Safety at level crossings

Belgrade, 21 November 2019

EUROPEAN
UNION
AGENCY
FOR RAILWAYS

EUROPEAN UNION AGENCY FOR RAILWAYS

Content

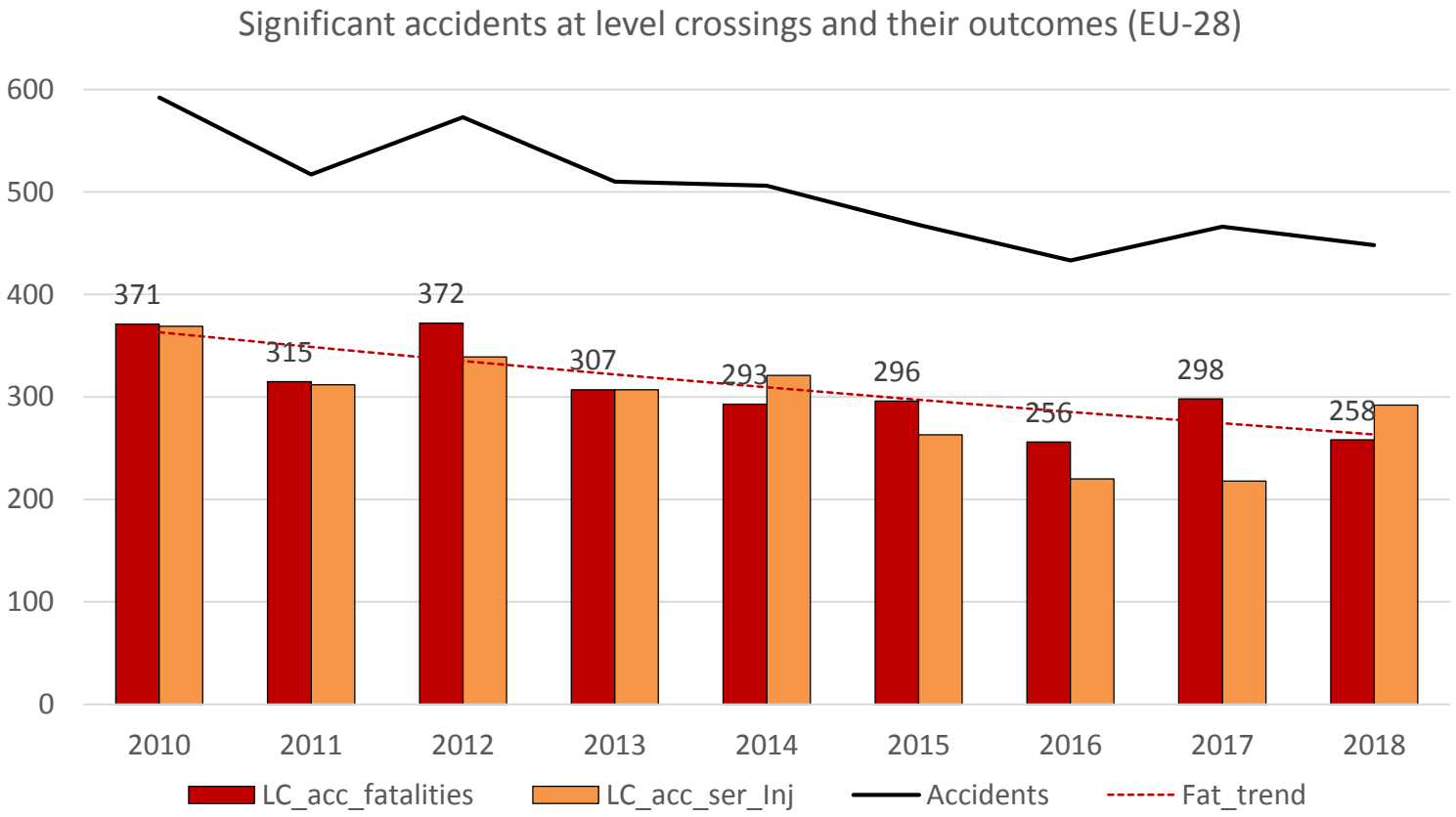
- Level-crossing safety in the EU
- Problem of level-crossing safety
- Improvement strategy
- Good practices

EUROPEAN UNION AGENCY FOR RAILWAYS

LC safety in the EU

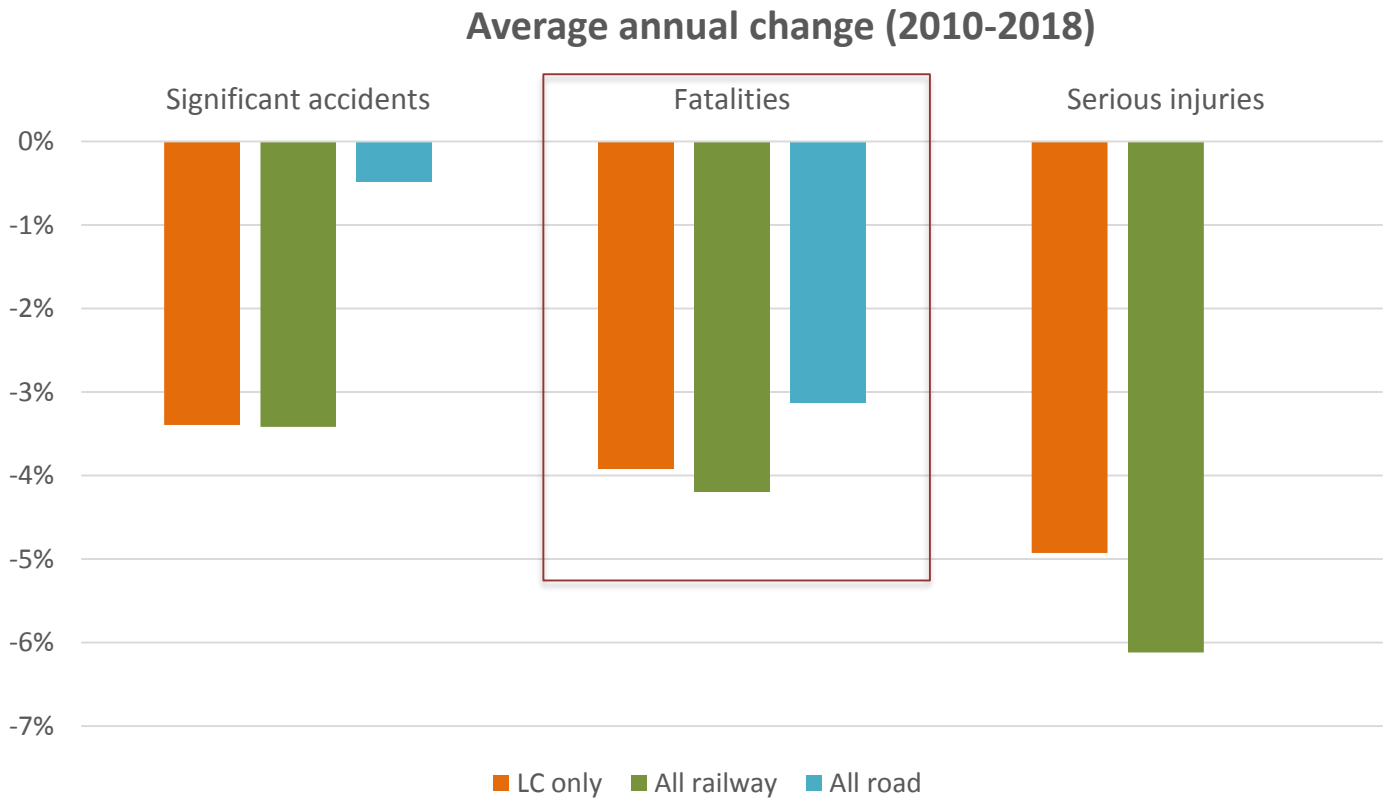
Safety overview for EU-28

- 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.



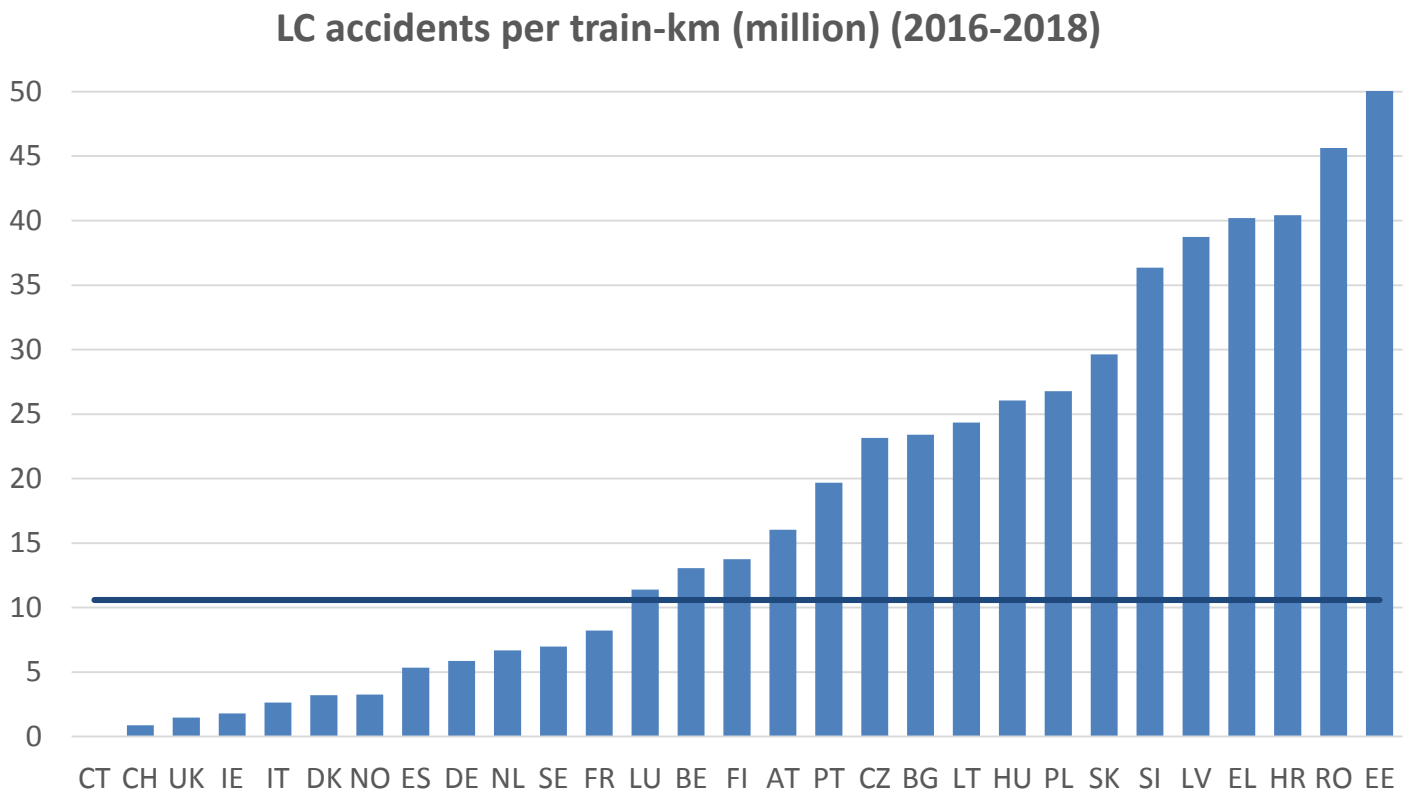
Overall trends

- Safety of LCs has been improving, but dragged down by a slower pace of improvements in road safety (compared to rail safety)



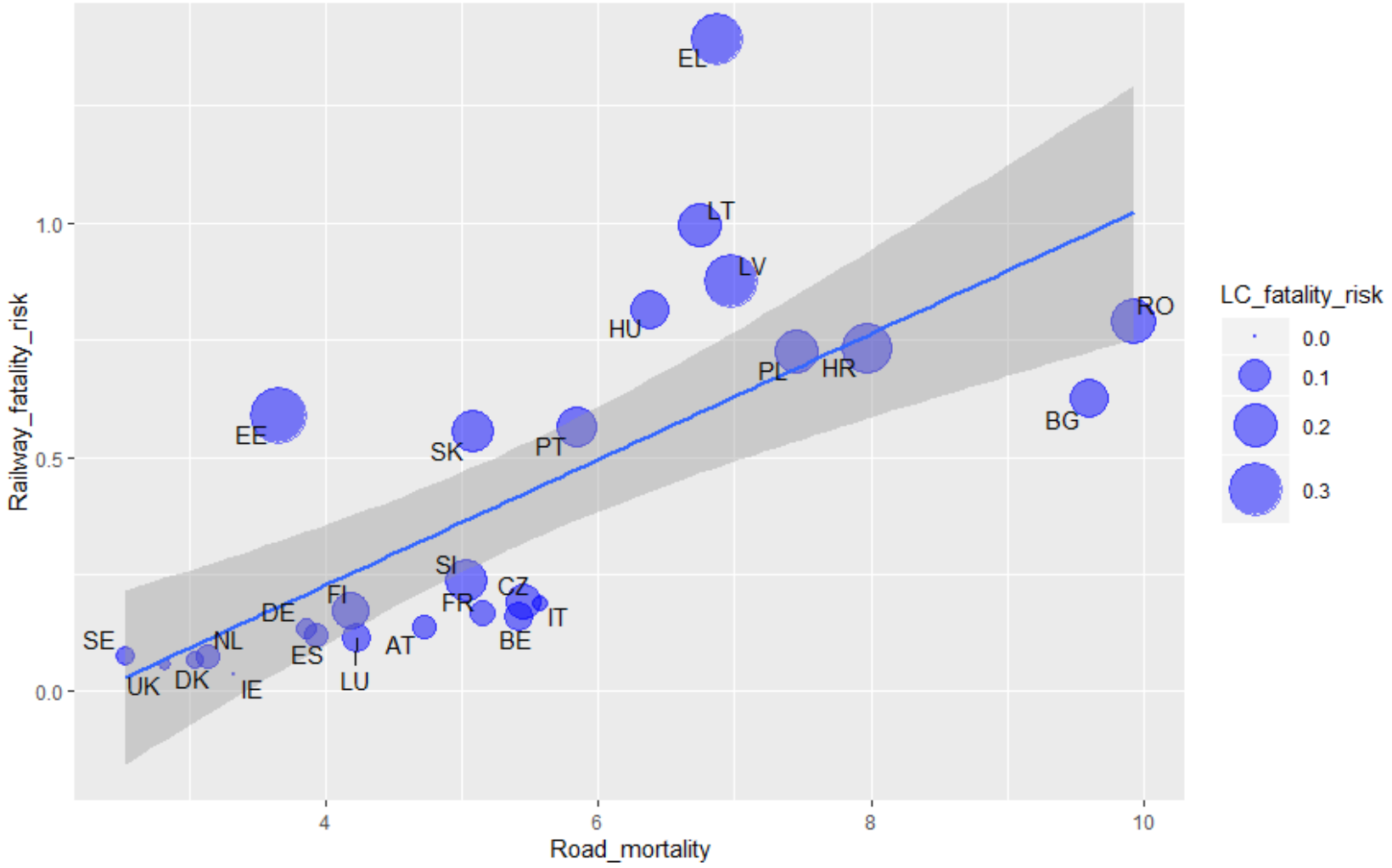
MS insight

- Major differences in accident rates exists among MSs (variance higher than for other types of accidents)



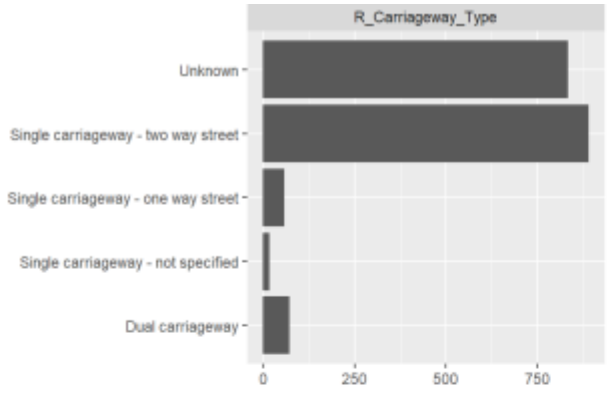
Railway safety, road safety and LC safety

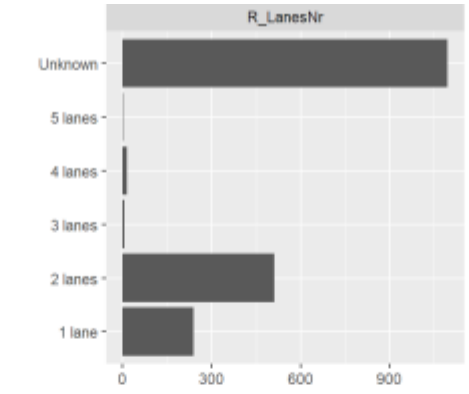
- LC safety associated with both road and rail safety at MS level

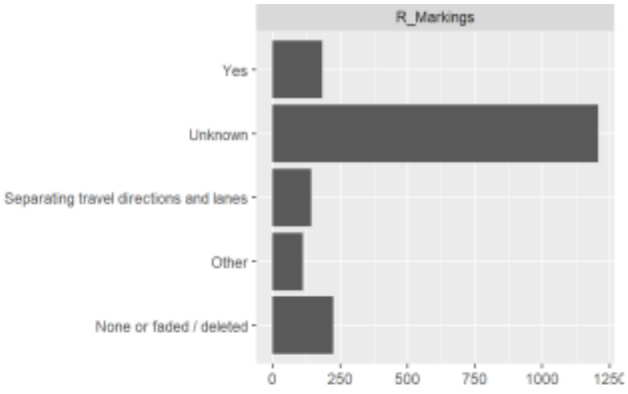


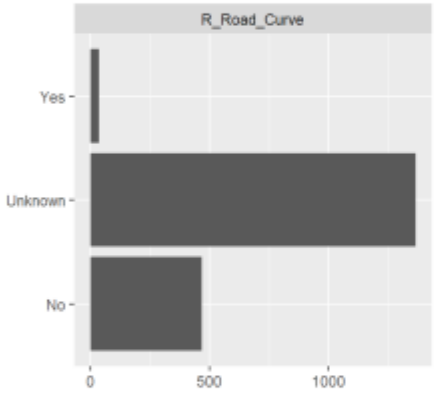
EUROPEAN UNION AGENCY FOR RAILWAYS

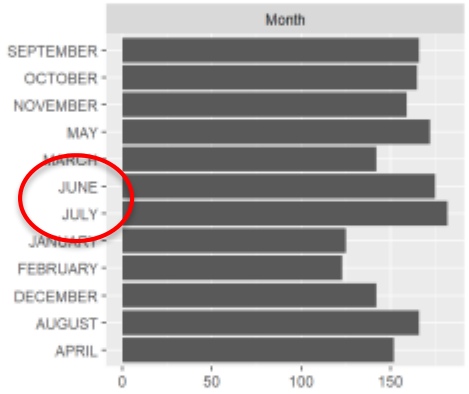
Insight through CARE data

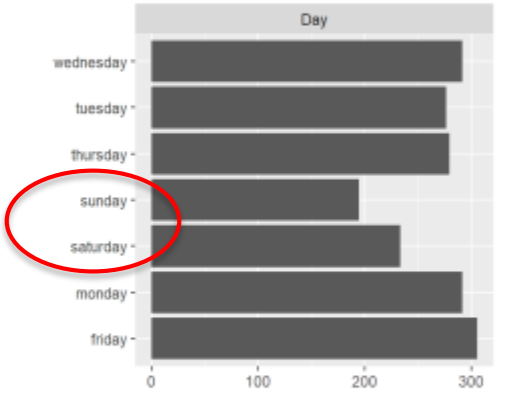


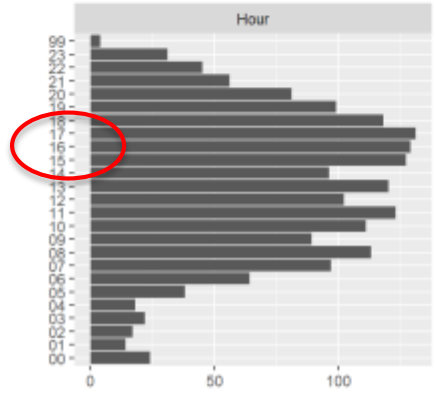


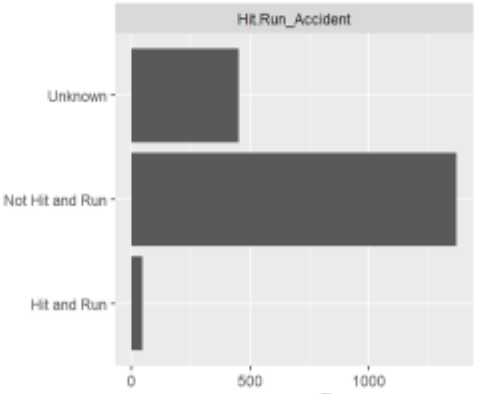


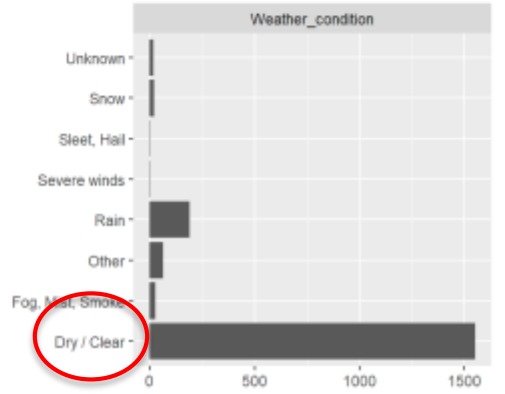












EUROPEAN UNION AGENCY FOR RAILWAYS

Level-crossing safety problem

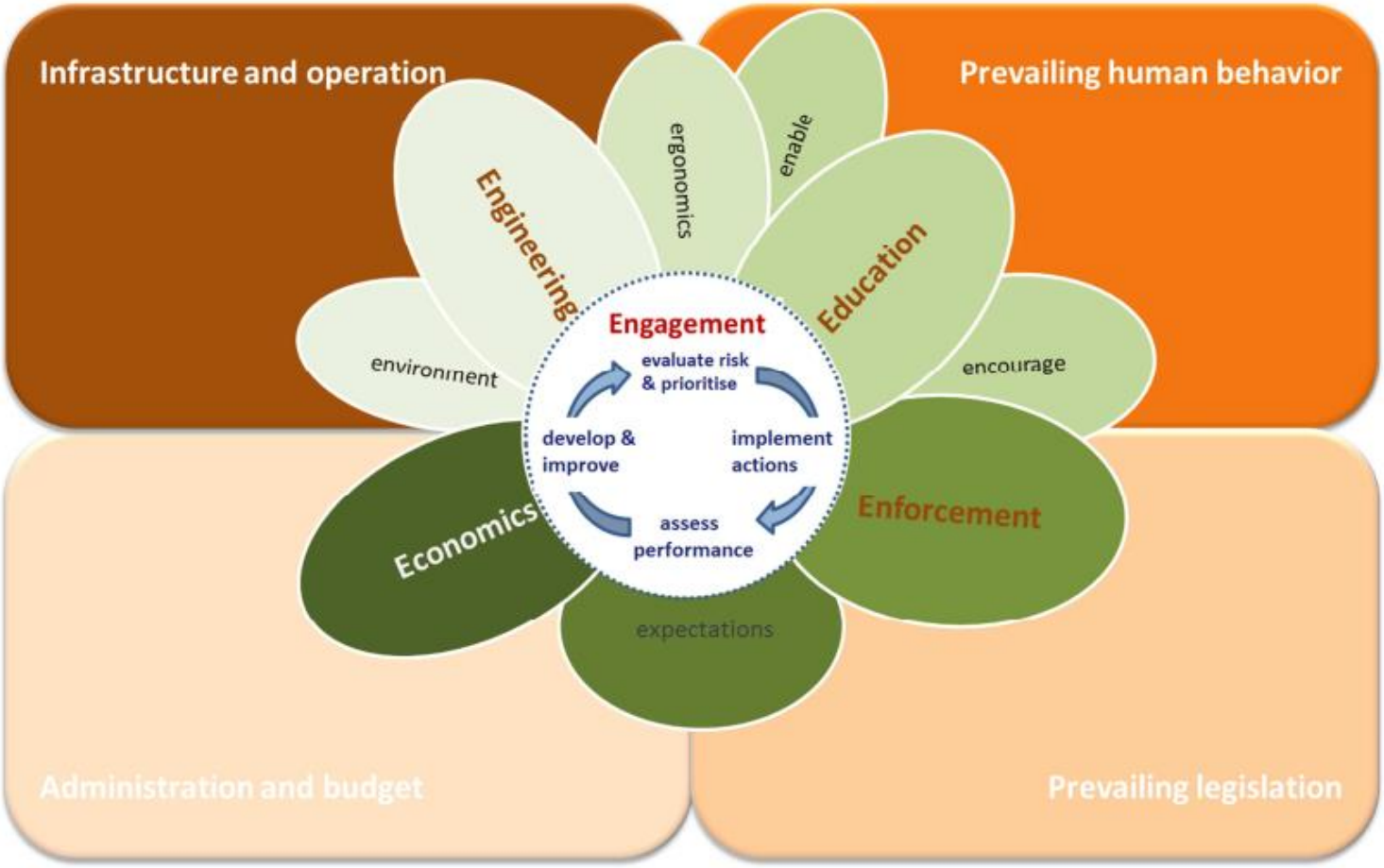
EUROPEAN UNION AGENCY FOR RAILWAYS

LC safety problem

- LC safety: a well known problem stemming from unsustainable transport system design punishing severely human errors

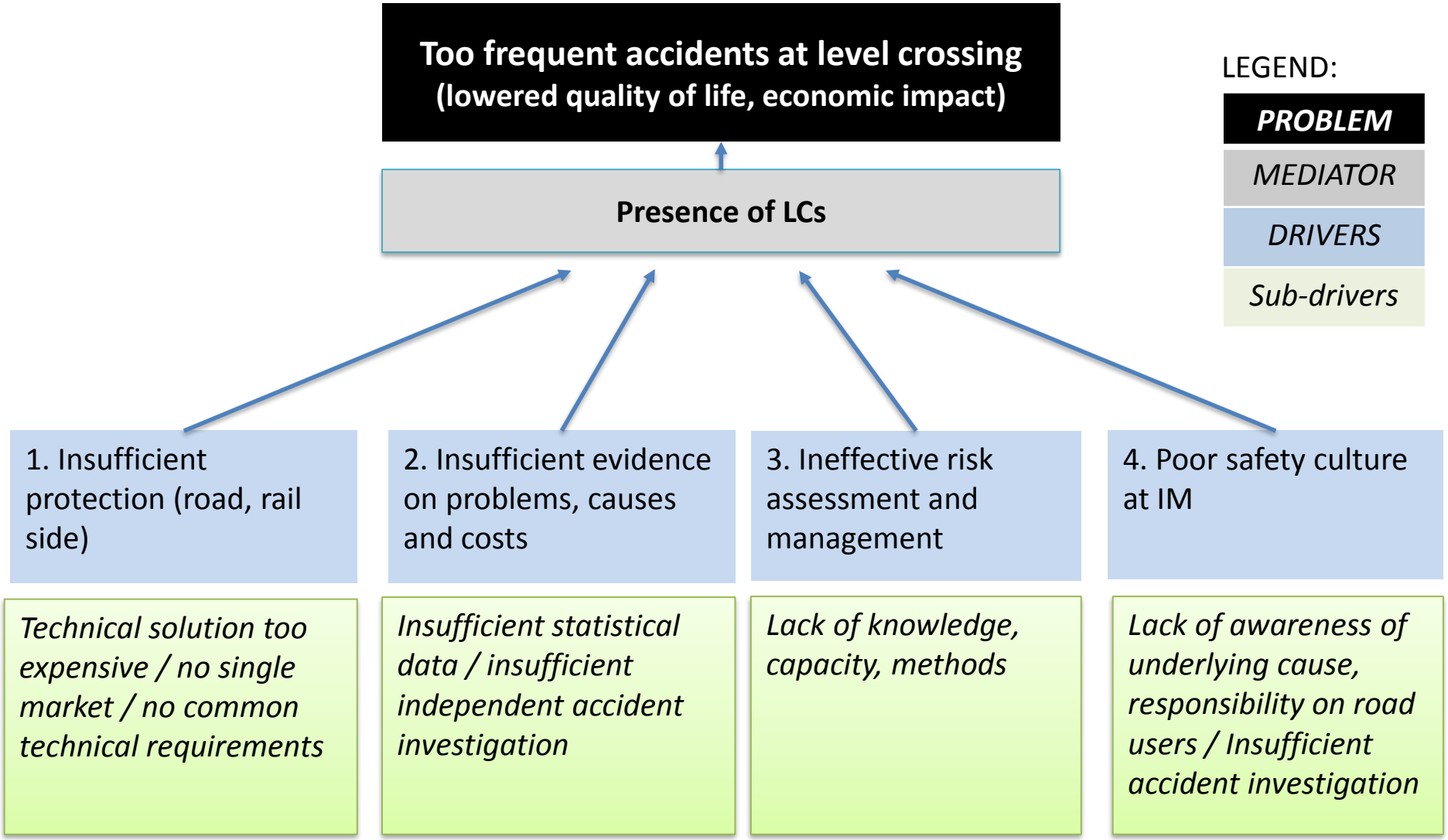
Safe system approach

Holistic view offered by Safe System philosophy:



Source: [Report](#) of the UNECE Group of Experts on Improving Safety at Level Crossings, 2017

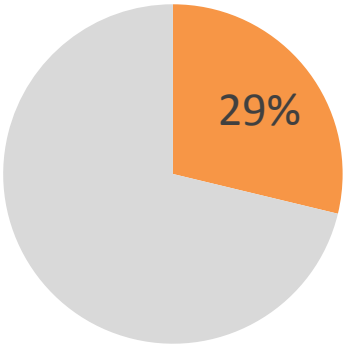
Problem and problem drivers



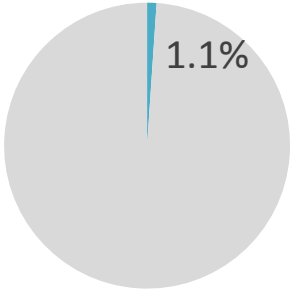
Constraints: Urgency perception gap and diverging interests

- 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

LC fatalities among all **rail** fatalities



LC fatalities among all **road** fatalities



Level crossing safety: a hazardous intersection of interests

Party	Preferred measure	Least favorite measure	Motivation
Road manager	Grade separation / upgrade	Removal	Accessibility and liveability
Rail manager	Grade separation / removal	Improvement	The best LC is no LC.
Central government	Upgrade / removal	Grade separation	Cost-effectiveness

Source: Level crossing safety: a hazardous intersection of interests, Dutch Safety Board, 2018

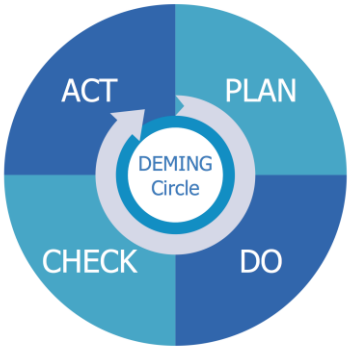
EUROPEAN UNION AGENCY FOR RAILWAYS

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*

PDCA

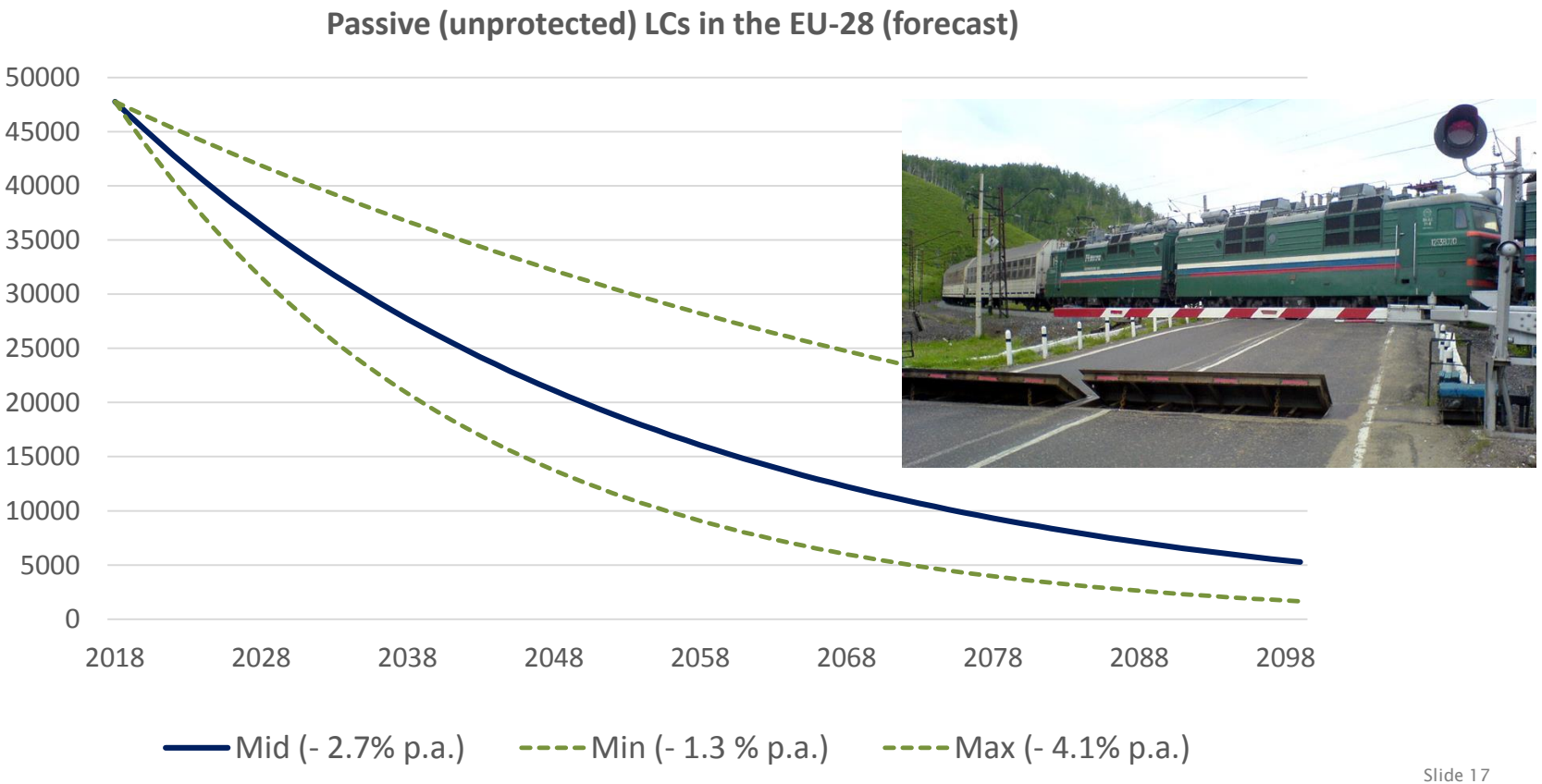


- **Goal** (holistic, realistic)
- **Objectives** and targets (specific, measurable, time-bound)
- **Strategy** and **plan** - with performance indicators jointly developed and backed by all relevant stakeholders
  - Resources
  - Tools, method
- Implementation and monitoring of the plan
- Review and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

- Well-integrated into overall national road and rail safety plans

Prospects

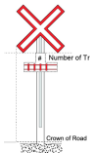
- 107.220 level crossings in EU-28 in 2018
- Passive and LCs in general disappear at a low pace
  - Still some 35.000 LCs by the end of century, of which 5.000 passive!



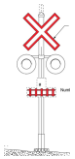
LCs protection types

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

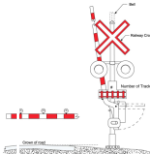
Passive



Automatic user-side warning



Automatic user side protection



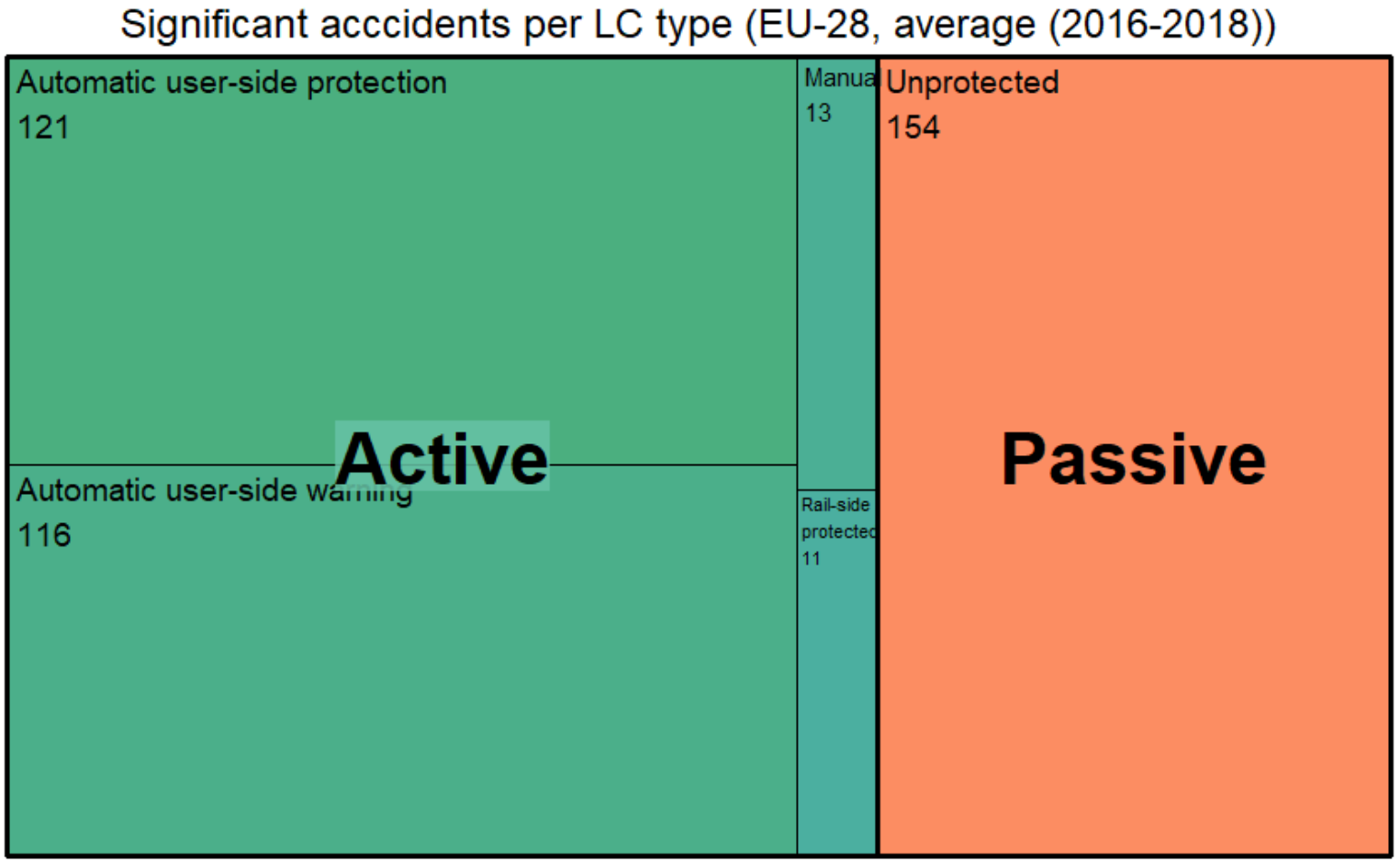
User-side protection and warning, and rail-side protection

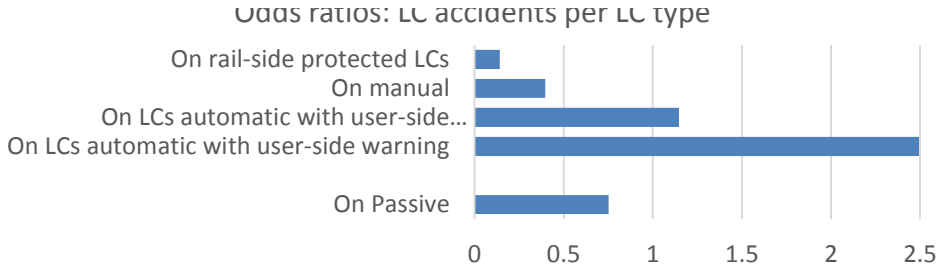
Manual

1. Eliminate LCs, upgrade with protective devices

Credible plan: target, strategy, actions, measures

LC types&accidents on them

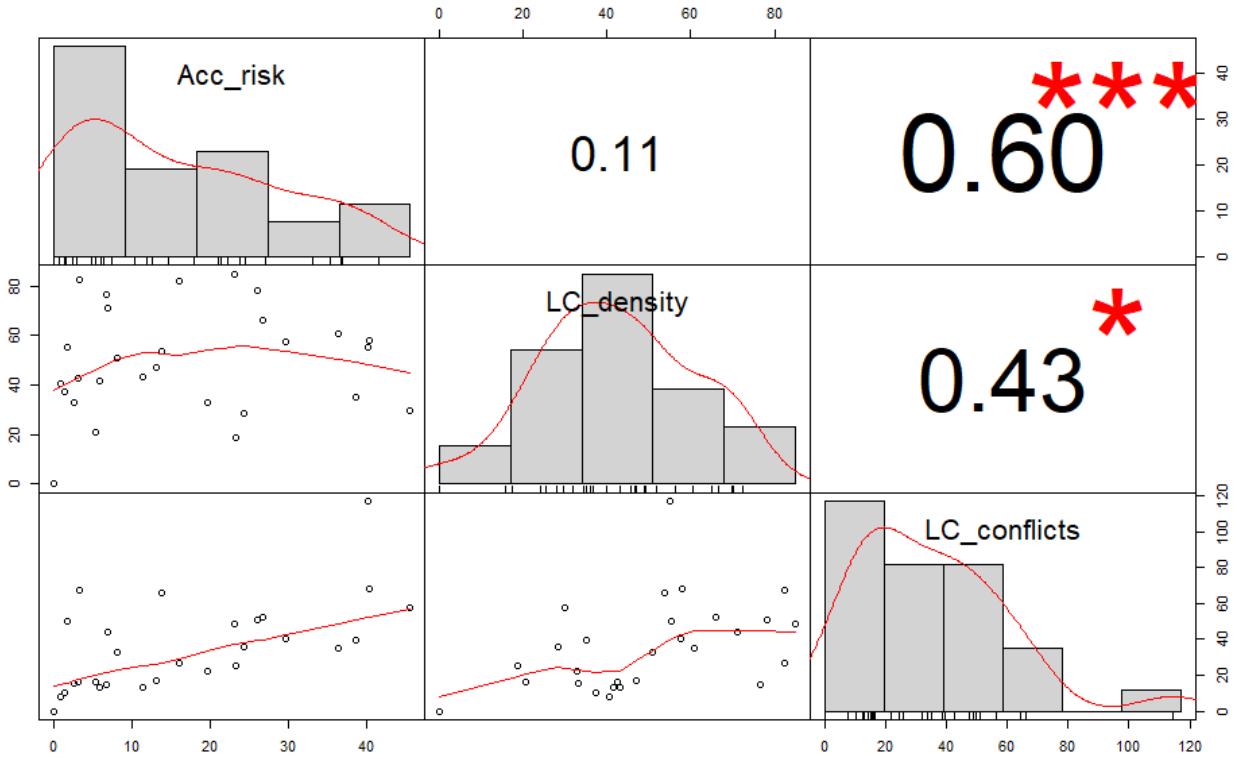




Explanatory factors

LC accident risk (significant accidents per train-km) driven by:

- Train-km (strongly)
- Density of LCs on the railway (moderately)

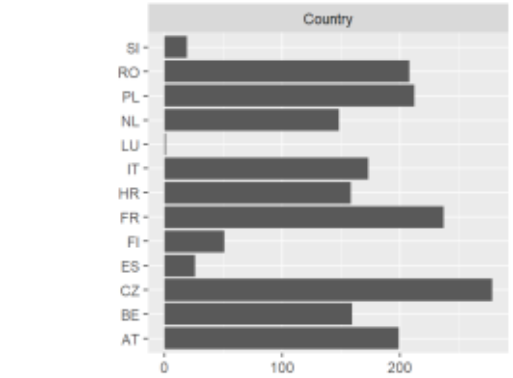


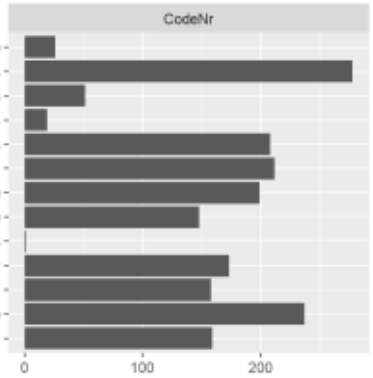
EUROPEAN UNION AGENCY FOR RAILWAYS

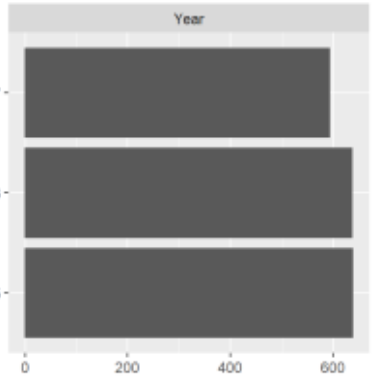
2. Collect and analyze data and information from LC accidents

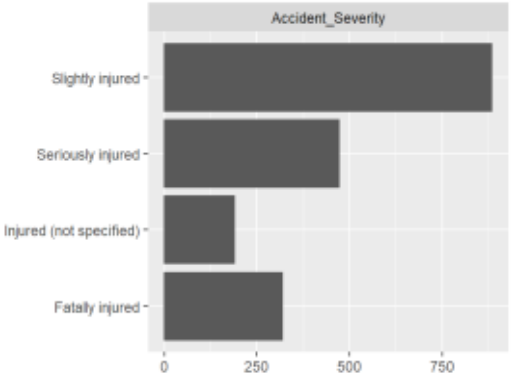
Better statistical and in-depth investigation data

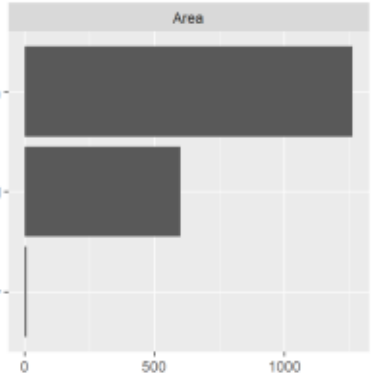
Insight from statistical data

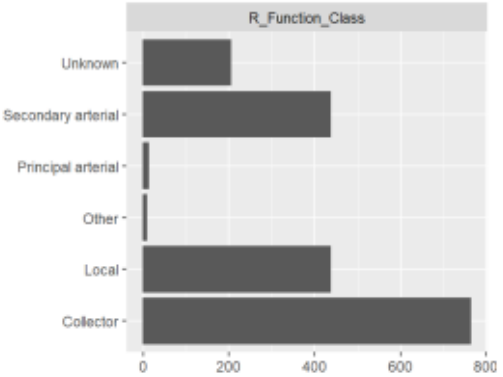


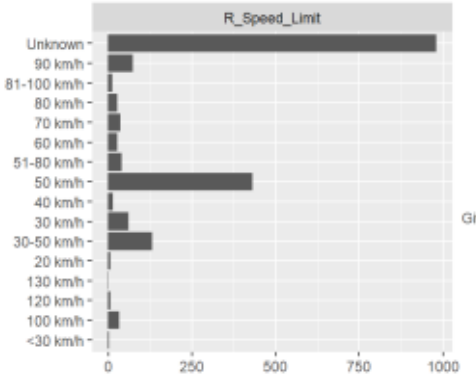


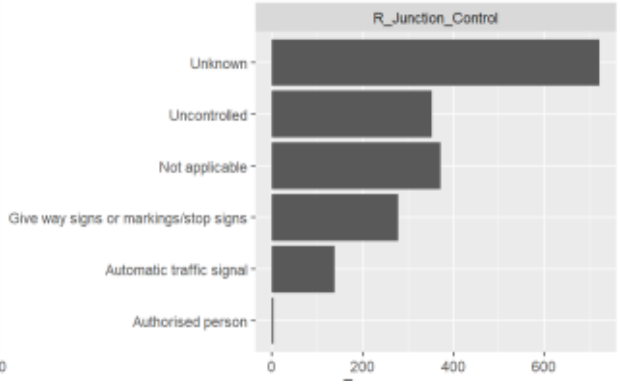


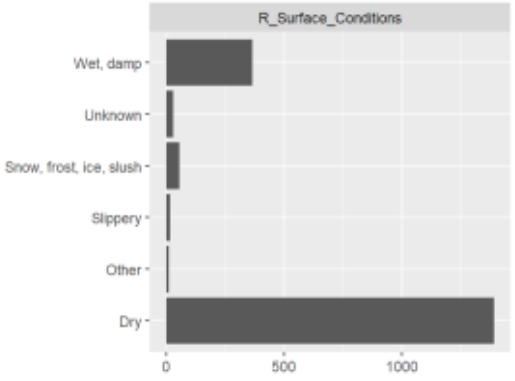












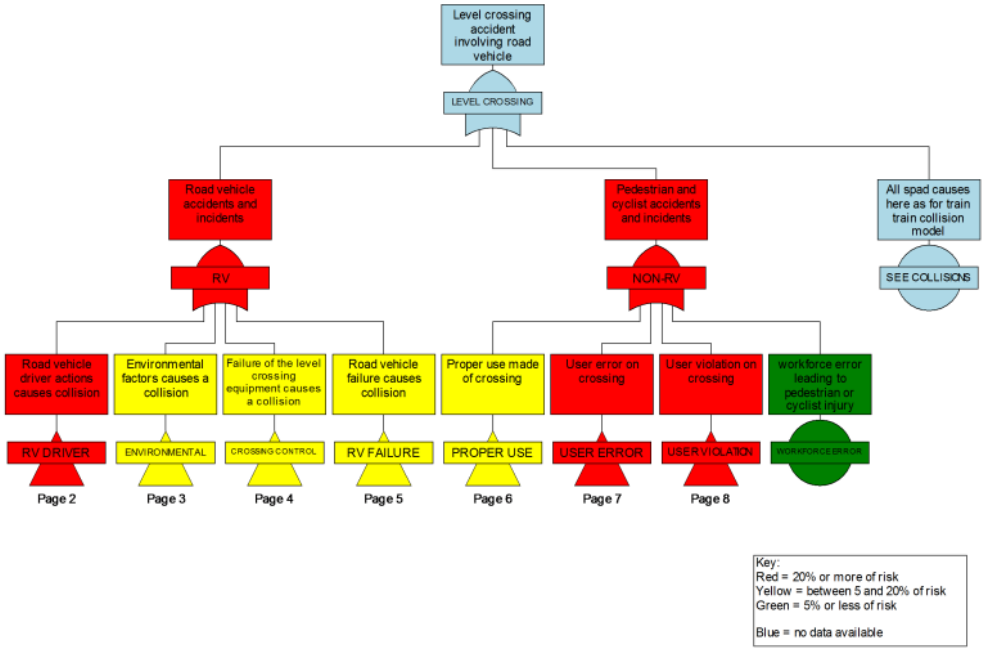
Insight from investigations

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

Approach

- 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



Means

- 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!

Improve safety culture

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

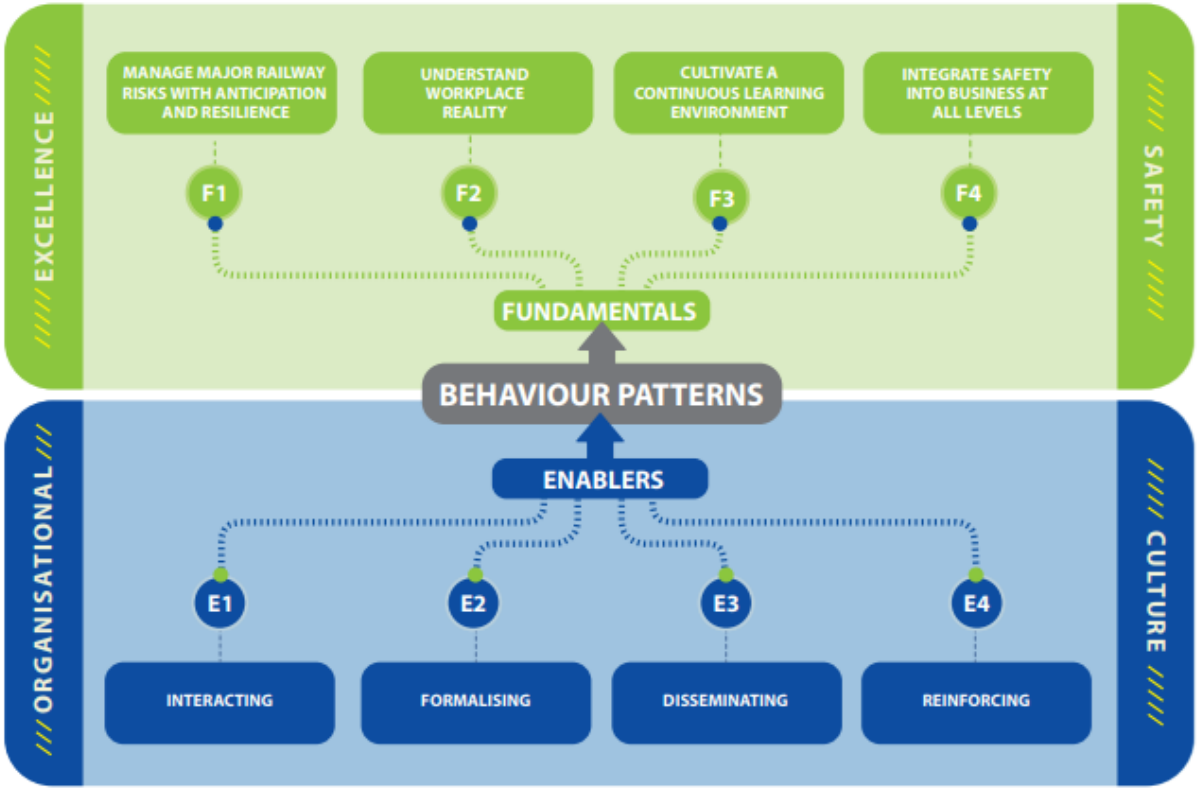


Figure 3: the European Railway Safety Culture Model

Improve safety culture

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

EUROPEAN UNION AGENCY FOR RAILWAYS

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/)

EUROPEAN UNION AGENCY FOR RAILWAYS

Making the railway system work better for society.

Follow us on ERA_railways

Discover our job opportunities on **era.europa.eu**

ISO 9001:2015
BUREAU VERITAS
Certification