



UIC Safety Report **2017**

Significant Accidents 2016 Public Report



Department of
Fundamental Values

Safety Unit

October 2017



INTERNATIONAL UNION
OF RAILWAYS

ISBN 978-2-7461-2649-7

Warning

No part of this publication may be copied, reproduced or distributed by any means whatsoever, including electronic, except for private and individual use, without the express permission of the International Union of Railways (UIC). The same applies for translation, adaptation or transformation, arrangement or reproduction by any method or procedure whatsoever. The sole exceptions - noting the author's name and the source - are "analyses and brief quotations justified by the critical, argumentative, educational, scientific or informative nature of the publication into which they are incorporated" (Articles L 122-4 and L122-5 of the French Intellectual Property Code).

© International Union of Railways (UIC) - Paris, 2017



UIC Safety Report **2017**

Significant Accidents
occurred in Europe
during the year 2016

Public Report

UIC Safety Report 2017

Table of contents

Foreword by the Chairman of the Safety Platform

Executive summary by the chairman of the Safety Performance Group

Part 1 - General report on significant accidents 2015

Part 2 - Time series and trends

Part 3 - Focus on collisions with an obstacle

Foreword

I am pleased to introduce the 11th edition of the UIC Safety Report, containing statistics on significant accidents during 2016 on the networks of the 22 participating railway companies.

Though the number of significant accidents in 2016 remains stable compared to 2015, we should not lose sight of the structural reduction over the past decade: between 2006 and 2016, the rail system as a whole was able to reduce the number of accidents by 31%.

The fall in the number of accident victims is even steeper: the number of serious injuries has halved over the same period whilst the number of fatalities has been cut by a third.

Let us not forget that 80% of railway accidents are caused by third parties, whether trespassers or level crossing users crossing at the wrong time. These are the accidents whose number is hardest to reduce, and which the railways cannot eliminate alone. Society as a whole needs to be educated about risk, starting with public authorities.

This year's report is structured as follows:

- Part one: overview of accidents in 2016 (causes, context, and consequences)
- Part two: analysis of decennial trends
- Part three: focus on collisions with an obstacle.

I have no doubt that this report will prove useful to you in all your statistical analyses of railway safety.

We would be grateful to receive readers' feedback, since continuous year-on-year improvement of the Safety Report is of a piece with improvements in railway safety.

I hope this year's report provides a thought-provoking and useful read.

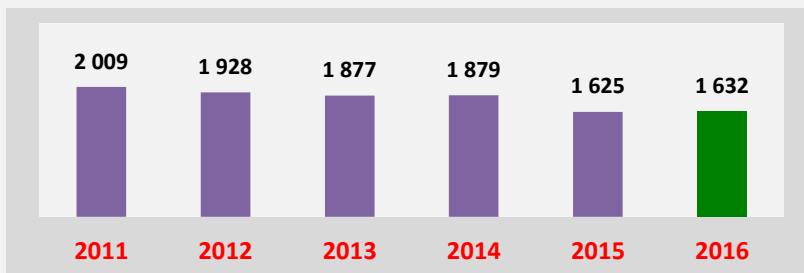
Frédéric Delorme

Chairman of the UIC Safety Platform

Executive summary

Number of significant accidents

The number of significant accidents in 2016 (1632) was similar to 2015 (1625). This means a consolidation of the general improvement of railway safety over the past 10 years. It does not mean that nothing changed in 2016. In the breakdown of different types of accidents, we see that 63.4% of all accidents are classified as “Individual hit by train”. This is an increase compared with the previous year (59.7%). A similar increase can be seen for “Trespassing” in relation to accident causes.



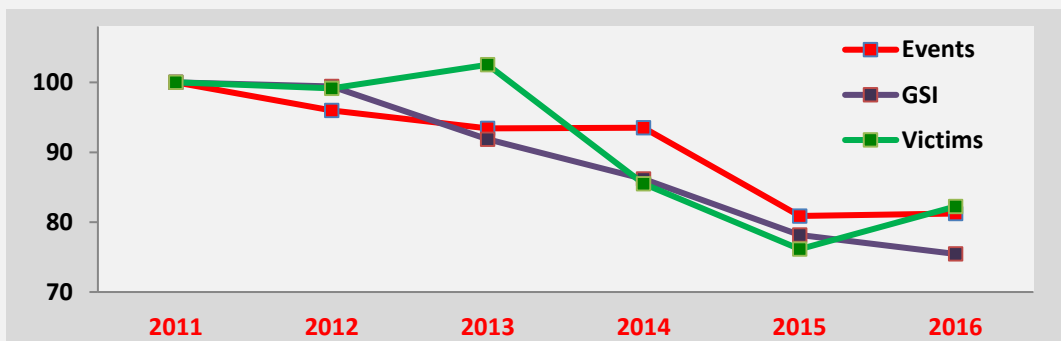
Number of fatalities

42 more fatalities were recorded in 2016 than in the previous year. Regarding the types of accidents the railway sector can influence most directly (train collisions, derailments, fires and shunting operations), we observe 31 fatalities in 2016 and 16 in 2015. This difference of 15 fatalities is mainly accounted for by 3 major events: a derailment in Spain with 4 fatalities and 13 serious injuries, a train collision in Belgium with 3 fatalities and 10 serious injuries, and a train collision in Germany with 11 fatalities and 24 serious injuries. 56 more persons died hit by a train or falling from a train outside LC and there were 29 less fatalities at level crossings.

Fatalities	2015	2016	Diff.
Individual hit by train or falling from a train (outside LC)	591	647	+56
Level crossing accidents	250	221	-29
Other accidents : collisions with an obstacle (outside LC), collisions between trains, derailments, fires in rolling stock, electrocutions, shunting operations, accidents involving dangerous goods	16	31	+15
Total	857	899	+42

UIC Global Safety index

The UIC Global Safety Index is actually a weighted number of accidents, whereby passenger and staff victims and internal causes are weighted more heavily than trespasser victims and external causes. In addition, a higher number of victims is weighted more heavily than a lower number. The index continued to decrease in 2016.



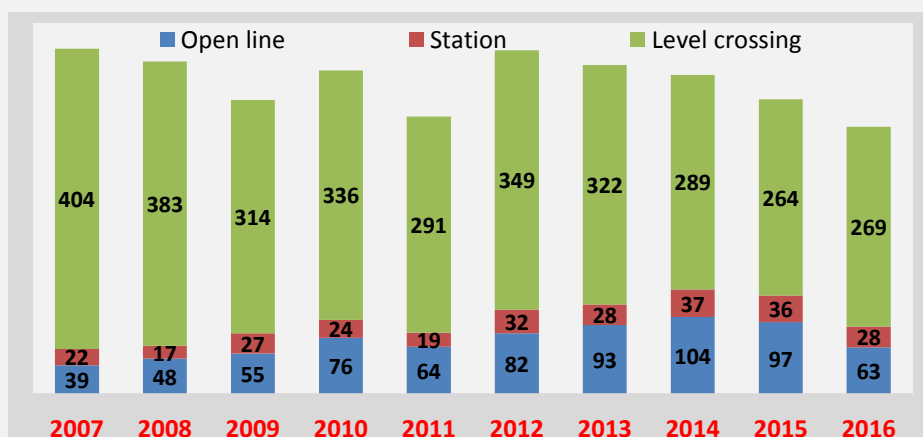
Over-all trends (part 2)

A 30-35% decrease in accidents and victims is observed over the 10-year period. The railway sector — and society as a whole — is making progress with regard to safety. Specifically: the decrease in accidents with internal causes (41%) is greater in relative terms than the decrease in accidents with external causes (26%). On the other hand, the absolute number of accidents with external causes is five times higher than the number of accidents with internal causes. This means that there is a greater reduction in respect of the lesser problem.



Collision of train with an obstacle

In this year’s report (part 3), we highlight “Collision of train with obstacle” as an accident type. As with all accidents, we see a gradual decrease over the years (34% in 10 years). The greatest proportion of obstacles causing significant accidents are road vehicles on level crossings (75% in 2016). The number of derailments occurring post-collision is remarkably constant (around 35 per year). As expected, victims are predominantly level crossing users. Staff victims are mostly train drivers. Passenger victims are frequently reported at level crossings, and rarely on open line or in stations. There are sometimes high numbers of passenger victims in major accidents (i.e. in 2008, with a collision with a herd of sheep and a collapsed road bridge). In more recent years, we have observed an increase in reports of accidents with overhead lines. The type of obstacle encountered in stations is often not accurately reported, making thorough analysis difficult.



Bart Hoogcarspel
Chairman of Safety Performance Group



Part 1

General Safety Indicators

Part 1 - General Safety Indicators

1.01 Evolution of significant accidents and UIC Global Safety Index

1.02 Types of accidents according to UIC-SDB and EU definitions

1.03 Main causes of accidents in the year 2016

1.04 Trend of accidents and rates on the last six years

1.05 Accidents by type

1.06 Fatalities and serious injuries by type of accident

1.07 Distribution of victims

1.08 Victims by type of accident according to Safety Directive definitions

1.09 Accidents by location details

1.10 Accidents at level crossings

1.11 Number of accidents and victims by type of accident

1.12 Passenger victims by type of accident and location

1.13 Staff victims by type of accident and location

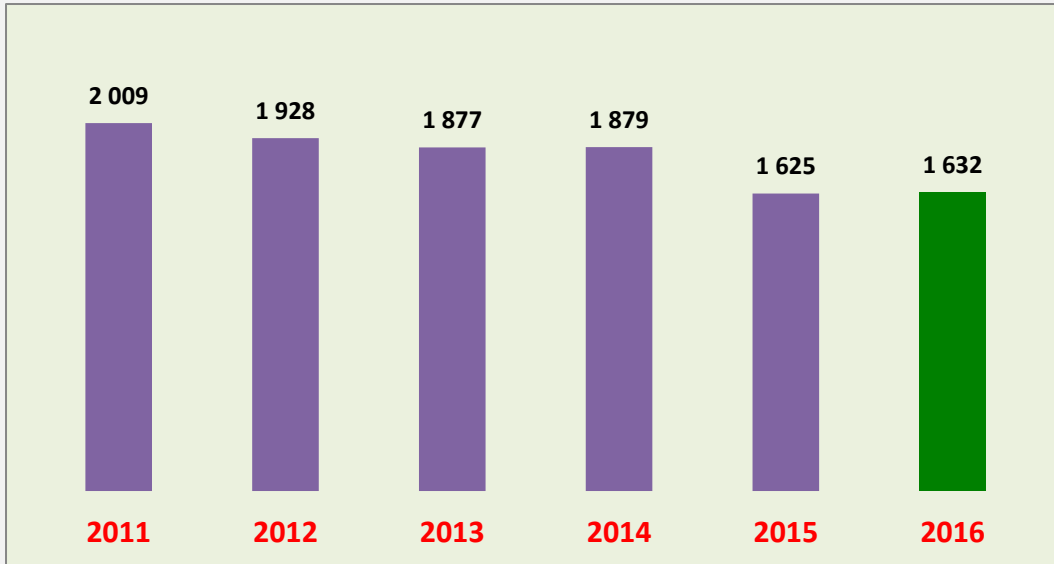
1.14 Victims by type of traffic

1.15 Accidents by type and number of victims

1.16 UIC Global Safety Index

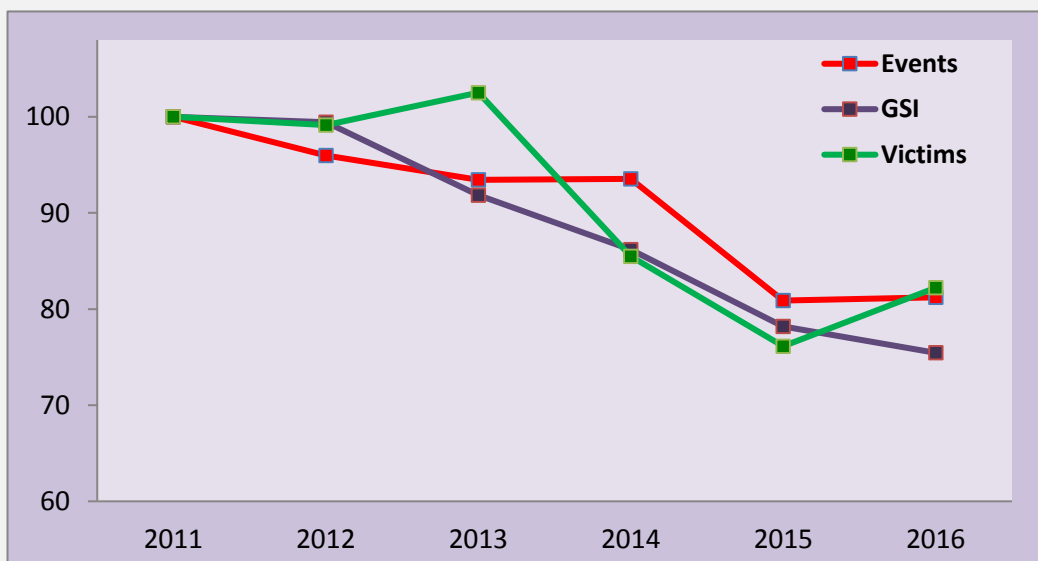
1.17 Accidents and victims by type of accident, causes and location

1.01 Evolution of significant accidents and UIC Global Safety Index



“Significant accident” means any accident involving at least one rail vehicle in motion, resulting in at least one killed or seriously injured person, or in significant damage to stock, track, other installations or environment, or extensive disruptions to traffic, excluding accidents in workshops, warehouses and depots.

The graph below compares the trends of the UIC Global Safety Index (GSI) with the trends of number of events and number of victims (Base 100 in 2011). Please confer page 1.16.



1.02 Types of accidents according to UIC-SDB and EU definitions

Types of accidents as defined in UIC – SDB	Additional information from UIC -SDB	Types of accidents as defined in Safety Directive
3,6%	Derailment of trains	3,6% Derailment of trains
0,7%	Train collision with another train	5,5% Collisions including collisions with obstacles within the clearance gauge
21,1% Train collision with an obstacle	4,8% Train collision with an obstacle not at LC	
	16,3% Train collision with an obstacle at LC	23,9% LC accidents, including accidents involving pedestrians at LC
63,4% Individual hit by a train	7,6% Individual hit by a train at LC	
	55,8% Individual hit by a train not at LC	59,5% Accidents to persons caused by rolling stock in motion, with the exception of suicides.
3,7%	Individual falling from a train	
1,2%	Fire in rolling stock	1,2% Fire in rolling stock
0,2%	Electrocution by overhead line or third rail	6,4% Other types of accidents
0,1%	Accident involving dangerous goods	
6,0%	Shunting operations	
0,0%	Runaway vehicles	

- Two thirds of accidents involved individuals hit by a train or falling from a train.
- Collision with an obstacle was the second most common accident (a fifth of all accidents).
- Accidents at level crossings accounted for 24% of all significant accidents.
- Accidents during shunting operations and involving runaway vehicles are now separated to better fit with the EU definitions.
- Accidents at level crossings are separated in the UIC database between collisions with an obstacle (motorized vehicle) and pedestrians (or cyclists) hit by a train.

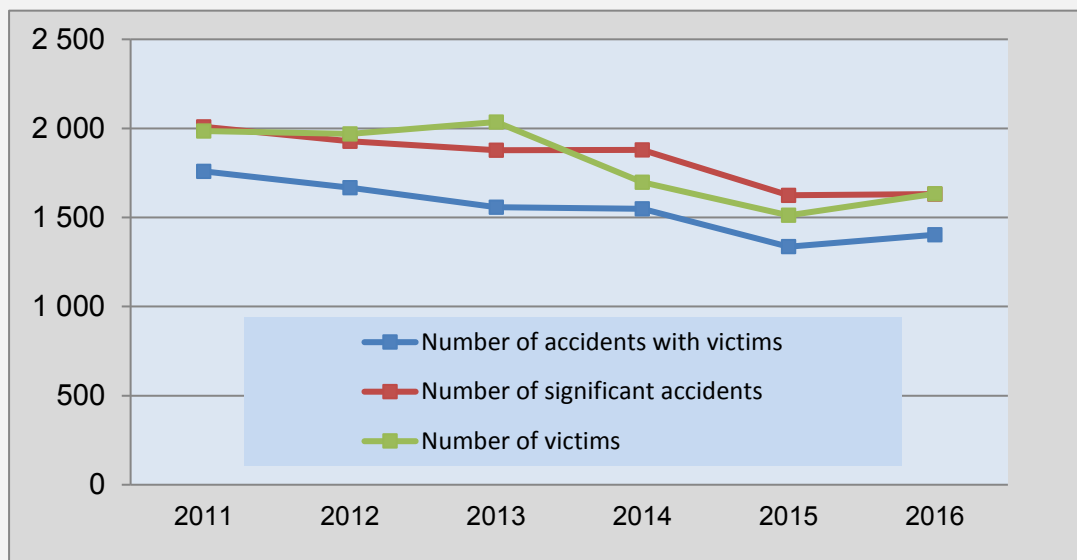
1.03 Main causes of accidents

2016	Causes at first level	Causes at second level
EXTERNAL CAUSES 82,8%	THIRD PARTIES 80,4%	Trespassing 52,0%
		Vehicle (LC accident) 16,2%
		Pedestrian (LC accident) 7,7%
		Pedestrian on public railway area 4,0%
		Other or not specified 0,5%
WEATHER & ENVIRONMENT 2,5%	Environment 2,1%	
	Weather 0,4%	
INTERNAL CAUSES 16,1%	INFRASTRUCTURES 2,5%	Tracks and structures 1,5%
		Energy system 0,6%
		Other or not specified 0,5%
	ROLLING STOCK 3,1%	Running gear 0,7%
		Other or not specified 2,5%
	HUMAN FACTORS (Railway staff & subcontractors) 7,2%	Track and switch maintenance staff 0,9%
		Traffic operating and signalling staff 1,3%
		Train drivers 1,8%
		Other or not specified 3,1%
	RAILWAY USERS 3,3%	Passengers 3,2%
Other or not specified 0,1%		
CAUSES NOT IDENTIFIED		1,0%

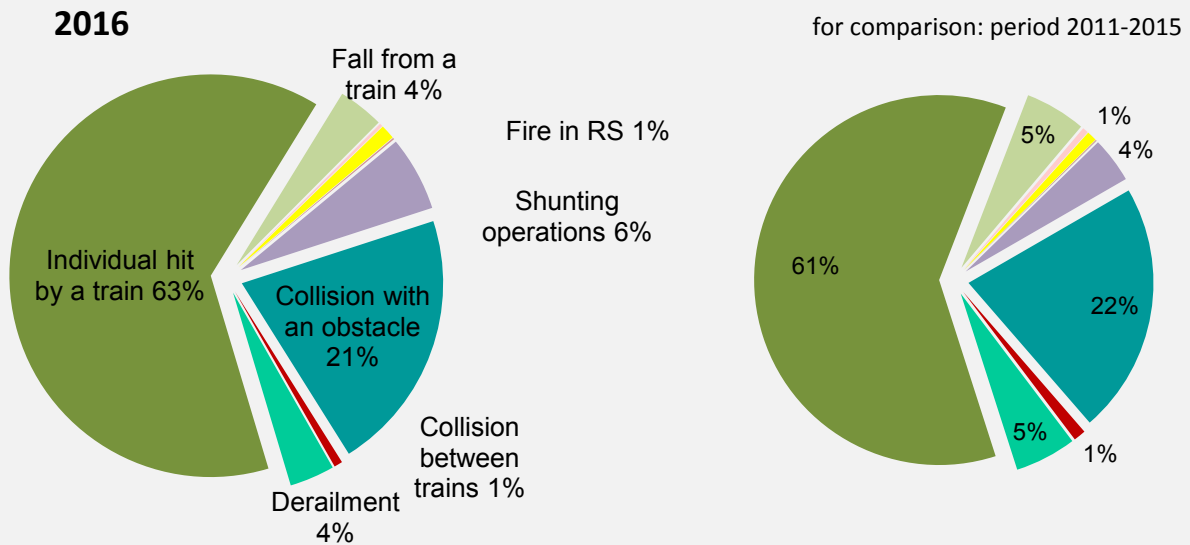
- More than 80% of accidents had external causes.
- Increase of the percentage of accidents caused by trespassing.
- Internal causes relate to both the infrastructure manager and railway undertakings.
- Decrease of all internal causes: infrastructure, rolling stock, human factors and users.

1.04 Trend of accidents and rates over the last six years

ALL RAILWAYS	2011	2012	2013	2014	2015	2016
Number of significant accidents	2 009	1 928	1 877	1 879	1 625	1 632
Significant accidents per million train-km	0,49	0,47	0,46	0,46	0,39	0,39
Number of accidents with victims	1 759	1 668	1 557	1 549	1 336	1 403
Accidents with victims per million train-km	0,43	0,41	0,38	0,38	0,32	0,34
Number of victims	1 986	1 969	2 036	1 698	1 512	1 633
Victims per million train-km	0,49	0,48	0,50	0,41	0,37	0,39
Number of fatalities	1 095	1 021	1 070	946	857	899
Fatalities per million train-km	0,27	0,25	0,26	0,23	0,21	0,22
Number of million train-kilometres	4 093	4 108	4 098	4 114	4 129	4 170



1.05 Accidents by type



	Victims per accident	Fatalities per accident	Serious injuries per accident
Passengers	0,10	0,01	0,08
Staff	0,04	0,02	0,02
Third parties	0,86	0,52	0,34
Total	1,00	0,55	0,45

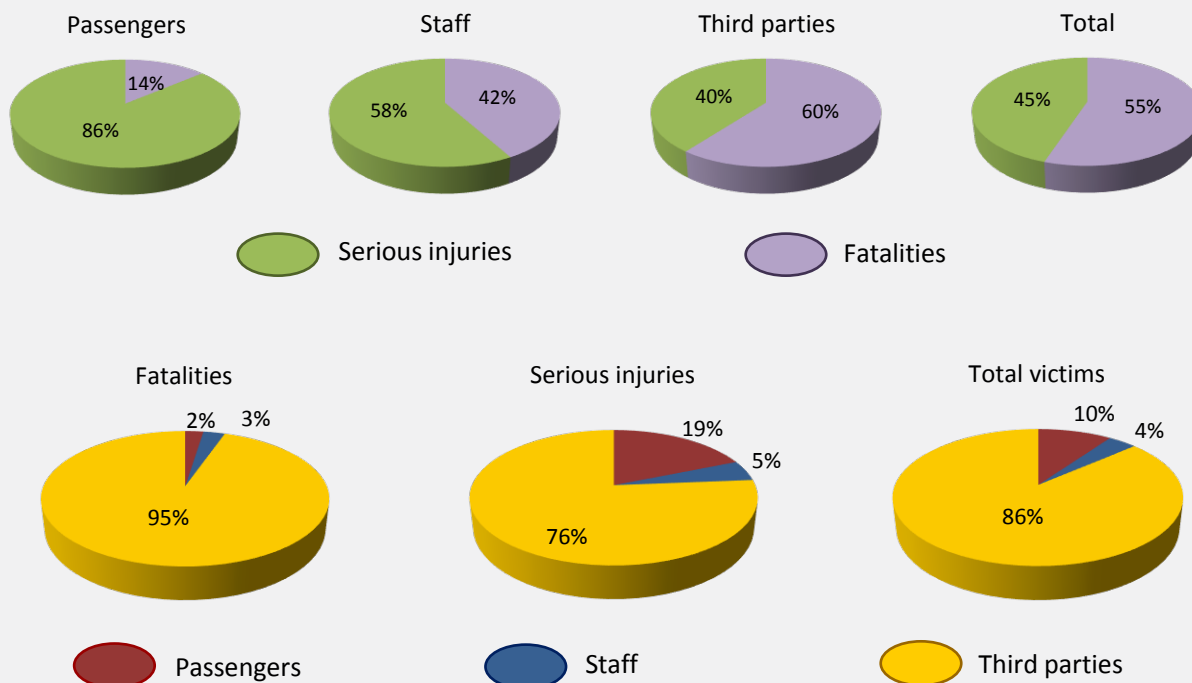
- Collisions with an obstacle include collisions at LC.
- Individual hit by a train include pedestrians at LC.
- For LC accidents, refer to table 1.11.

Type of accident - year 2016	Accidents		Victims	
	Number	%	Fatalities	Serious injuries
Collision with an obstacle	344	21,1%	132	231
Collision between trains	11	0,7%	15	40
Derailment	59	3,6%	4	50
Individual hit by a train	1035	63,4%	724	332
Fall from a train	60	3,7%	12	50
Electrocution	4	0,2%	1	5
Fire in RS	19	1,2%	-	1
Dangerous goods accidents (no release)	2	0,1%	-	-
Dangerous goods accidents (with release)	-	0,0%	-	-
Shunting operations	98	6,0%	11	25
Runaway vehicles	-	0,0%	-	-
Total	1 632		899	734

1.06 Fatalities and serious injuries by type of accident

2016	Fatalities			Serious injuries		
	Passen- gers	Staff	Third parties	Passen- gers	Staff	Third parties
Collision with an obstacle	-	3	129	5	9	217
Collision between trains	10	5	-	38	2	-
Derailment	2	2	-	48	2	-
Individual hit by a train	-	10	714	-	8	324
Fall from a train	10	1	1	46	-	4
Electrocution	-	-	1	-	2	3
Fire in rolling stock	-	-	-	1	-	-
Dangerous goods accidents	-	-	-	-	-	-
Shunting operations	-	5	6	-	13	12
Runaway vehicles	-	-	-	-	-	-
Total	22	26	851	138	36	560

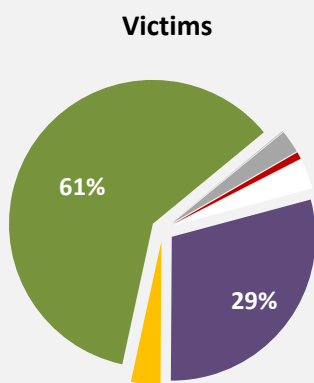
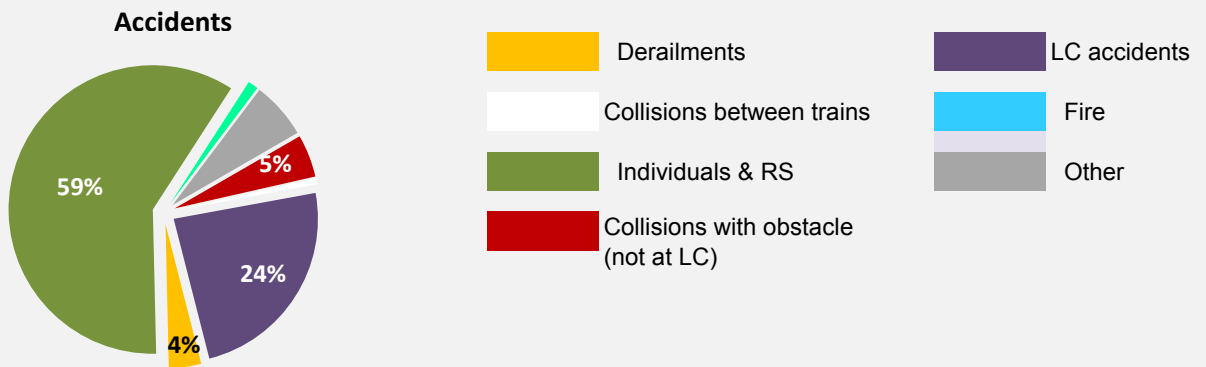
1.07 Distribution of victims



Reading method: fatalities account for 14% of passenger victims and passengers represent 2% of fatalities.

- Third parties represented 95% of all fatalities and 76% of serious injuries.
- Passengers accounted for 10% of all victims (5% in 2014 and 8% in 2015).

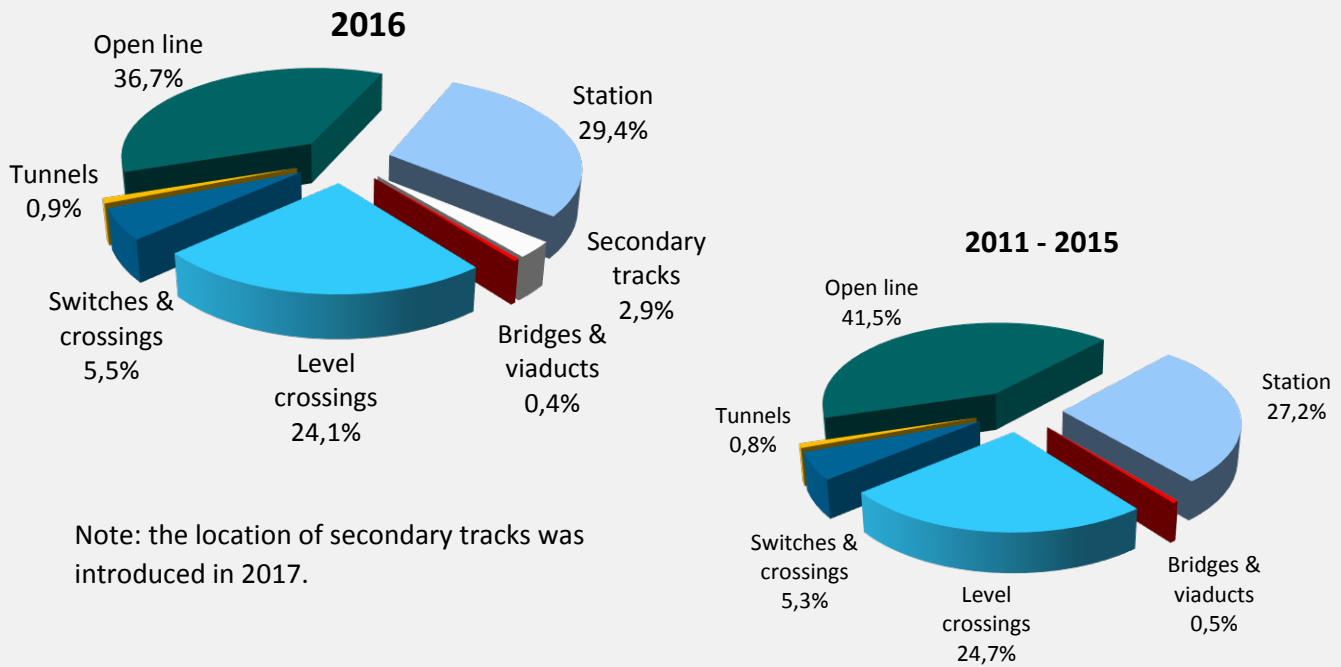
1.08 Victims by type of accident according to Safety Directive definitions



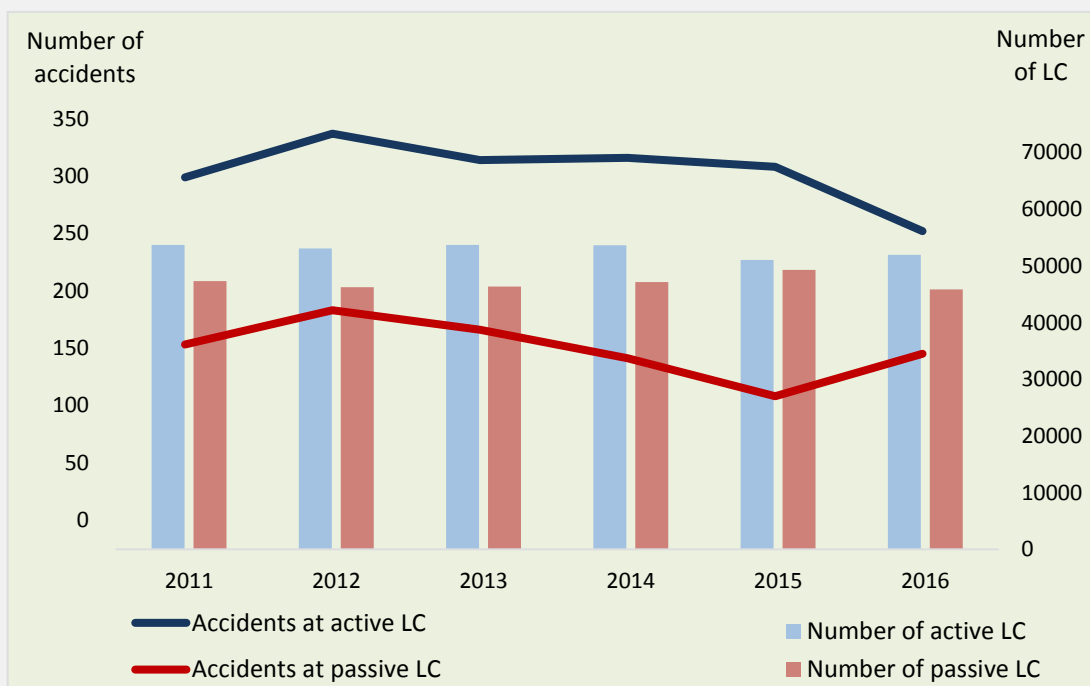
Breakdown of human consequences			
	Fatal.	Injur.	All
Passengers	1,3%	8,5%	10%
Staff	1,6%	2,2%	4%
Third parties	52,1%	34,3%	86%
All categories	55%	45%	100%

Type of accident	Number of events	%	Fatalities			Serious injuries		
			Passengers	Staff	3rd parties	Passengers	Staff	3rd parties
Collisions with obstacle (not at LC)	78	4,8%	-	-	-	2	5	6
Collisions between trains	11	0,7%	10	5	-	38	2	-
Level crossings	390	23,9%	-	3	218	3	4	250
Derailment	59	3,6%	2	2	-	48	2	-
Individuals & rolling stock in motion (not at LC)	971	59,5%	10	11	626	46	8	289
Fire	19	1,2%	-	-	-	1	-	-
Other types	104	6,4%	-	5	7	-	15	15
Total	1 632		22	26	851	138	36	560

1.09 Accidents by location details



1.10 Accidents at level crossings



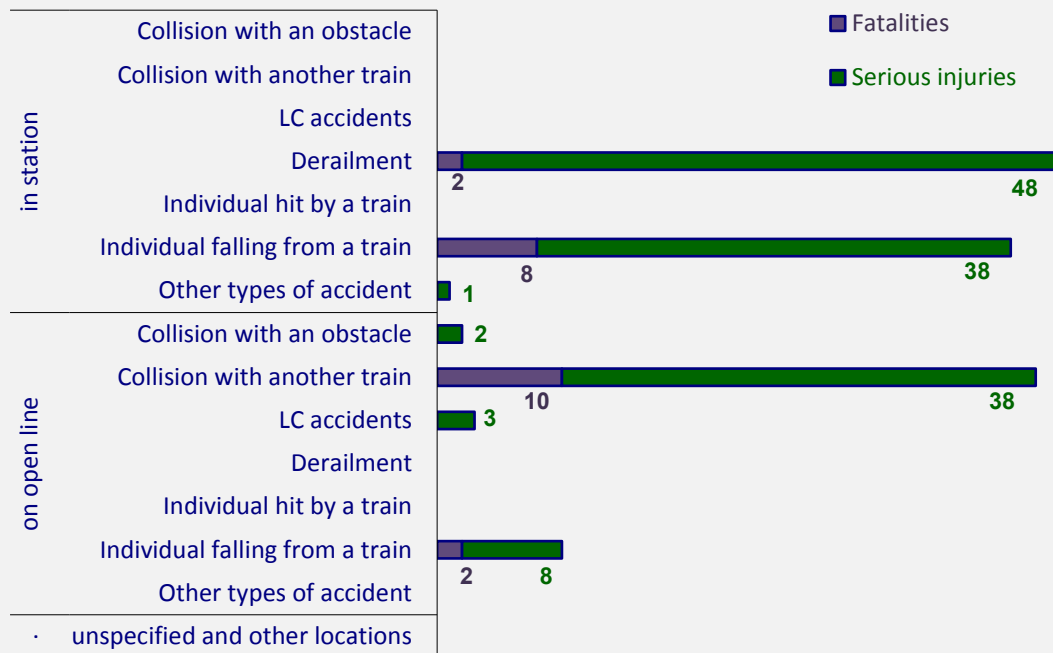
While the number of significant level crossing accidents show a slow decrease over the years, the number of level crossings stay virtually the same. Hence, the number of accidents per level crossing is slowly decreasing.

1.11 Number of accidents and victims by type of accident

2014		Number of accidents	FATALITIES			SERIOUS INJURIES			ALL VICTIMS
			Passengers	Staff	3rd parties	Passengers	Staff	3rd parties	
At station	Collisions with an obstacle (not at LC)	17	-	-	-	-	1	2	3
	Collisions between trains	5	-	-	-	-	2	-	2
	LC accidents	60	-	-	36	-	-	38	74
	Derailments	33	2	2	-	48	-	-	52
	Hit by a train (not at LC)	412	-	2	249	-	3	162	416
	Falling from a train	48	8	-	-	38	-	3	49
	Other accidents	99	-	5	3	1	13	10	32
	Total at station	674	10	9	288	87	19	215	628
On open line	Collisions with an obstacle (not at LC)	61	-	-	-	2	4	4	10
	Collisions between trains	6	10	5	-	38	-	-	53
	LC accidents	330	-	3	182	3	4	212	404
	Derailments	26	-	-	-	-	2	-	2
	Hit by a train (not at LC)	499	-	8	376	-	5	123	512
	Falling from a train	12	2	1	1	8	-	1	13
	Other accidents	24	-	-	4	-	2	5	11
	Total in open line	958	12	17	563	51	17	345	1005
not specified		-	-	-	-	-	-	-	
GRAND TOTAL		1632	22	26	851	138	36	560	1633

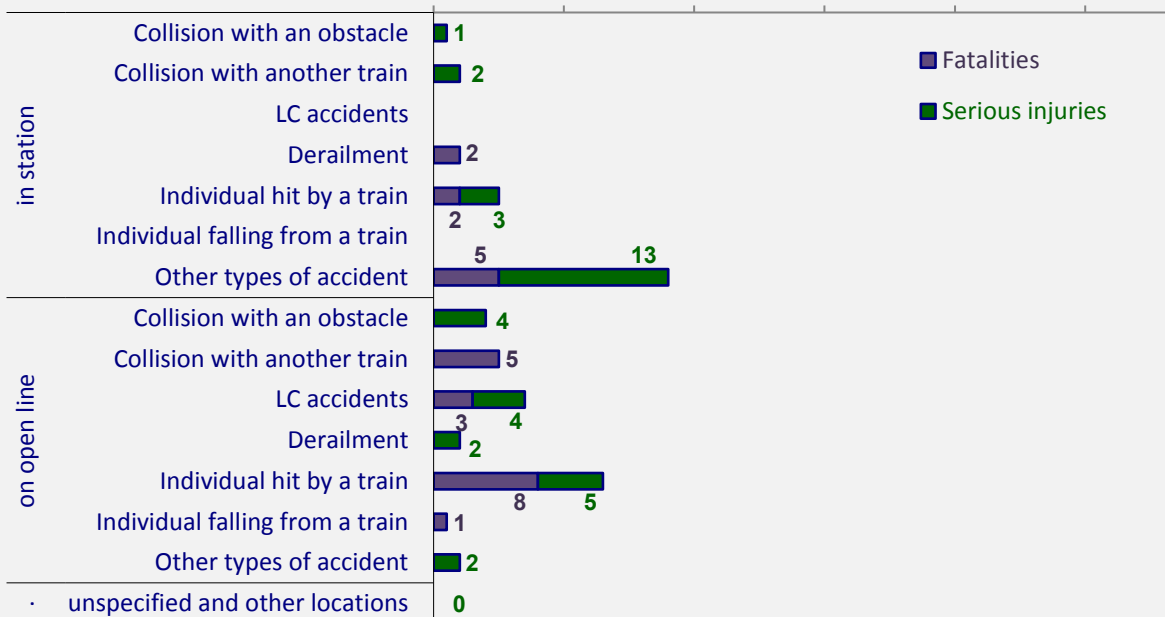
- 59% of accidents occurred on open line, whilst 41% happened in stations and yards.
- 66% of fatalities occurred on open line.
- Persons hit by a train and LC accidents represented 95% of all fatalities.

1.12 Passenger victims by type of accident and location



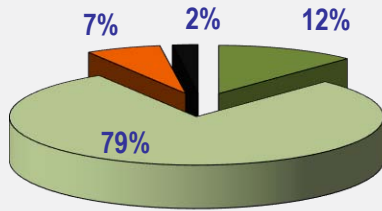
- One derailment caused 51% of passenger victims in station
- 2 collisions between trains caused 68% of passenger victims on open line.

1.13 Staff victims by type of accident and location



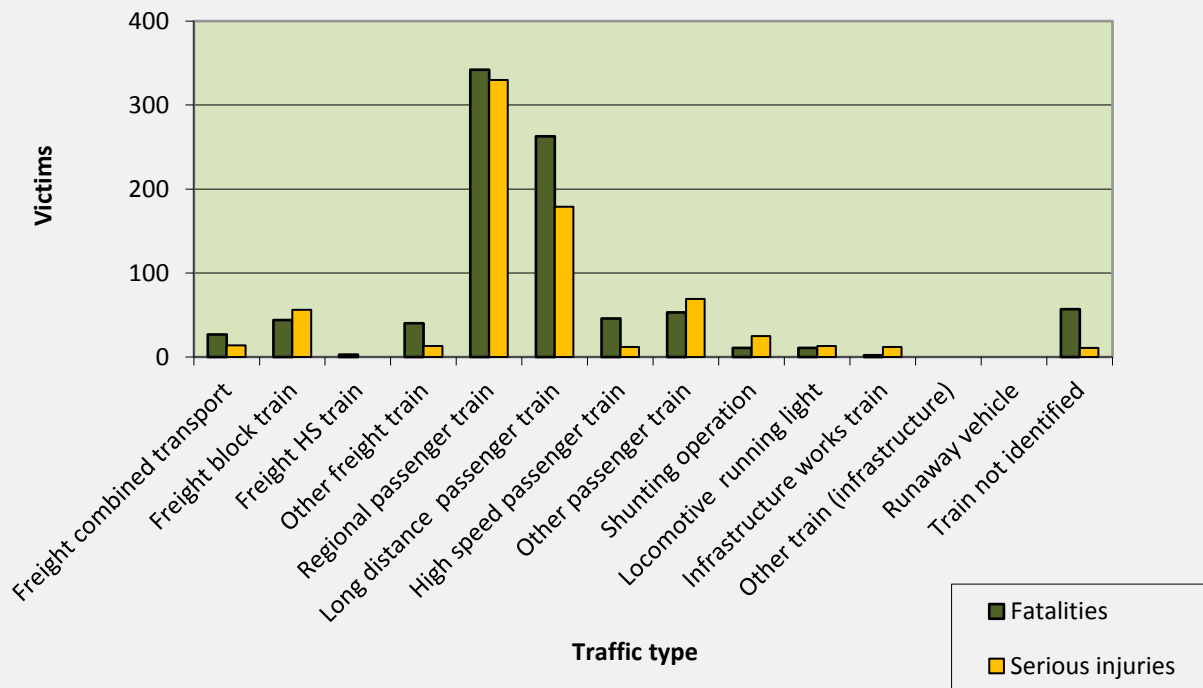
- Most of staff victims were hit by a train, and particularly during shunting operations (included in 'other types of accidents').

1.14 Victims by type of traffic



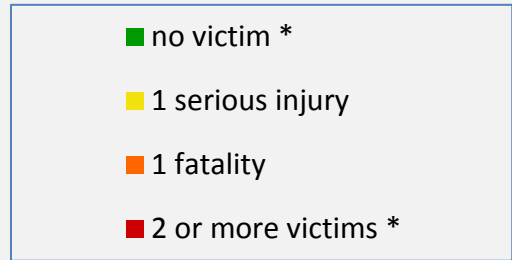
- Freight trains
- Passenger trains
- Locomotive running light, infrastructure trains, not identified trains
- Shunting and runaway vehicles

Type of accident	Freight trains	Passenger trains	Locomotive running light, infrastructure trains, not identified trains	Shunting and runaway vehicles
Collision	-	66	2	4
Derailment	-	52	2	2
Level-crossing accidents	60	395	23	5
Accidents to persons caused by rolling stock in motion	136	777	77	24
Other accidents	1	4	2	1
TOTAL victims	197	1294	106	36



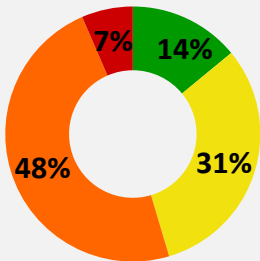
- Passenger trains were involved in accidents leading to 79% of victims.
- Regional passenger trains were involved in accidents leading to 41% of victims (27% for long distance passenger trains).

1.15 Accidents by type and number of victims

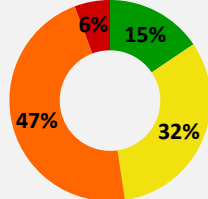


* a victim is a fatality or a serious injury

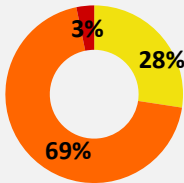
All accidents 2016 (1632 events)



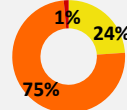
2011 - 2015 (9817 events)



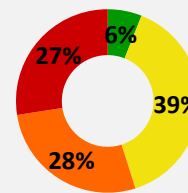
Individual hit by a train at LC 2016 (124 events)



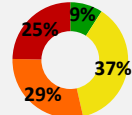
2011 - 2015 (809 events)



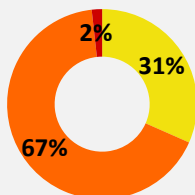
Collision with an obstacle at LC 2016 (266 events)



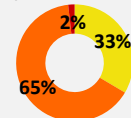
2011 - 2015 (1575 events)



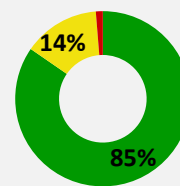
Individual hit by a train not at LC 2016 (911 events)



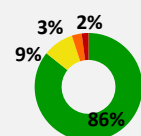
2011 - 2015 (5189 events)



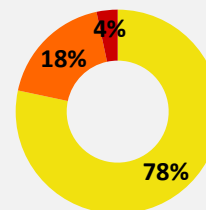
Collision with an obstacle not at LC 2016 (78 events)



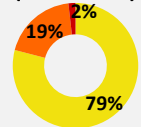
2011 - 2015 (517 events)



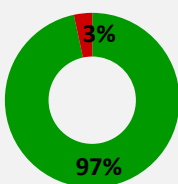
Fall from a train 2016 (60 events)



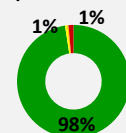
2011 - 2015 (548 events)



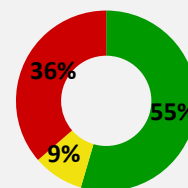
Derailment 2016 (59 events)



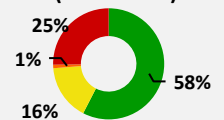
2011 - 2015 (538 events)



Collision between trains 2016 (11 events)

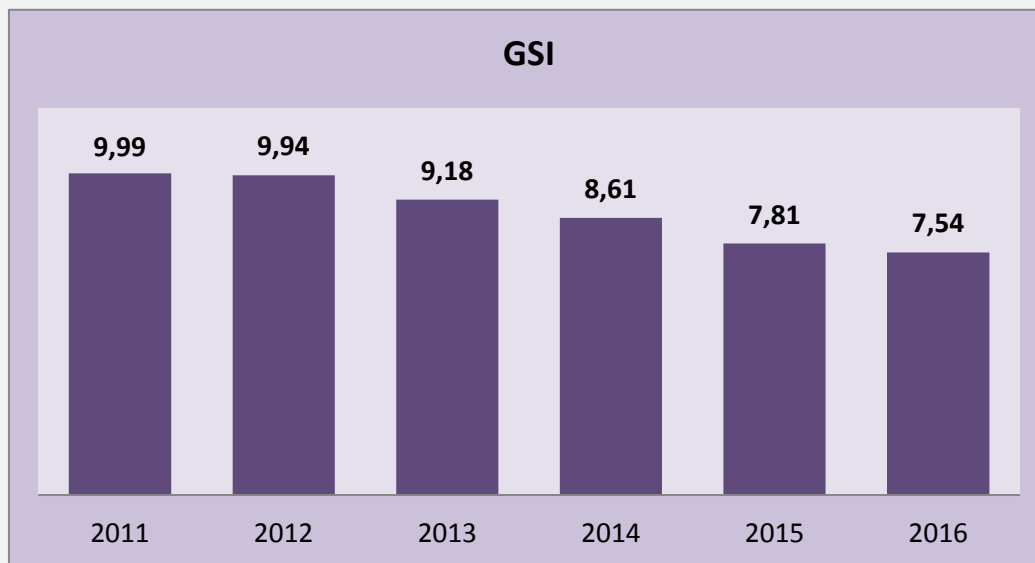


2011 - 2015 (109 events)



- Fires in RS: 18 events without victims and 1 event with a serious injury
- Dangerous goods: 2 events without victims
- Electrocutions: 4 events with 5 serious injury and 1 fatality

1.16 UIC Global Safety Index



The UIC Global Safety Index was created in 2015 by the Safety performance Group. It reflects more aspects than the sole number of events. Each event is weighted following the type of accident, the category of victim, the number of victims and the cause. Its general formula is as follows:

$$\text{GSI} = 1/1000 \times \Sigma (((\text{Cv} \times \text{Cn}) + \text{Ca}) \times \text{Cr})$$

where:

- Cv is the coefficient for the category of victim, from 1 (a serious trespasser injury) to 8 (a passenger fatality);
- Cn is the coefficient for the number of victims, from 0 (no victim) to 5 (more than 5 victims);
- Ca is the coefficient for the type of accident, from 1 (a person hit by a train) to 7 (a derailment or a collision between trains);
- Cr is the coefficient for the cause, from 1 (external causes) to 2 (internal causes).



1.17 Accidents and victims by type of accident, causes and location

Type of accidents	Causes		Location				Victims					
			Type of location		Location details		Fatal.	S. Inj.				
Individual hit by a train 1035 1056	INF	-	-	OL	595	610	LC	124	128	P	-	-
	RS	-	-				SC	35	35			
	HF	16	17	S	440	446	BV	6	6	S	10	8
	RU	-	-				T	10	10			
	WE	-	-	Ot	-	-	O	822	838	T	714	324
	TP	1015	1035									
Train collision with an obstacle 344 363	INF	15	-	OL	295	316	LC	266	350	P	-	5
	RS	11	-				SC	1	-			
	HF	9	6	S	49	47	BV	1	-	S	3	9
	RU	-	-				T	2	-			
	WE	36	5	Ot	-	-	O	74	13	T	129	217
	TP	271	351									
Individual falling from a train 60 62	INF	-	-	OL	12	13	LC	-	-	P	10	46
	RS	-	-				SC	-	-			
	HF	2	2	S	48	49	BV	-	-	S	1	-
	RU	51	53				T	-	-			
	WE	-	-	Ot	-	-	O	57	59	T	1	4
	TP	7	7									
Train collision with another train 11 55	INF	-	-	OL	6	53	LC	-	-	P	10	38
	RS	1	-				SC	1	-			
	HF	8	43	S	5	2	BV	-	-	S	5	2
	RU	-	-				T	-	-			
	WE	-	-	Ot	-	-	O	9	53	T	-	-
	TP	1	-									
Derailment 59 54	INF	22	-	OL	26	2	LC	-	-	P	2	48
	RS	13	2				SC	20	52			
	HF	16	52	S	33	52	BV	-	-	S	2	2
	RU	-	-				T	2	-			
	WE	4	-	Ot	-	-	O	37	2	T	-	-
	TP	-	-									
Electrocution 4 6	INF	1	1	OL	3	5	LC	-	-	P	-	-
	RS	-	-				SC	-	-			
	HF	1	2	S	1	1	BV	-	-	S	-	2
	RU	-	-				T	-	-			
	WE	-	-	Ot	-	-	O	4	6	T	1	3
	TP	2	3									
Fires 19 1	INF	-	-	OL	11	-	LC	-	-	P	-	1
	RS	17	1				SC	-	-			
	HF	-	-	S	8	1	BV	-	-	S	-	-
	RU	1	-				T	-	-			
	WE	-	-	Ot	-	-	O	19	1	T	-	-
	TP	-	-									

Type of accidents	Causes		Location				Victims								
			Type of location		Location details		Fatal.	S. Inj.							
Accident involving dangerous goods without release 2 -	INF	-	-	OL	-	-	LC	-	-	P	-	-			
	RS	1	-		S	-		-	SC		-	-	S	-	-
	HF	-	-	BV		-	-	T		-	-	T		-	-
	RU	1	-			O	-			-	O			2	-
	WE	-	-	Ot			-	-		-		-		-	-
	TP	-	-		-	-	-	-	-		-	-	-	-	
Accident involving dangerous goods with release - -	INF	-	-	OL		-	-		LC	-	-		P	-	-
	RS	-	-		S	-	-	SC		-	-	S		-	-
	HF	-	-	BV		-	-		T	-	-		T	-	-
	RU	-	-			O	-			-	O			-	-
	WE	-	-	Ot			-		-	-			-	-	-
	TP	-	-		-	-	-	-	-		-	-	-	-	
Shunting operations 98 36	INF	3	-	OL		10	6		LC	4	5		P	-	-
	RS	8	2		S	88	30	SC		33	4	S		5	13
	HF	65	17	BV		-	-		T	1	1		T	6	12
	RU	1	-			O	-			-	O			55	22
	WE	-	-	Ot			-		-	-			-	-	-
	TP	16	16		-	-	-	-	-		-	-	-	-	
Runaway vehicles - -	INF	-	-	OL		-	-		LC	-	-		P	-	-
	RS	-	-		S	-	-	SC		-	-	S		-	-
	HF	-	-	BV		-	-		T	-	-		T	-	-
	RU	-	-			O	-			-	O			-	-
	WE	-	-	Ot			-		-	-			-	-	-
	TP	-	-		-	-	-	-	-		-	-	-	-	

TOTAL	INF	41	1	OL	958	1005	LC	394	483	P	22	138			
	RS	51	5		S	674		628	SC		90	91	S	26	36
	HF	117	139	BV		-	-	T		15	11	T		851	560
	RU	54	53			O	-			-	O			1079	994
	WE	40	5	Ot			-	-		-		-		-	-
	TP	1312	1412		-	-	-	-	-		-	-	-	-	
	1632														
1633										899	734				

number of accidents	INF: Infrastructures RS: Rolling stock HF: Human Factors RU: Railway users	OL: Open line S: At station Ot: Other locations	LC: Level crossings SC: Switches & Crossings BV: Bridges & Viaducts T: Tunnels O: Other or unidentified	P: passengers S: Staff T: Third parties
number of victims	WE: Weather-Environment TP: Third Parties			



Part 2

**Time series and trends
2007-2016**

Part 2 - Time series and trends 2007-2016

CAUSES

2.01 Significant accidents

2.02 Causes

2.03 Internal causes

2.04 External causes

2.05 Third parties

HUMAN CONSEQUENCES

2.06 Human consequences

2.07 Severe accidents (two and more victims)

2.08 Passengers

2.09 Staff

2.10 Third parties

TYPE OF ACCIDENT

2.11 Collisions with an obstacle

2.12 Collisions between trains

2.13 Derailments

2.14 Individuals hit by a train

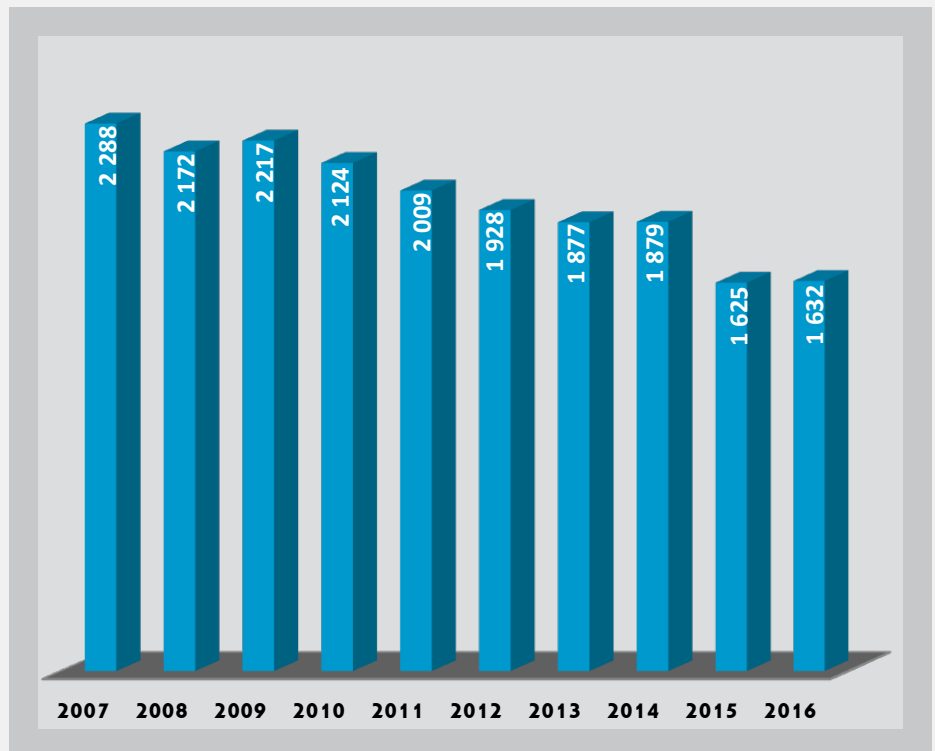
2.15 Individuals falling from a train

2.16 Accidents at level crossings

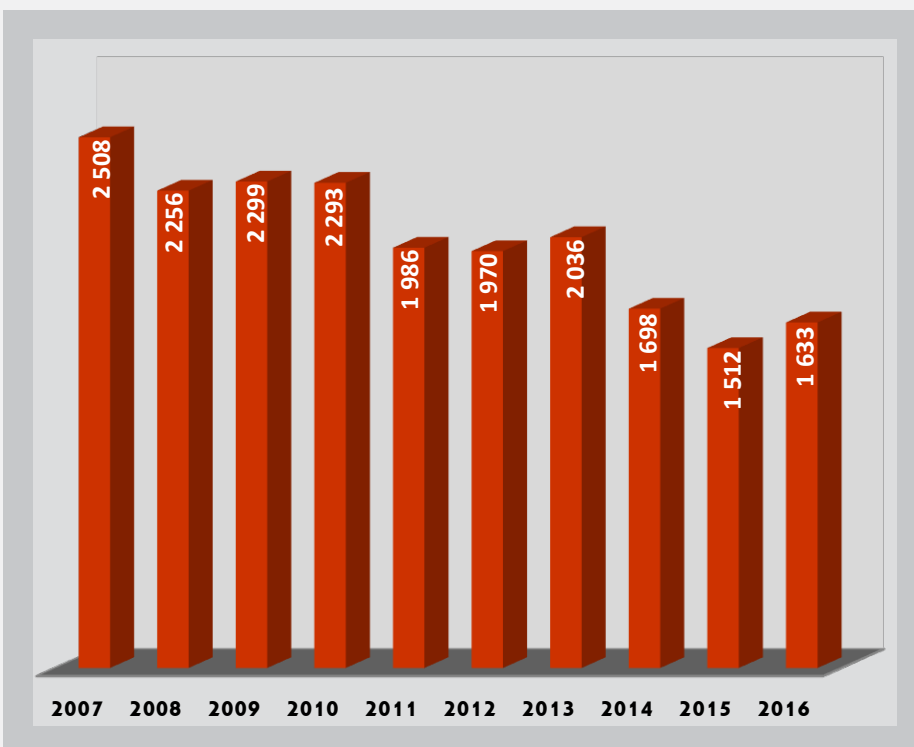
2.01a All significant accidents

Significant accidents declared by railway members of the Safety Database dropped from 2288 in 2007 to 1630 in 2016, which means a decrease of 29%.

“Significant accident” means any accident involving at least one rail vehicle in motion, resulting in at least one killed or seriously injured person, or in significant damage to stock, track, other installations or environment, or extensive disruptions to traffic, excluding accidents in workshops, warehouses and depots.



2.01b Victims of rail accidents



Trends in number of victims show three-year stages:

- 2 500 victims in 2007
- around 2 300 victims per year in 2008-2010
- around 2 000 victims per year in 2011-2013
- around 1 600 victims per year in 2014-2016

The number of victims in 2016 represents 65% of the number of victims in 2007. This means that more than one third of 2007 victims were spared in 2016. This is the most positive trend in railway safety issues we may observe on the past ten years.

2.02a Accidents per internal / external causes

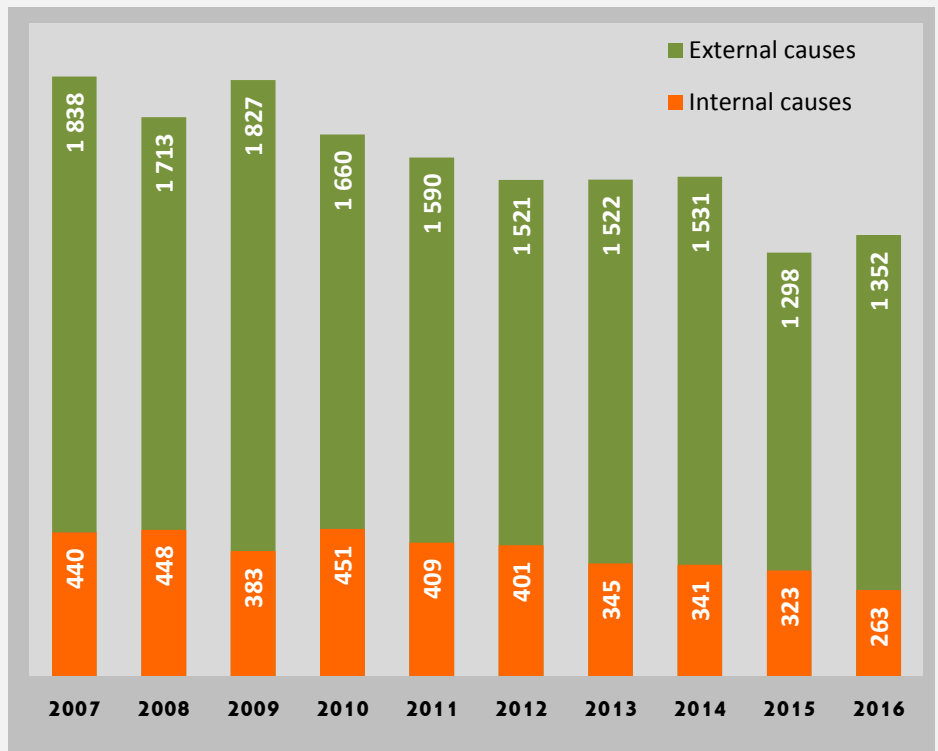
The number of accidents with internal causes decreased -41% between 2007 and 2016.

The number of accidents with external causes decreased -26% between 2007 and 2016.

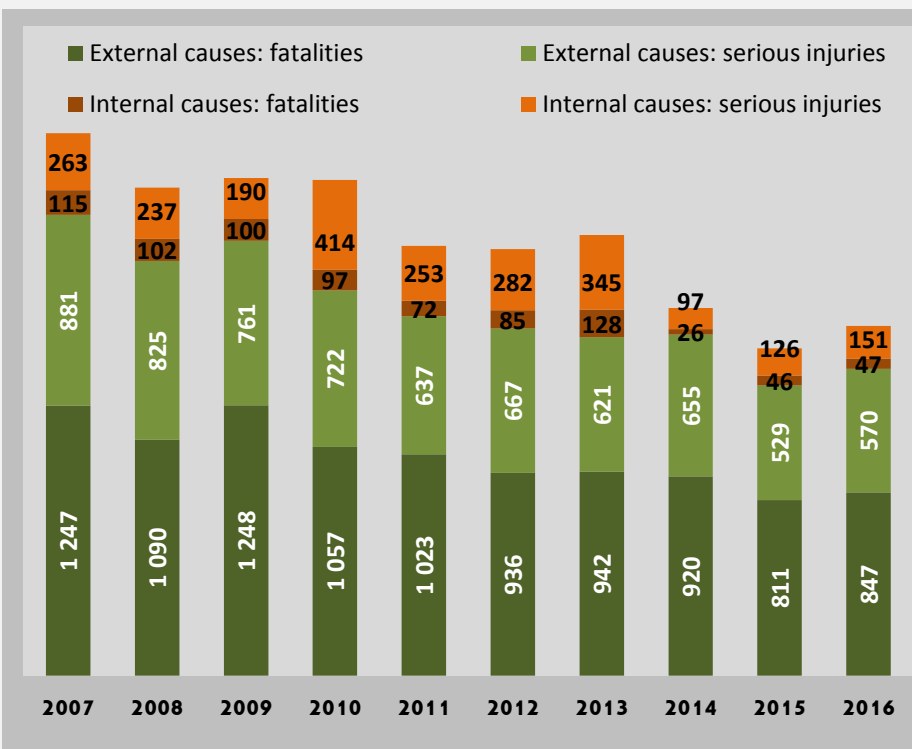
External causes are responsible for more than 80% of accidents each year.

Reminder

- Internal causes: infrastructure, rolling stock, human factors and railway users.
- external causes: third parties, weather and environment.



2.02b Victims per internal / external causes



Decrease from 2007 to 2016:

Internal causes	-52%
fatalities	-59%
serious injuries	-43%
External causes	-33%
fatalities	-32%
serious injuries	-36%

In the year 2016:

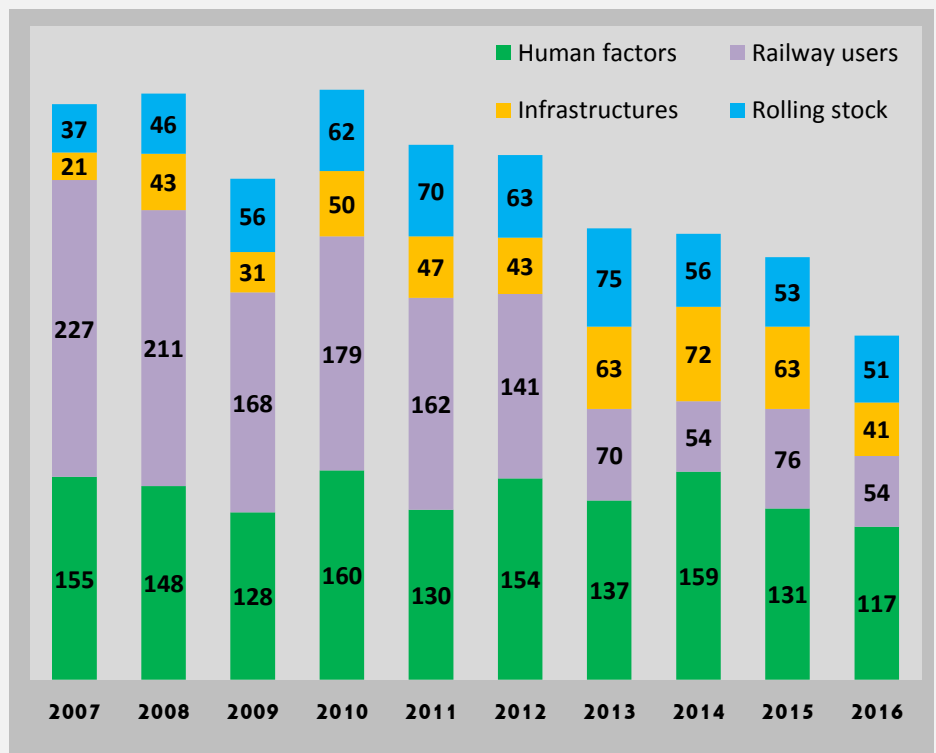
- ✓ External causes are responsible for 88% of all victims and 95% of all fatalities.
- ✓ 60% of victims of accidents with external causes are fatalities.
- ✓ Only 24% of victims of accidents with internal causes are fatalities.

2.03a Accidents per internal causes

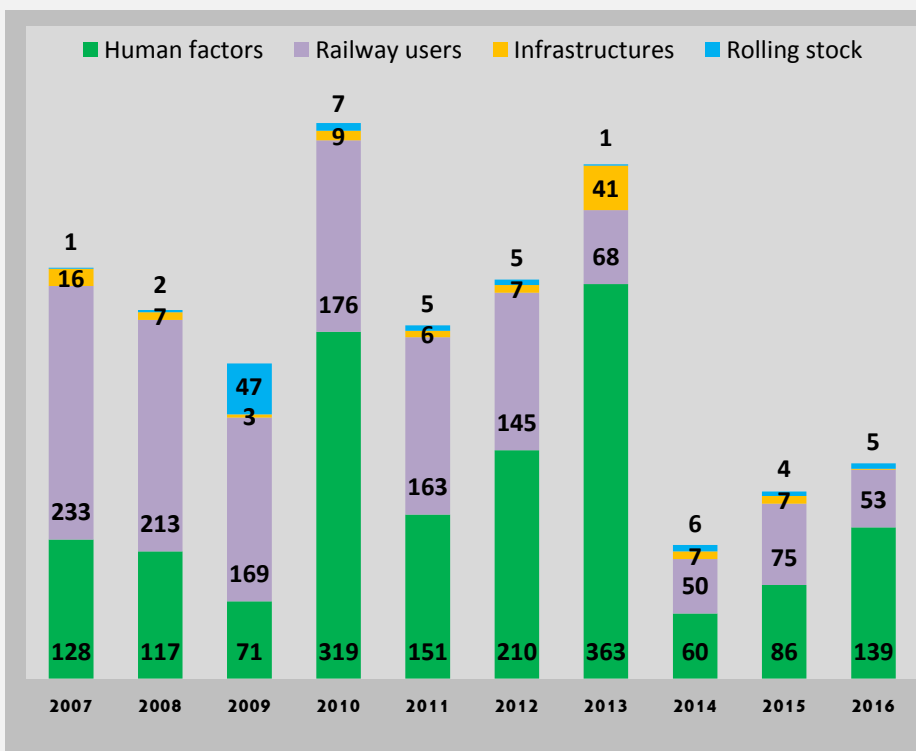
Accidents with "human factor" causes decreased -41% between 2007 and 2016.

We observe a huge drop of accidents with "railway users" causes: -76%

On the contrary, accidents with "infrastructure" causes doubled on the period and no change is noticeable for accidents with "rolling stock" causes.



2.03b Victims per internal causes



Victims of accidents with internal causes during the last two years represent a half of the 2006 victims.

Number of accidents and number of victims are quite disconnected. A few severe accidents may have a huge number of victims (years 2010 and 2013, for instance).

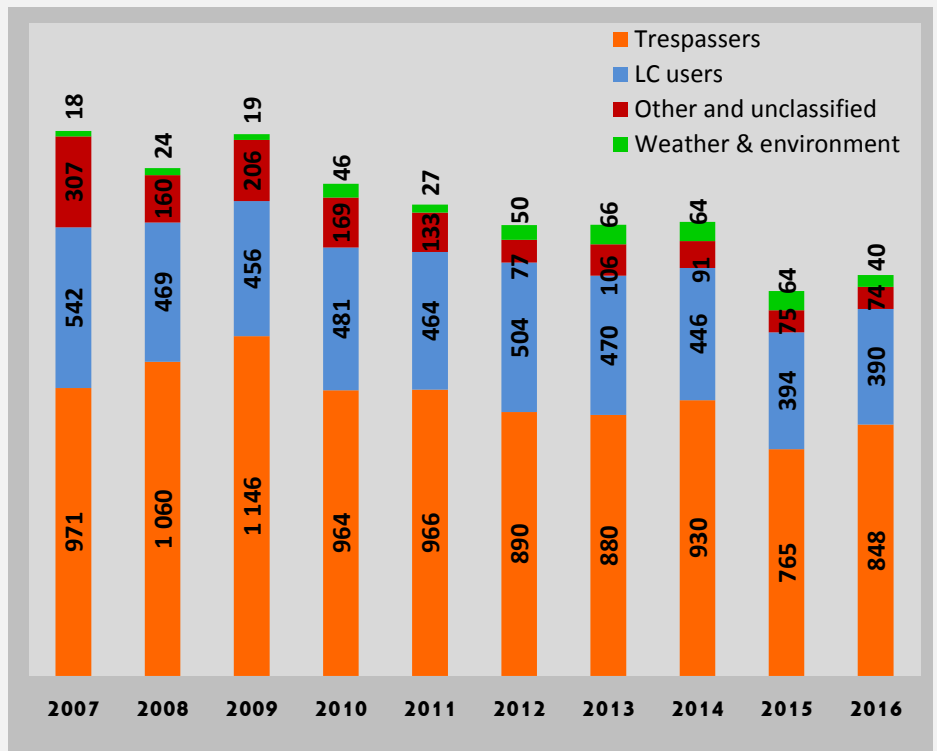
To be noticed: No victim was notified in an accident caused by rolling stock in the year 2016.

2.04a Accidents per external causes

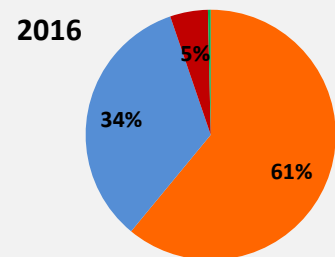
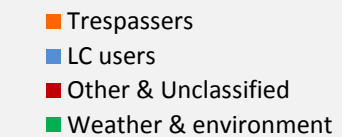
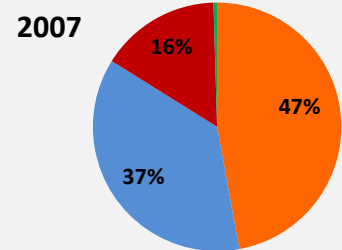
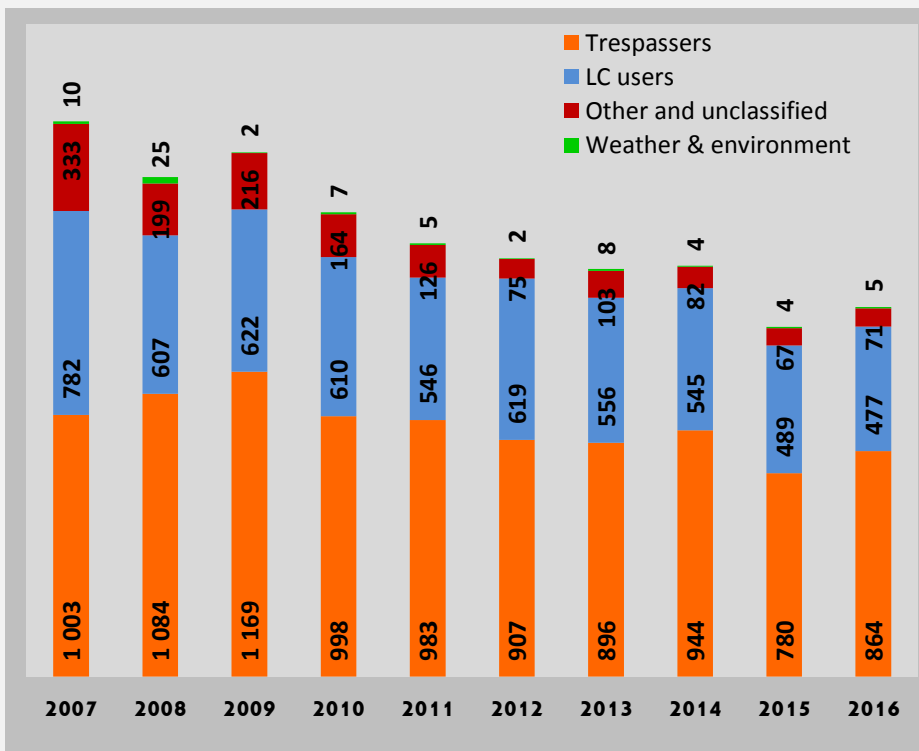
Graphs 2.04a and 2.04b show a lot of accidents with unclassified causes as the database was first implemented.

The data quality improved over the years, reclassifying events in other established categories. Hence the difficulty to analyse trends over the whole period.

The number of trespasser victims is decreasing more slowly than other types of victims (see pie chart below).



2.04b Victims per external causes



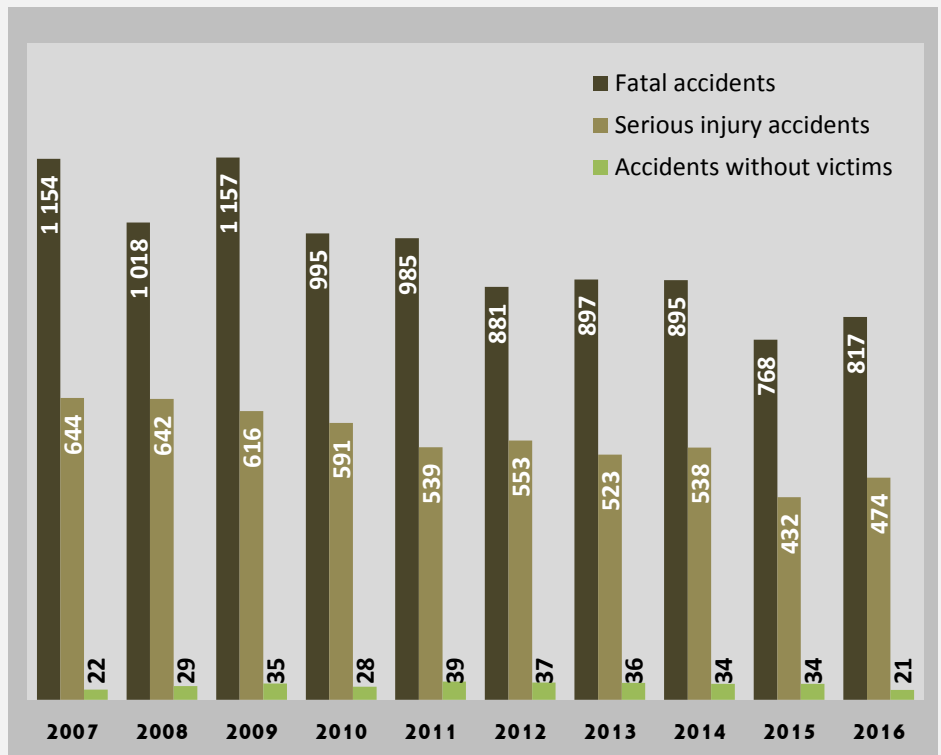
2.05a Accidents caused by third parties

Accidents caused by third parties decreased -28% between 2007 and 2016.

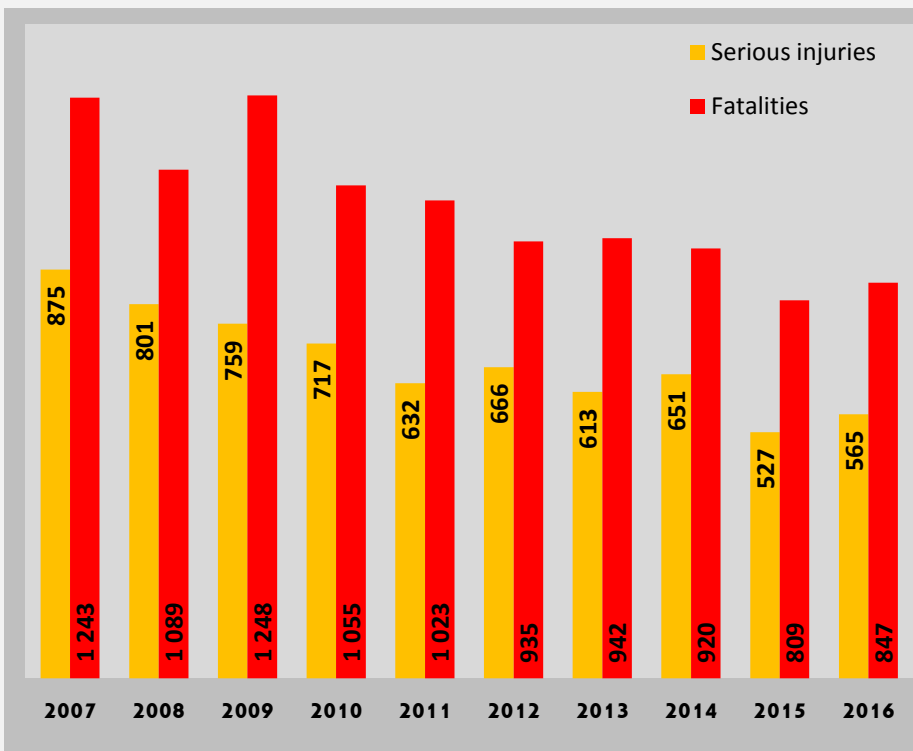
96% of fatal accidents and 86% of serious injury accidents are caused by third parties (year 2016).

Serious injuries decreased -32% and fatalities decreased -36% on the 10-year period.

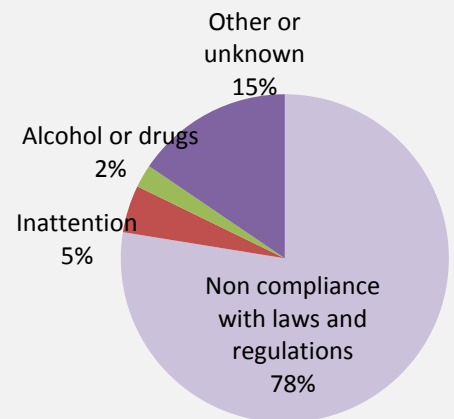
Non compliance with laws and regulations is the most common cause at third level, representing 78% of cases in 2015.



2.05b Victims of accidents caused by third parties



Split of victims per cause at third level 2016

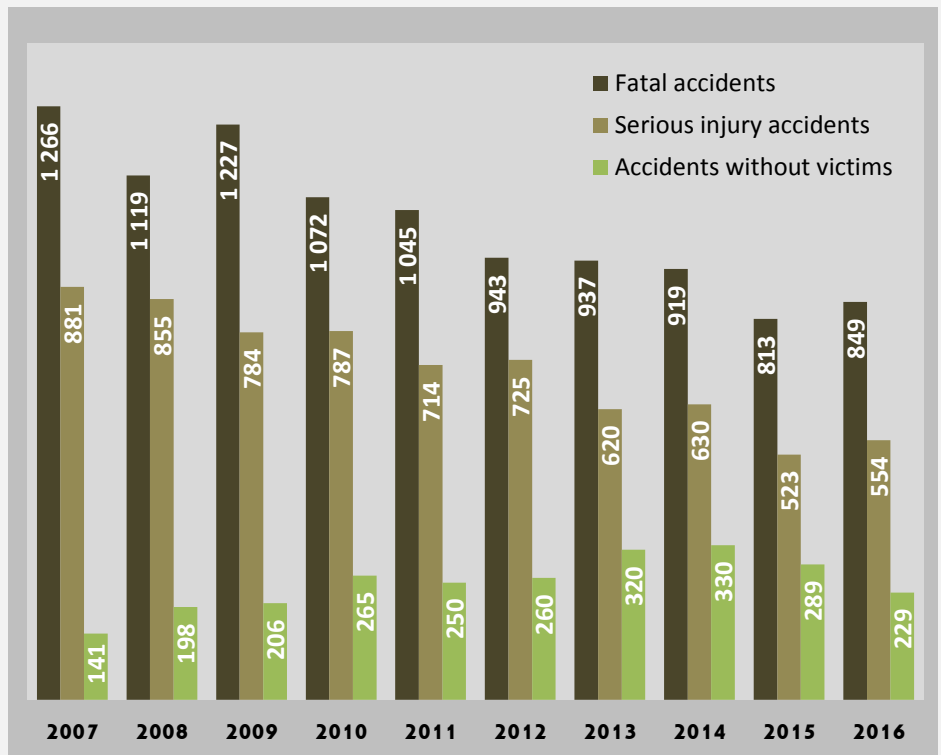


2.06a Accidents per human consequences

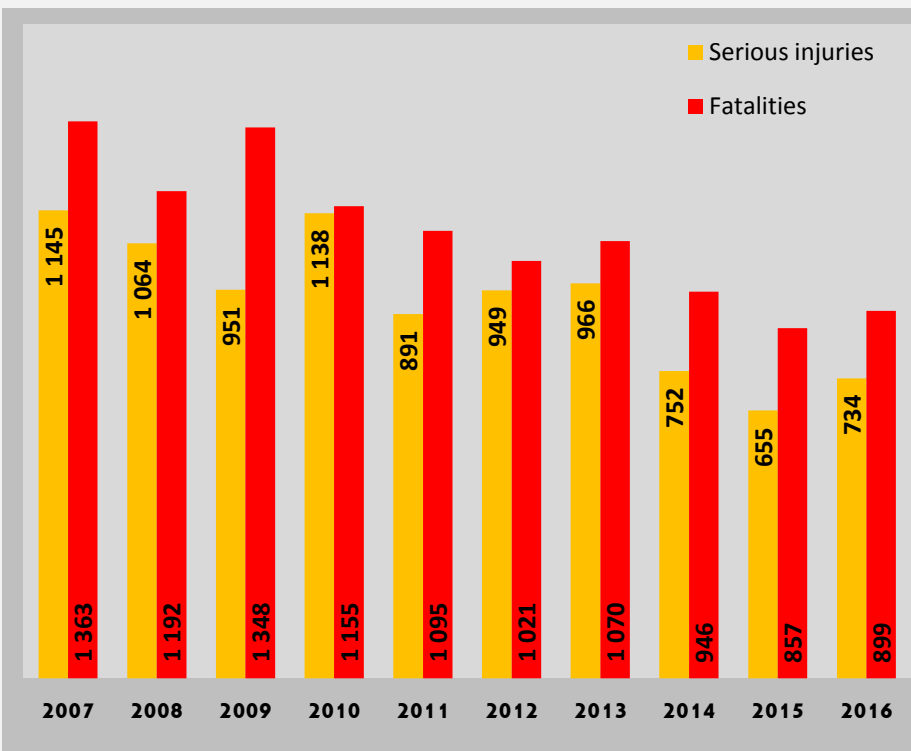
Fatal accidents roughly represent half of all significant accidents. This proportion is quite stable along the years, with a trend towards fewer fatal accidents.

A maximum of 55% of fatal accidents was observed in 2007 and 2009 and a minimum of 49% in 2014.

Fatal accidents decreased by 27% from 2006 to 2014 while serious injury accidents decreased by 35%.



2.06b Fatalities and serious injuries



From 2007 to 2016, fatalities decreased by -33% while serious injuries decreased by -36%.

This evolution appears quite erratic as it might depend on a small number of severe accidents.

There were more victims in 2016 than 2015, but still less than previous years.

Every year, railway accidents lead to more fatalities than serious injuries, due to the preeminence of "individuals hit by a train" (see graph 2.14).

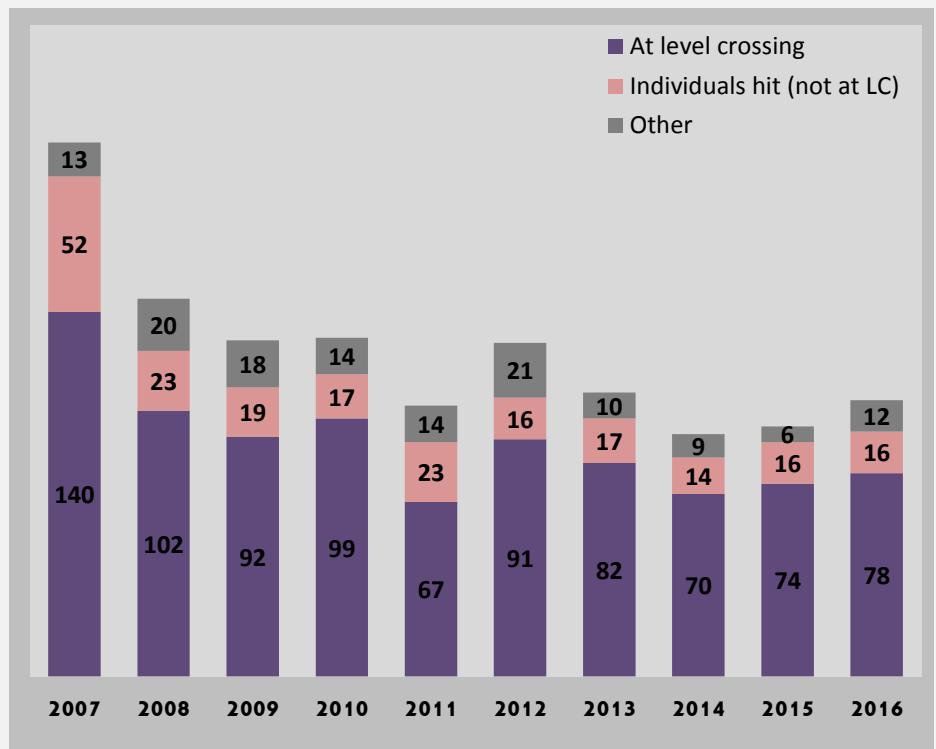
2.07a Severe accidents (two and more victims)

Accidents with two and more victims decreased -48% between 2007 and 2016.

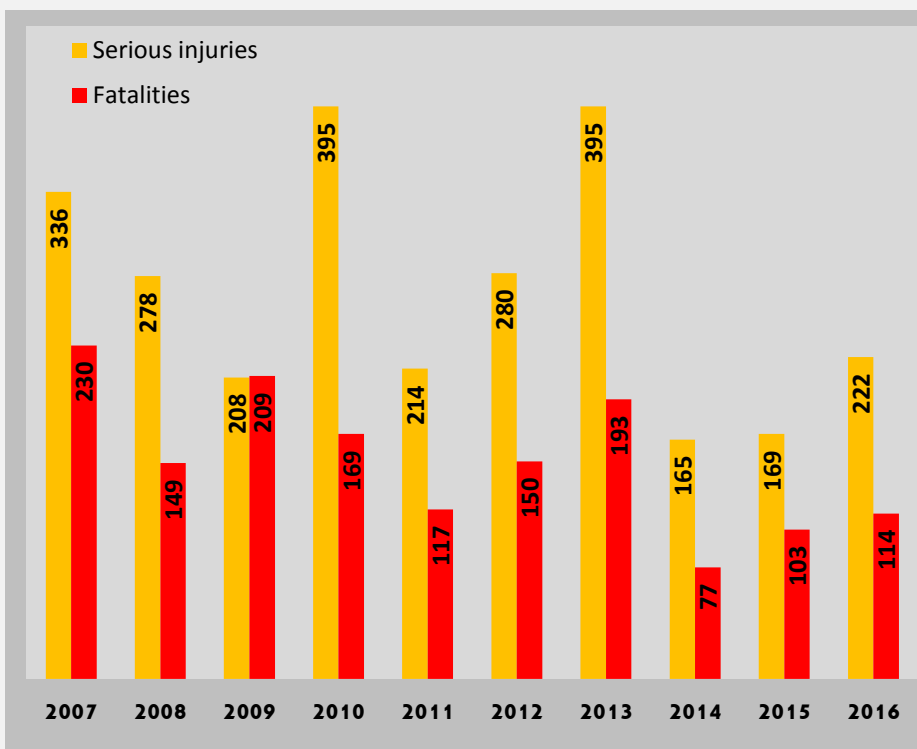
Collisions with road vehicles at level crossings represent 82% of the severe events (68% in 2007).

'Groups of individuals hit by a train' is the second most common severe accident : 12 events on open line and 4 events in station during 2016.

In 2016, the most severe event was a derailment causing 52 victims (of which 4 fatalities).



2.07b Victims of severe accidents



Severe accidents are unpredictable.

Regarding this indicator, 2014 and 2015 appear as the safest years of the decade.

The 2016 figures are higher and very similar to 2011 figures.

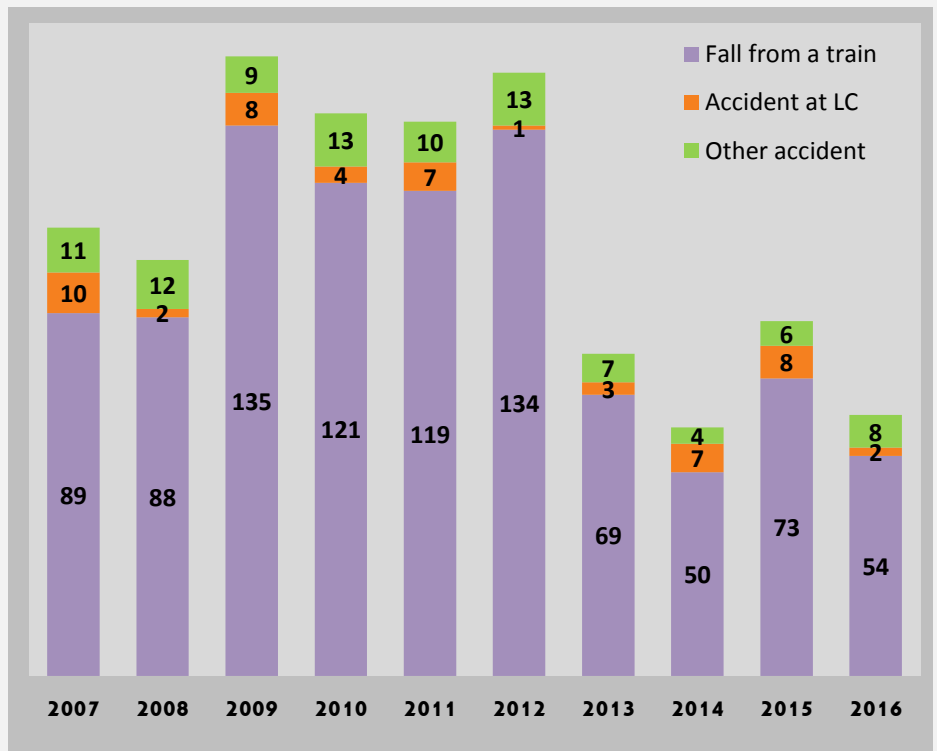
Nevertheless, serious injuries decreased -34% and fatalities decreased -50% compared to 2007.

2.08a Accidents with passenger victims

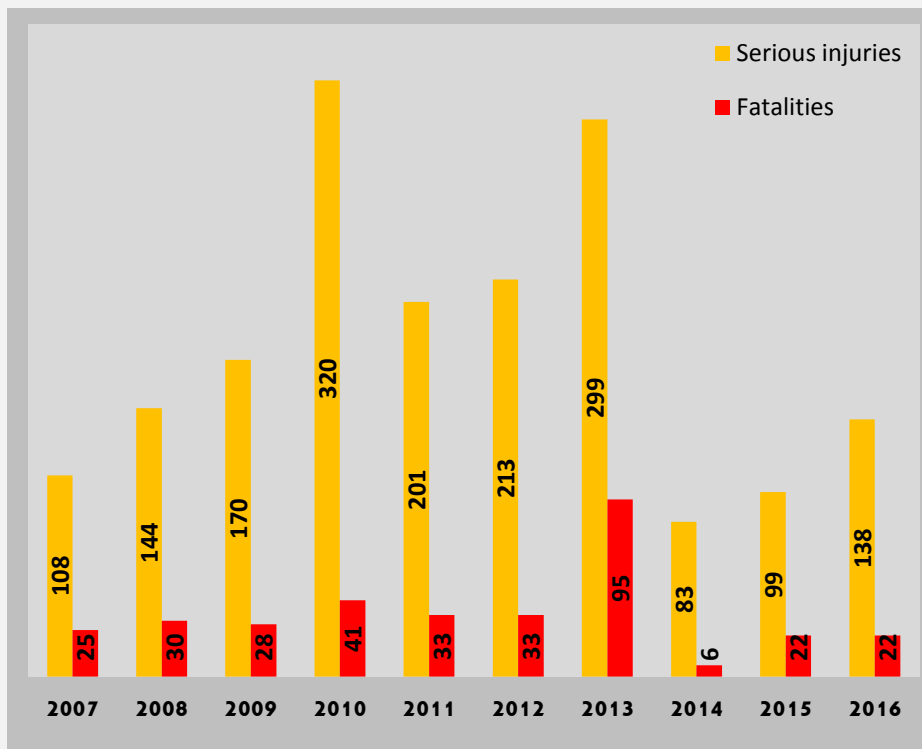
The number of accidents with passenger victims was stable before 2008 (around 110 events), rose to 140 on the 2009-2012 period, and decreased afterwards to levels unseen by the past.

2016 remains at the same low level as previous years.

Around 80% of events with passenger victims are "individuals falling from a train". They represent around 60 events a year since 2013.



2.08b Passenger victims



From 2013 to 2014, the number of passenger victims decreased -80%, confirming 2013 as the "annus horribilis" for rail safety in Europe.

From 2006 to 2013, there seemed to be an uncompressible threshold of 20 passenger fatalities. But 2014 smashed this threshold with a total of 6 fatalities.

Unfortunately, the 2015 and 2016 figures are again above the threshold.

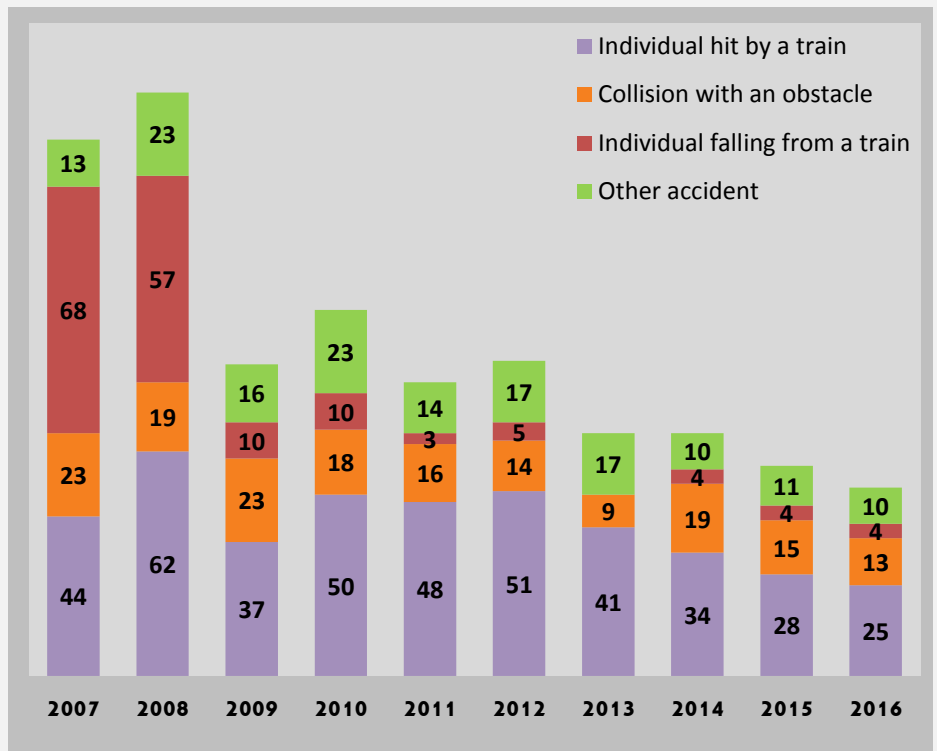
Serious passenger injuries increased in 2015 and again in 2016.

2.09a Accidents with staff victims

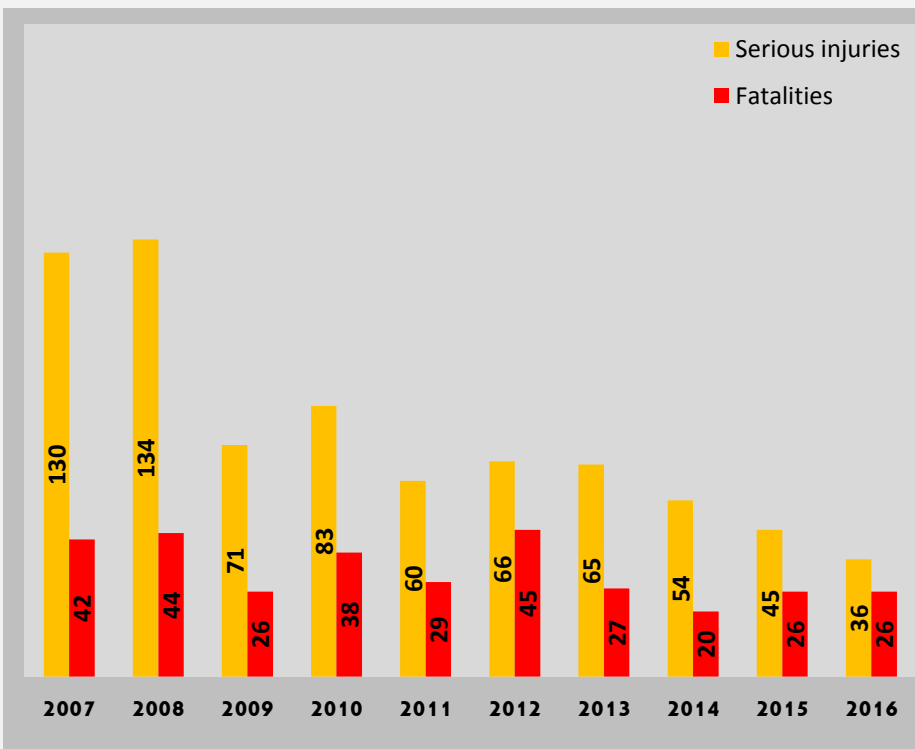
Accidents with staff victims decreased -65% on the whole period. The improvement of staff safety began in 2009.

We observe a peculiar high level of staff falling from a train till 2008. 90% of these events occurred on the same network, which means there was probably a misunderstanding of definitions at the beginning of the database project.

In 2016, the total number of staff victim is the lowest of the decade, confirming the trends towards a better staff safety.

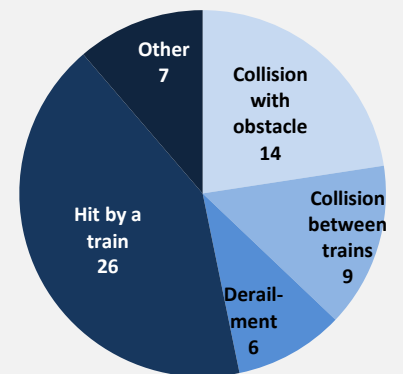


2.09b Staff victims



Staff serious injuries decreased - 72% since 2007, whilst staff fatalities decreased -38%.

Staff victims per type of accident (2016):

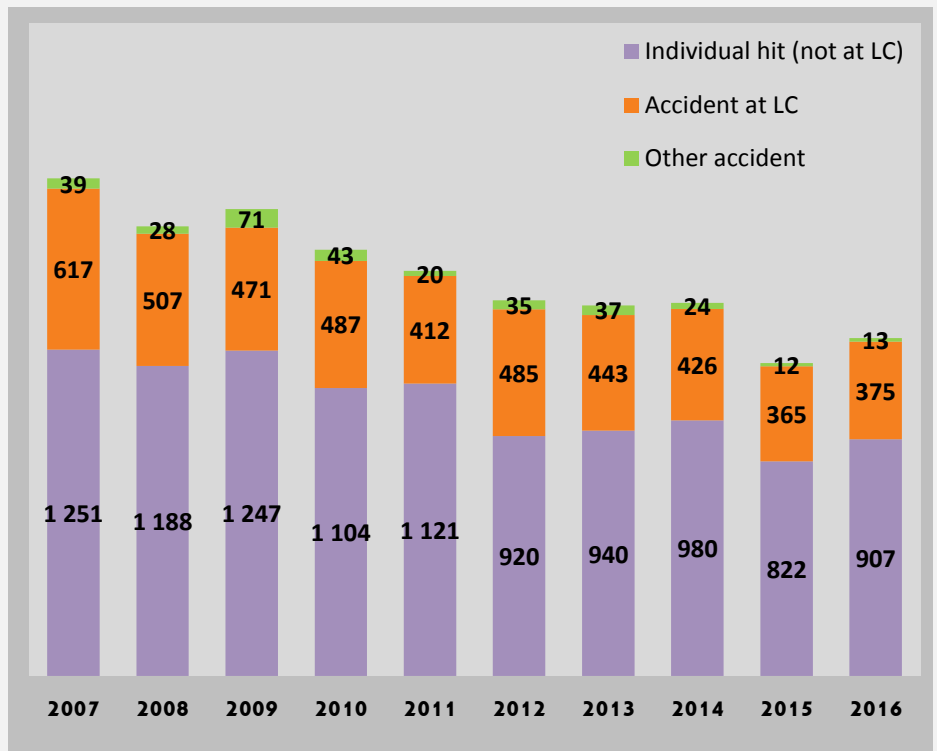


2.10a Accidents with third parties victims

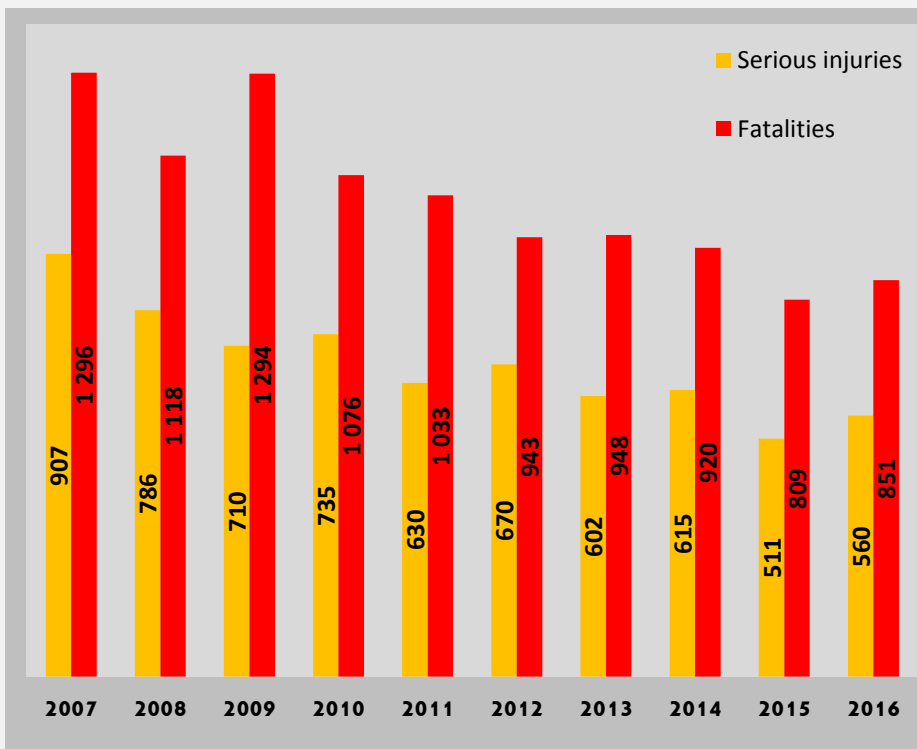
The number of accidents with third parties victims decreased -32% since 2007.

The number of accidents at LC decreased more deeply (-39%) than the number of individuals hit outside LC (-28%).

These two types of accidents represented 99% of accidents with third parties victims in 2016.



2.10b Third parties victims



Fatalities decreased -35% from 2007 to 2016, whilst serious injuries decreased -39%.

Fatalities represent around 60% of all victims every year.

In 2016, most victims were trespassers (61%), followed by LC users (34%) and other third parties (5%), mostly pedestrians on public railway area (platforms).

2.11a Collisions with an obstacle

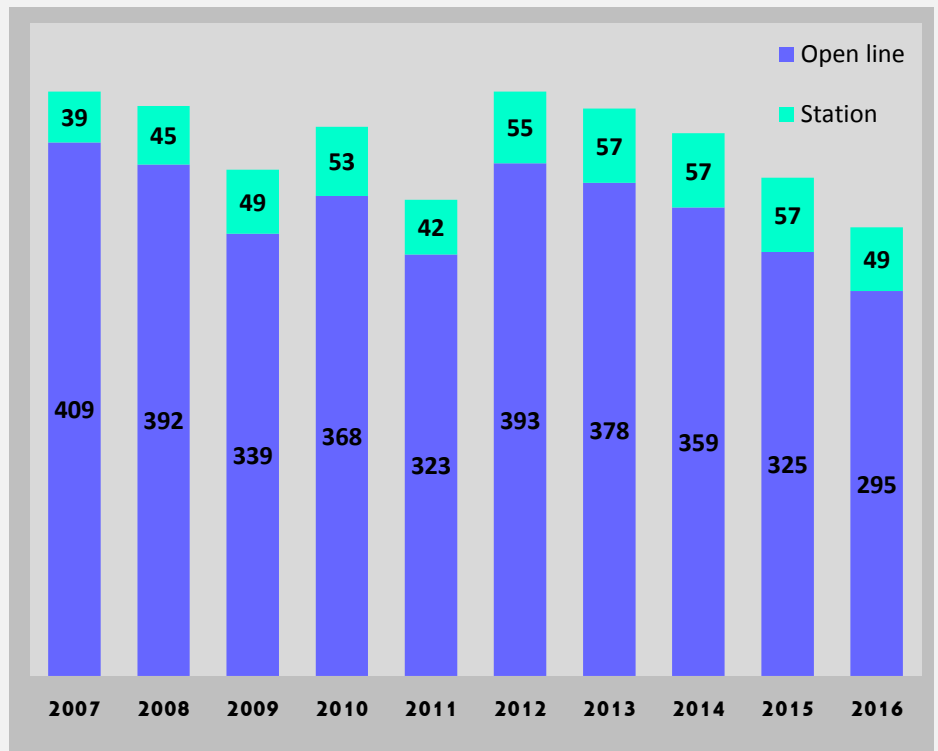
This graph excludes shunting operations.

Collisions with an obstacle decreased -23% between 2007 and 2016.

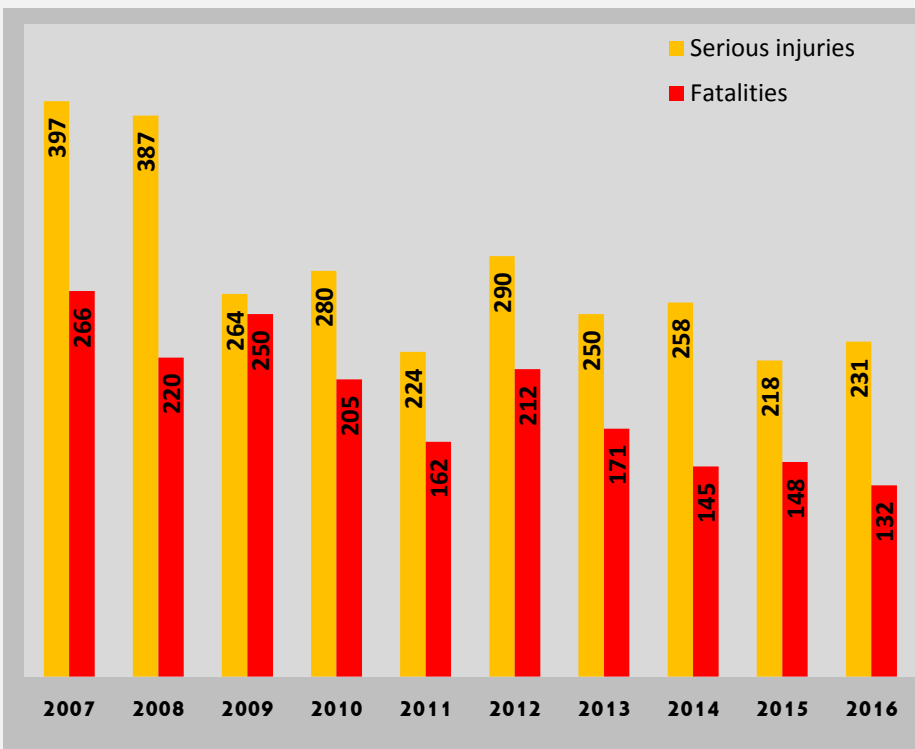
There was no decrease in collisions with an obstacle at stations.

We shouldn't forget that most collisions with an obstacle occur at level crossings. See graph 2.16.

Analysis of collisions with an obstacle is further elaborated in part 3 of this report.



2.11b Victims of collisions with an obstacle



Collisions with an obstacle had fewer human consequences in 2016 than 2007:

- ⇒ 1.48 victim per event in 2007;
- ⇒ 1.06 victim per event in 2016.

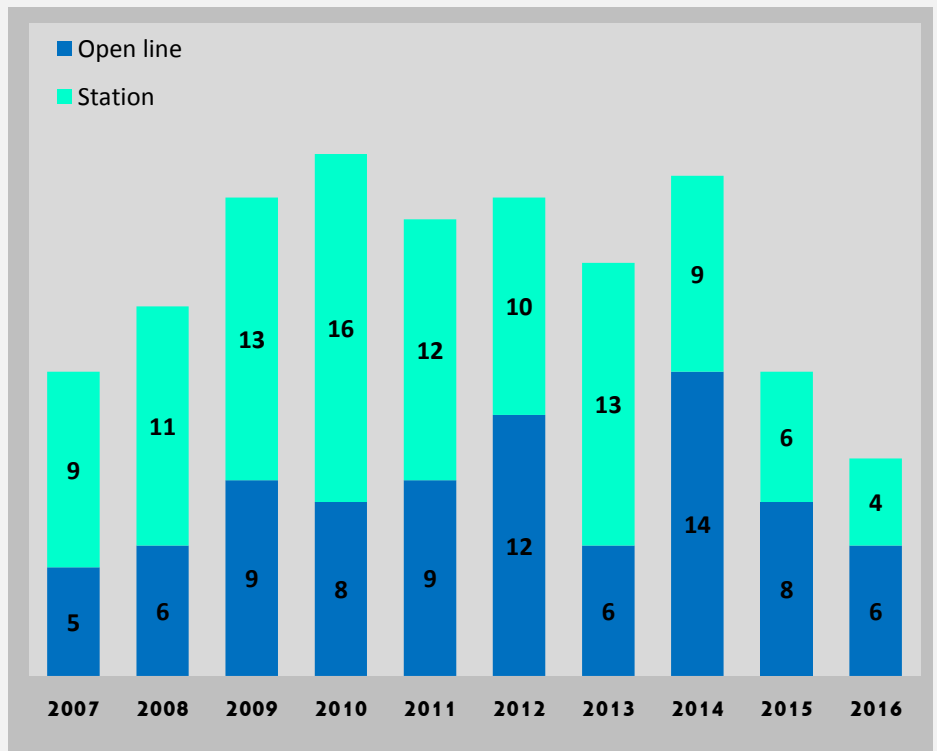
The total number of victims decreased -46% (fatalities: -51% and serious injuries: -43%).

2.12a Collisions between trains

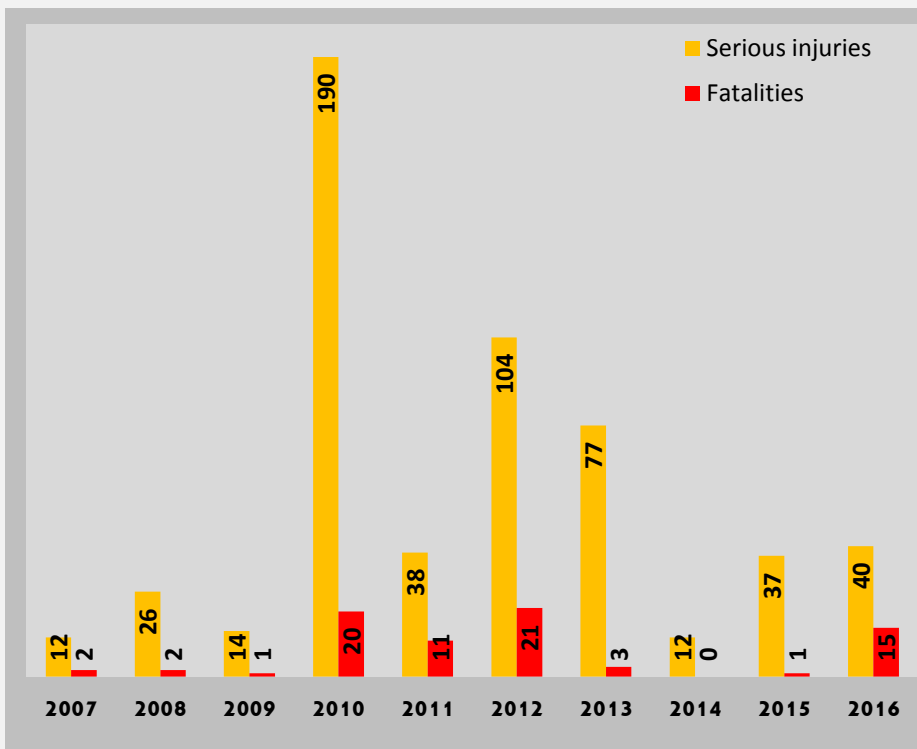
This graph excludes shunting operations.

There is no observable trend towards fewer collisions between trains, although 2016 appears as the safest year in terms of number of collisions between trains.

There is no correlation between the number of accidents and the number of victims. Few very severe accidents may lead to a large number of victims.



2.12b Victims of collisions between trains



Proportion of victims caused by the 2 most severe collisions each year:

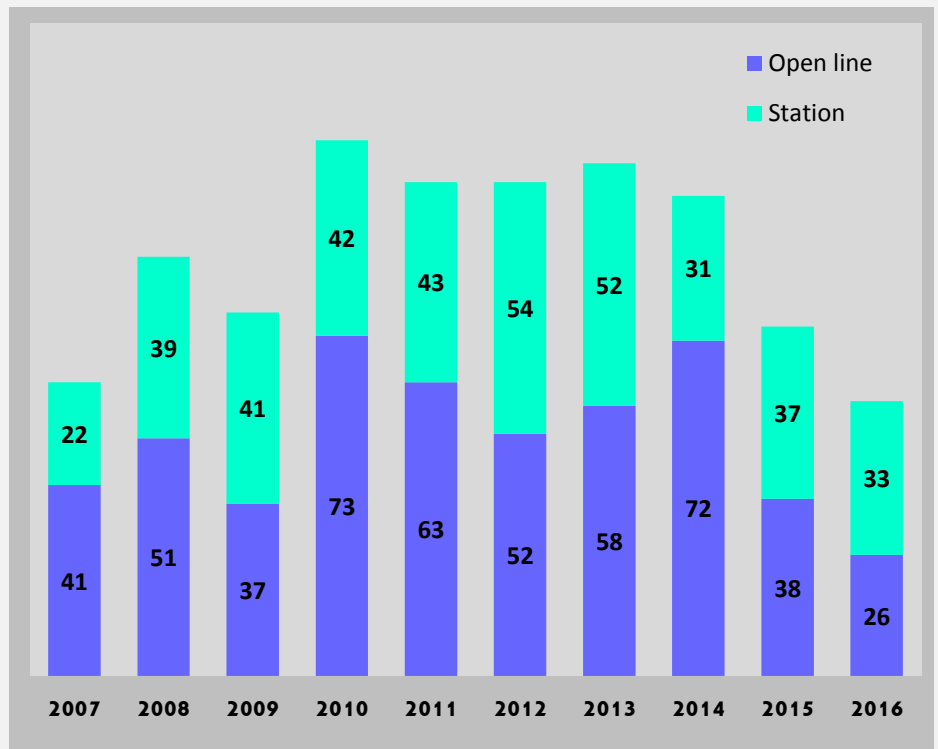
2007	57%
2008	50%
2009	53%
2010	96%
2011	80%
2012	76%
2013	80%
2014	58%
2015	79%
2016	87%

On the whole decade, these 20 accidents (11% of the total) led to 82% of the victims in collisions between trains.

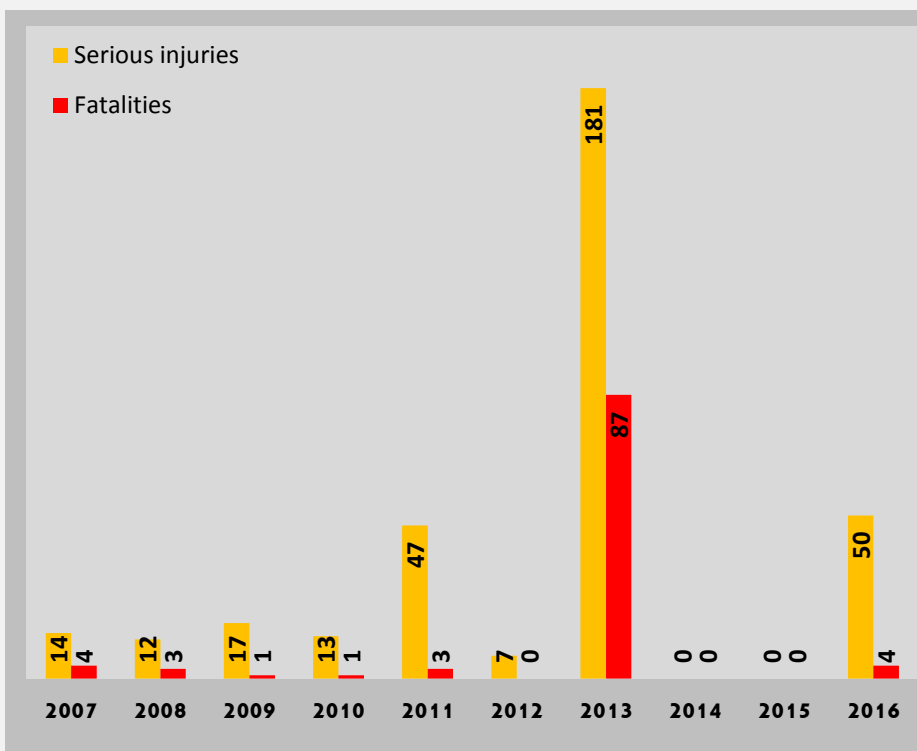
2.13a Derailments

This graph excludes shunting operations.

The number of derailment was stable around 110 events a year between 2010 and 2014, but dropped to 75 in 2015 and 61 in 2016.



2.13b Victims of derailments



97% of all derailments during the decade had no human consequences.

Unfortunately, 12 derailments (1% of all derailments) were disastrous and led to 5 or more victims. These 12 derailments caused 95% of all victims.

For the first time of history, there was no victim of derailment on participating rail networks during 2014 and 2015.

In 2016, one sole derailment caused 52 victims, which means 96% of all victims of derailments.

2.14a Individuals hit by a train: accidents

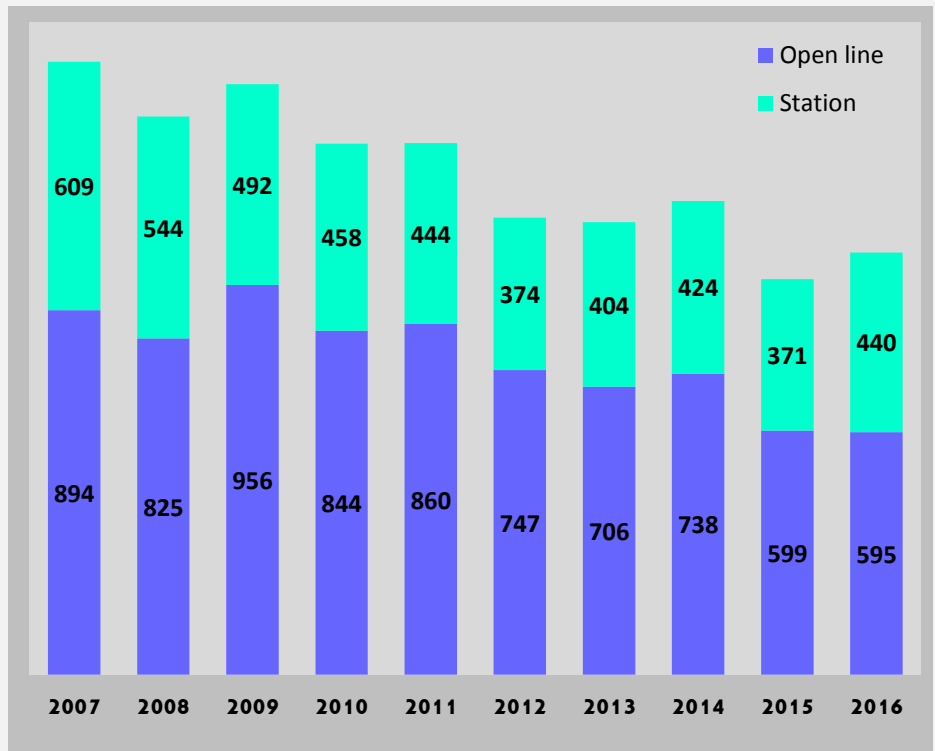
This graph excludes shunting operations.

The number of accidents involving an "individual hit by a train" decreased -31% between 2007 and 2016.

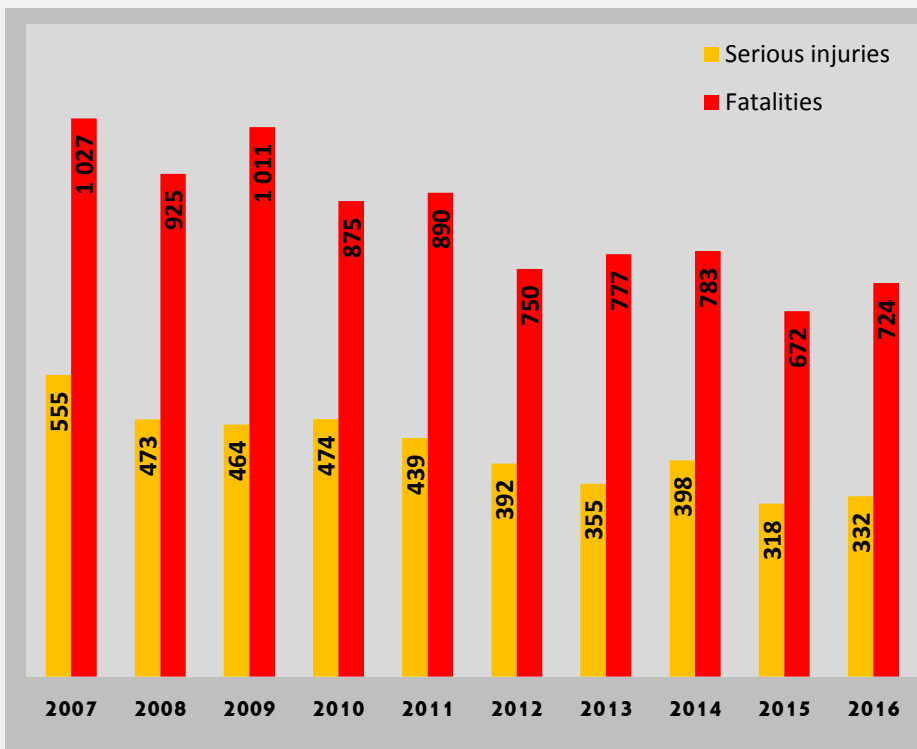
No real improvement was observed after 2012.

This type of accident represents 62% of all significant accidents on the rail network.

63% of individuals hit by a train occurred on open line during the 10-year period (57% in 2016).



2.14b Individuals hit by a train: victims



Individuals being hit by a train is fatal in two thirds of events. This proportion remains equal along the years.

Split of victims in 2016:

- ⇒ Trespassers 80%
- ⇒ LC users 12%
- ⇒ Persons hit on platform 6%
- ⇒ Staff 2%

Split of accidents per number of victims in 2016:

- ⇒ 1 victim: 1 014 events
- ⇒ 2 victims: 19 events
- ⇒ 3 victims: 1 event

2.15a Individuals falling from a train: accidents

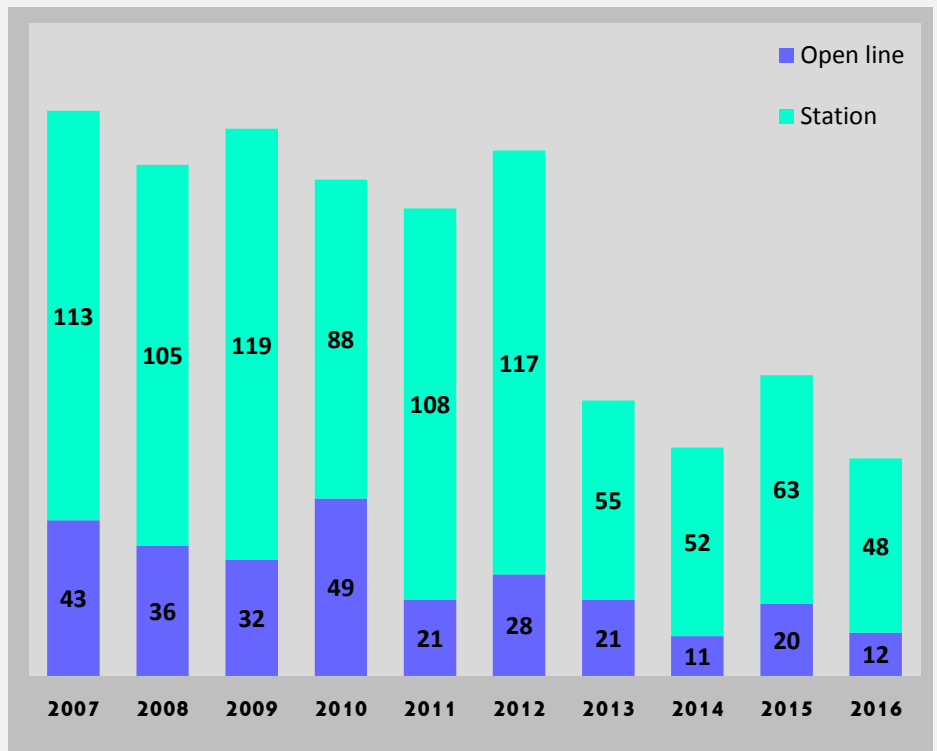
This graph excludes shunting operations.

The number of individuals falling from a train decreased -62% between 2007 and 2016.

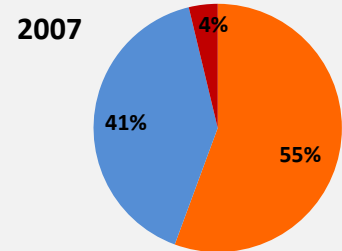
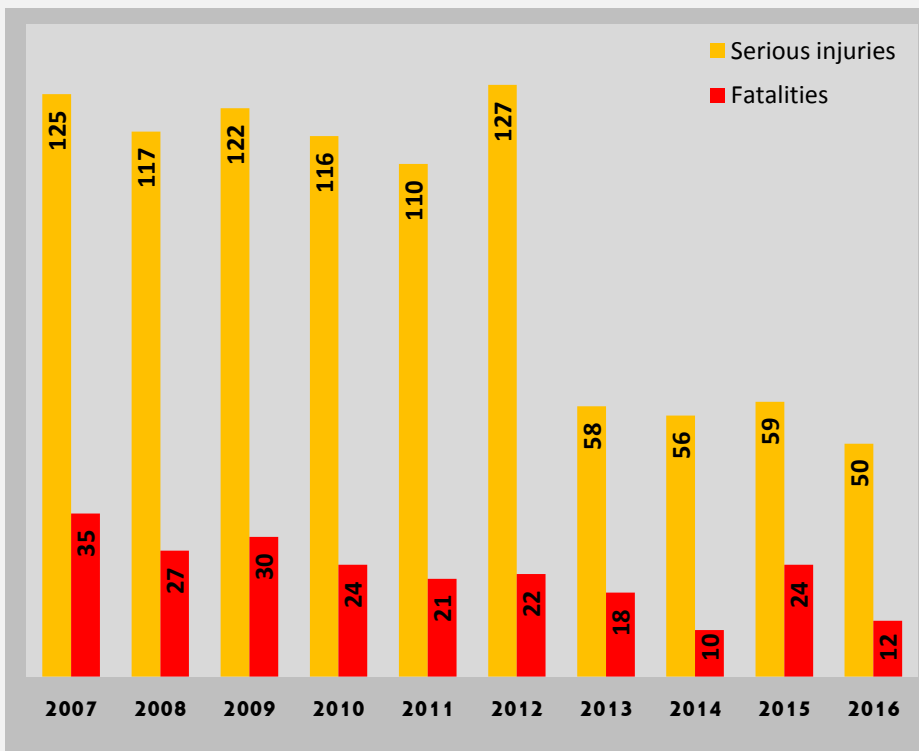
2013 showed a reduction of -50% compared to the previous year.

This was confirmed in the following years, with a majority of cases at stations.

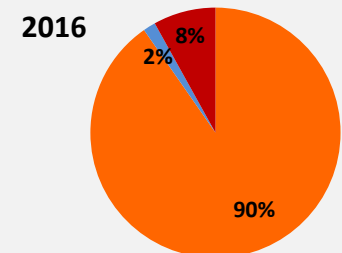
Passengers were involved in 54 cases, unauthorised persons in 5 cases and staff in 1 case.



2.15b Individuals falling from a train: victims



■ Passengers
■ Staff
■ Unauthorised

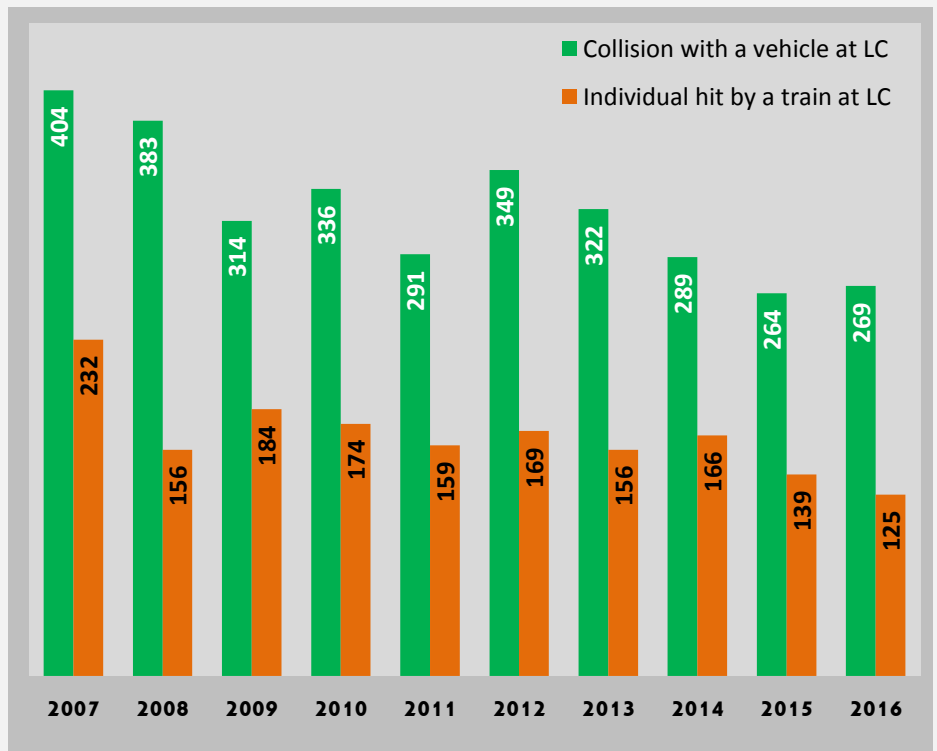


2.16a Accidents at level crossings

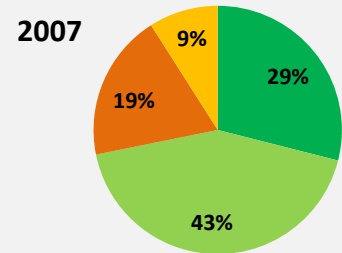
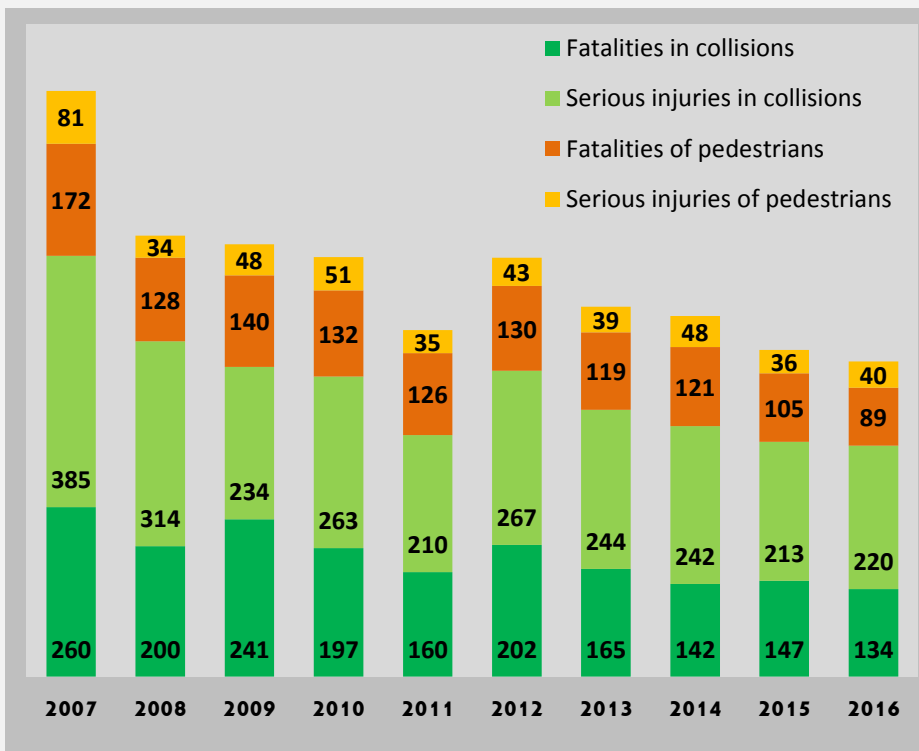
Safety at level crossings showed an huge improvement since 2007:

- ⇒ the number of collisions with a road vehicle dropped -33%;
- ⇒ the number of accidents involving pedestrians and cyclists decreased -46%.

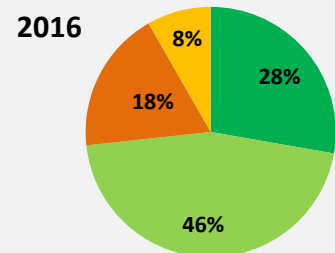
The split of victims (see graph below) is remarkably stable along the years.



2.16b Victims of accidents at level crossings



- Fatalities in collisions
- S. injuries in collisions
- Fatalities of pedestrians
- S. injuries of pedestrians





Part 3

**Focus on collisions
with an obstacle**

Part 3 - Focus on collisions with an obstacle

3.01 Collisions with an obstacle per location

3.02 Collisions with an obstacle followed by a derailment

3.03 Type of obstacle on open line

3.04 Type of obstacle in station

3.05 Collisions with an obstacle at level crossings per type of LC

3.06 Collisions with an obstacle at level crossings per type of LC (2016)

3.07 Collisions with an obstacle per number of victims

3.08 Collisions with an obstacle per location and number of victims (2016)

3.09 Collisions with an obstacle per severity of human consequences

3.10 Collisions with an obstacle per location and severity of human consequences (2016)

3.11 Passenger victims in collisions with an obstacle

3.12 Staff victims in collisions with an obstacle

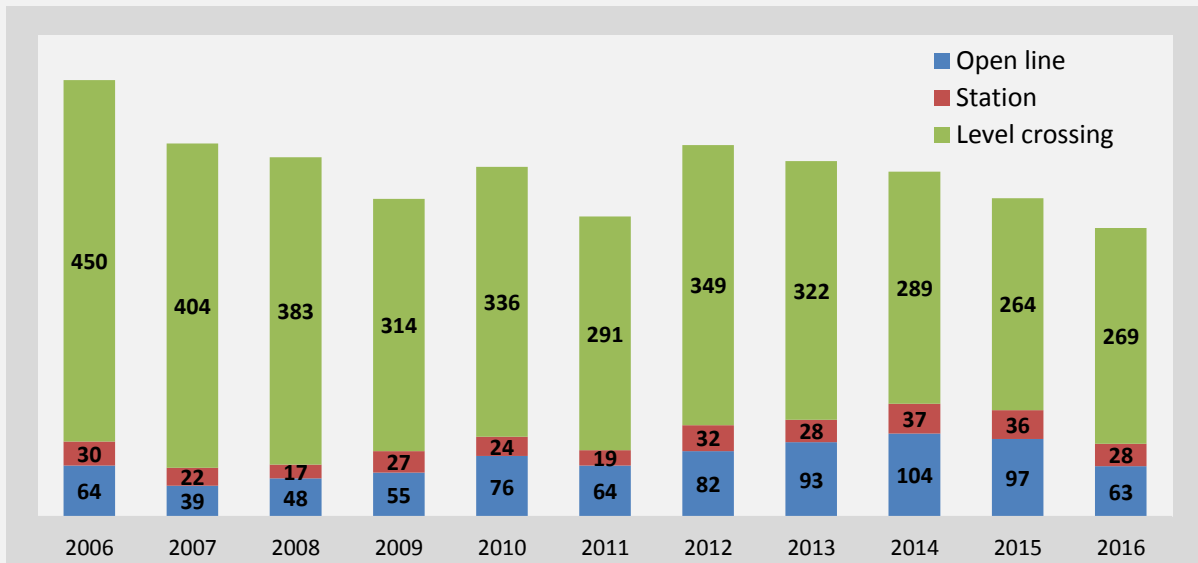
3.13 LC user victims in collisions with an obstacle

3.14 Unauthorised and other victims in collisions with an obstacle

Focus in previous reports

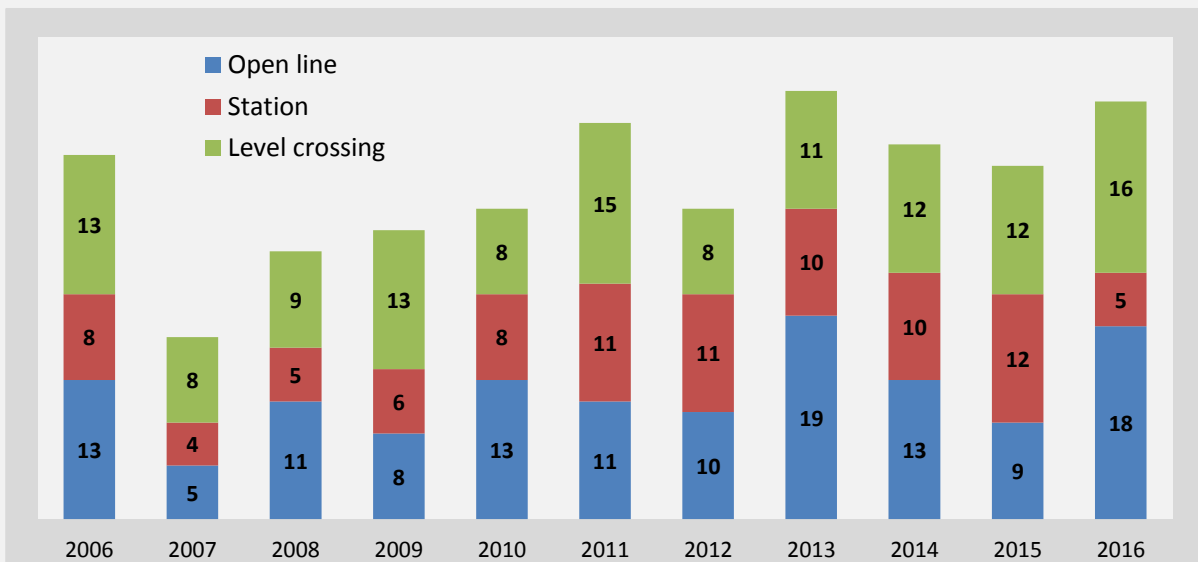
2016	Time series 2006-2015
2015	Time series 2006-2014
2014	Human factors
2013	Accidents in stations
2012	Derailments

3.01 Collisions with an obstacle per location



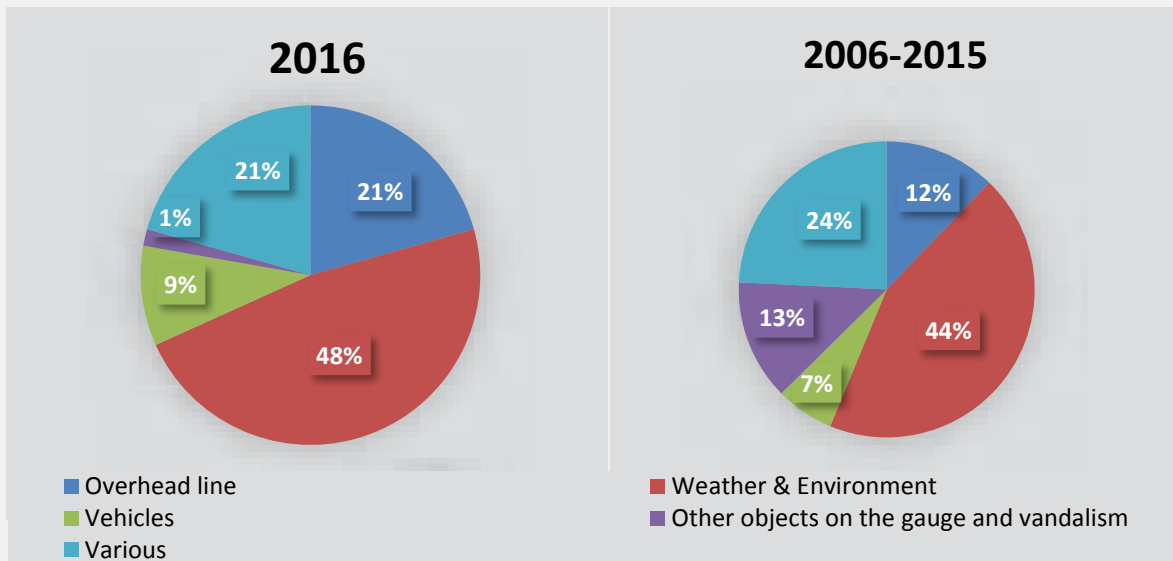
Collisions with an obstacle decreased -34% between 2006 and 2016. Collisions with motorized road vehicle dropped -40%. The number of collisions with an obstacle in station or on open line didn't change on the overall period. Collisions at level crossings still represent 75% of all collisions with an obstacle in 2016.

3.02 Collisions with an obstacle followed by a derailment



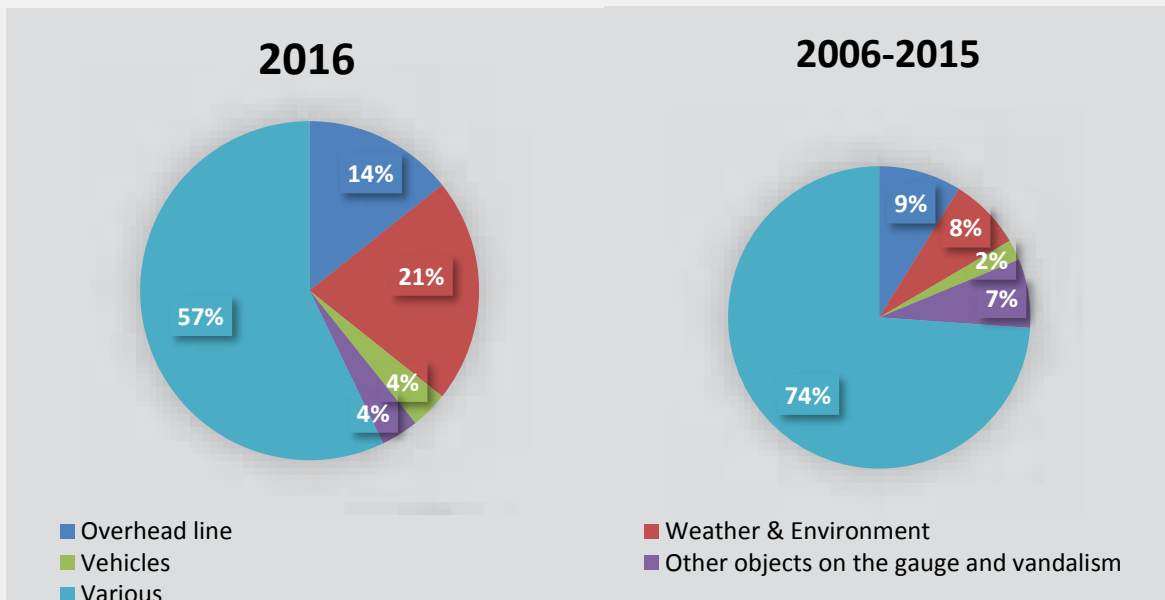
One on ten collisions with an obstacle led to a derailment in 2016. The number of derailments is generally low and there is no sensitive difference per location.

3.03 Type of obstacle on open line



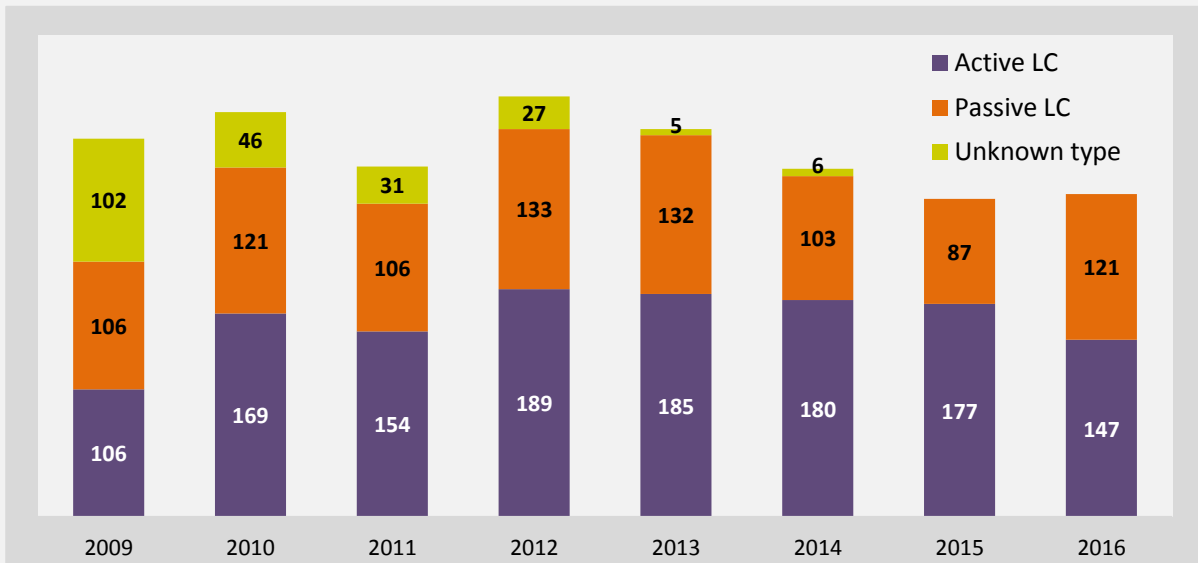
Almost one half of obstacles on open line in 2016 are linked to weather and environment. It includes: fallen trees, fallen rocks, landslides and animals. 21% of obstacles are torn overhead lines, an increase in proportion, compared to the 2006-2015 period.

3.04 Type of obstacle in station



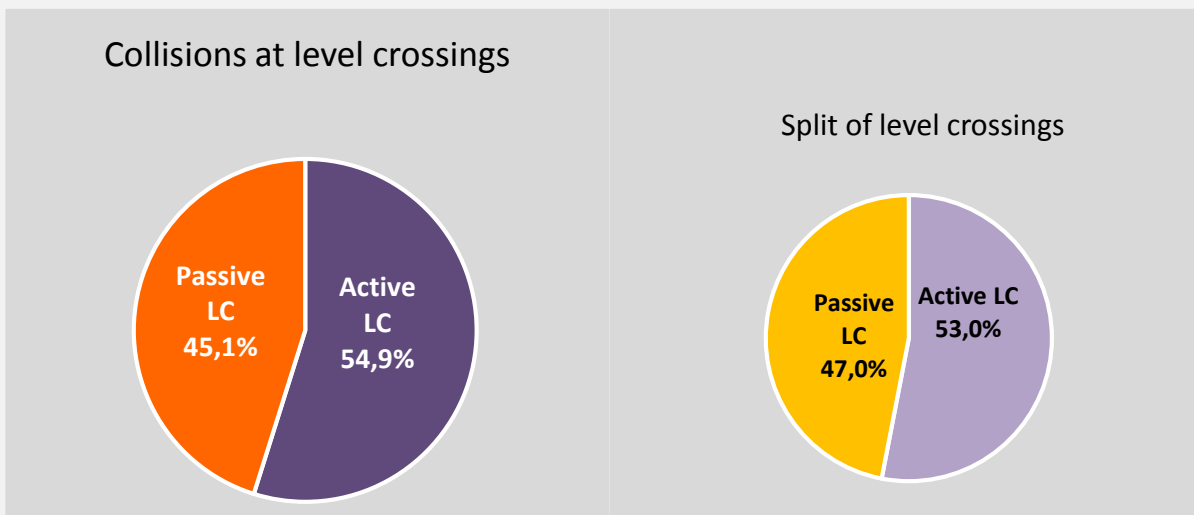
Most obstacles in station are not well defined as a cause. They may include buffers, maintenance and other infrastructure equipment. Collisions during shunting are excluded. Problems with overhead lines are particularly observable since 2014.

3.05 Collisions with an obstacle at level crossings per type of LC



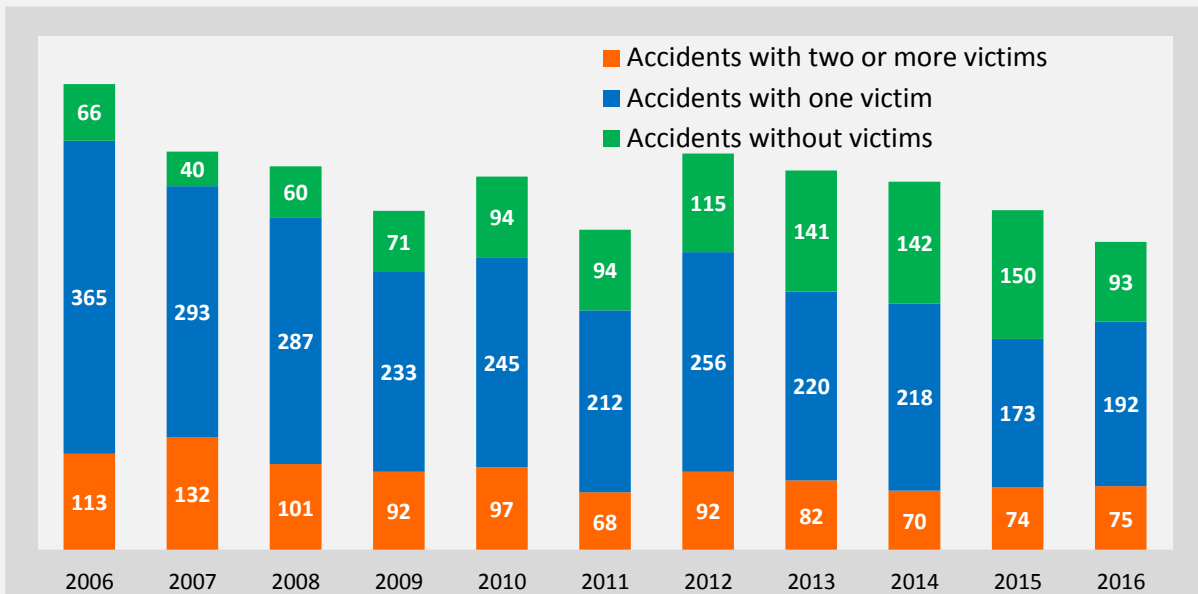
From 2012 (a peak in collisions at level crossing) to 2015, accidents at passive LC dropped -35%, when accidents at active LC decreased only -8%. From 2015 to 2016 appears the inverse phenomenon : increase of +39% in accidents at passive LC and decrease of -17% in accidents at active LC. The total number of accidents remains unchanged.

3.06 Collisions with an obstacle at level crossings per type of LC (2016)



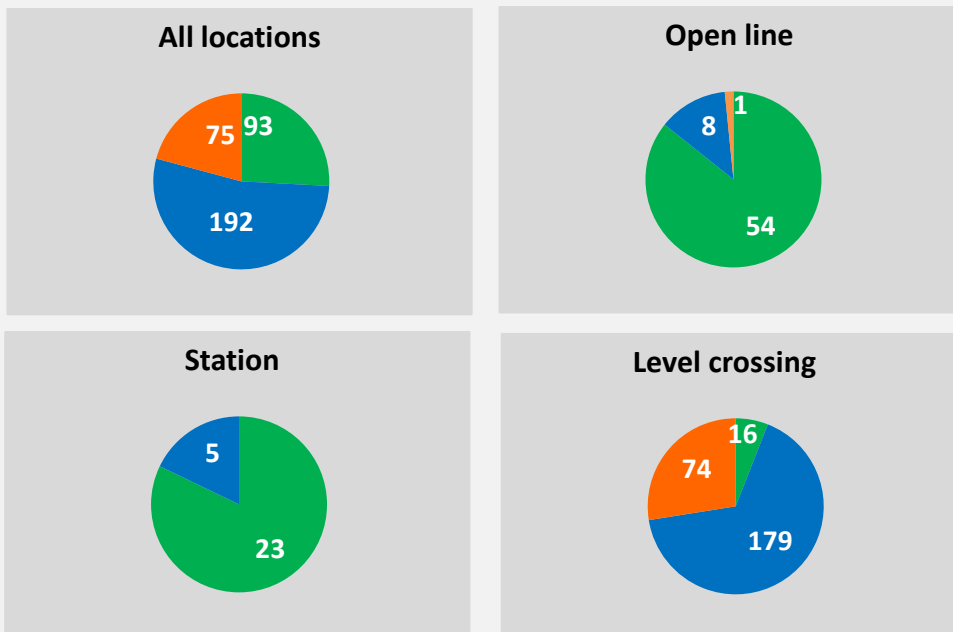
During the year 2016 occurred 147 collisions with road vehicles at active level crossings (55%) and 121 at passive level crossings (45%). The networks of the 22 infrastructure managers included in the project count with 55 545 active level crossings and 46 450 passive level crossings. This indicates that the proportion of accidents is absolutely similar to the proportion of level crossings.

3.07 Collisions with an obstacle per number of victims



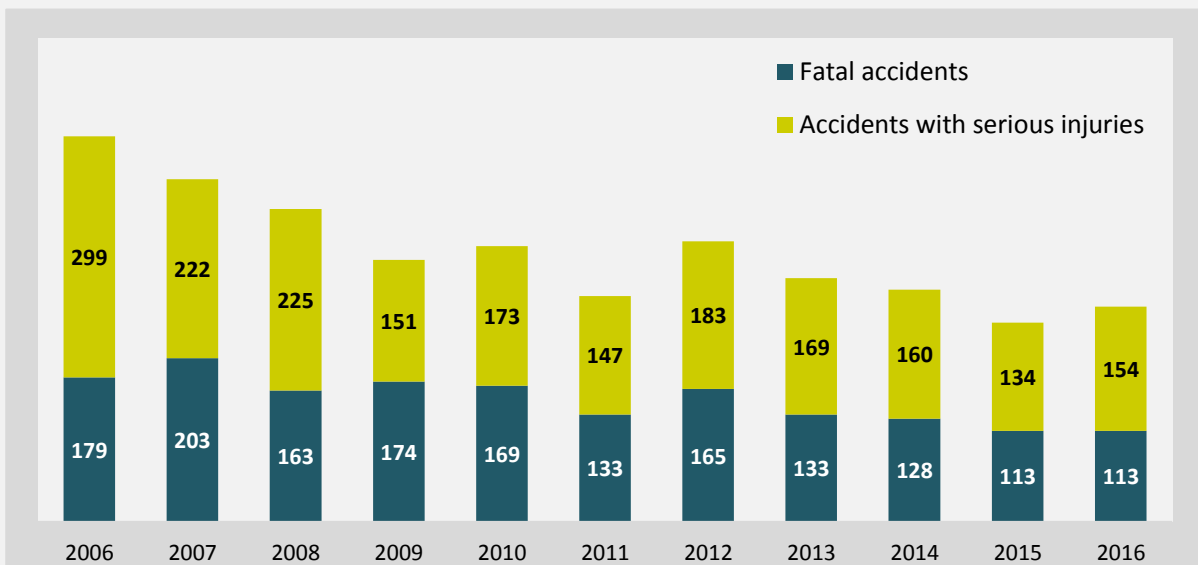
Most collisions with an obstacle make one victim. Accidents with two or more victims oscillate between 16% (in 2014) and 29% (in 2007). The proportion of accidents without victims increases till 2015. The trend is reverse in 2016: stability of accidents with two or more victims, increase of accidents with one victim and decrease of accidents without victim.

3.08 Collisions with an obstacle per location and number of victims (2016)



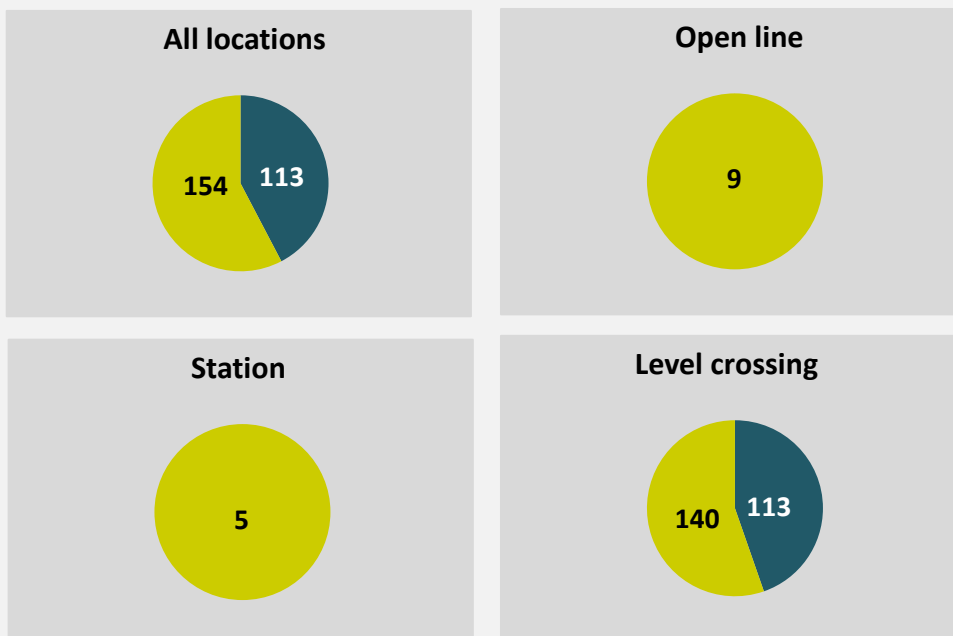
More than 80% of collisions with an obstacle on open line or in station make no victims. All accidents resulting with two or more victims occur at level crossing.

3.09 Collisions with an obstacle per severity of human consequences



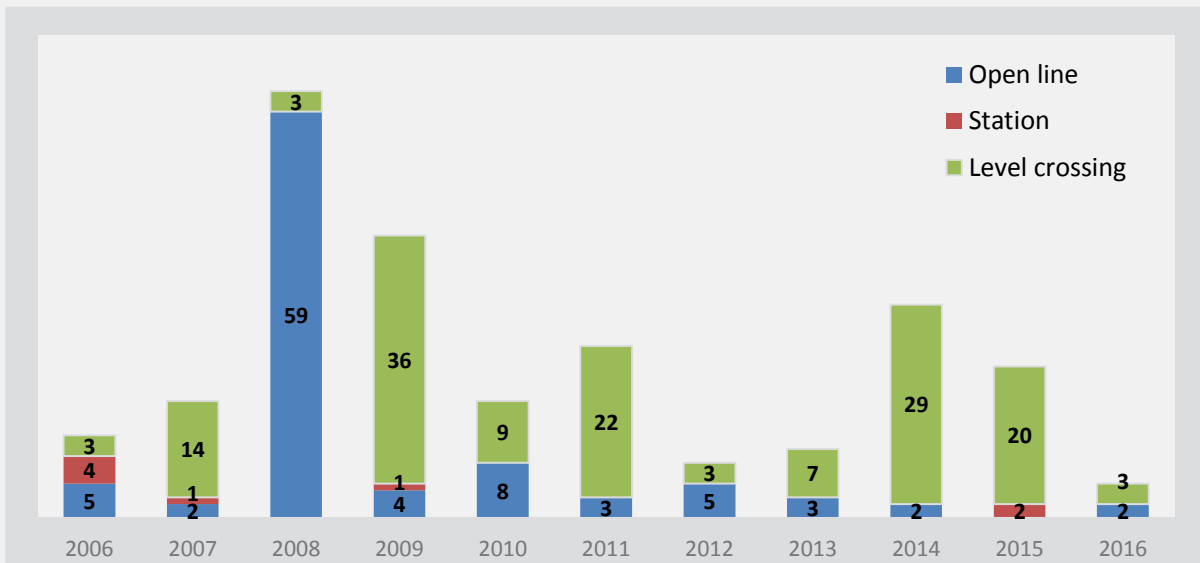
Accidents with serious injuries decreased -49% from 2006 to 2016, while fatal accidents only decreased -37%. Around 33% of collisions with an obstacle are fatal. This percentage reached 45% in 2009.

3.10 Collisions with an obstacle per location and severity (2016)



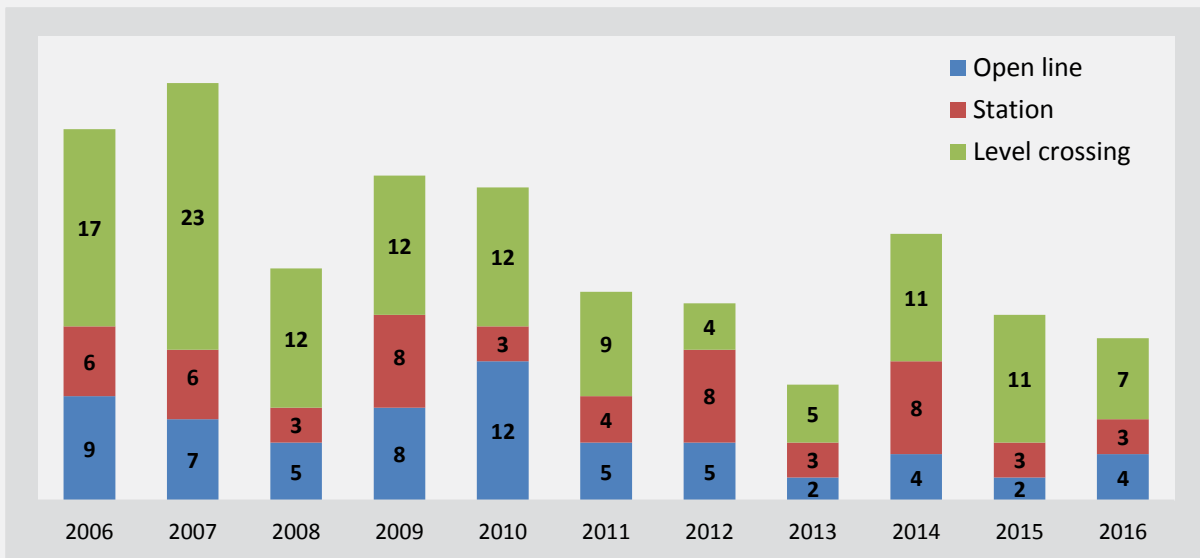
There was no fatal collision with an obstacle on open line or in station during 2016. 113 fatal collisions with a road vehicle occurred at level crossing during 2016, representing 33% of collisions with an obstacle and 7% of all significant accidents.

3.11 Passenger victims in collisions with an obstacle



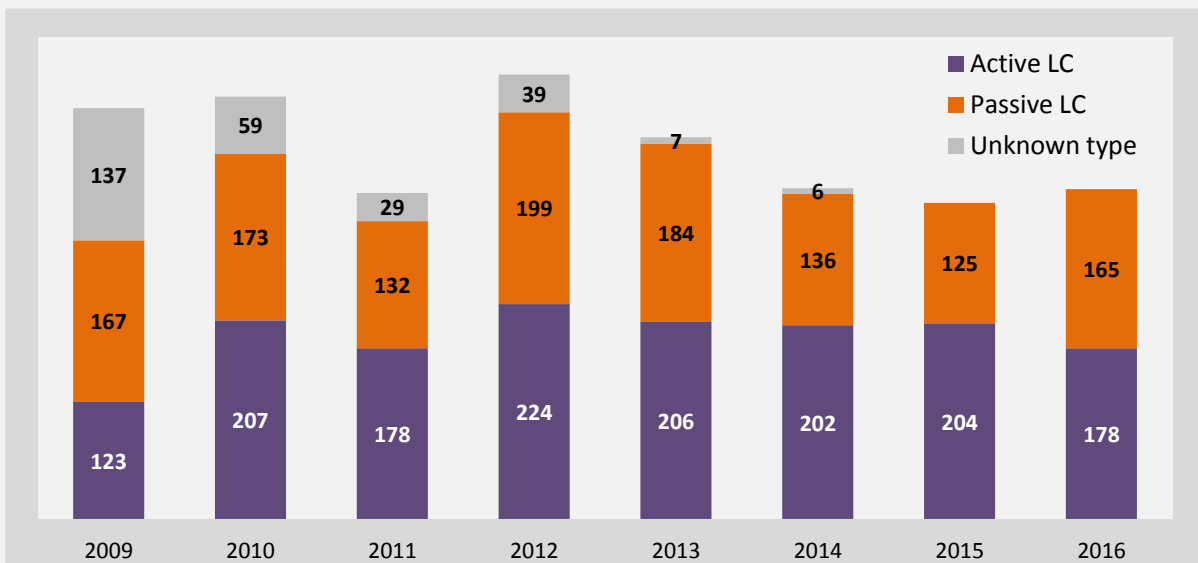
The huge and exceptional number of passenger victims in the year 2008 is due to two accidents where trains respectively crashed into a sheep herd inside a tunnel and a collapsed road bridge. Most collisions leading to passenger victims occurred at level crossing. Regarding this indicator, 2016 appears as the best year of the latest period.

3.12 Staff victims in collisions with an obstacle



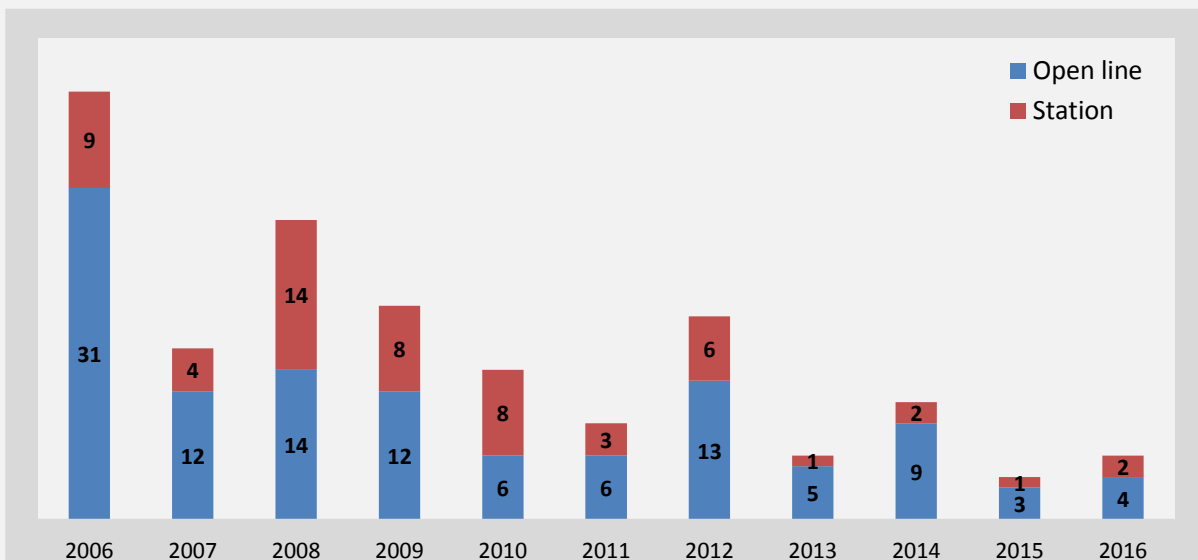
The number of staff victims dropped from 32 in 2006 to 14 in 2016 (-56%). Victims are mostly train drivers, more rarely infrastructure workers when trains collide with a work engine.

3.13 LC user victims in collisions with an obstacle



The number of level crossing user victims of a collision with a train decreased -26% since the peak reached in 2012 and has remained steady since 2014. Collisions at passive level crossings lead to more victims than collisions at active level crossings (1.36 against 1.21 in 2016). This might be linked to the different occupation rates of road vehicles in urban and rural areas.

3.14 Unauthorised and other victims in collisions with an obstacle



The number of unauthorised and other victims is very low in comparison with the numbers of LC users, passenger and staff victims. In 2016, three victims are drivers of a car that fell from a road bridge, a car that crossed the tracks outside a level crossing and a road work engine. Two victims are trespassers (by car). The type of the sixth victim is not notified.

Definitions from the Commission Directive 2016/798/EC ("Safety Directive")

"**Significant accident**" means any accident involving at least one rail vehicle in motion, resulting in at least one killed or seriously injured person, or in significant damage to stock, track, other installations or environment, or extensive disruptions to traffic, excluding accidents in workshops, warehouses and depots.

"**Significant damage to stock, track, other installations or environment**" means damage that is equivalent to EUR 150 000 or more.

"**Extensive disruptions to traffic**" means that train services on a main railway line are suspended for six hours or more.

European Safety Database Members

Company	Country	Code
ADIF	Spain	ES
ADIF AV	Spain	ES
Bane NOR SF	Norway	NO
CFL	Luxembourg	LU
CFR SA	Romania	RO
DB AG *	Germany	DE
Eurotunnel	France - UK	-
HZ	Croatia	HR
Infrabel *	Belgium	BE
IP	Portugal	PT
MÁV	Hungary	HU
ÖBB	Austria	AT
PKP	Poland	PL
PRORAIL **	Netherlands	NL
RFI	Italy	IT
RSSB *	United Kingdom	GB
SBB CFF FFS *	Switzerland	CH
SNCF Réseau *	France	FR
SŽ	Slovenia	SI
SŽDC	Czech Rep.	CZ
Trafikverket *	Sweden	SE
ŽSR	Slovak Rep.	SK

* Members and ** Chair of the Safety Performance Group

UIC Safety Database

Report 2017

Significant Accidents 2016

Contact

Olivier Georger

UIC Safety Unit

International Union of Railways

16 rue Jean Rey - F-75015 Paris

georger@uic.org

www.uic.org

The electronic version of the report is available on the UIC website at the following address:

<http://safetydb.uic.org>





ETF

Editions Techniques Ferroviaires
Railway Technical Publications
Eisenbahntechnische Publikationen

16 rue Jean Rey - F 75015 PARIS
www.shop-etf.com

Design and production:
C. Filippini / © ETF Publication
Photo credit: Fotolia

October 2017

ISBN 978-2-7461-2649-7



ΨΙΣ