardoso [a]

ARTICLE INFO ABSTRACT

Contents lists available at ScienceDirect

Accident Analysis and Prevention

journal homepage: www.elsevier.com/locate/aap

Investigating the relationship between run-off-the-road crash frequency and traffic flow through different functional forms

Carlos Roque *, João Lourenço Cardoso

ARTICLE INFO ABSTRACT

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Safety Science

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SAFESIDE: A computer-aided procedure for integrating benefits and costs in roadside safety intervention decision making

Carlos Roque *, João Lourenço Cardoso

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Accident Analysis and Prevention

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Detecting unforgiving roadside contributors through the severity analysis of ran-off-road crashes

Carlos Roque [a,*], Filipe Moura [b], João Lourenço Cardoso [a]

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Portuguese freeways

ABSTRACT

The objective of this paper is to study the contributors influencing ran-off-road (ROR) crash severities in a setting that has not been analysed in the literature, namely on freeways not designed according to the "*forgiving roadside*" concept. To accomplish the analysis, ROR crash data were collected on freeway road sections in Portugal and multinomial and mixed logit models were estimated using the driver injury and the most severely injured occupant as outcome variables. Our results are in line with previous findings reported in the literature on ROR crash severity in a number of distinct settings. Most importantly, this study shows the contribution of critical slopes and vehicle rollover towards fatal injuries and highlights the importance of introducing the "*forgiving roadside*" concept to mitigate ROR crash severity in Portuguese freeways. The study also indicates the importance of protecting errant vehicles particularly in horizontal curves, as these are linked with fatalities. Finally, the empirical findings from the developed models revealed problems in current Portuguese roadside design, especially with regards to criteria for forgiving slopes provision and warrants for safety barrier installation.

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Improving roadside design policies for safety enhancement using hazard-based duration modeling

Carlos Roque [a,*], Mohammad Jalayer [b]

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Topic analysis of Road safety inspections using latent dirichlet allocation: A case study of roadside safety in Irish main roads

Carlos Roque [a,*], João Lourenço Cardoso [a], Thomas Connell [b], Govert Schermers [c], Roland Weber [d]

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Journal of Safety Research

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Investigation of injury severities in single-vehicle crashes in North Carolina using mixed logit models

Carlos Roque [a,*], Mohammad Jalayer [b], Ahmed Sajid Hasan [b]

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ABSTRACT

Introduction: Roadway departure (RwD) crashes, comprising run-off-road (ROR) and cross-median/centerline head-on collisions, are one of the most lethal crash types. According to the FHWA, between 2015 and 2017, an average of 52 percent of motor vehicle traffic fatalities occurred each year due to roadway departure crashes. An avoidance maneuver, inattention or fatigue, or traveling too fast with respect to weather or geometric road conditions are among the most common reasons a driver leaves the travel lane. Roadway and roadside geometric design features such as clear zones play a significant role in whether human error results in a crash,in a crash. *Method:* In this we used mixed-logit models to investigate the contributing factors on injury severity of single-vehicle ROR crashes. To that end, we obtained five years' (2010–2014) of crash data related to roadway departures (i.e., overturn and fixed-object crashes) from the Federal Highway Administration's Highway Safety Information System Database. *Results:* The results indicate that factors such as driver conditions (e.g., age), environmental conditions (e.g., weather conditions), roadway geometric design features (e.g., shoulder width), and vehicle conditions significantly contributed to the severity of ROR crashes. *Conclusions:* Our results provide valuable information for traffic design and management agencies to improve roadside design policies and implementing appropriately forgiving roadsides for errant vehicles. *Practical applications:* Our results show that increasing shoulder width and keeping fences at the road can reduce ROR crash severity significantly. Also, increasing road friction by innovative materials and raising awareness campaigns for careful driving at daylight can decrease the ROR crash severity.

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VIAS institute

STUDY ON THE INFLUENCE OF HIGH ENERGY ABSORBING PASSIVE SAFE POLES IN RUN-OFF-ROAD CRASH SEVERITY

A STUDY CASE OF THE FLEMISH REGION IN BELGIUM

Carlos Roque (LNEC)
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TRB 103rd ANNUAL MEETING
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ESTIMATING THE EFFECT OF ROADSIDE FEATURES ON CRASH SEVERITY OF POWERED TWO-WHEELER SINGLE-VEHICLE CRASHES IN PORTUGAL

Carlos Roque (LNEC)
Eric Ananou-Johansson (ENTPE, l'école de l'aménagement durable des territoires)
João Lourenço Cardoso (LNEC)

2nd International Conference and Peer Exchange on
Roadside Safety
TRB TRANSPORTATION RESEARCH BOARD
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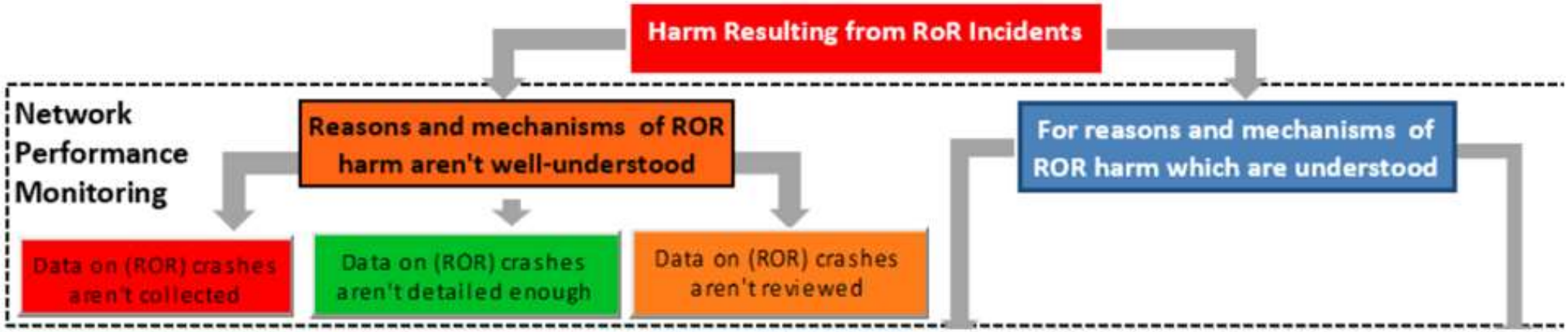
Forgiving roadside schemes

NRA's practice appraisal, for the whole life cycle:

- Network performance monitoring
- Design
- Implementation / Installation / Construction
- Operational life

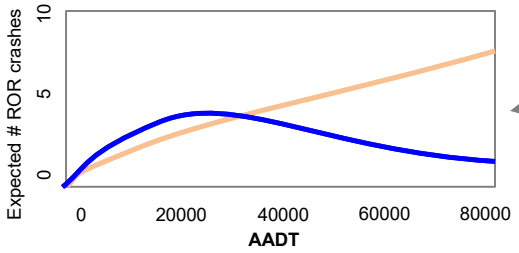


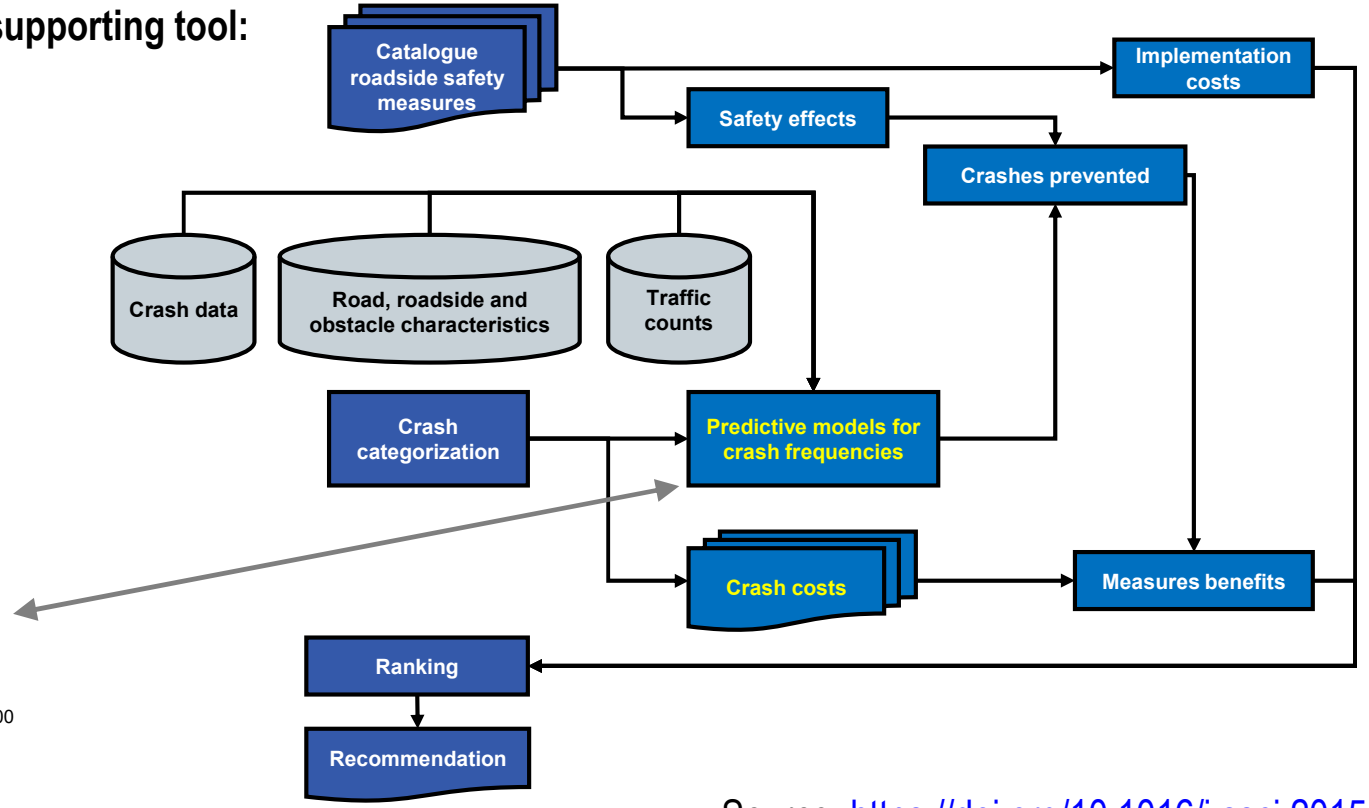
Source: https://cedrprogress.eu/

Forgiving roadside design

Portuguese Cost/Benefit Analysis supporting tool:

- New roads
- Existing roads





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