Safety at level crossings

Belgrade, 21 November 2019
• Level-crossing safety in the EU
• Problem of level-crossing safety
• Improvement strategy
• Good practices
LC safety in the EU
A significant accident (rail) leads to serious or fatal injury – with similar frequency. Injury accident (road) produces slight injury with the same frequency as any more serious injury.
• Safety of LCs has been improving, but dragged down by a slower pace of improvements in road safety (compared to rail safety)

**Average annual change (2010-2018)**

- **Significant accidents**: LC only, All railway, All road
- **Fatalities**: LC only, All railway, All road
- **Serious injuries**: LC only, All railway, All road
• Major differences in accident rates exists among MSs (variance higher than for other types of accidents)
Railway safety, road safety and LC safety

- LC safety associated with both road and rail safety at MS level
Insight through CARE data
Level-crossing safety problem
LC safety: a well known problem stemming from unsustainable transport system design punishing severely human errors
Holistic view offered by Safe System philosophy:

Source: Report of the UNECE Group of Experts on Improving Safety at Level Crossings, 2017
Problem and problem drivers

Too frequent accidents at level crossing (lowered quality of life, economic impact)

Presence of LCs

1. Insufficient protection (road, rail side)
   - Technical solution too expensive / no single market / no common technical requirements

2. Insufficient evidence on problems, causes and costs
   - Insufficient statistical data / insufficient independent accident investigation

3. Ineffective risk assessment and management
   - Lack of knowledge, capacity, methods

4. Poor safety culture at IM
   - Lack of awareness of underlying cause, responsibility on road users / Insufficient accident investigation
Constraints: Urgency perception gap and diverging interests

- Objective evidence: Almost 300 people die annually in LC accidents (EU-28), causing economic damage of €1 billion
- LC accidents: a major problem for railways, a minor for road authorities

Level crossing safety: a hazardous intersection of interests

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<tr>
<td>Rail manager</td>
<td>Grade separation / removal</td>
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<td>The best LC is no LC.</td>
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<td>Central government</td>
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<td>Grade separation</td>
<td>Cost-effectiveness</td>
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Source: Level crossing safety: a hazardous intersection of interests, Dutch Safety Board, 2018
Improvement strategy
Objectives

1. Too many LCs, passive LCs, or poorly protected active LCs
2. Insufficient evidence on problems, causes and costs
3. Ineffective risk assessment and management
4. Poor safety culture at IM

1. Eliminate LCs, upgrade with protective devices
2. Collect and analyze data and information from LC accidents
3. Use of risk assessment and management techniques
4. Improving safety culture

Credible plan: target, strategy, actions, measures
Better statistical and in-depth investigation data
Knowledge and capacity building, methods and tools
Raising awareness of genuine underlying causes, just and reporting culture

Mixed  Reactive  Preventive  Mixed
Overall approach

PDCA

- **Goal** (holistic, realistic)
- **Objectives** and targets (specific, measurable, time-bound)
- **Strategy** and **plan** - with performance indicators jointly developed and backed by all relevant stakeholders
  - Resources
  - Tools, method
- Implementation and monitoring of the plan
- Review and improvement of the strategy/plan

- Well-integrated into overall national road and rail safety plans
• 107,220 level crossings in EU-28 in 2018
• Passive and LCs in general disappear at a low pace
  – Still some 35,000 LCs by the end of century, of which 5,000 passive!

**Passive (unprotected) LCs in the EU-28 (forecast)**

- **Credible plan: target, strategy, actions, measures**
- 1. Eliminate LCs, upgrade with protective devices

Legend:
- **Mid (- 2.7% p.a.)**
- **Min (- 1.3% p.a.)**
- **Max (- 4.1% p.a.)**
LCs protection types

- Common EU classification (Railway Safety Directive, Annex I)

Passive

Automatic user-side warning

Automatic user side protection

User-side protection and warning, and rail-side protection

Manual

1. Eliminate LCs, upgrade with protective devices

Credible plan: target, strategy, actions, measures
LC types & accidents on them

Credible plan: target, strategy, actions, measures

Significant accidents per LC type (EU-28, average (2016-2018))

- **Active**
  - Automatic user-side protection: 121
  - Automatic user-side warning: 116

- **Passive**
  - Manual: 13
  - Rail-side protected: 11
  - Unprotected: 154

Odds ratios: LC accidents per LC type

1. Eliminate LCs, upgrade with protective devices
LC accident risk (significant accidents per train-km) driven by:
- Train-km (strongly)
- Density of LCs on the railway (moderately)

1. Eliminate LCs, upgrade with protective devices

Credible plan: target, strategy, actions, measures
2. Collect and analyze data and information from LC accidents

Better statistical and in-depth investigation data

Insight from statistical data
EU-28 countries experience so far

• Selected railway accidents are investigated by National (independent) Investigation Bodies

• 506 investigation reports available (2007-2019) in ERAIL-INV database hosted by ERA

• Only basic common taxonomy available > difficult to analyze information

• Nevertheless:
  • Indirect causes not always analyzed (available)
  • Deliberate action of a road user rather seldom
  • Non-functioning of LC protection sometimes present
  • Many recommendations made towards the road infrastructure managers
Phase 1: review of the risk drivers at level crossings to identify those crossing / user characteristics that can be more associated with ‘risk’

Phase 2: produce a computer-based “risk tool” that can be used to assess level crossing risk and prioritize investment in risk reduction
Risk drivers: Line speed, Skew (layout), Sight times, Strike in time, Road layout, Traffic (intensity, mix)

Relevant specific conditions: Current protection equipment, Costs of upgrades

Tool to estimate risk for individual LC (collective, individual, ...)

Optimum prioritization through cost-benefit techniques

Competent and motivated staff!
4. Improving safety culture

Raising awareness of genuine underlying causes, just and reporting culture

- Promote safety culture in the operational environment, through conditions for just and reporting culture, good habits promotion, leadership skills building, ...
Objectives for different actors:

- Railway Infrastructure Manager: Eliminate road-user blame culture, investigate in-depth, cooperate with road authorities.
- Road Infrastructure Manager: Increase ownership of the problem, integrate into road safety assessment program and road safety audits under our outside road investment projects.
- Railway undertakings: Near-miss reporting.
Good practices
Examples of good practice

• Explicit responsibility and accountability attribution
• No-unless principle (new LC, or more intensive use permitted only if it does not increase safety risks)
• Improved road traffic signs

• Risk models (PT, UK, ...)
• Low cost barrier protection (PT)
• Low cost infrastructure (CZ)

• SAFER_LC EU-funded project (http://safer-lc.eu/)
• Safe strip (https://safestrip.eu/)
Making the railway system work better for society.

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