SAFER-LC project: Safer Level Crossings by integrating and optimizing road-rail infrastructure management and design

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Breakdown of significant accidents per type (EU-28; 2011-2015)

Relative share of fatalities per victim category among all fatalities (EU-28; 2011-2015)

Source: European Agency for Railways (ERA, 2017)
SAFER-LC: Key facts

- Framework: H2020 Call 2016-2017 Mobility for Growth

- Topic: MG-3.4-2016: Transport infrastructure innovation to increase the transport system safety at modal and intermodal level (including nodes and interchanges)

- Proposal selected in January 2017

- www.safer-lc.eu

Key facts

- Time frame: 01/05/2017 – 30/04/2020
- Budget: 4.8 M€
- Work effort: 487 PM
Consortium

17 partners from 10 countries

- Coordinator: UIC Security Division
- 1 association
- 3 UIC members (IMs, RUs)
- 6 research centres
- 4 universities
- 2 industries
Objectives

**Improve safety** and minimize risks at and around LCs

Focus on **technical solutions** (early detection, communication between vehicles)

Focus on **human processes** (adapt the infrastructure to end-users, human centred measures, VRUs)

**Develop a toolbox** which will integrate all the project results and solutions

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Methodology

- **Analysis of LC safety systems** and definition of needs and requirements of the rail and road users for safer level crossings (WP1)

- **Development of innovative measures**: human centered low-cost measures (WP2) & technical solutions (WP3)

- **Lab-tests, field-tests and evaluation** of the measures (WP4)

- **Cost-benefit analysis** and elaboration of recommendations (WP5)

- Collection of all results in a [toolbox](#) (WP6)
Human Factor at LCs
Design for ‘self-explaining’ and ‘forgiving’ infrastructure

- Analysis of HF in LC safety systems
  - Review a bibliographical database
  - Literature analysis according to a standard template
  - Identify key safety indicators concerning human errors and violations

- HF methodological framework
  - Analyse how measures can be better adapted from a user perspective
  - Identify evaluation criteria
  - Focus on specific VRUs

- Design and evaluation of HF low-cost measures
  - Collect information on countermeasures
  - Design new measures and/or upgrade existing ones
  - Evaluate the measures
Sets of criteria

Background classification criteria
- Feasibility for LC type
- Feasibility for environmental conditions
- Feasibility for type of user
- Feasibility for further socio-demographical factors
- Intended effect mechanism

Criteria to assess the behavioural safety effects
- Conspicuity factors
- Cognitive factors
- Rule knowledge
- (Risky) decision-making

Criteria to assess the user experience and social perception
- Acceptance
- Trust in the system (Reliability)
- Level of self-explanatory nature (Usability)

Other assessment criteria
- Integration with road and railway environment, other safety measures

Estimation of short term safety effects on road user behaviour
(These refer to direct, immediate reactions)

Estimation of long term safety effects on road user behaviour
(These involve learning processes and experiences leading to behavioural adaptation or indirect effects on safe bahviour)
## Criteria for behavioural safety effects

<table>
<thead>
<tr>
<th>Function involved</th>
<th>Indicator (i.e. behavioural output that can be measured as dependent variable to assess the safety effect)</th>
<th>Factors influencing the behavioural effect</th>
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</table>
| **Detection**     | Detectability of approaching LC and/or train  
• Speed and timing of detection  
**Prevalence of errors**  
• Number of errors (i.e. perception) / correct detections | • Sight distances  
• Signs  
• Crossing angle |
| **Identification**| Road users’ workload  
• Road users’ focus of attention (focus on other road users and/or road)  
• Looking left and right (yes/no, how often)  
• Timing of reactions  
**Prevalence of errors**  
• Type and number of errors (e.g. attention, memory etc.) | • Tiredness / fatigue  
• Overload with stimuli  
• External and visual distraction  
• Gender, age, disability  
• Use of addictive substances |
| **Rule knowledge**| Correct action to the correct hint / cue  
• Knowing the hint / cue from the traffic rule / traffic sign etc.  
• Knowing required behaviour (i.e. what to do when you detect the hint / cue)  
**Prevalence of errors**  
• Number of errors / correct replies  
**Prevalence of violations**  
• Type and number of violations | • Knowledge and understanding of the correct action |
| **Risky decision-making** | Risky behaviours and prevalence of violations  
• Type and number of violations (at active LC)  
• Speed choice / Approach speed (at passive LC) (+/- km/h)  
• Trajectories  
• Verification behaviours for frequent users  
• Time to collision (TTC) when a train is coming  
• Interaction with other road users  
**Prevalence of errors**  
• Type and number of errors (e.g. biased decision) | • Perception of probability  
• Perception of dangerousness  
• Perception of legal consequences  
• Perception of cost-benefits  
• Motivational factors  
• Personality of the road user  
• Frustration and impatience  
• Suicide or vandalism |
SAFER-LC Mid-term Conference
10 October, Madrid at FFE HQ

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