Isabelle
FONVERNE,
Senior Advisor,
Safety

ILCAD
Act safely at level crossings

UIC
INTERNATIONAL UNION
OF RAILWAYS

« Level Crossing Safety Worldwide »

LAST MINUTE SOLUTION

https://youtu.be/dwovu97Tyvc : 58 ''

The best level crossing is the one that does not exist !
We should close the riskiest ones, upgrade passive LCs into active LCs, and not open new LCs.
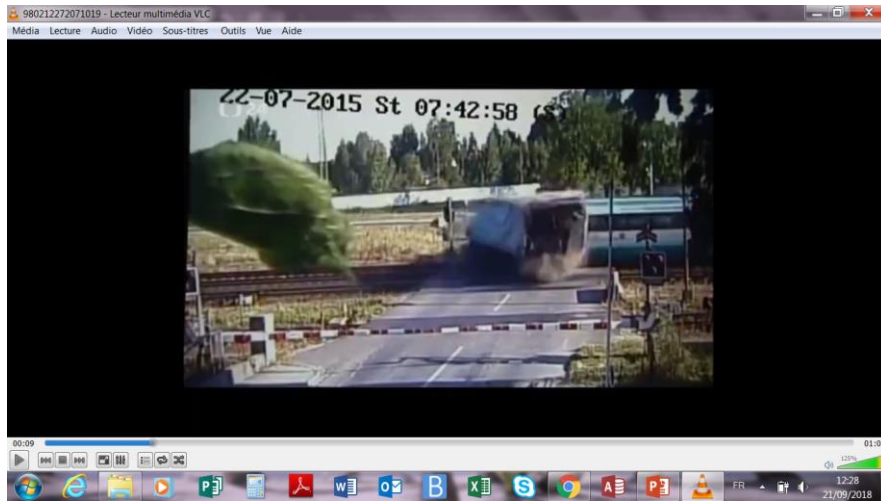Nowadays the vision is also that LCs should be self explaining and forgiving.
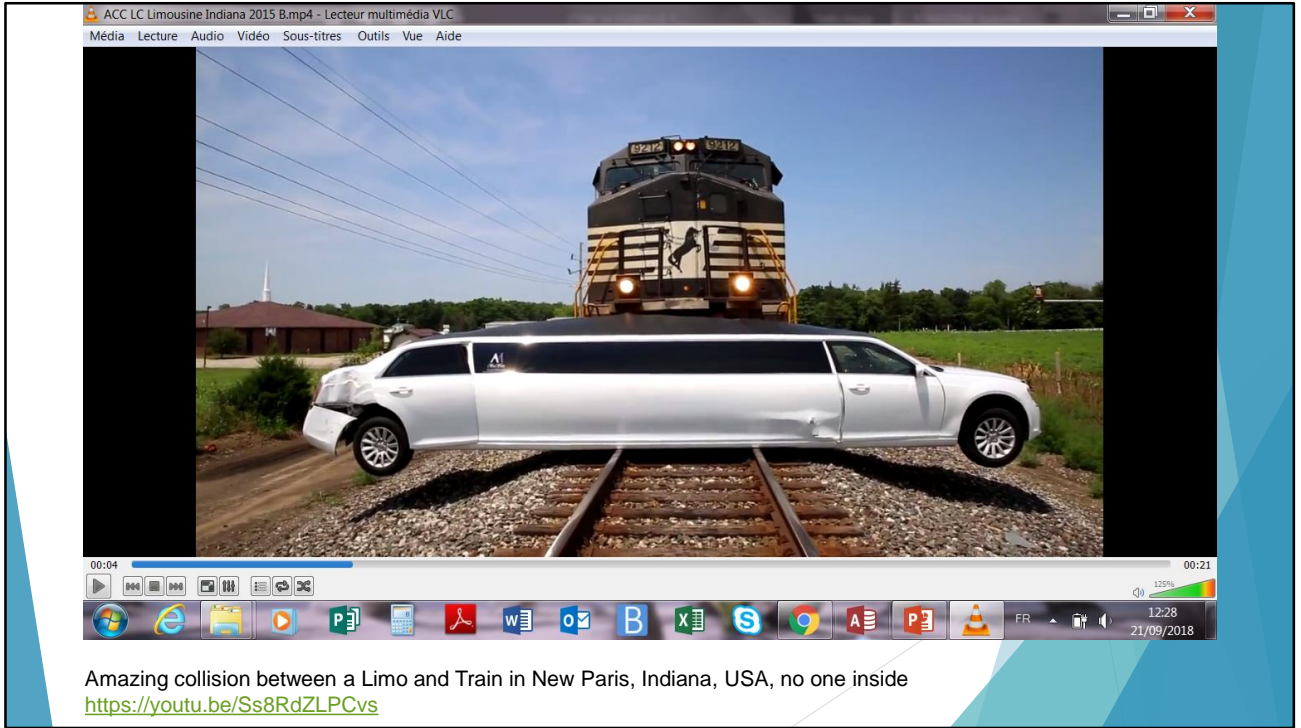
1.Situation
2.Statistics
3.Solutions
   a) Elimination
   b) Research
   c) Evaluation
   d) Engineering
   e) Enforcement
   f) Education

1.Situation :

Near misses and collisions happen every day at level crossings everywhere in the world !
Major risks: large, heavy vehicules.

Miracle for the driver of a truck in a collision with a train in the Czech Republic,
the driver was just shocked : 1'09'' https://youtu.be/TQLhslqr-lw

Amazing collision between a Limo and Train in New Paris, Indiana, USA, no one inside
https://youtu.be/Ss8RdZLPCvs

Infrabel: man ontsnapt aan dood op overweg | Traverser au péril de sa vie

0:31 / 0:39

Pedestrian crossing: CCTV Camera images by INFRABEL in Belgium used by the company on tv on 16.03.2018 to aware **pedestrians** on unsafe behaviours : 39" https://youtu.be/Nmt-F-ioi-Q

One collision, one fatality is one too many but tragedies involving children hits you, the media and the public opinion more than others !

14 December 2017, Millas, France: collision of a school bus with a train : 6 fatalities, 14 injured, trauma for the families but also for the whole country just before Christmas.

26 April 2018, in Uttar Pradesh's Kushinagar, India: 13 school children died at an unmanned level crossing (UMLC). The driver had headphones.

20 September 2018, Oss, NL: collision involving a train and an electric cart driven by a supervisor : **4 children died, two of them sisters. 2 severe injured (including a child).**
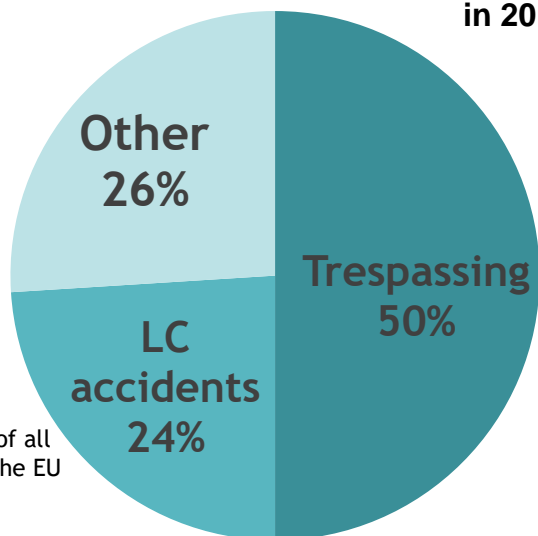
The Indian Railways have eliminated 1464 unmanned level crossings in 2017. As of March 31, 2018, there are still 3,479 unmanned level crossings in the country.
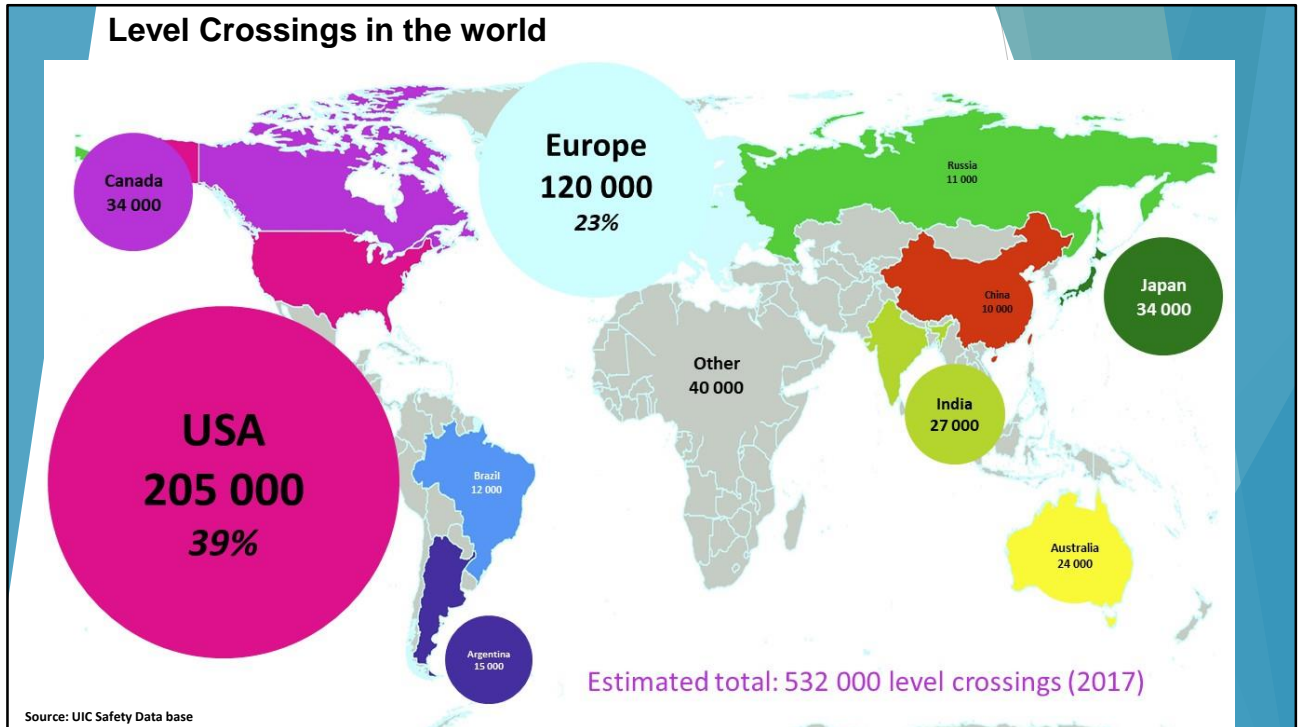
2. Statistics

**Significant railway accidents
in 2017 in Europe**

Other
26%

Trespassing
50%

LC
accidents
24%

LC accidents = 1% of all
road accidents in the EU

Source: UIC Safety Data base

**Source: UIC Safety Data base figures (UE without Bulgaria, DK, Baltic countries) +
Norway and Switzerland + Iran + Turkey**

Level Crossings in the world

Canada 34 000

Europe 120 000 23%

Russia 11 000

China 10 000

Japan 34 000

Other 40 000

India 27 000

USA 205 000 39%

Brazil 12 000

Australia 24 000

Argentina 15 000

Estimated total: 532 000 level crossings (2017)

Source: UIC Safety Data base

Of course the types of LCs, the number of accidents, the size of countries are different around the world.

But we can see that the highest number of LC is in the USA amounting to 205 000 LC it represents 39% of the total number. Around 50% are active ; 50 % are passive.

They had in 2017 : 1 accident/1000 LC that means 2108 accidents for 273 fatalities. : 5 times more accidents compared to Europe but not too many more fatalities

120 000 LC on the European continent (without Bulgaria, Ukraine, Moldavia): 23% of the total ; 400 accidents. ; 250 fatalities.
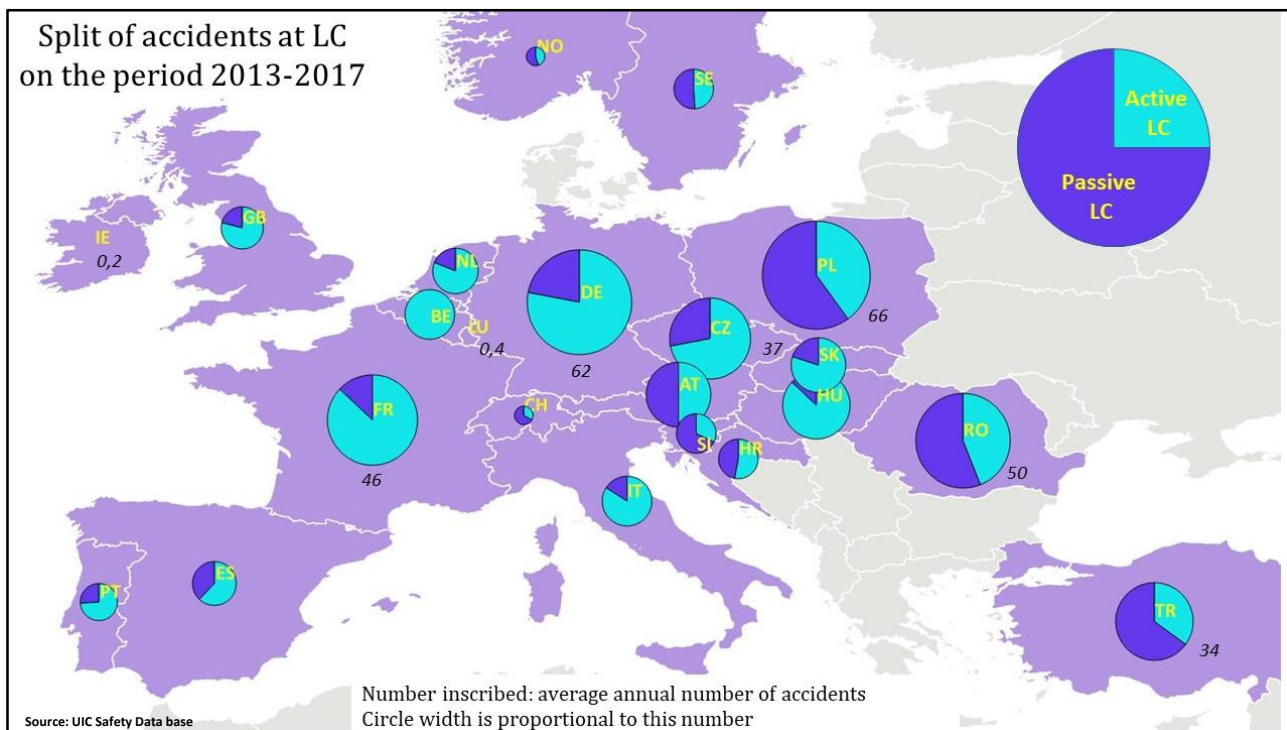
Split of level crossings
Year 2017

Number inscribed: total number of level crossings
Circle width is proportional to this number
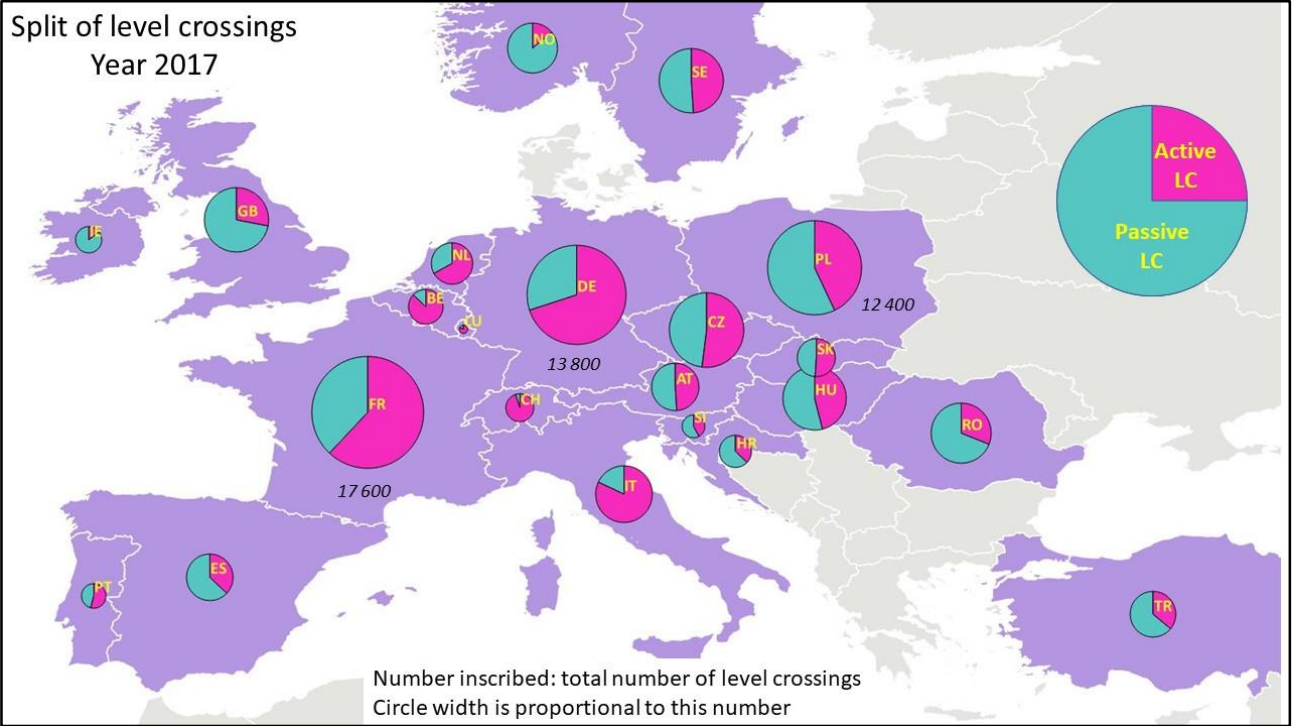
EU without Bulgaria, DK, Baltic countries + Norway and Switzerland + Turkey
Acive crossings: In Swizerland (95%), Belgium (87%), Norway (86%), Italy (82%), Luxembourg (82%),
Netherlands (67%), Germany (70%) and France (62%).
In GB they are more passive (62%)/ 28% are active.

2017 Figures for the whole of Europe
Number of active LC   56085
Number of passive LC 47031
Accidents at active LC 263
Accidents at passive LC 163

Split of accidents at LC on the period 2013-2017

Number inscribed: average annual number of accidents
Circle width is proportional to this number

Source: UIC Safety Data base

EU without Bulgaria, DK, Baltic countries + Norway and Switzerland + Turkey

Different situations according to countries : with a high majority of accidents at active crossings for example in France and Germany.
In GB the majority of crossings are passive (62%), but 79% of accidents happen at active crossings.
Ireland and Luxembourg had almost no accident in 5 years this is why we cannot draw any circle.
Switzerland has 95% of active crossings where 33% of all accidents happen in comparison with 67% of accidents at passive crossings.

**Causes of accidents on public LCs (2014 – 2016)
(except harbors) - Example of Belgium (INFRABEL)**

3%

12%

51%

34%

■ Negligence : zigzagging
■ Imprudence
■ Weather factors
■ Others
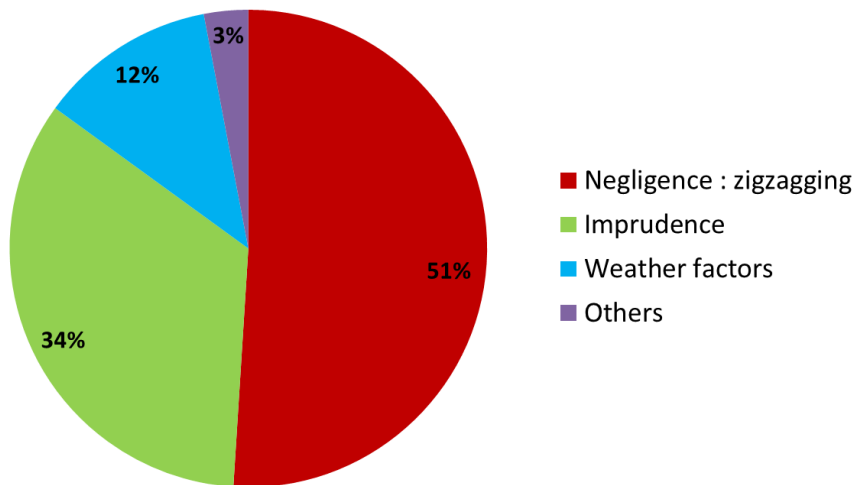
Source: INFRABEL, Belgium

Causes of accidents: mainly negligence from drivers of vehicles zigzagging between closed barriers, and by imprudence.

3. Solutions

a) Elimination (example of a project in France)

b) Research (UIC Safer LC project)

c) Evaluation, risk assessment (example of INFRABEL)

d) Engineering (examples of INFRABEL, ProRail)

e) Enforcement (example of SNCF, BTP/Network Rail, others)

f) Education/Awareness (ILCAD, ILCAD partners…)

a) Removal

Today's situation

Concrete example of a project to replace a LC in the Parisian suburbs in France by an underpass for pedestrians, a ramp for persons with reduced mobility and a tunnel for vehicles,.

In 2016 after a public enquiry the French state and SNCF decided to get rid of this level crossing in the Parisian suburbs:
8 500 vehicles and around 100 trains a day, second most used in the Parisian suburbs. Still in discussion.

Projet : vue depuis l'angle de la rue Massy et de la rue Mirabeau

SNCF Proposal for the future

FRANCHISSEMENT ROUTIER
- Hauteur : 3,70 m
- Largeur : 14 m
- Deux voies de circulation
- Passage des bus, véhicules de secours et de collecte des ordures ménagères

INTÉGRATION PAYSAGÈRE
Une meilleure intégration paysagère grâce au déplacement des voies

PASSAGE POUR LES PIÉTONS ET VÉLOS
- Hauteur : 2,20 m
- Largeur : 5 m
- Éclairage naturel (grâce à la surélévation des voies ferrées à cet endroit)
- Une rampe d'accès pour les personnes à mobilité réduite

Budget estimated to 27 million euros to be financed by local authorities, the state and SNCF.
Discussions have started 15 years ago.
The surrounding shop owners and the population are happy with the idea of eliminating this LC but do not agree on this proposal: railway tracks raised higher, noise-barrier wall erected, visibility and surroundings modified: still in discussion with the local authorities, mayor, citizens' demonstration and petitions…

b) Research

SAFER-LC

- Duration: from 1st May 2017 to 30 April 2020
- Estimated Budget : 4,889 000 €
- Coordinator : UIC
- Consortium : 17 partners from 10 countries

- Website : *www.safer-lc.eu*
- Contact : info@safer-lc.eu

SAFER-LC

CONSORTIUM

COORDINATOR: 1-UIC - International Union of Railways

2-VTT - Technical Research Centre of Finland Ltd

3-NTNU - Norwegian University of Science and Technology

4-IFSTTAR - French institute of science and technology for transport, development and networks

5-FFE - Spanish Railways Foundation

**6-CERTH-HIT** - Centre for Research and Technology Hellas - Hellenic Institute of Transport

7-TRAINOSE - Trainose Transport – Passenger and Freight Transportation Services SA

8-INTADER - Intermodal Transportation and Logistics Research Association

9-CEREMA - Centre for Studies and Expertise on Risks, Environment, Mobility, and Urban and Country planning

10-GLS - Geoloc Systems

11-RWTH - Rheinisch-Westfaelische Technische Hochschule Aachen University
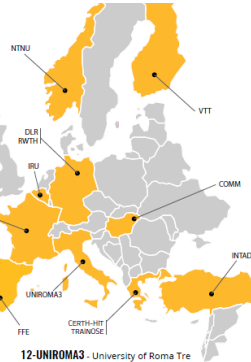
12-UNIROMA3 - University of Roma Tre

13-COMM - Commsignia Ltd

14-IRU - International Road Transport Union - Projects ASBL

15-SNCF - French Railways

16-DLR - German Aerospace Center - Institute of transportation Systems

17-UTBM - University of Technology of Belfort-Montbéliard

15

b) Research

Goal

► Improve safety and minimize risks at and around level crossings (LCs)

» *by developing innovative solutions and tools to detect as early as possible potentially dangerous situations leading to collisions at LCs and to prevent incidents at level crossing*

► Focus both on technical solutions and on human processes

» *to adapt infrastructure design to end-users*

» *to enhance coordination and cooperation between different stakeholders from different transportation modes.*

► Develop a toolbox which will integrate all the project results and solutions to help both rail and road managers to improve safety at level crossings.

"The project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723205"

SAFER-LC aims to improve safety and minimize risk by developing a fully-integrated cross-modal set of innovative solutions and tools for the proactive management and design of level-crossing infrastructure.

These tools will enable road and rail decision makers to find even more effective ways to detect potentially dangerous situations leading to collisions at level crossings, prevent incidents at level crossing by innovative design and predictive maintenance methods, and mitigate the consequences of incidents/disruptions due to accidents or other critical events.

The project will focus both on technical solutions, such as smart detection services and advanced infrastructure-to-vehicle communication systems and on human processes to adapt infrastructure design to end-users and to enhance coordination and cooperation between different stakeholders from different transportation modes.

The project will first identify the needs and requirements of rail-road infrastructure managers and LC users and then seek to develop innovative smart detection and communication systems and adapt them for use by all types of level crossing users.

A series of pilot tests across Europe are being rolled out to demonstrate how these new technological and non-technological solutions can be integrated, validate their feasibility and evaluate their performance.

The project will deliver a bundle of recommended technical specifications (for standardisation), human processes and organizational and legal frameworks for implementation.

Finally, SAFER-LC will develop a toolbox accessible through a user friendly interface which will integrate all the project results and solutions to help both rail and road managers to improve safety at level crossings

b) Research

Selected scenario

- ► Scenario for risk assessment :
  - ► Risk evaluation based on user behaviours using automatic video data analysis
- ► Scenario for Smart detection system :
  - ► car stuck or stopped at LC.
  - ► information sharing in case of a train approaching
- ► Scenario for early detection of failures on the LC's equipment
- ► Scenario for surveillance of the road and rail surface at the LC
- ► Scenario for Optimized closure time
- ► Communication system for information sharing between the approaching train and the car driver in the vicinity of the level crossing

"The project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723205"

SAFER-LC

Innovative solutions to enhance the safety of level crossings for road and rail users.

MID-TERM CONFERENCE

10 October 2018 Madrid, FFE premises

c) Evaluation, Risk assessment

Example of INFRABEL LC statistical model

Define the
LC hotspots

Create a **decision tool**
to build a **LC ranking** in
terms of potential risk
of accident (except
history of accident)

Drawing up a **Top 50**
for:

• LC with a highest
potential risk of
accident,

• LC with a high risk of
Blocking back,

• LC with the worst
visibility.

Source: INFRABEL, Belgium

The goal of our statistical model is to create a decision tool to build a LC ranking
in terms of potential risk of accident. We don't take into account the historic of
accident, it's 2 things different.

Finally we want to have a top 50 for:
- LC with a highest potential risk of accident,
- LC with a high risk of Blocking back,
- LC with the worst visibility.

UNIVERSITE LIBRE DE BRUXELLES

d) Engineering measures
Some examples of preventive measures at INFRABEL, Belgium

Pilot projects in progress in some hotspots

Installation of technical measures following the TOP 50

Source: INFRABEL, Belgium

For the moment we test some new technical measures to improve safety at some LC via pilot projects. For example:

In the future, when we will get the final results of our statistical model. The goal is to install the new technical measures following the Top 50 LC with the highest risk of accident.

d) Engineering measures: Example of ProRail, NL

Behavioural tests: yellow floor and led Illumination.

Source: Jeroen Nederlof, ProRail, Netherlands

ProRail are testing a new LC concept on a pilot location and in a virtual reality setting. Using yellow painting and blue led lights on the ground to emphasise the crossing, to make it more visible.

d) Engineering measures: Example of ProRail

When the green light is on, it will take at least 30 seconds before the barriers close, you can cross calmly

Crossing assistant for elderly people and persons with reduced mobility

Source: Jeroen Nederlof, ProRail, Netherlands

Why a crossing assistant: Numbers show that older, less mobile pedestrians more often are involved in incidents at level crossings.

Reasons: panic when the bells ring and the barriers are closing, they freeze or fall while rushing over and falling. Or they get locked within the barriers.

Trend: people get older over the years and participate longer in traffic.

Product will not reduce the safety at level crossings!

The signs of the level crossing are always superior to the crossing assistant.

Information display near to the level crossing so pedestrians can relate it to the level crossing.

Clear message to target group, no room for misinterpretation.

Tested 01-03/2018.

50 pedestrians from the target group were interviewed. 24 pedestrians from that group used the crossing assistant. All these pedestrians say the crossing assistant is very useful.

e) Enforcement: red light enforcement cameras or cameras posted at LCs example of SNCF, France

- ❑ Around 80 speed or red light enforcement cameras equipped from 2009 at certain LCs with high road and rail traffic representing highest risks
- ❑ The camera takes 2 photos of the vehicle crossing after (from 3 till 5 seconds) the LC signals (bell, and flashing light) have started to function announcing the approach of train.
- ❑ Amount of the fine: 135 euros+ 4 points (out of 12) withdrawn from the French driving license

Source: SNCF, France
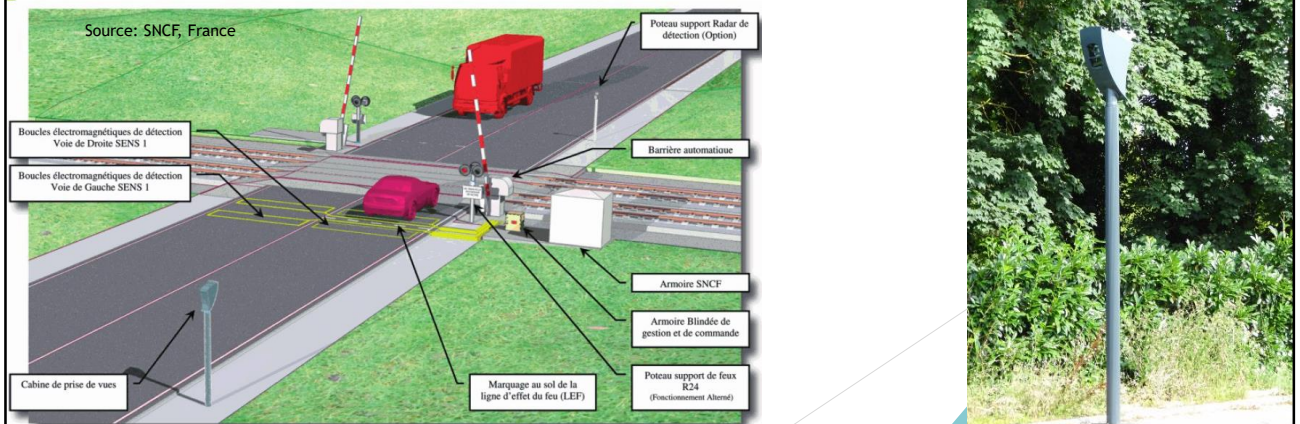
❑ 22 LCs equipped with speed cameras between 2009 and 2012

❑ 42 LCs equipped with red light enforcement cameras between 2012 and 2016

OBB 2018 – plan:
90 level crossing equipped with the infrastructure for radar
30 radar devices – rotating on the 90 level crossings

Fine: up to € 726,-. In the future revision of the Austrian Railway law it is planned to increase the fine up to € 2.180,-

e) Enforcement: examples of Poland and UK

CCTV cameras may serve to fine offenders

A cyclist was caught on Polish Railway surveillance cameras as he circumvented a lowered barrier at a railway crossing and was hit by an approaching high-speed train. The man survived and was fined by the police. (Dec. 16) : 35'' https://youtu.be/9OBTCxZn_Jo
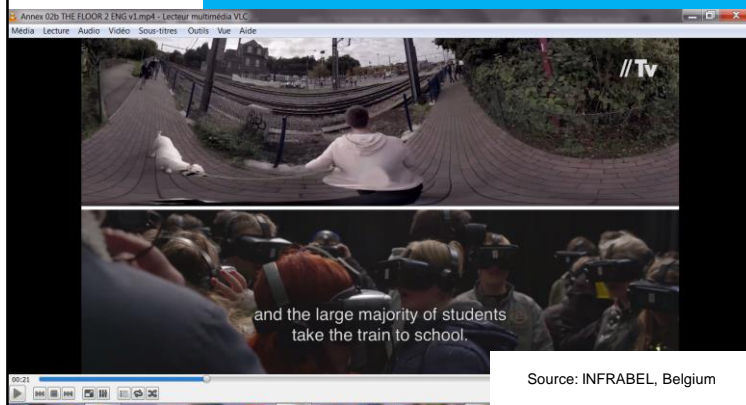
BTP/Network rail vans equipped with enforcement cameras to deter misuse at level crossings in the UK

f) Education, awareness: example of INFRABEL, Belgium

Since 2017, priority has been put on increasing the awareness of young people on the basic safety rules in the vicinity of the tracks. The main message is:

Your life is worth taking the long way round!
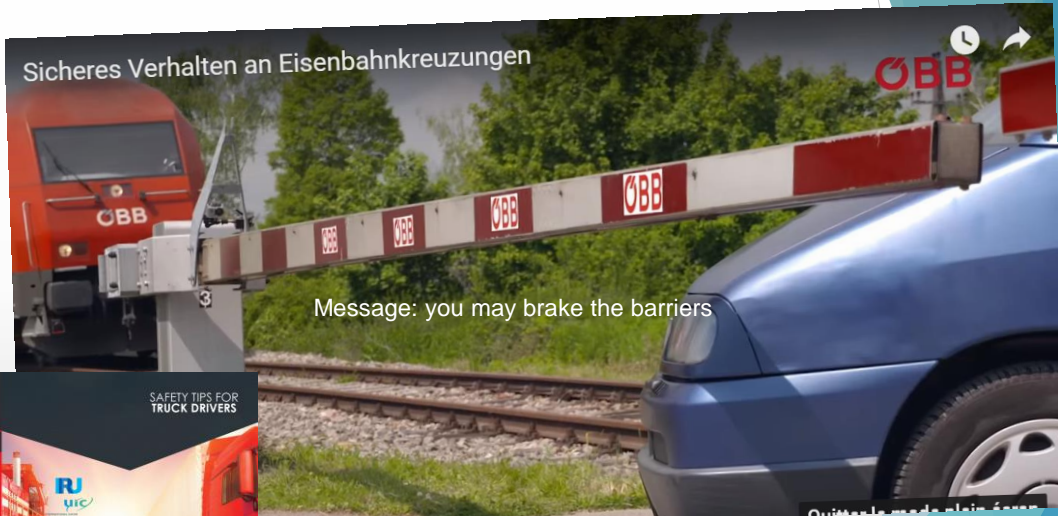
TOOL FOR SECONDARY SCHOOLS
(12 – 18 years)
The Floor
https://youtu.be/71gGjsvjr-w

and the large majority of students take the train to school.

Source: INFRABEL, Belgium

We developed different tools for teachers and pupils in primary schools. So we have our school kit, which includes a powerpoint presentation, posters, a parlour game, a guide for a field trip … this modules teachers can teach themselves the pupils about railway security. Pupils can test their knowledge with our games booklet, and finally we offer also to each class a large school calender, on which they can plan holidays, anniversary and learn about the safety rules on railways

f) Education, awareness: example of ÖBB Austria

Sicheres Verhalten an Eisenbahnkreuzungen

Message: you may brake the barriers

SAFETY TIPS FOR TRUCK DRIVERS

http://www.ilcad.org/LC-Safety-Tips.html
3 UIC/IRU/OLE LC safety flyers for truck, bus, coach and taxi drivers in 12 languages

f) Education, awareness: ILCAD 2018, Public Targeted :
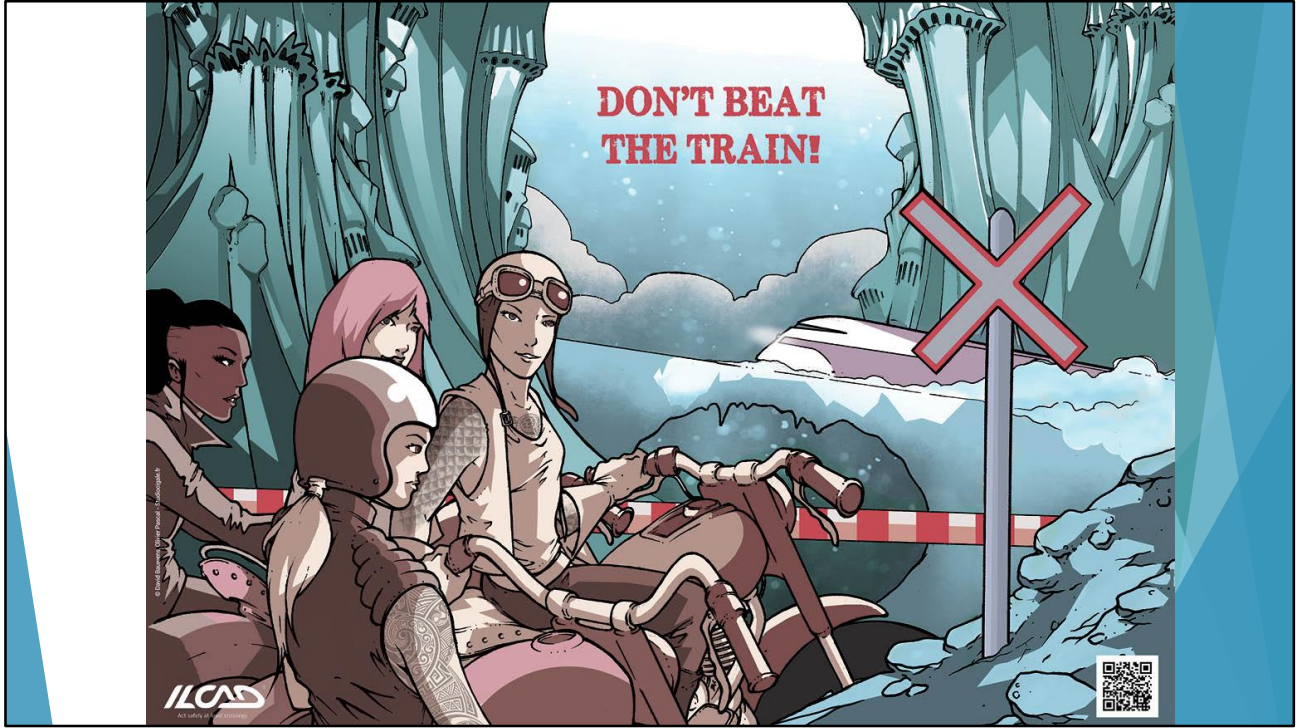## *« Young level crossing users »*

ILCAD 2018 :
over 40
countries

http://www.ilcad.org/Participants-2018.html

Summary here: https://www.uic.org/com/uic-e-news/603

ILCAD
Act safely at level crossings

**ILCAD 2018 Launch conference hosted by
HZ INFRA and the Faculty of Transport and Traffic Sciences of Zagreb, Croatia**

❑ **180 delegates from 29 countries (most from the EU, but also from India, USA, Russia, Mongolia, Japan) in the conference**

❑ **Various sectors were represented: Railways, national railway safety authorities (NSAs), members of ministries, academics, railway research centres, industries sponsoring the event**

❑ **30 speakers from 13 different countries**

Support of
Jean Todt,
President of
FIA
(Fédération
Internationale de
l'Automobile)

ILCAD 2018 Support of Jean Todt

0:12 / 1:38

https://youtu.be/q_Xh0U953tw

ILCAD 2018 Social media

https://www.facebook.com/ILCAD
http://twitter.com/#!/ilcad
ILCAD Youtube channel https://bit.ly/2GWJNKq
https://www.instagram.com/ilcaduic/

ILCAD Youtube channel https://bit.ly/2GWJNKq
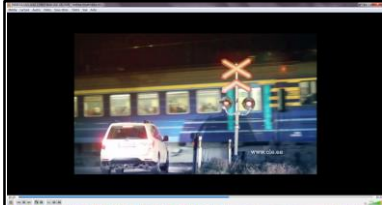
Christmas 2010 with OL Estonia

ILCAD 2010 with the EC
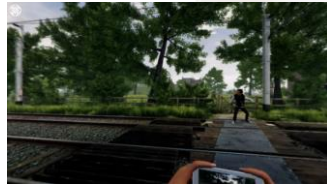
ILCAD 2011 with OL Estonia

ILCAD 2014 with the UNECE and FOT

ILCAD 2016 with LdZ (Latvian railways)

UIC ILCAD 2015

ILCAD 2017-18 with Network Rail

UIC ILCAD 2012-2013

ILCAD 2019 launch conference first week of June in the Netherlands

From left to right, ProRail team: Jeroen Nederlof (ELCF Chairman- UIC WG on LC, Pier Eringa (CEO) and Brenda Struve

For information or questions:
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www.ilcad.org
https://uic.org/safety-database

Thank you for your attention !