

Special focus on the COVID 19 pandemic

UIC SAFETY UNIT
UIC Safety Report 2022
Significant Accidents 2021
Public Report

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UIC Safety Report 2022

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Foreword

2022 is a special year as not only is UIC celebrating its centenary, but it is also the 16th birthday of the UIC Safety Report. 16 years may not seem like a long time, but we have come a long way since then.

Effectively, since the report was first published in 2006, it has been vital to filling in knowledge gaps and in sharing information regarding accident prevention, with the number of companies joining the Safety Database doubling between 2007 and 2022. In the last four years, 11 more companies have become members, the most recent addition to the community being Infrakos, the railway infrastructure manager for Kosovo.

Accordingly, the present report addresses railway safety for 2021.

Firstly, it is important to note that the various indicators integrated into and presented in the report are based on train-kilometres travelled.

Secondly, as expected, due to the COVID-19 pandemic, a decrease in accidents was observed for 2020. However, this “decrease” was also still less than the relative overall reduction in railway traffic.

While everything is not entirely back to its pre-COVID state-of-affairs, the indicators show a certain level of “recovery”, demonstrating how many countries, particularly in Europe, have had to deal with multiple waves of the virus and the subsequent effects of restrictions on railway travel.

Section 3 of the report on "the effect of COVID on traffic and accidentality" is dedicated to this analysis and highlights how this recovery is taking place.

It remains to be seen whether the next report will show a full return to normal. Russia's war in Ukraine will undoubtedly influence the risks to European, and even global, railway systems.

While hoping that a peaceful solution is found quickly, UIC will continue its activities over the next few years to expand the number of members collecting safety data. However, in particular, it will also continue to act as a link between UIC members and European operators, so that a single system, interface and ideology can engender standardisation and promote knowledge sharing at a global level.

François Davenne

UIC Director General

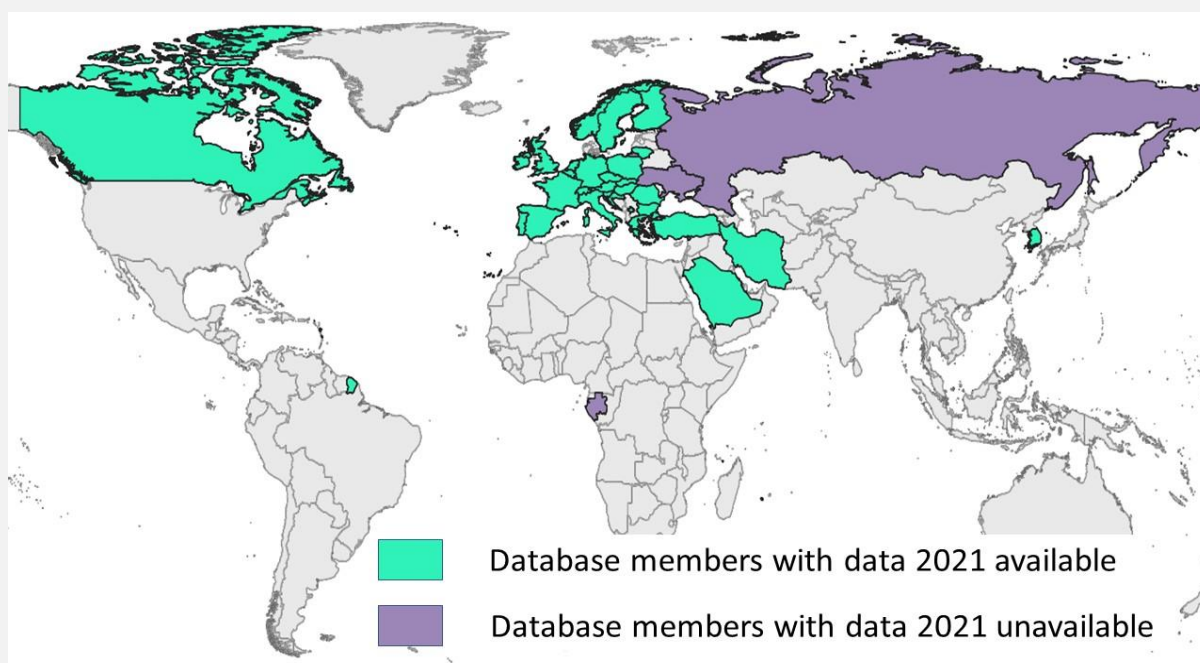
UIC Safety database members and data availability in 2021

Company	Country	Code
ADIF	Spain	ES
Bane NOR SF	Norway	NO
CANADA ³	Canada	CA
CFL	Luxembourg	LU
CFR SA	Romania	RO
CIE	Ireland	IE
DB AG ²	Germany	DE
EUSKOTREN	Spain	ES
FGC	Spain	ES
FTIA	Finland	FI
HZ	Croatia	HR
Infrabel ²	Belgium	BE
Infrakos	Kosovo	XK
IP	Portugal	PT
KRRI	South Korea	KR
LTG	Lithuania	LT
MÁV	Hungary	HU

Company	Country	Code
NRIC	Bulgaria	BG
ÖBB	Austria	AT
OSE	Greece	GR
PKP	Poland	PL
PRORAIL ¹	Netherlands	NL
RAI	Iran	IR
RFI	Italy	IT
RSSB ²	United Kingdom	GB
SAR	Saudi Arabia	SA
SBB CFF FFS ²	Switzerland	CH
SNCF Réseau ²	France	FR
SŽ (si)	Slovenia	SI
SŽ (cz)	Czechia	CZ
TCDD	Turkey	TR
Trafikverket ²	Sweden	SE
ŽSR	Slovakia	SK

¹ Chair and ² Members of the Safety Performance Group

³ All infrastructure managers. Data extracted from the TSB website: www.tsb.gc.ca/fra/stats/rail/data-5.html



Executive summary

The perimeter of this report has been extended with one new infrastructure manager. As a consequence of the war in Ukraine we were not able to include the information of two networks, that were in last year's report. Therefore absolute numbers are different, but it is still possible to evaluate trends and ratios.

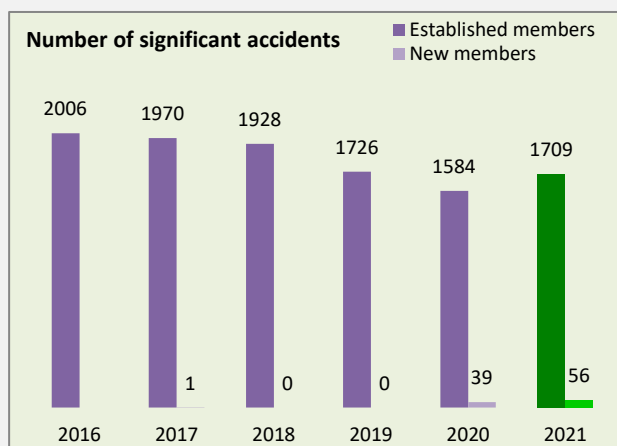
The year 2021 has been the second year with the COVID-19 pandemic. Train traffic was growing back to pre-pandemic levels, but still had lock-downs and work-at-home resulting in low volumes of passengers. In 2021 we did not experience major train collisions nor major derailments, resulting in the lowest number of passenger victims (38) ever observed.

Number of significant accidents

From 2006 till 2014 the annual number of significant accidents has decreased with around 25%. In the period of 2016-2019 we see a slow decrease from around 2000 to 1725 significant accidents per year.

The number of significant accidents declared by established members in 2020 (1584) was lower than all previous years, 2020 is an exceptional year.

In 2021 the number of 1709 recorded significant accidents is comparable to 2019 (-1%).



Number of fatalities (excepting Lithuania, Bulgaria and Kosovo)

In 2021 we recorded 875 fatalities, which is 9% lower than 2019 (leaving out the first COVID-year). The types of accidents the railway sector can influence most directly (train collisions, derailments, fires and shunting operations) show a decrease of 13 fatalities (-39%!), mostly due to the absence of large scale train collisions and derailments, which is good news. On level crossings we see 14% less fatalities over two years. The number of fatalities related to individuals hit by train has decreased by 5% in two years.

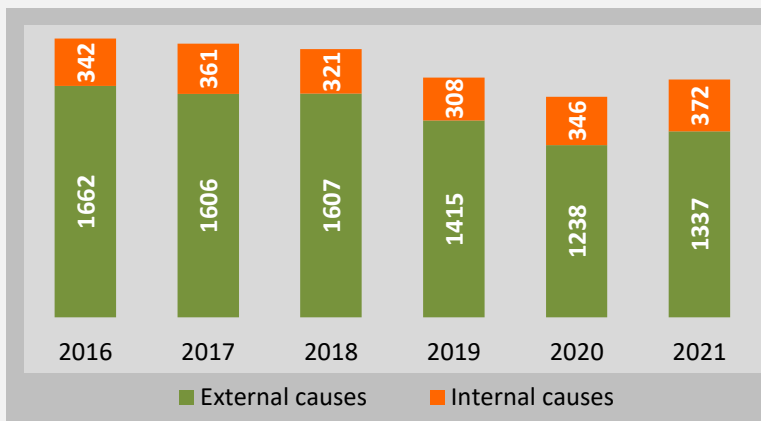
Fatalities	2019	2020	2021	Diff 2019-2021
Individual hit by train or falling from a train (outside LC)	618	606	585	-5%
Level crossing accidents	315	239	270	-14%
Other accidents (train collisions, derailments, fires and shunting operations)	33	34	20	-39%
Total	966	879	875	-9%

UIC Safety Index (established members)



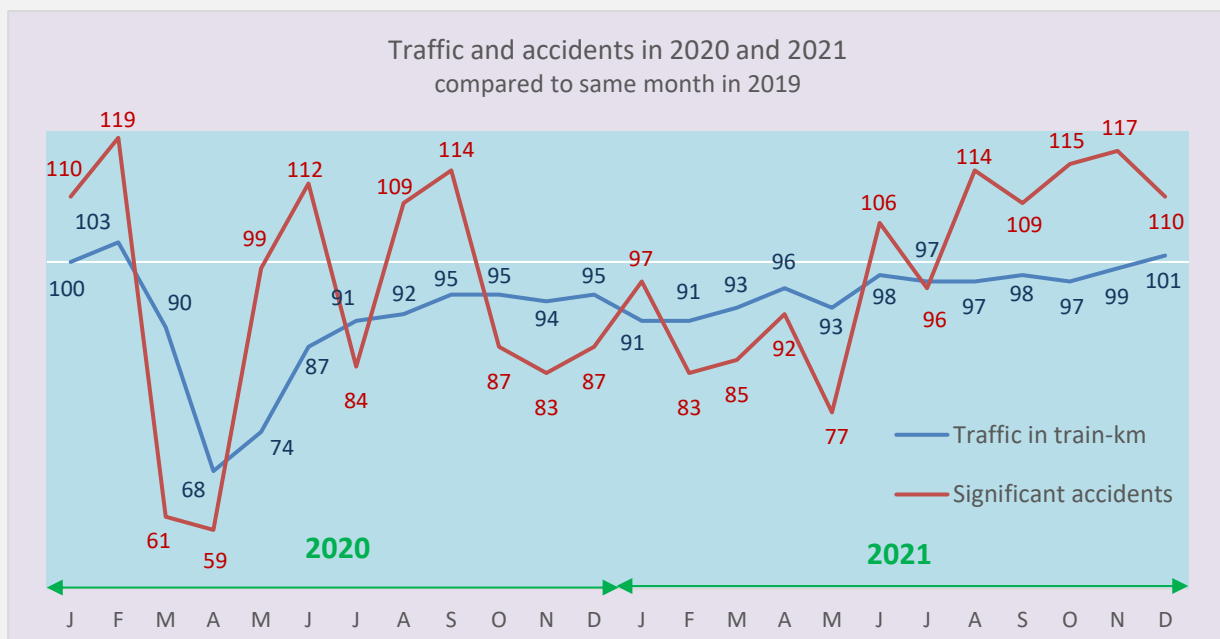
The UIC Safety Index is actually a weighted number of accidents, whereby passenger and staff victims and internal causes are weighted more heavily than trespasser victims and external causes. In addition, a higher number of victims is weighted more heavily than a lower number. We see a steady improvement of the safety index in the period 2016-2019, but in 2020 the expected lower index (due to the lower numbers of train-kilometers) is not seen. Relative to train-km, the safety indexes in 2020 and 2021 are higher than in 2019.

Causes of accidents



Numbers of significant accidents with external causes have been decreasing since 2016, with an extra dip in 2020 due to the COVID-pandemic. But it is worrying to see the number of accidents with internal causes have increased in the last two years. Internal causes are infrastructure, rolling stock, human factors and railway users. Human factors being the most abundant.

COVID-19 pandemic



Due to the COVID-19 pandemic we see 20% less train kilometers in Q2-2020 and we also see a sharp drop in significant accidents in March and April 2020, coinciding with the first lock-downs. Surprisingly the period from June till September 2020 show higher numbers of significant accidents compared to the same month in 2019. In the period from October 2020 till March 2021 we see 15% lower numbers and then from June till December 2021 the numbers are around 15% higher. How lock-downs and curfews on one side influence these numbers and if the year 2019 is the right measure for a pre-COVID-year require further investigation.

Bart Hoogcarspel

Chairperson of Safety Performance Group

Part 1

General report on significant accidents

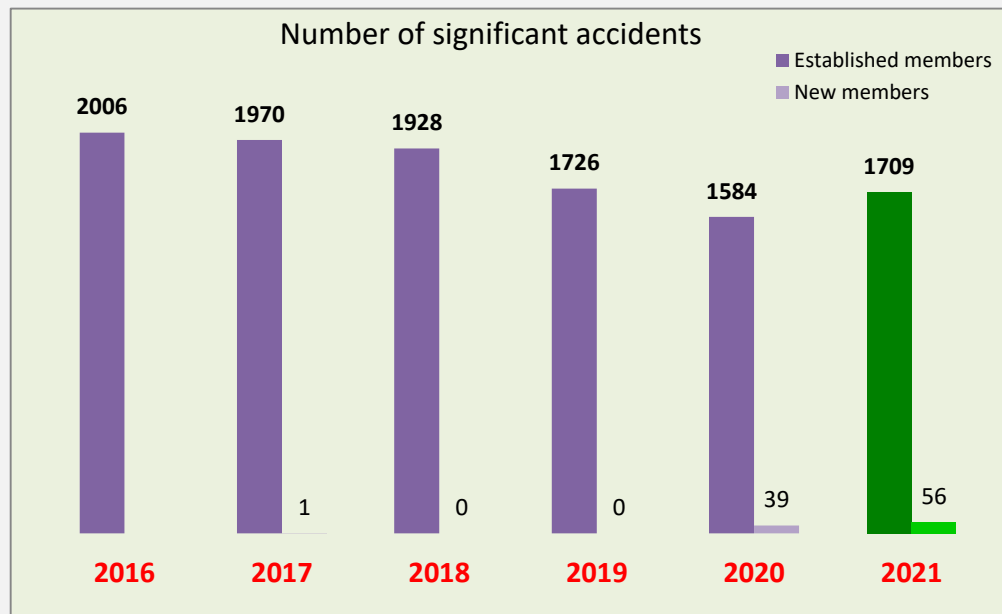


Part 1 - General Safety Indicators for the year 2021

- 1.01 Evolution of significant accidents and UIC Safety Index
- 1.02 Types of accidents according to UIC-SDB and EU definitions
- 1.03 Main causes of accidents
- 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
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- 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 Safety Index
- 1.17 Normalized UIC Safety Index
- 1.18 Accidents and victims by type of accident, causes and location

NB: the number 0 is indicated by the sign "-"

1.01 Evolution of significant accidents and UIC Safety Index

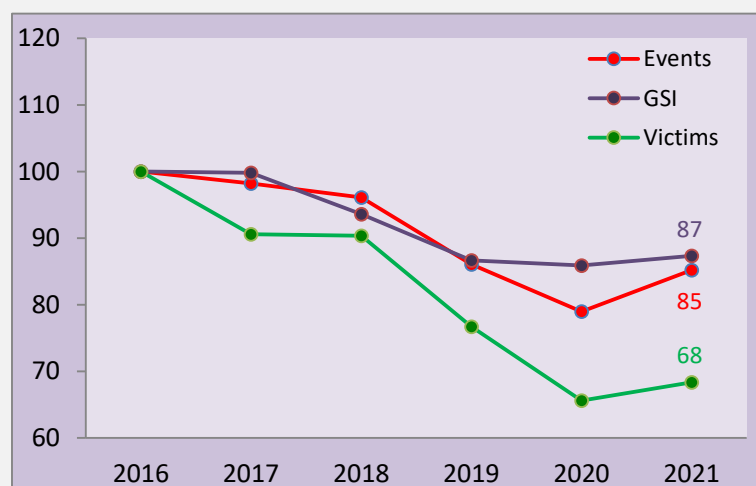


“Significant accident” means any accident involving at least one rail vehicle in motion, resulting in at least one killed or seriously injured person, or in significant damage to stock, track, other installations or environment, or extensive disruptions to traffic, excluding accidents in workshops, warehouses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

We consider as established members, railway companies that provided data on the whole six-years period. New members are listed below:

Country	Data provider	Period
Bulgaria	NRIC	2020-2021
Lithuania	LTG	2020-2021
Kosovo	Infrakos	2021
Saudi Arabia	SAR	2017 - 2021

The number of events at Established members observed in 2021 an increase of 8% compared to 2020 but a decrease of -5% compared to the average on the period 2016-2020. The graph compares the trends of the UIC Safety Index (GSI) with the trends of number of events and number of victims (Base 100 in 2016) for Established members.



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 EU Safety Directive
8,5%	Derailment of trains	8,5% Derailment of trains
1,2%	Train collision with another train	1,2% Train collision with another train
24,8%	Train collision with an obstacle	7,0% Train collision with an obstacle not at LC
	17,8% Train collision with an obstacle at LC	26,9% LC accidents, including accidents involving pedestrians at LC
58,3%	Individual hit by a train	
	9,1% Individual hit by a train at LC	51,0% Accidents to persons caused by rolling stock in motion, with the exception of suicides.
	49,2% Individual hit by a train not at LC	
1,8%	Individual falling from a train	
1,0%	Fire in rolling stock	1,0% Fire in rolling stock
0,2%	Electrocution by overhead line or third rail	4,4% Other types of accidents
0,1%	Accident involving dangerous goods	
4,1%	Shunting operations	
0,1%	Runaway vehicles	

- 60% of accidents involved individuals hit by a train or falling from a train.
- Collision with an obstacle was the second most common accident (25% of all accidents).
- Accidents at level crossings accounted for 27% of all significant accidents.
- Accidents during shunting operations and involving runaway vehicles are 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.

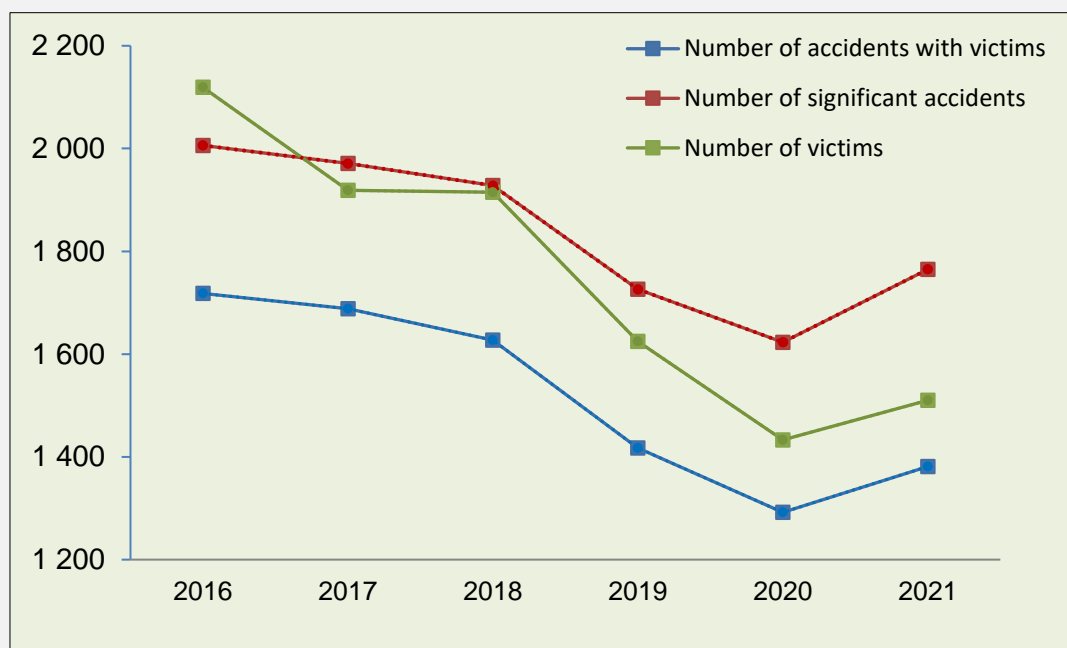
1.03 Main causes of accidents

2021	Causes at first level	Causes at second level	
EXTERNAL CAUSES	THIRD PARTIES 75,4%	Trespassing	44,7%
		Vehicle (LC accident)	18,0%
		Pedestrian (LC accident)	9,2%
		Pedestrian on public railway area	2,2%
		Other or not specified	1,3%
78,2%	WEATHER & ENVIRONMENT 2,9%	Environment	2,4%
		Weather	0,5%
INTERNAL CAUSES	INFRASTRUCTURES 4,0%	Tracks and structures	2,5%
		Energy system	1,1%
		Other or not specified	0,3%
	ROLLING STOCK 4,1%	Running gear	2,1%
		Other or not specified	2,0%
	HUMAN FACTORS (Railway staff & subcontractors) 10,3%	Track and switch maintenance staff	1,4%
		Traffic operating and signalling staff	2,0%
		Train drivers	2,4%
		Other or not specified	4,4%
	RAILWAY USERS 1,5%	Passengers	1,4%
		Other or not specified	0,1%
19,9%			
CAUSES NOT IDENTIFIED			1,9%

- External causes are responsible for nearly 80% of accidents.
- Internal causes relate to both the infrastructure manager and railway undertakings.

1.04 Trend of accidents and rates on the last six years

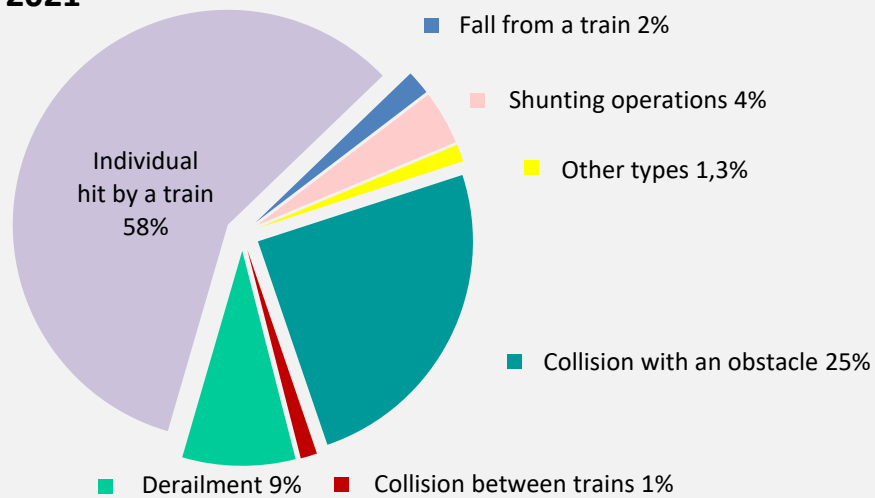
ALL RAILWAYS	2016	2017	2018	2019	2020	2021
Number of significant accidents	2 006	1 971	1 928	1 726	1 623	1 765
Significant accidents per million train-km	0,44	0,42	0,41	0,36	0,37	0,38
Number of accidents with victims	1 718	1 688	1 627	1 417	1 292	1 381
Accidents with victims per million train-km	0,37	0,36	0,34	0,30	0,30	0,29
Number of victims	2 119	1 919	1 915	1 625	1 433	1 510
Victims per million train-km	0,46	0,41	0,40	0,34	0,33	0,32
Number of fatalities	1 181	1 086	1 081	966	905	897
Fatalities per million train-km	0,26	0,23	0,23	0,20	0,21	0,19
Number of million train-kilometres	4 610	4 726	4 757	4 788	4 353	4 700



The year 2020 is atypical because of COVID-19 pandemics and mobility restrictions imposed by most governments. This led to a clear drop of railway accidents. The inversion of trends for all indicators in the year 2021 shows a readjustment to the former situation.

1.05 Accidents by type

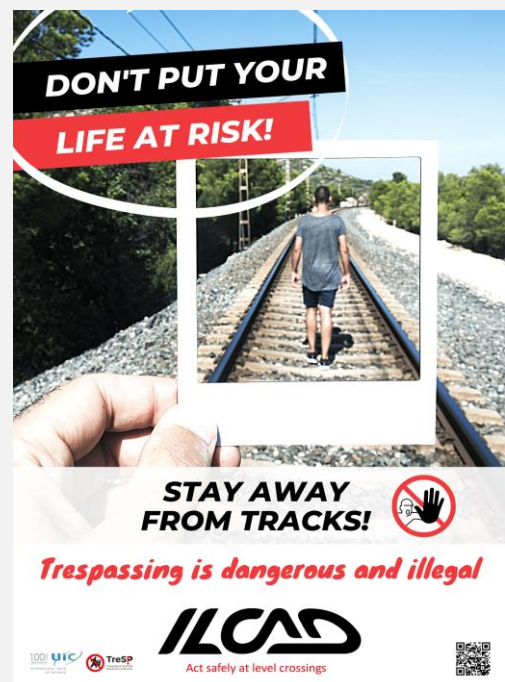
2021



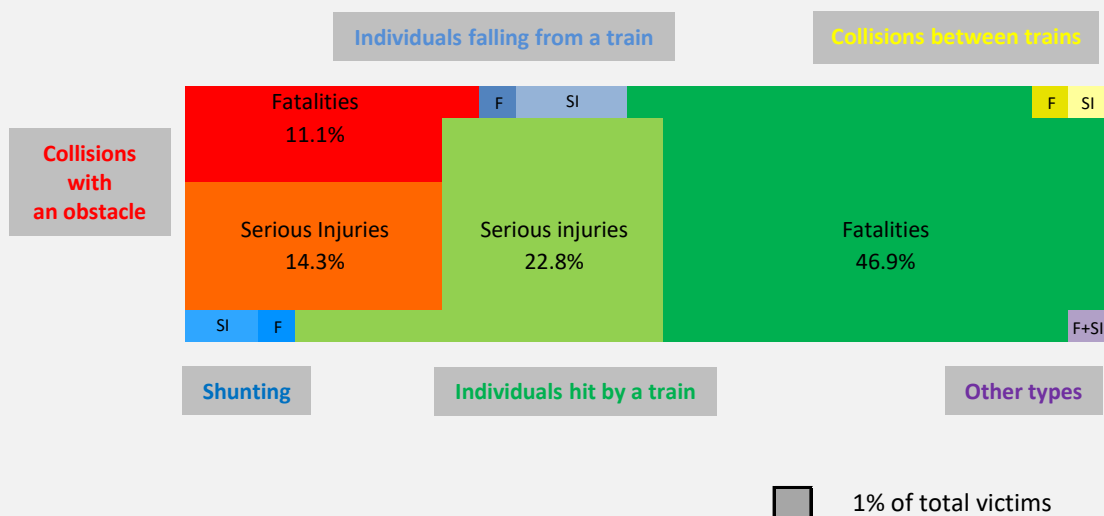
- "Collision with an obstacle" includes collisions at LC.
- "Individual hit by a train" includes pedestrians at LC.
- "Other types": electrocutions, fires in rolling stock, dangerous goods and runaway vehicles
- For LC accidents, refer to graph 1.10.



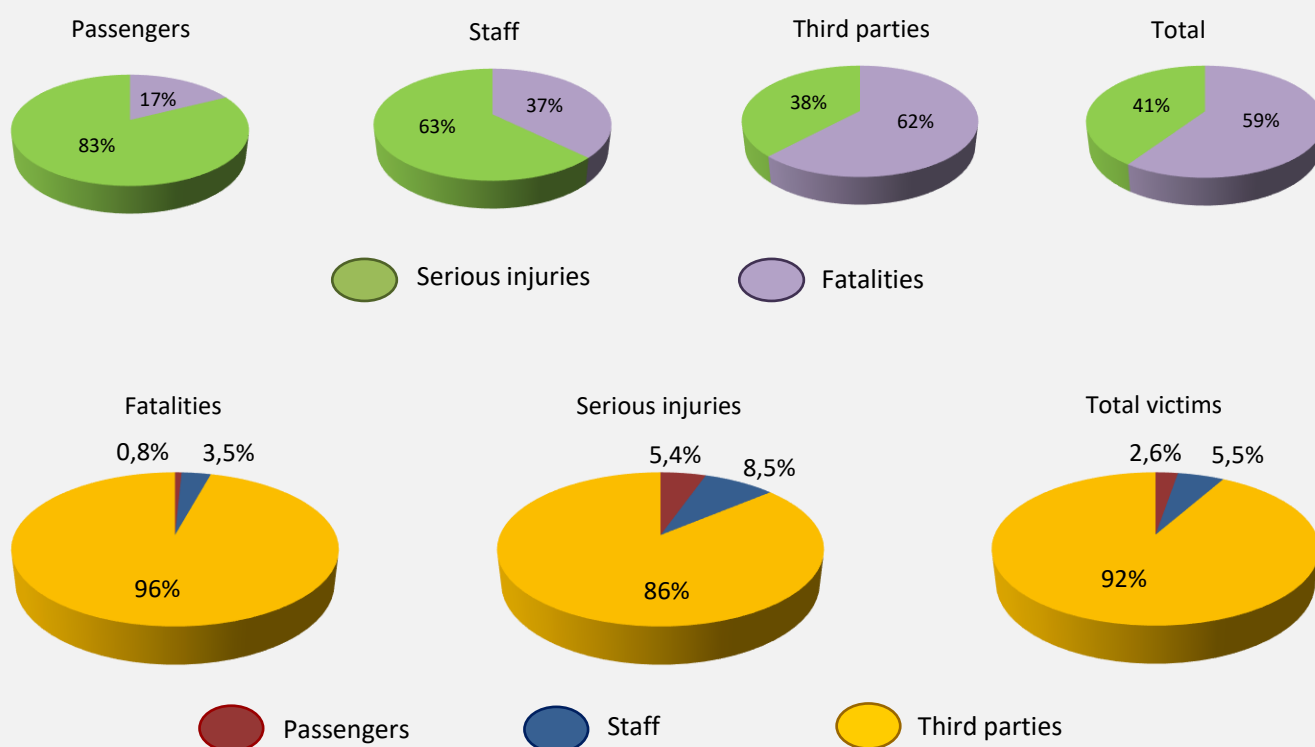
<https://uic.org/safety/trespass-and-suicide-prevention>
 #TrespassSuicidePrevention



1.06 Fatalities and serious injuries by type of accident



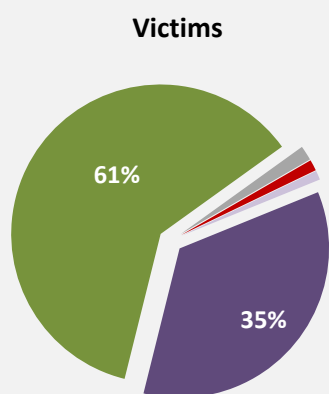
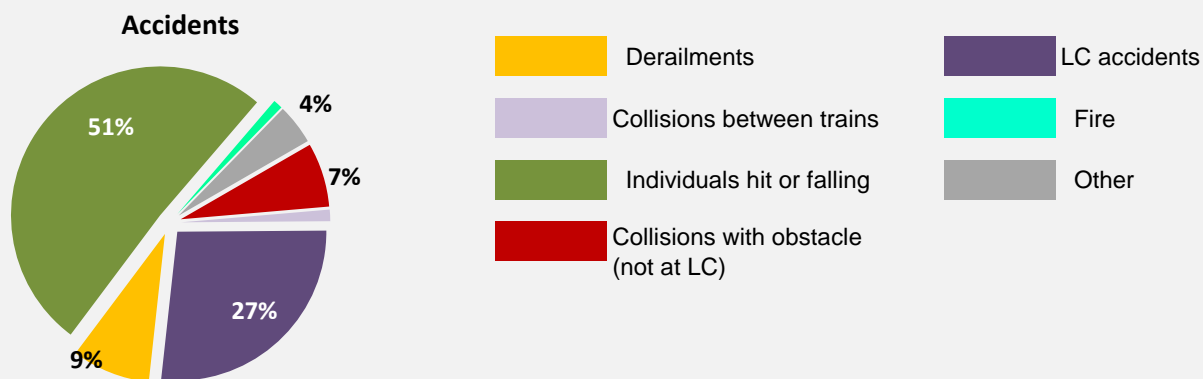
1.07 Distribution of victims



Reading method: fatalities account for 18% of passenger victims and passengers represent 0,8% of fatalities.

- Third parties represented 96% of all fatalities and 86% of serious injuries.
- Fatalities accounted for 59% of victims.

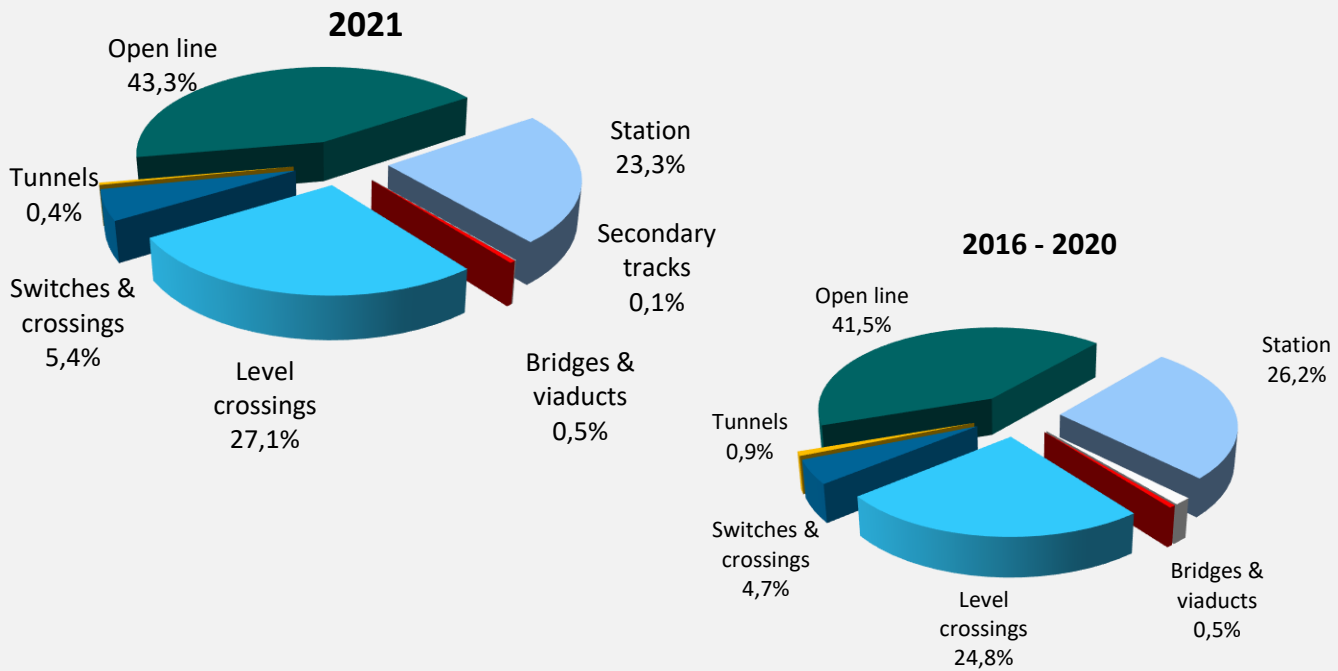
1.08 Victims by type of accident according to Safety Directive definitions



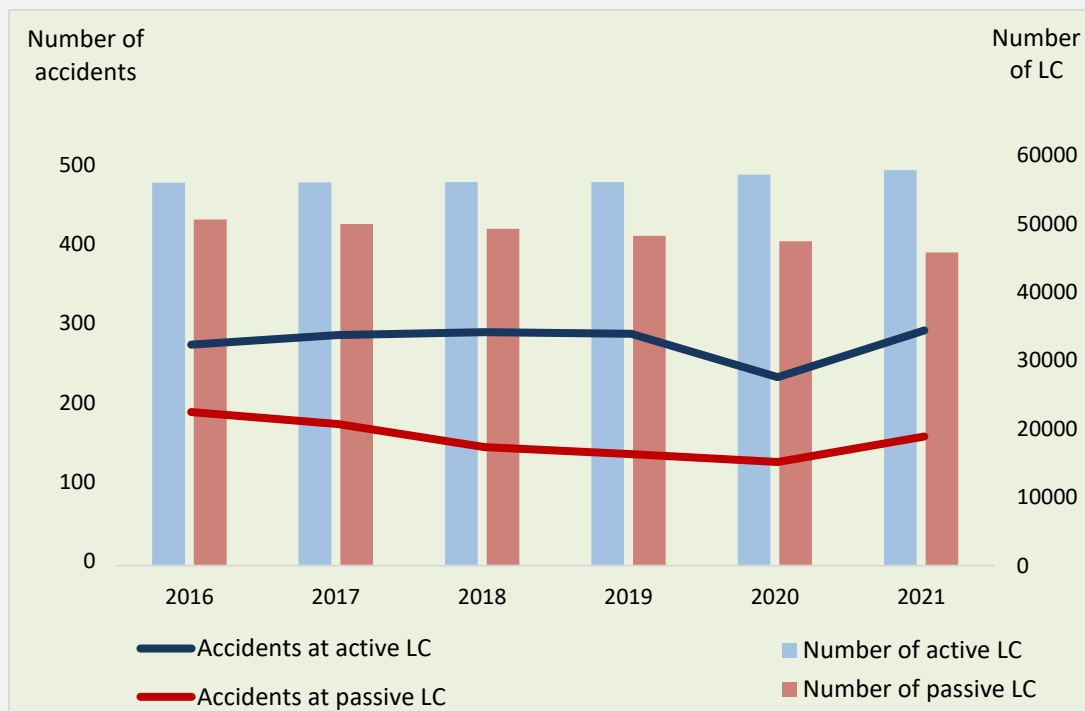
Breakdown of human consequences			
	Fatal.	Injur.	All
Passengers	0,5%	2,2%	3%
Staff	2,1%	3,4%	5%
Third parties	56,9%	35,0%	92%
All categories	59%	41%	100%

Type of accident	Number of events	%	Fatalities			Serious injuries		
			Passengers	Staff	3rd parties	Passengers	Staff	3rd parties
Collisions with obstacle (not at LC)	123	7,0%	-	-	10	2	4	2
Collisions between trains	22	1,2%	1	3	-	7	4	-
Level crossings	474	26,9%	-	-	276	5	6	242
Derailment	150	8,5%	-	-	-	-	-	-
Individuals & rolling stock in motion (not at LC)	901	51,0%	6	25	570	19	25	279
Fire	18	1,0%	-	-	-	-	-	-
Other types	77	4,4%	-	3	3	-	13	5
Total	1 765		7	31	859	33	52	528

1.09 Accidents by location details



1.10 Accidents at level crossings



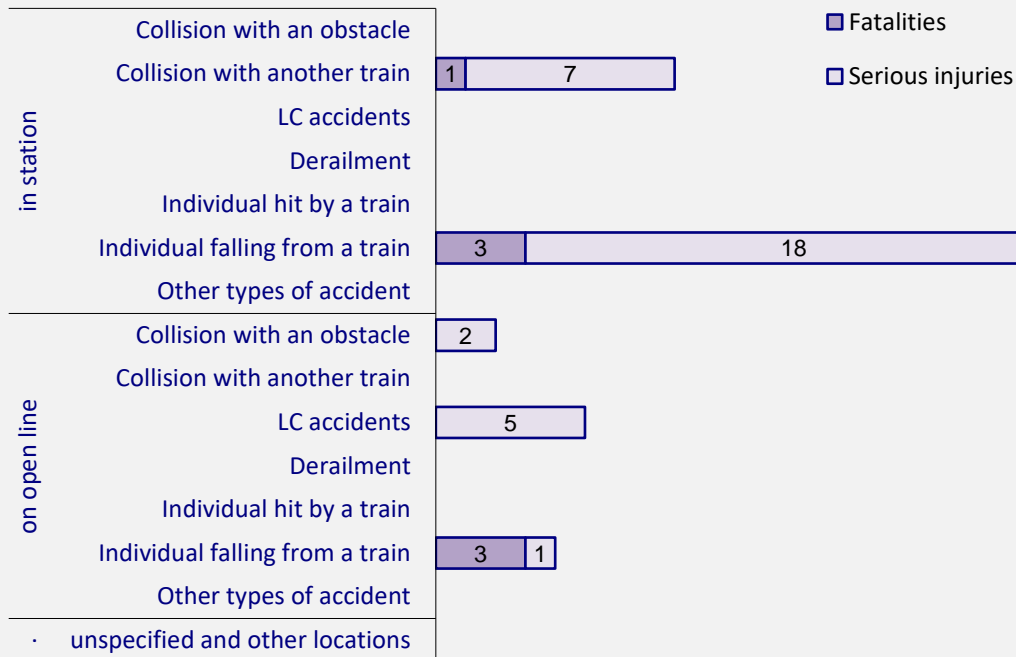
- This graph excludes Canada (split between passive and active level crossings unavailable).
- Accidents at active LC remained stable till 2019, dropped in 2020 but increased to the previous level in 2021.
- Accidents at passive LC slowly decreased between 2016 and 2020 but increased in 2021.

1.11 Number of accidents and victims by type of accident

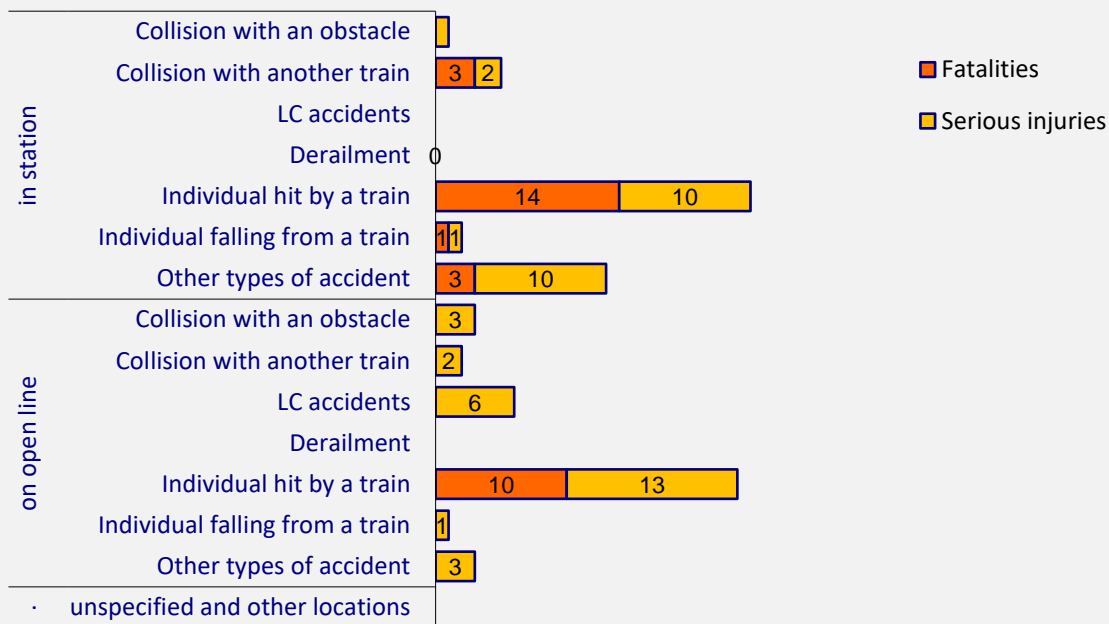
2021		Number of accidents	FATALITIES			SERIOUS INJURIES			ALL VICTIMS
			Passengers	Staff	3rd parties	Passengers	Staff	3rd parties	
In station	Collisions with an obstacle (not at LC)	24	-	-	-	-	1	-	1
	Collisions between trains	15	1	3	-	7	2	-	13
	LC accidents	61	-	-	36	-	-	28	64
	Derailments	64	-	-	-	-	-	-	-
	Hit by a train (not at LC)	286	-	14	144	-	10	124	292
	Falling from a train	25	3	1	2	18	1	-	25
	Other accidents	80	-	3	3	-	10	4	20
	Total at station	555	4	21	185	25	24	156	415
On open line	Collisions with an obstacle (not at LC)	98	-	-	10	2	3	2	17
	Collisions between trains	7	-	-	-	-	2	-	2
	LC accidents	398	-	-	231	5	6	209	451
	Derailments	83	-	-	-	-	-	-	-
	Hit by a train (not at LC)	583	-	10	423	-	13	154	600
	Falling from a train	7	3	-	1	1	1	1	7
	Other accidents	14	-	-	-	-	3	1	4
	Total in open line	1190	3	10	665	8	28	367	1081
not specified		20	-	-	9	-	-	5	14
GRAND TOTAL		1765	7	31	859	33	52	528	1510

- 67% of accidents occurred on open line, whilst 31% happened in stations and yards.
- 76% of fatalities occurred on open line.
- Persons hit by a train and LC accidents represented 96% of all fatalities.

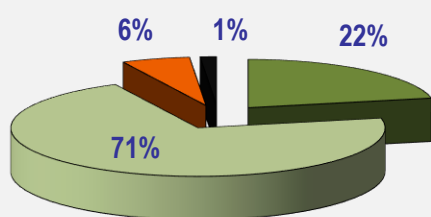
1.12 Passenger victims by type of accident and location



1.13 Staff victims by type of accident and location



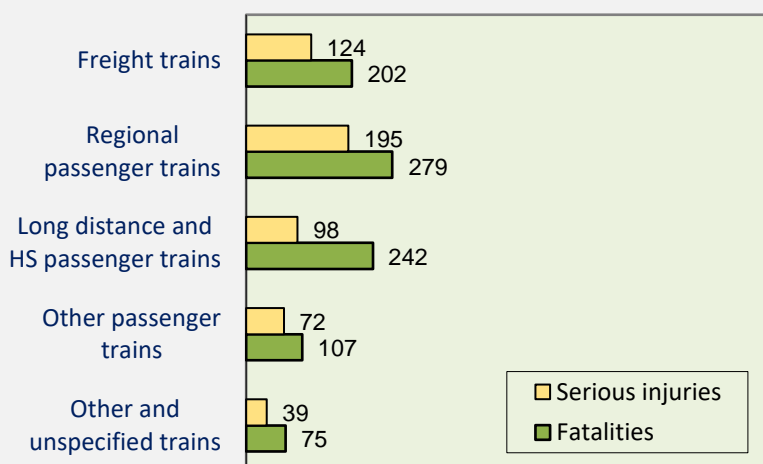
1.14 Victims by type of traffic



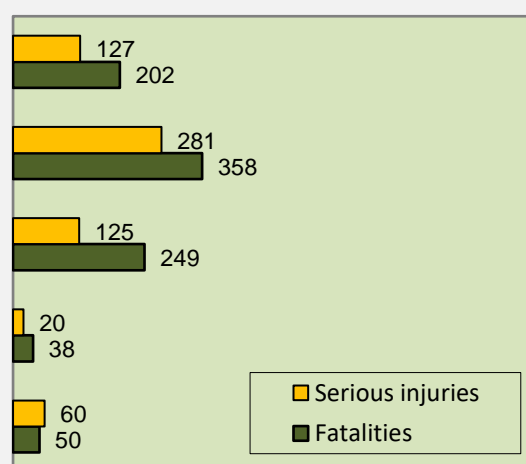
- Freight trains
- Passenger trains
- Locomotives running light, infrastructure trains, unspecified trains
- Shunting and runaway vehicles

Type of accident	Freight trains	Passenger trains	Locomotives running light, infrastructure trains, unspecified trains	Shunting and runaway vehicles
2021				
Collision	10	20	3	2
Derailment	-	-	-	-
Level crossing accidents	130	380	18	2
Accidents to persons caused by rolling stock in motion	188	671	65	16
Other accidents	1	-	3	1
TOTAL victims	329	1071	89	21

2020



2021



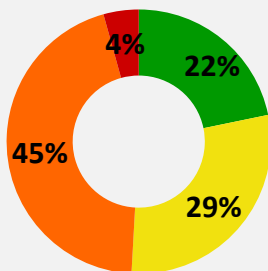
Due to lockdowns and other mobility restrictions, less passenger trains were running during 2020. This led logically to a drop of accidents involving passenger trains between 2019 and 2020, unfortunately partly compensated by the increase of accidents involving freight trains.

The number of fatalities and serious injuries in accidents involving freight trains remained stable from 2020 to 2021.

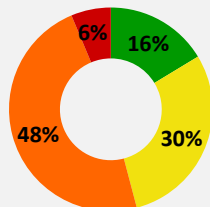
Among accidents where the type of train is registered, passenger trains are involved in accidents leading to 77% of victims in 2021.

1.15 Accidents by type and number of victims

All accidents 2021
(1765 events)



2016 - 2020
(9254 events)



■ no victim *

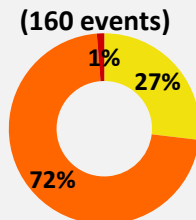
■ 1 serious injury

■ 1 fatality

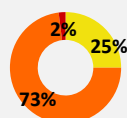
■ 2 or more victims *

* a victim is a fatality or a serious injury

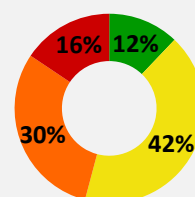
Individual hit by a train at LC 2021
(160 events)



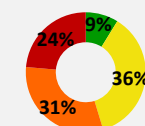
2016 - 2020
(708 events)



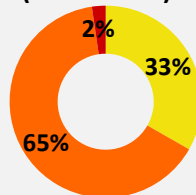
Collision with an obstacle at LC 2021
(314 events)



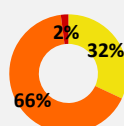
2016 - 2020
(1576 events)



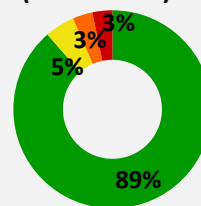
Individual hit by a train not at LC 2021
(869 events)



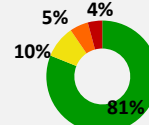
2016 - 2020
(4957 events)



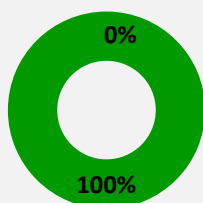
Collision with an obstacle not at LC 2021
(122 events)



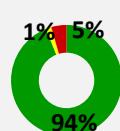
2016 - 2020
(598 events)



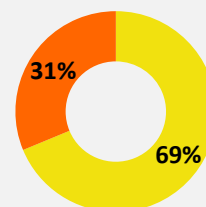
Derailment 2021
(151 events)



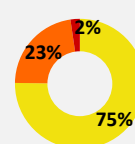
2016 - 2020
(498 events)



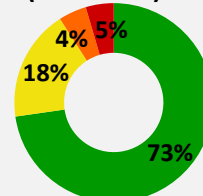
Fall from a train 2021
(32 events)



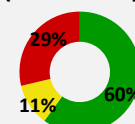
2016 - 2020
(258 events)



Collision between trains 2021
(22 events)

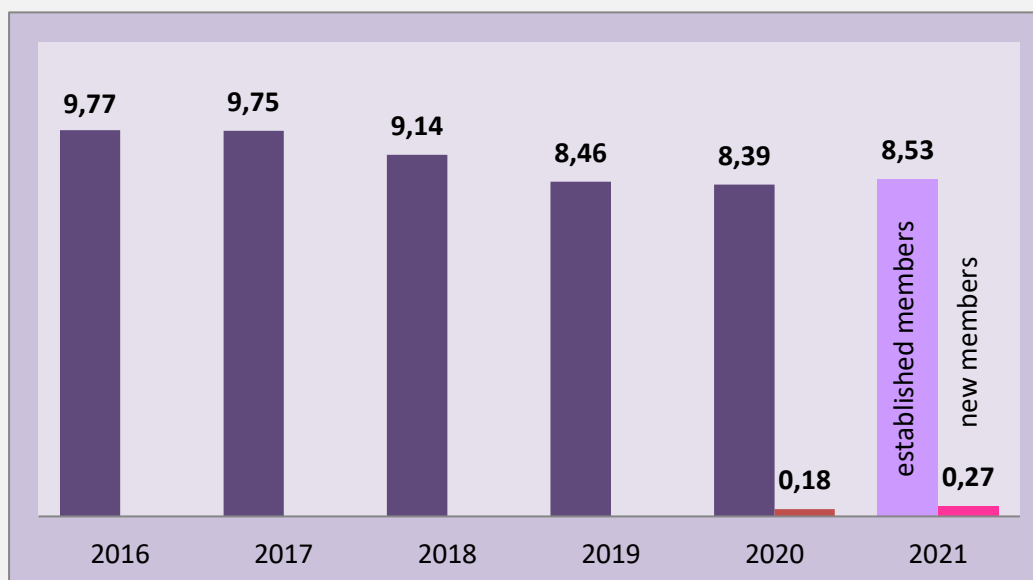


2016 - 2020
(115 events)



- Fires in RS: 18 events (no victim)
- Electrocutions: 4 events (1 fatality and 3 serious injuries)

1.16 UIC Safety Index



The UIC 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.

The exact calculation behind the UIC Safety Index is available at UIC.

1.17 Normalized UIC Safety Index



This graph shows the change of UIC Safety Index normalized by the total number of train-km on the networks of the established members (members that delivered data at least since 2016).

Basis 100 = year 2016

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

Type of accidents	Causes			Location				Victims Fatal. S. Inj.				
				Type of location		Location details						
Individual hit by a train 1029 1054	INF	-	-	OL	710	728	LC	160	162	P	-	-
	RS	1	1				SC	20	20			
	HF	47	47	S	316	322	BV	6	6	S	24	23
	RU	1	1				T	4	4			
	WE	-	-	Ot	3	4	O	839	862	T	685	322
	TP	980	1005									
	Train collision with an obstacle 437 385	INF	27	1	OL	369	340	LC	314	367	P	-
RS		11	-	SC				8	1			
HF		20	5	S	55	35	BV	-	-	S	-	10
RU		-	-				T	-	-			
WE		43	2	Ot	13	10	O	115	17	T	168	200
TP		333	377									
Individual falling from a train 32 32		INF	-	-	OL	7	7	LC	-	-	P	6
	RS	-	-	SC				-	-			
	HF	4	4	S	25	25	BV	1	1	S	1	2
	RU	24	24				T	-	-			
	WE	-	-	Ot	-	-	O	31	31	T	3	1
	TP	4	4									
	Train collision with another train 22 15	INF	-	-	OL	7	2	LC	-	-	P	1
RS		-	-	SC				5	2			
HF		19	14	S	15	13	BV	-	-	S	3	4
RU		-	-				T	1	1			
WE		1	1	Ot	-	-	O	16	12	T	-	-
TP		-	-									
Derailment 150 -		INF	42	-	OL	83	-	LC	1	-	P	-
	RS	48	-	SC				36	-			
	HF	38	-	S	64	-	BV	1	-	S	-	-
	RU	1	-				T	2	-			
	WE	7	-	Ot	3	-	O	110	-	T	-	-
	TP	4	-									
	Electrocution 3 3	INF	-	-	OL	-	-	LC	-	-	P	-
RS		-	-	SC				-	-			
HF		1	1	S	3	3	BV	-	-	S	-	1
RU		-	-				T	-	-			
WE		-	-	Ot	-	-	O	3	3	T	1	1
TP		2	2									
Fires 18 -		INF	-	-	OL	9	-	LC	-	-	P	-
	RS	12	-	SC				-	-			
	HF	-	-	S	9	-	BV	-	-	S	-	-
	RU	-	-				T	-	-			
	WE	-	-	Ot	-	-	O	18	-	T	-	-
	TP	1	-									

Type of accidents	Causes			Location				Victims		
				Type of location		Location details		Fatal.	S.	Inj.
Accident involving dangerous goods without release 1 -	INF	-	-	OL	-	-	LC	-	-	-
	RS	-	-				SC	-	-	-
	HF	-	-	S	1	-	BV	-	-	-
	RU	-	-				T	-	-	-
	WE	-	-	Ot	-	-	O	-	-	-
	TP	-	-							
Accident involving dangerous goods with release - -	INF	-	-	OL	-	-	LC	-	-	-
	RS	-	-				SC	-	-	-
	HF	-	-	S	-	-	BV	-	-	-
	RU	-	-				T	-	-	-
	WE	-	-	Ot	-	-	O	-	-	-
	TP	-	-							
Shunting operations 72 21	INF	2	-	OL	5	4	LC	2	2	-
	RS	1	-				SC	26	1	-
	HF	51	13	S	66	17	BV	-	-	-
	RU	-	-				T	-	-	-
	WE	-	-	Ot	1	-	O	44	18	-
	TP	6	6							
Runaway vehicles 1 -	INF	-	-	OL	-	-	LC	-	-	-
	RS	-	-				SC	-	-	-
	HF	1	-	S	1	-	BV	-	-	-
	RU	-	-				T	-	-	-
	WE	-	-	Ot	-	-	O	1	-	-
	TP	-	-							

TOTAL 1765 1510	INF	71	1	OL	1190	1081	LC	477	531	P	7	33
	RS	73	1				SC	95	24			
	HF	181	84	S	555	415	BV	8	7	S	31	52
	RU	26	25				T	7	5			
	WE	51	3	Ot	20	14	O	1177	943	T	859	528
	TP	1330	1394									
										897	613	

number of accidents	INF: Infrastructures	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
	RS: Rolling stock			
	HF: Human Factors			
	RU: Railway users			
	WE: Weather-Environment			
number of victims	TP: Third Parties			

Part 2

Time series and trends 2016-2021



Part 2 - Time series and trends 2016-2021

excluding NRIC (Bulgaria), INFRAKOS (Kosovo) and LTG (Lithuania)
(full time series unavailable)

CAUSES

2.00 Traffic in train-km

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

INDICATORS

2.17 Significant accidents and victims per million train-km

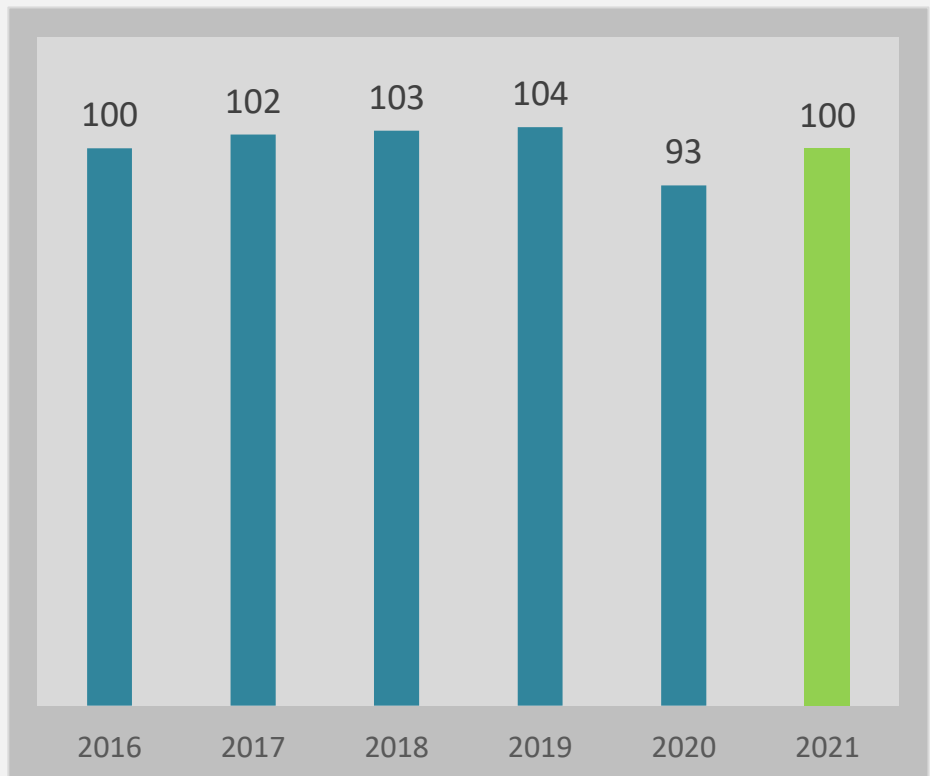
2.00 Railway traffic in million train-km (basis 100 = year 2016)

Railway traffic is measured in train-kilometres, which means the total number of kilometres run by trains on railway networks.

The traffic slowly increased between 2016 and 2019 but dropped heavily in 2020, due to the COVID-19 pandemic and the measures of mobility restriction taken by most governments.

Most railway companies were obliged to reduce the rail traffic, especially during lockdown periods.

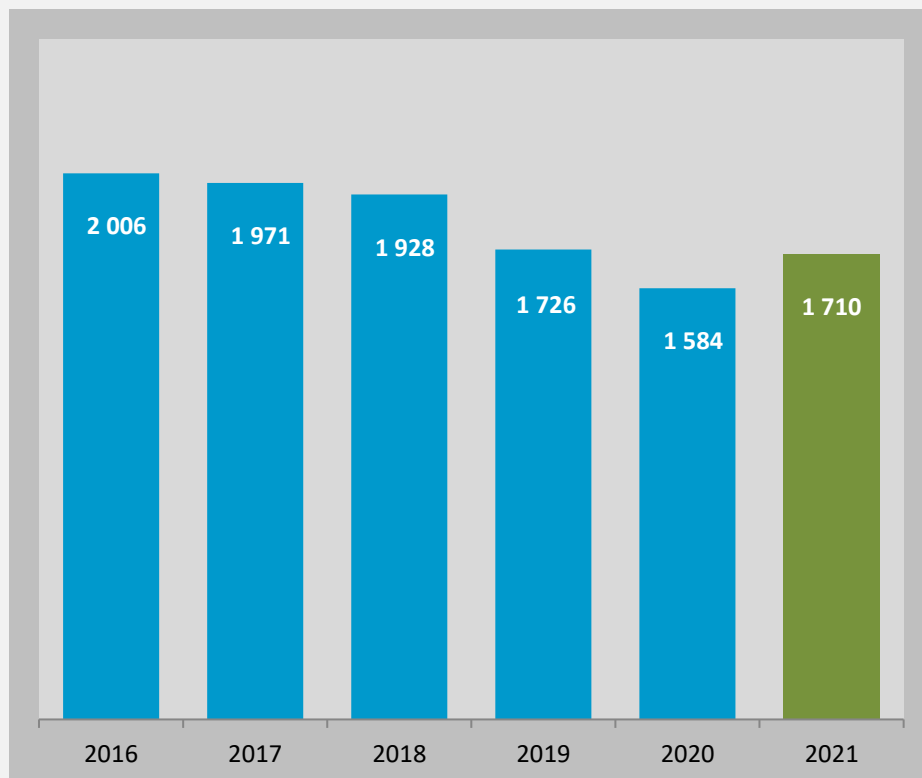
In the year 2021, the rail traffic increased but didn't reach the level observed before the pandemic.



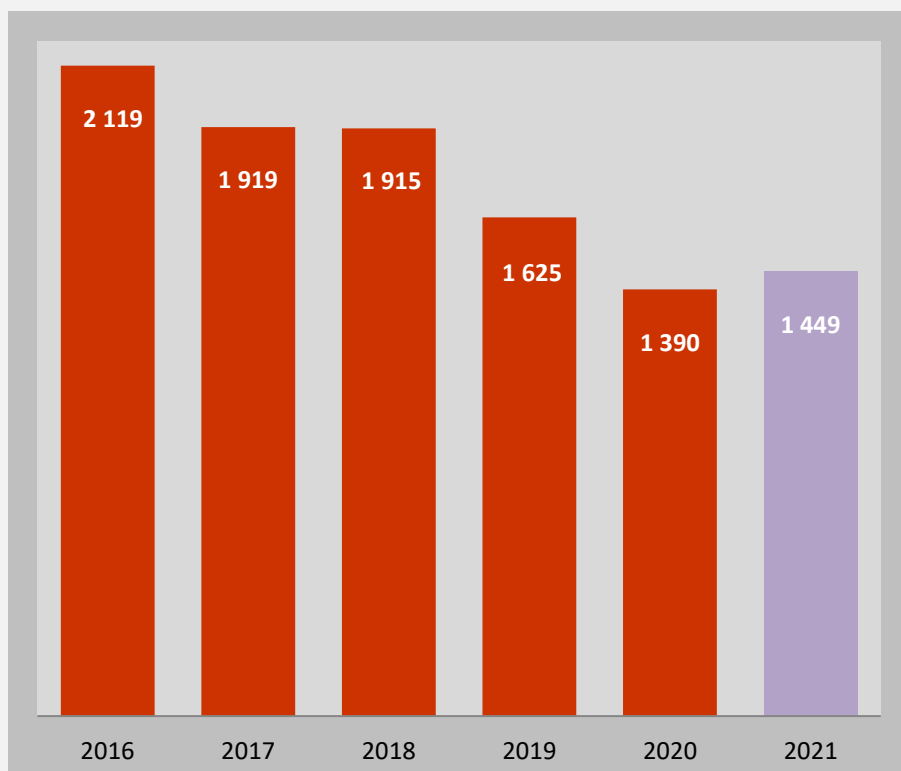
2.01a All significant accidents

Significant accidents declared by railway members of the Safety Database dropped from 2006 in the year 2016 to 1584 in the year 2020, which means a decrease of -21%. But 2021 shows an increase of 8% compared to 2020.

“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



Although the number of victims increased by +59 in 2021, it still represents the second lowest number since the establishment of the database in 2006.

The number of victims decreased - 32% compared to the year 2016.

The low figures obtained in 2020 and in 2021 may remain exceptional, due to the COVID-19 pandemic.

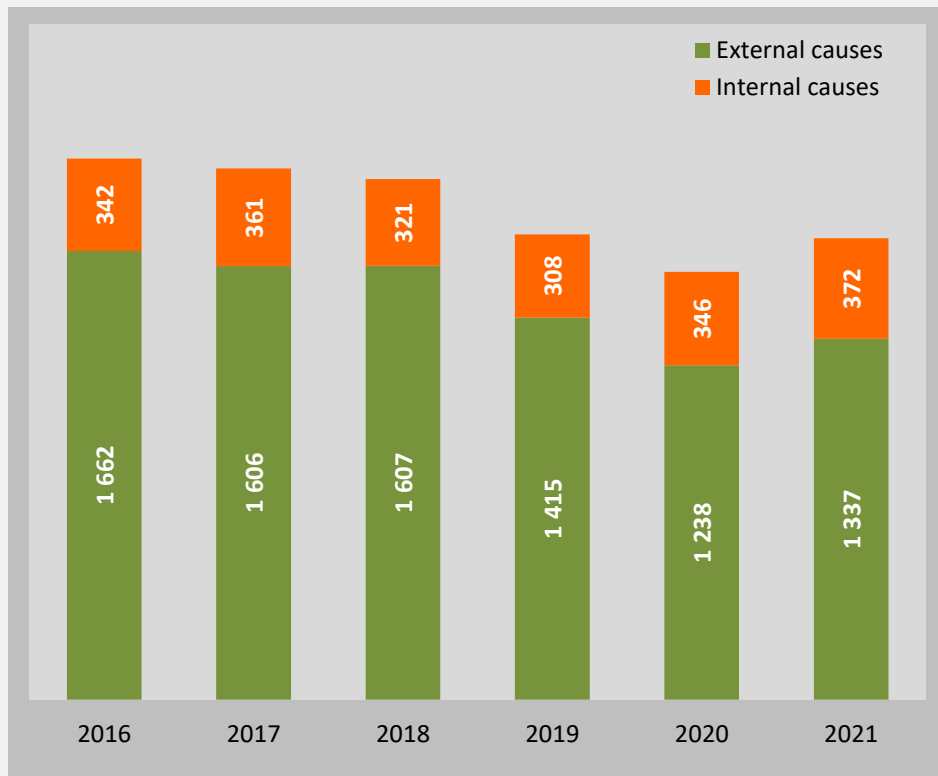
2.02a Accidents per internal / external causes

The number of accidents with internal causes decreased from 2017 to 2019, but increased in 2020 and again in 2021.

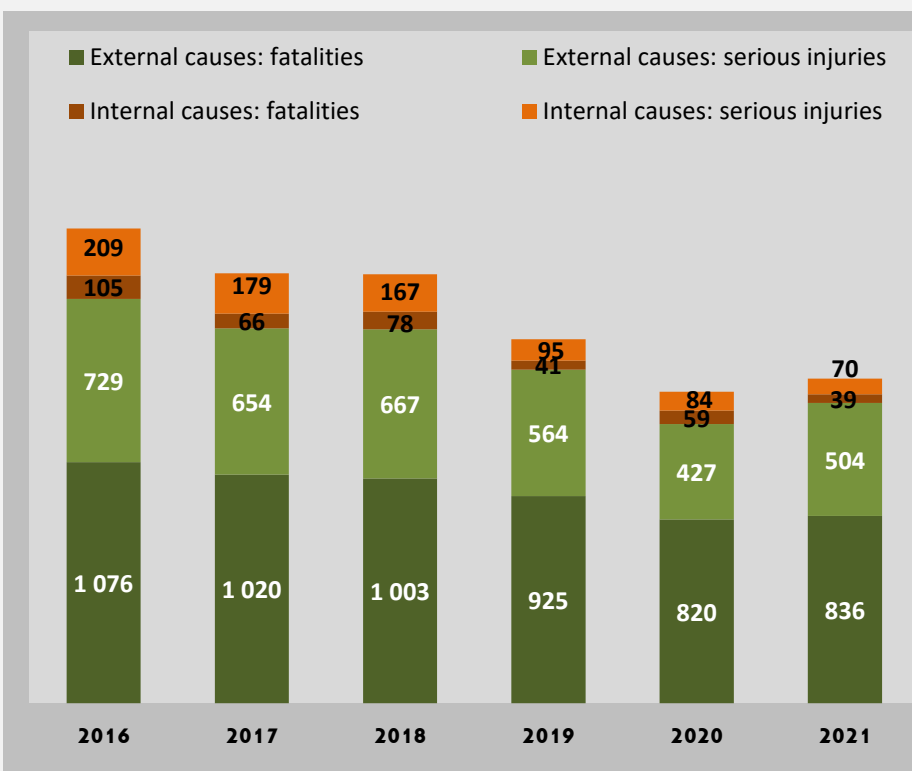
The number of accidents with external causes decreased -12% between 2018 and 2019, and again -12% between 2019 and 2020, but increased +8% in 2021.

Reminder

- Internal causes: infrastructure, rolling stock, human factors and railway users.
- External causes: third parties, weather and environment.
- Some accidents have unidentified causes. They are excluded from the graph.



2.02b Victims per internal / external causes



External causes

The number of victims for external causes increased by +7% between 2020 and 2021 but remains 23% lower than 2016.

Internal causes

The number of victims for internal causes dropped by -23% between 2020 and 2021 and by -5% when compared to the peak of 2016.

In the year 2021:

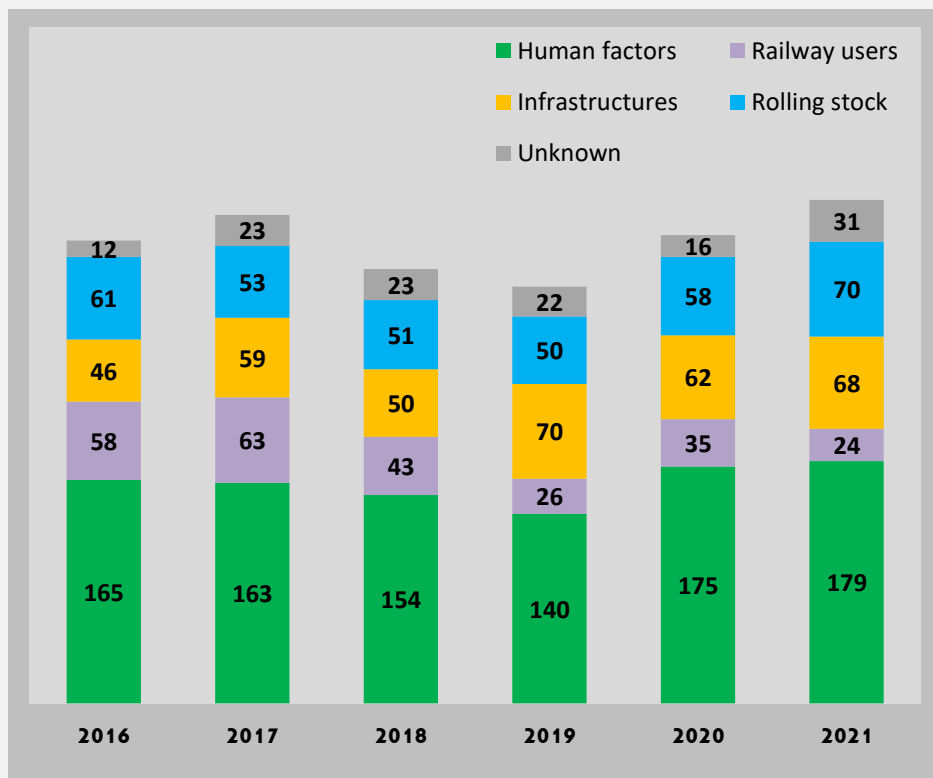
- ✓ External causes are responsible for 92% of all victims and 96% of all fatalities.
- ✓ 62% of victims of accidents with external causes are fatalities.
- ✓ 65 % of victims of accidents with internal causes are serious injuries.

2.03a Accidents per internal causes

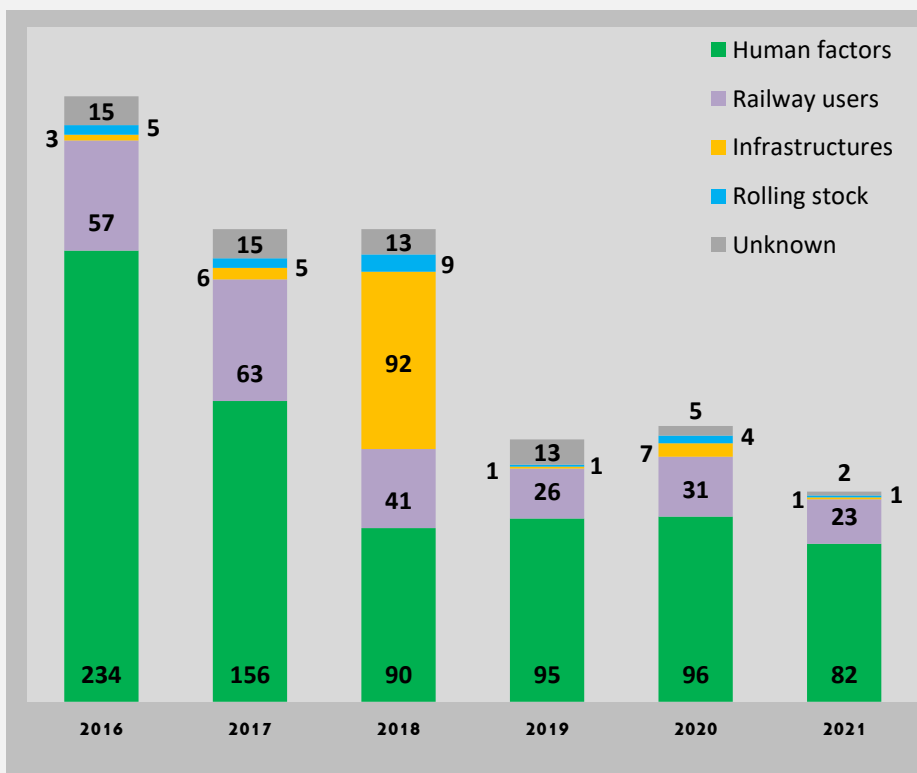
The year 2021 confirms the inversion of trends observed in 2020. The number of accidents with internal causes in 2021 is the highest on the whole 6-years period.

From 2019 to 2020, the number of accidents increased in three of the four subcategories (unknown internal causes not being taken into account).

The same evolution may be observed between 2020 and 2021, especially regarding the worrying increase of accidents with human factors.



2.03b Victims per internal causes



The number of victims in 2021 represents only one third of the number of victims in 2016.

Number of accidents and number of victims are quite disconnected. A few severe accidents may have a huge number of victims (year 2016, for instance).

During 2021, one sole collision between trains led to 10 victims (2 staff fatalities, 1 passenger fatality and 7 passenger injuries). Another collision led to two staff injuries.

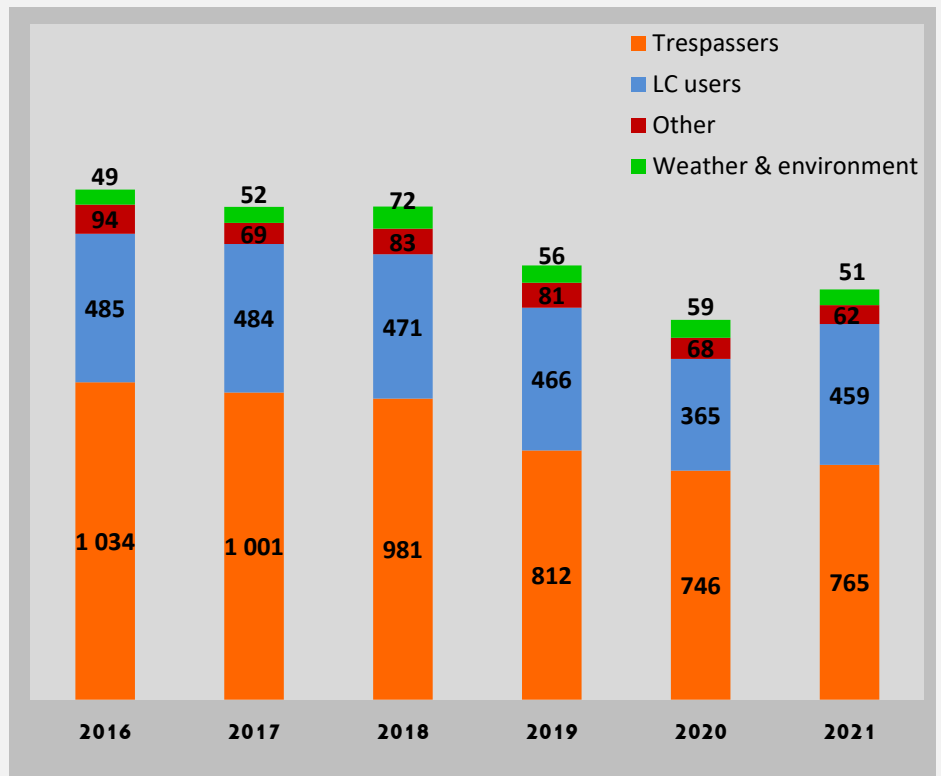
98 events (26%) led to 1 injury and 272 events (73%) made no victims.

2.04a Accidents per external causes

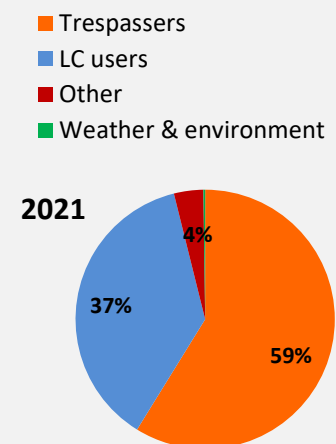
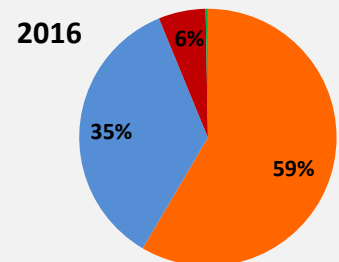
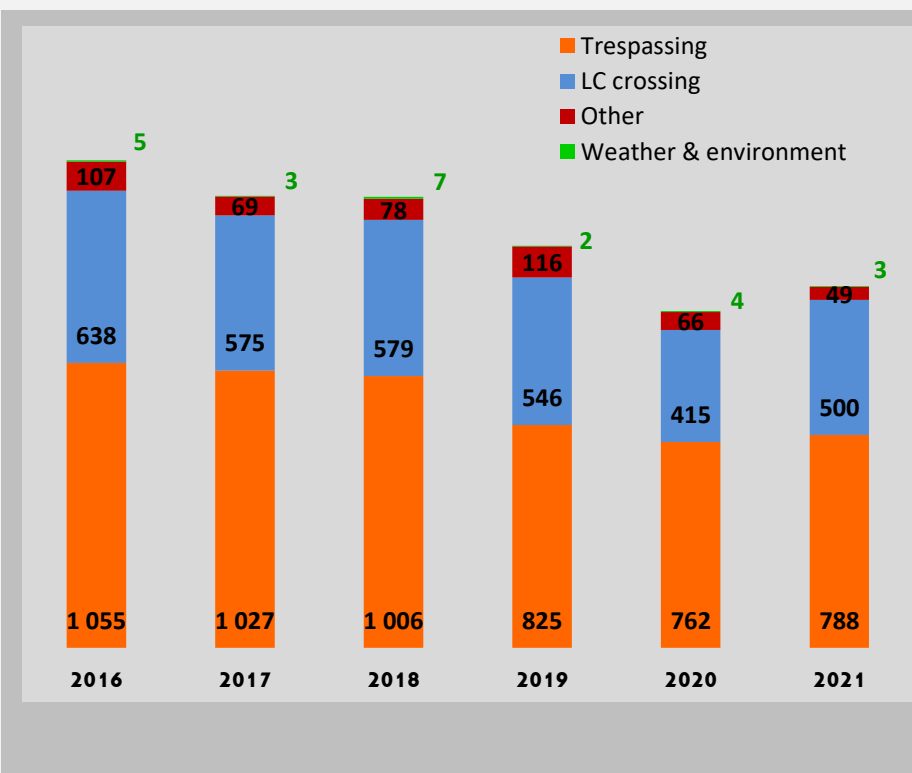
The number of accidents with external cause decreased -20% between 2016 and 2021.

Trespassers remain the most common cause of accident: 57% of all accidents with external causes in 2020.

LC users are causing 34% of all accidents with external causes in 2020. The number (around 470) is relatively stable since 2016, despite all awareness campaigns. The year 2020 distinguishes itself with a lower number (365), due to the several lockdowns and curfews settled by authorities to fight the COVID-19 pandemic.



2.04b Victims per external causes

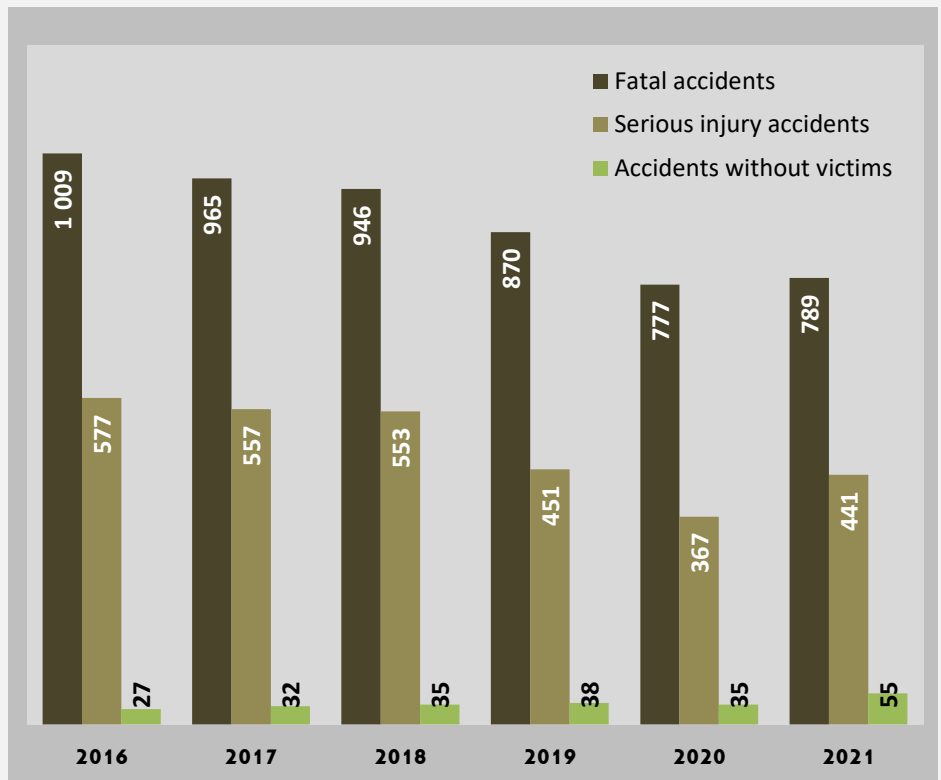


2.05a Accidents caused by third parties

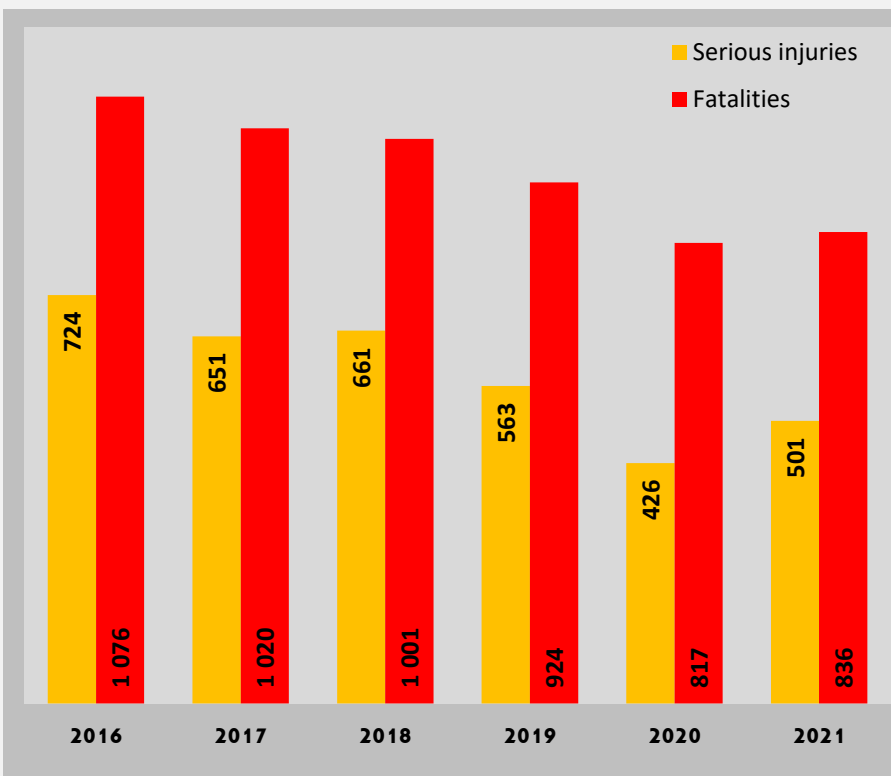
Accidents caused by third parties decreased -20% between 2016 and 2021.

96% of fatal accidents and 87% of serious injury accidents are caused by third parties (year 2021).

Accidents with serious injuries decreased -24% and fatal accidents decreased -22% since 2016.

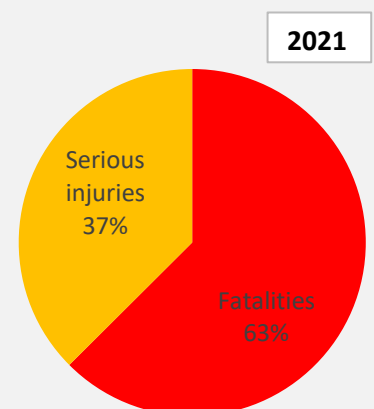


2.05b Victims of accidents caused by third parties



Compared to the peak of 2016, serious injuries decreased by - 31% and fatalities decreased by - 22%.

As a result the part of fatalities among the victims increased from 59,8% in 2016 to 62,5% in 2021.

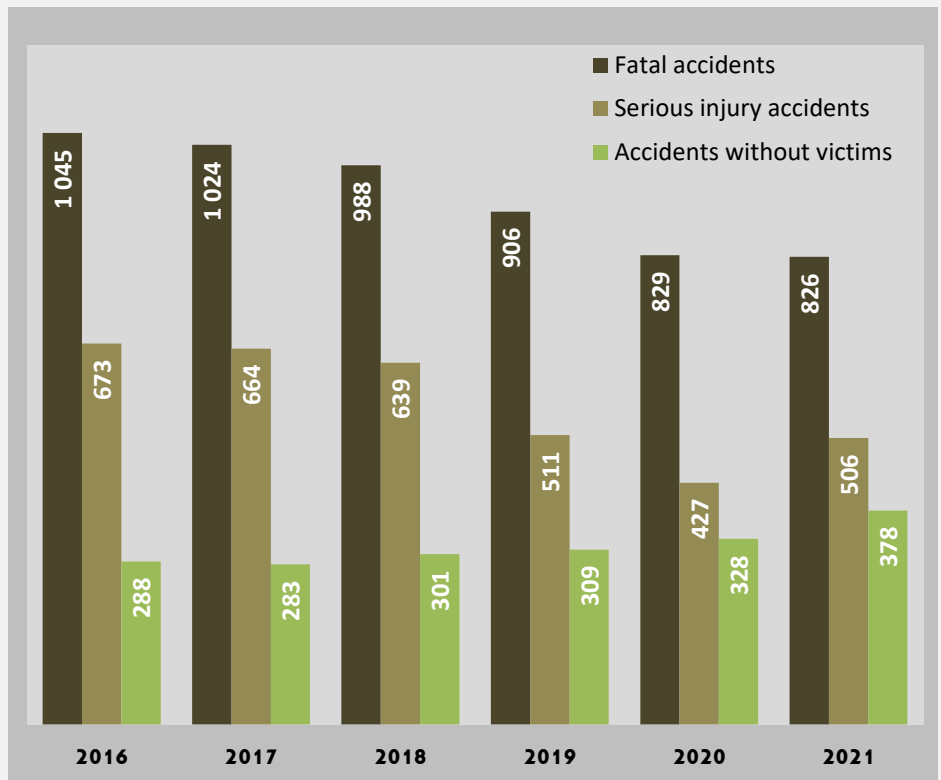


2.06a Accidents per human consequences

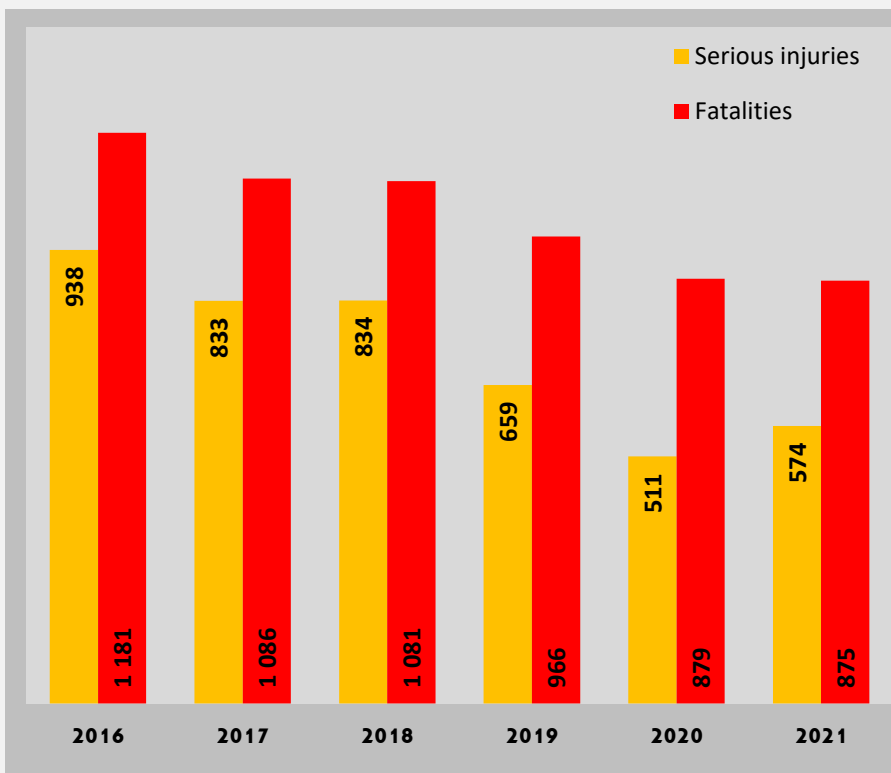
Fatal accidents used to represent slightly more than a half of all significant accidents. In 2021, fatal accidents represent 48% of the total accidents.

Fatal accidents decreased by -25% from 2016 to 2021 while serious injury accidents decreased by -21%.

The number of accidents without victims increases since 2017. This might be linked to more information about accidents with damages or traffic disruption.



2.06b Fatalities and serious injuries



From 2016 to 2020, fatalities decreased -26% while serious injuries decreased -44%.

From 2020 to 2021, serious injuries increased by +13% while fatalities remained stable.

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

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).

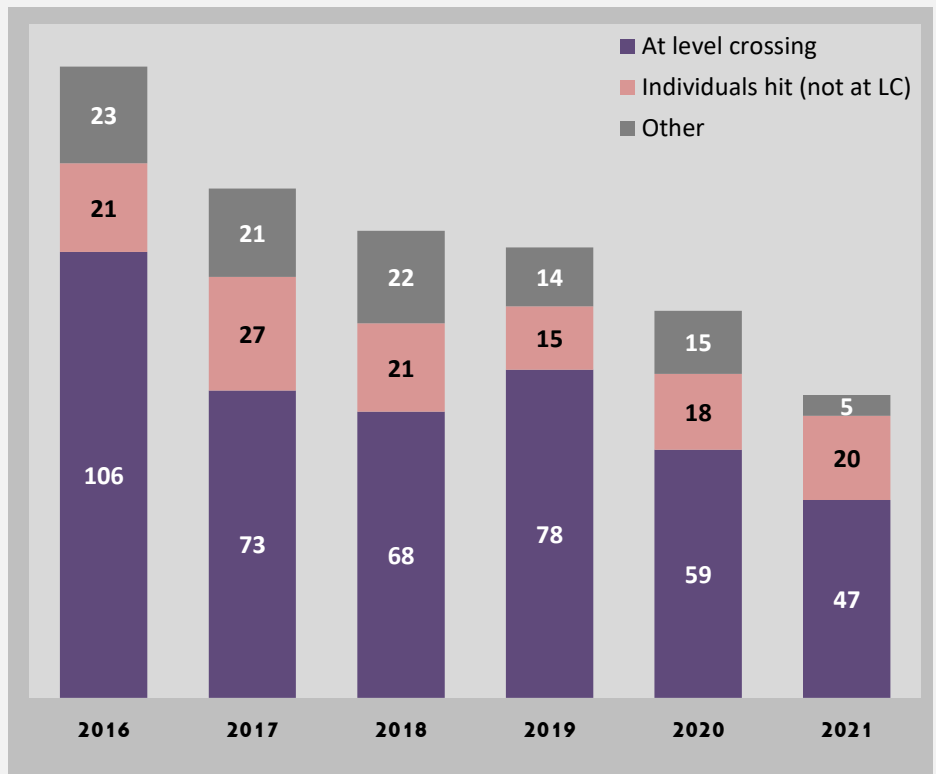
2.07a Severe accidents (two and more victims)

Severe accidents peaked in 2016. Severe accidents decreased -51% between 2016 and 2021. They represent 5% of all accidents in 2021.

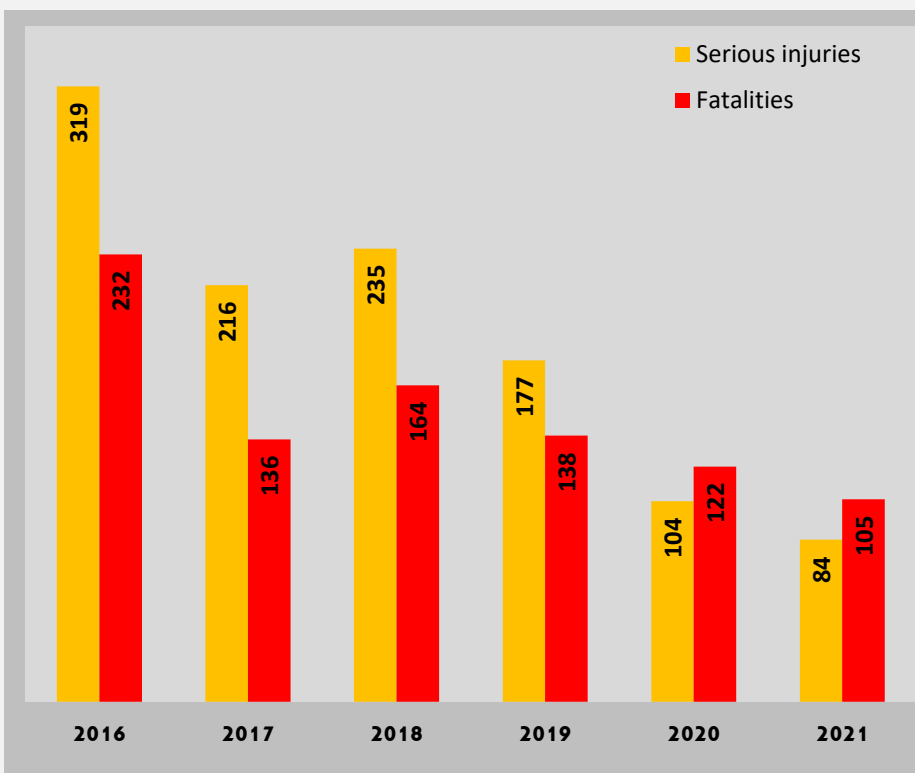
The number of collisions with road vehicles at level crossings decreased -56% on the same period.

The heaviest accidents that occurred during 2021 are:

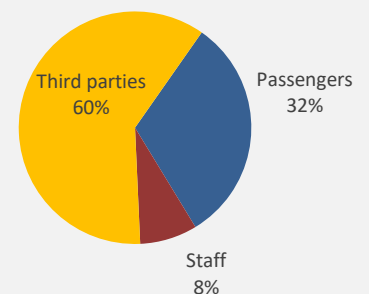
- a collision between trains (3 fatalities and 7 injuries)
- two collisions with road vehicles at LC with 6 and 5 victims respectively.



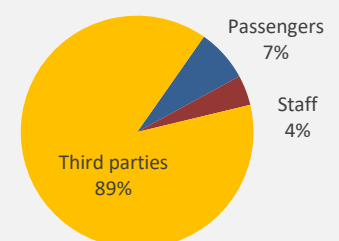
2.07b Victims of severe accidents



Split of victims 2016



Split of victims 2021



We observe that severe injuries decrease more rapidly than fatalities.

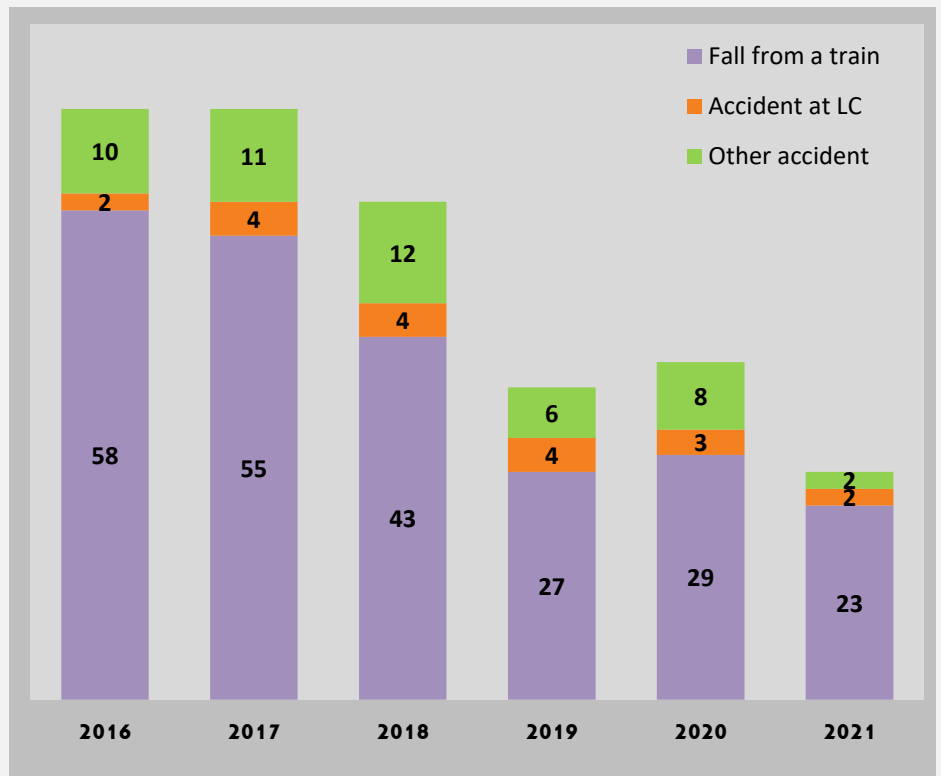
2.08a Accidents with passenger victims

The number of accidents with passenger victims decreases, since the peaks of 2016 and 2017. The figure obtained in 2021 (27 accidents) is the lowest observed since 2006.

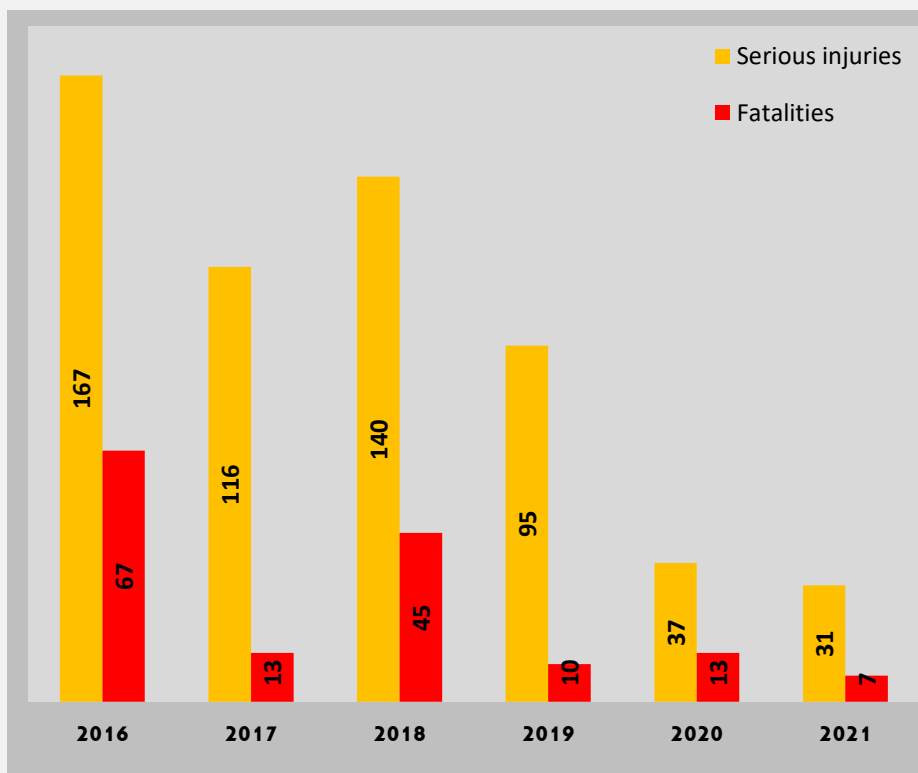
85% of events with passenger victims are "individuals falling from a train", representing 59% of passenger victims in 2021.

One sole collision between railway vehicles is responsible for 8 passenger victims (and two staff victims).

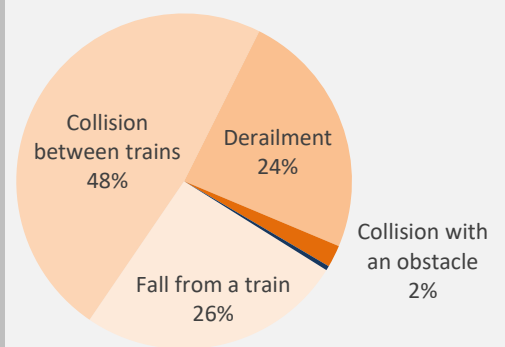
No derailment with passenger victims occurred in 2021.



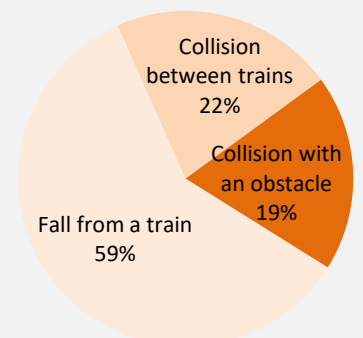
2.08b Passenger victims



Split of passenger victims in 2016



Split of passenger victims in 2021

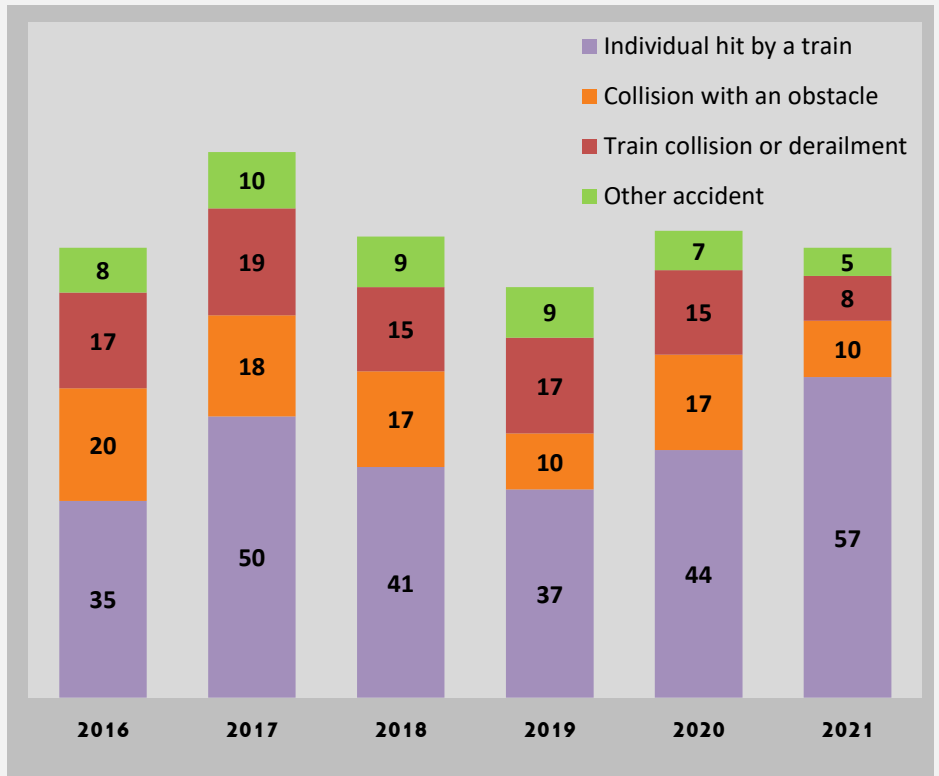


2.09a Accidents with staff victims

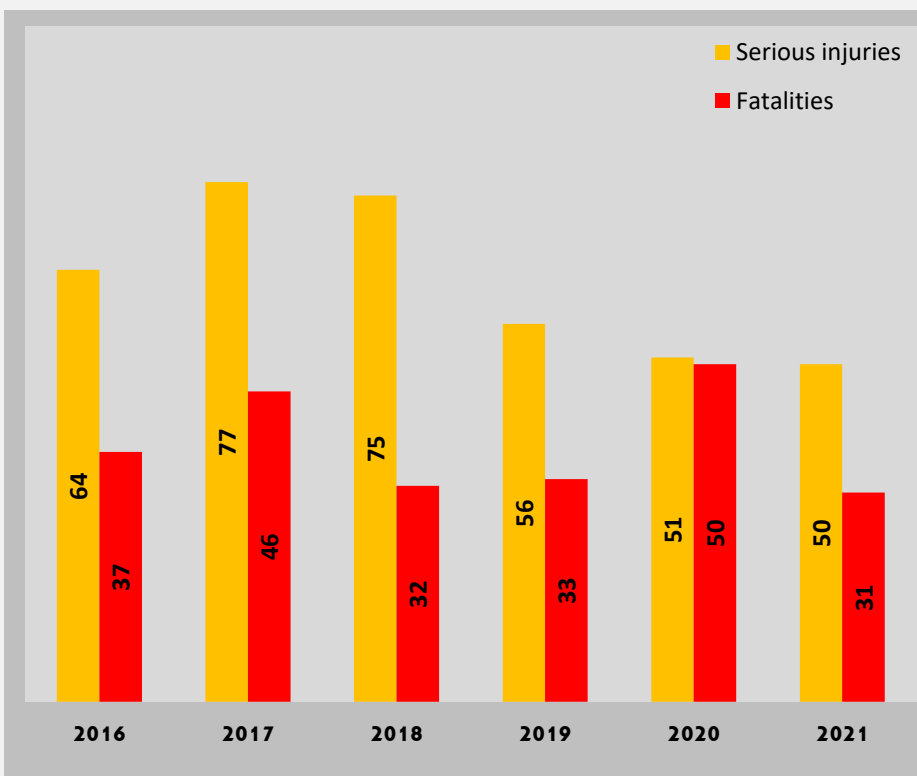
Trends are not obvious on this six-year period, but we should not forget that the number of accidents ten years ago was around 200, which means twice the present number.

Rail infrastructure staff pays the heaviest price (71% of accidents are workers hit by a train).

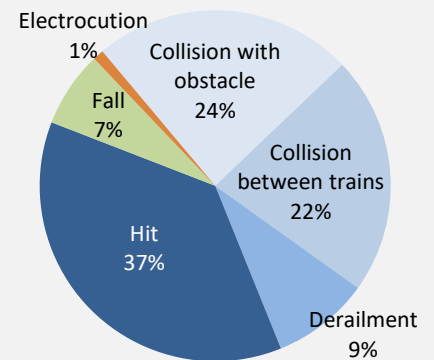
All accidents but one are individual accidents.



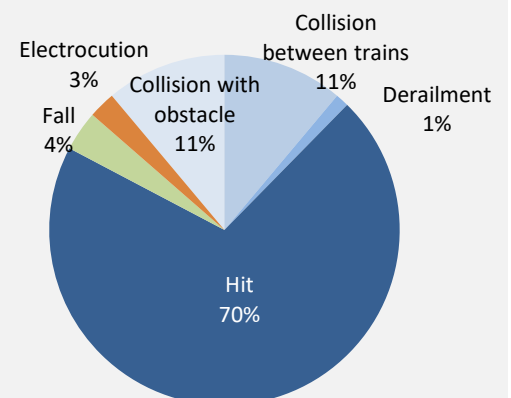
2.09b Staff victims



Split of staff victims in 2016



Split of staff victims in 2021

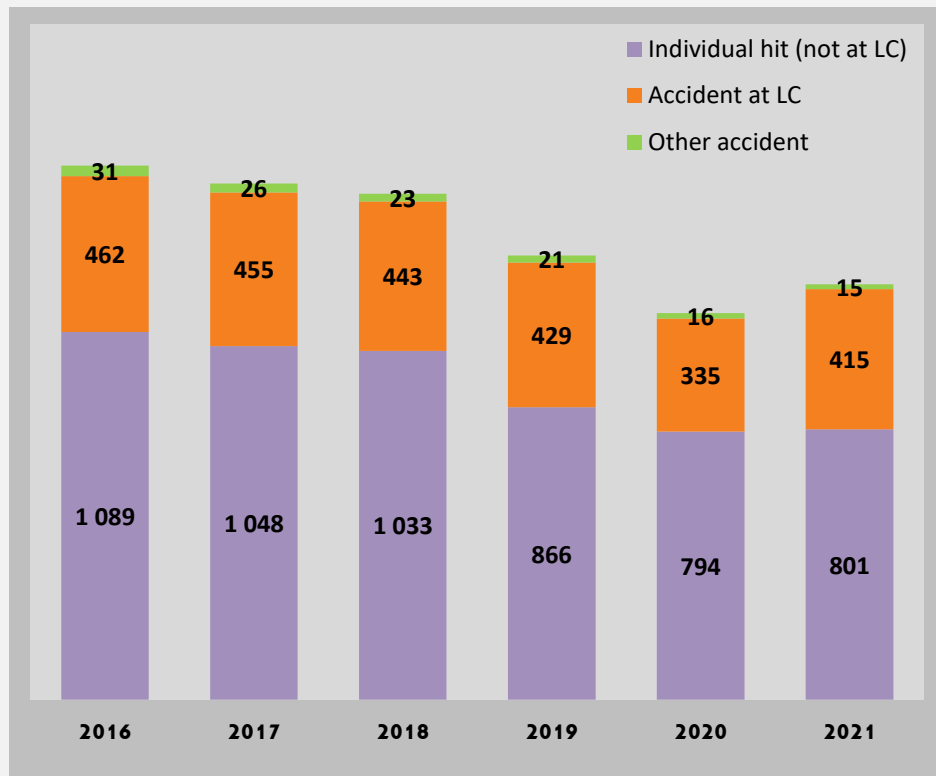


2.10a Accidents with third parties victims

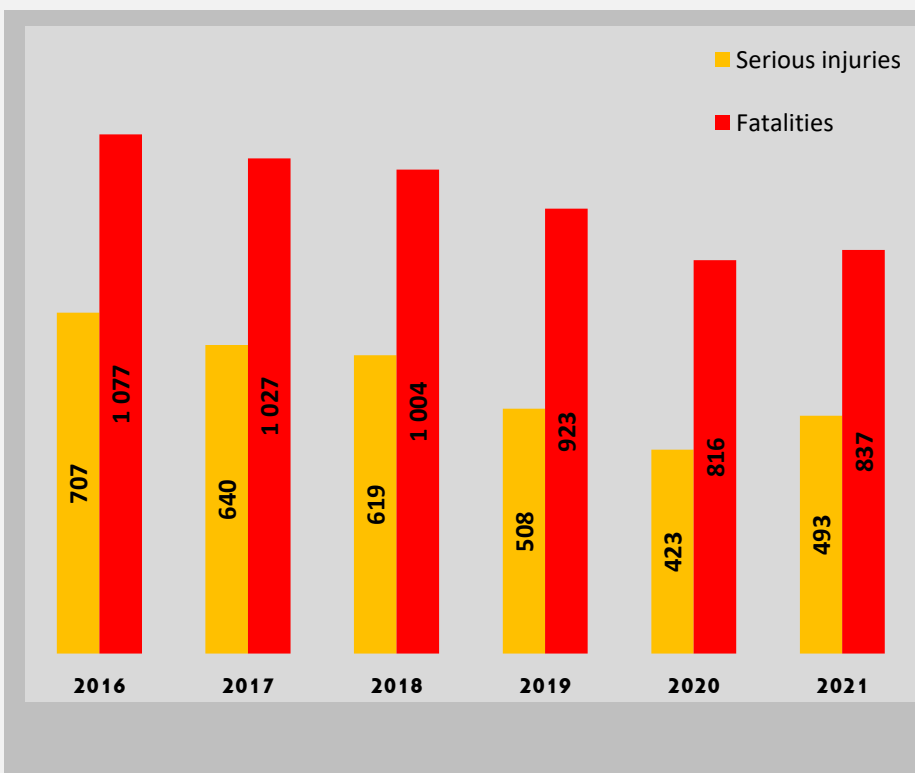
The number of accidents with third parties victims decreased -22% between 2016 and 2020 but increased in 2021.

2020 was the year of lockdowns and mobility restrictions. Less people were allowed to go out and less trains were running. 2020 is an exception and doesn't fit with the trends observed on the past years.

The numbers observed in 2021 are aligned with the years 2016 to 2019 and represent a drop of 6% when compared to 2019.



2.10b Third parties victims



Fatalities decreased -22% from 2016 to 2021, whilst serious injuries decreased -30%.

Fatalities represent around 60% of all victims every year (63% in 2021).

In 2021, most victims were trespassers (60%), followed by LC users (37%) and other third parties (3%), mostly pedestrians on public railway area (platforms).

One sole LC accident led to 7 fatalities and 6 serious injuries.

2.11a Collisions with an obstacle

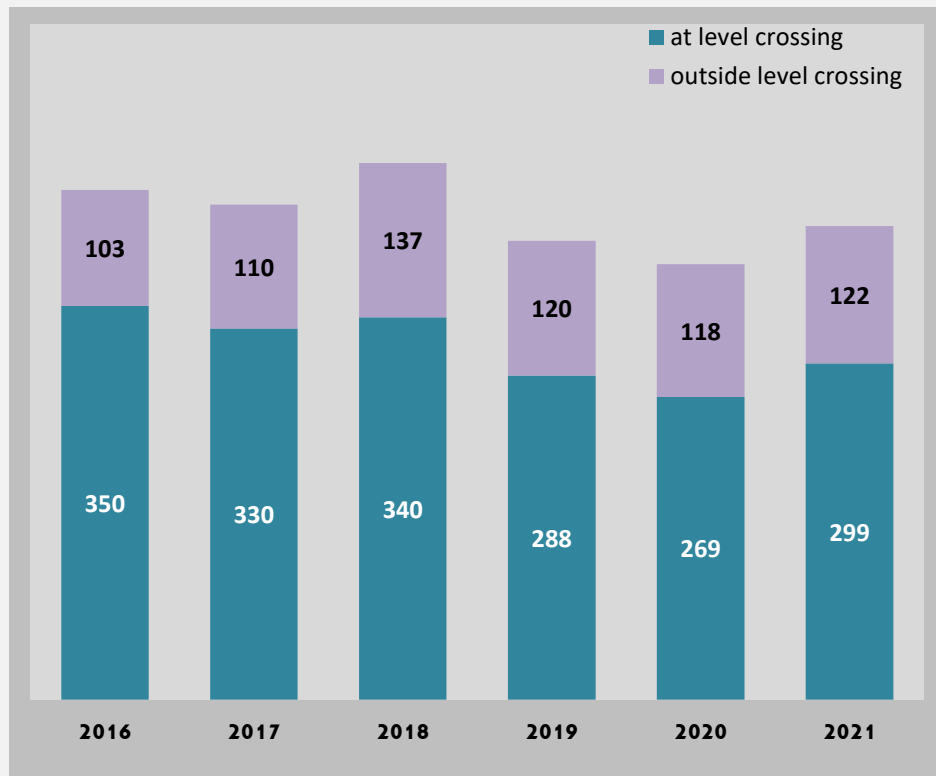
This graph excludes shunting operations.

Collisions with an obstacle were stable from 2016 to 2018, then decreased -14% from 2018 to 2019 and again -6% from 2019 to 2020.

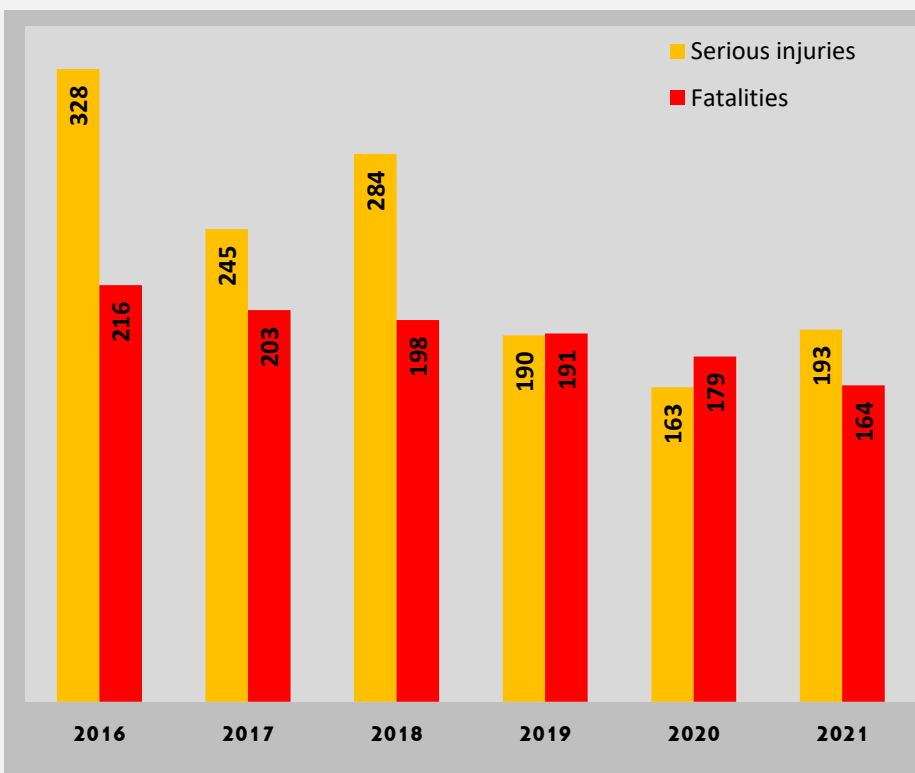
This decrease is due to collisions at level crossing, which dropped -23% since the peak of 2016.

2021 saw an increase of collisions with an obstacle, both at and outside level crossings.

70% of collisions with an obstacle occur at level crossings. See graph 2.16.



2.11b Victims of collisions with an obstacle



Collisions with an obstacle had fewer human consequences since 2019 than previous years:

- ⇒ 1.19 victim per event in 2016
- ⇒ 0.88 victim per event in 2020
- ⇒ 0.85 victim per event in 2021

The total number of victims decreased -35% since 2016 (fatalities: -24% and serious injuries: -41%).

In 2019, fatalities overtake serious injuries for the first time. But 2021 is more conform with the historical trends.

Level crossing users represent 92% of the 356 victims in 2021.

2.12a Collisions between trains

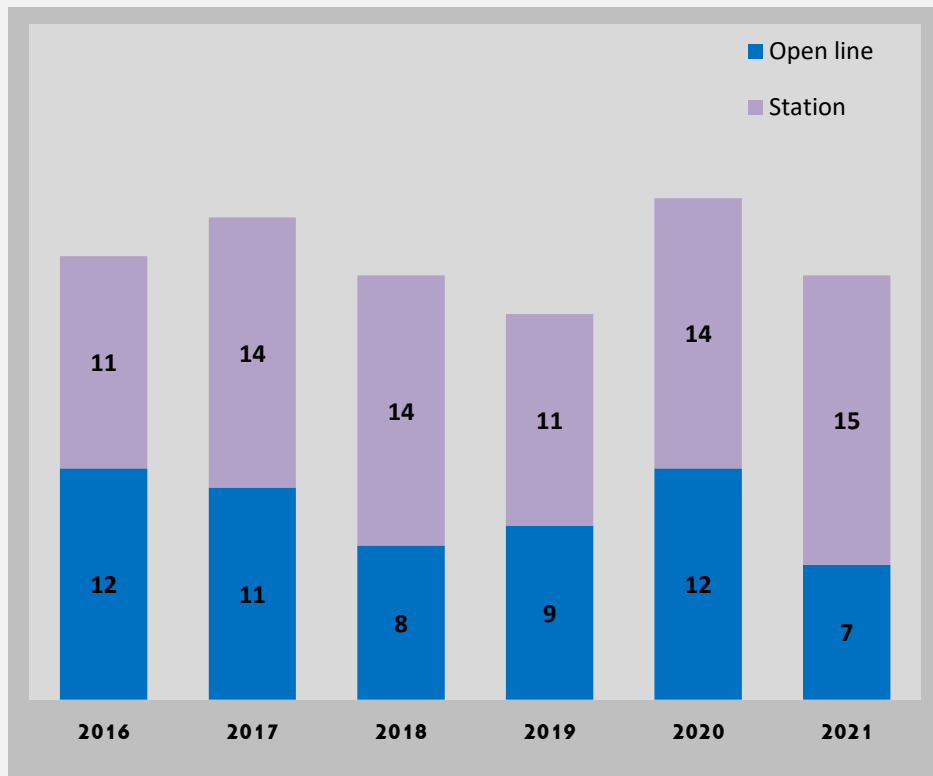
This graph excludes shunting operations.

Numbers are hopefully low. On another hand, they do not allow to determine trends.

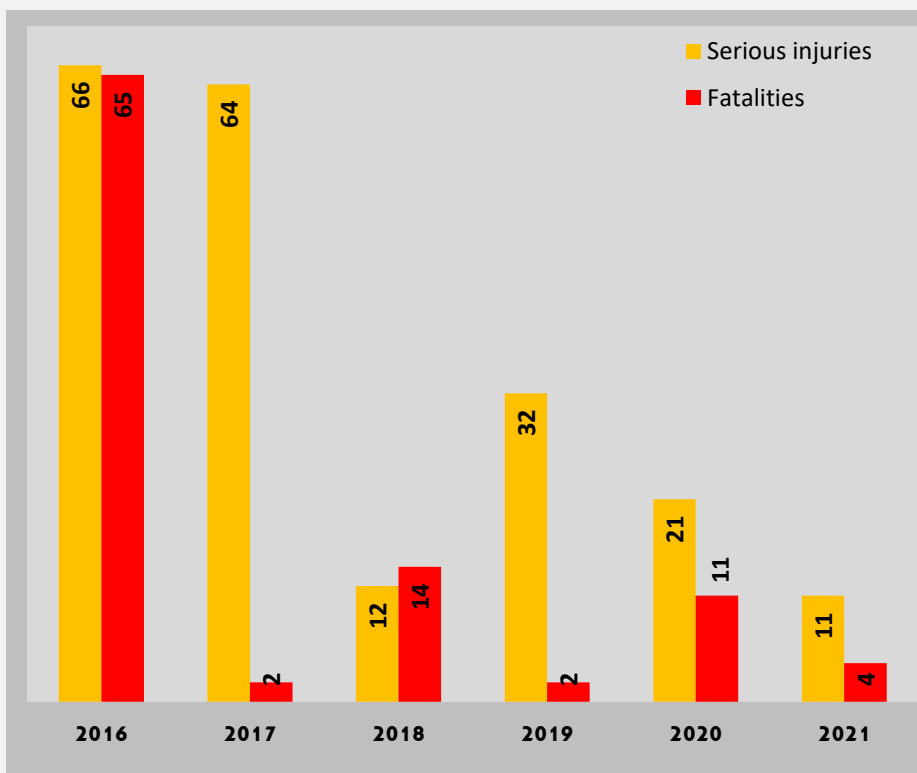
There is no correlation between the number of accidents and the number of victims. Few very severe accidents may lead to a large number of victims.

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

2016	83%
2017	68%
2018	53%
2019	93%
2020	36%
2021	73%



2.12b Victims of collisions between trains



On the whole period, 10 accidents led to 70% of accounted victims in collisions between trains.

82% of the collisions that occurred during 2021 had no human consequences.

53% of the victims recorded in 2021 were passengers and 43% were staff.

One passenger lost life in a collision between trains.

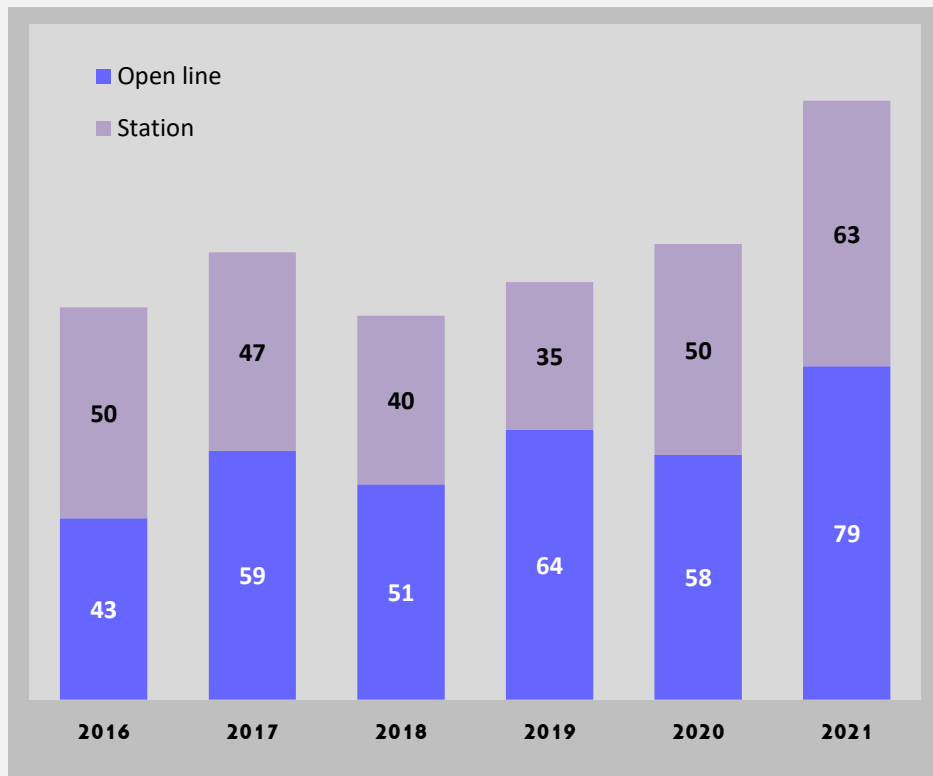
2.13a Derailments

The number of derailments is stable from 2016 to 2020 (around 100 per year).

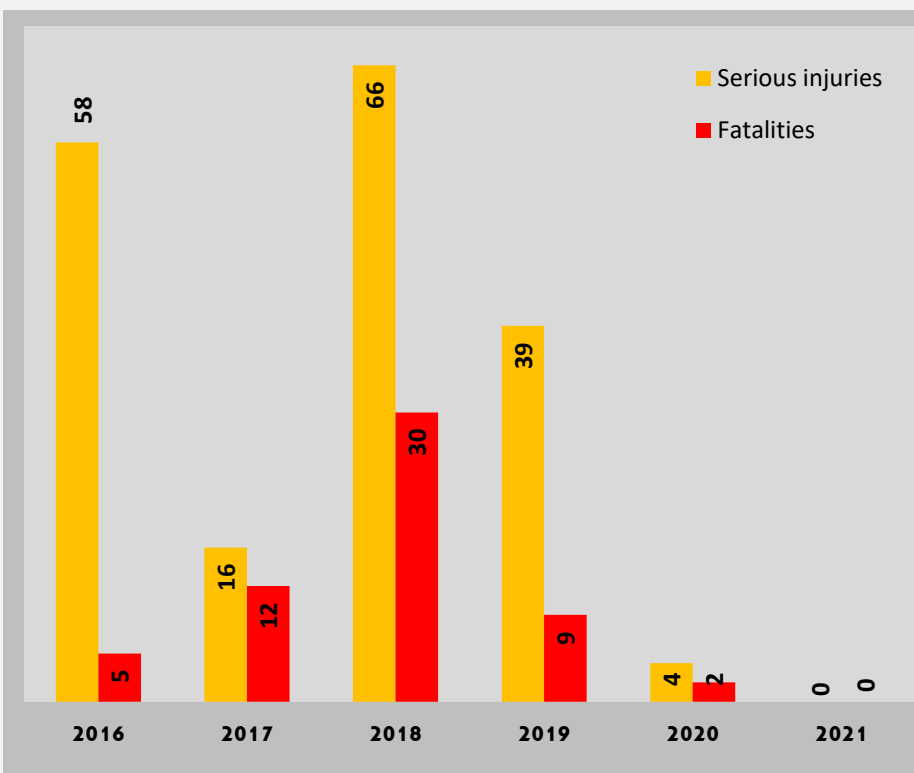
It sharply increased in 2021 and reached a total of 143.

59% of derailments in the year 2021 concerned freight trains (against respectively 30% passenger trains and 11% infrastructure trains and other trains).

The graph excludes shunting operations (there were 36 derailments during shunting operations).



2.13b Victims of derailments



95% of all derailments during the period had no human consequences.

Four accidents generated 62% of all fatalities and 77% of all serious injuries.

16 accidents were fatal during the period.

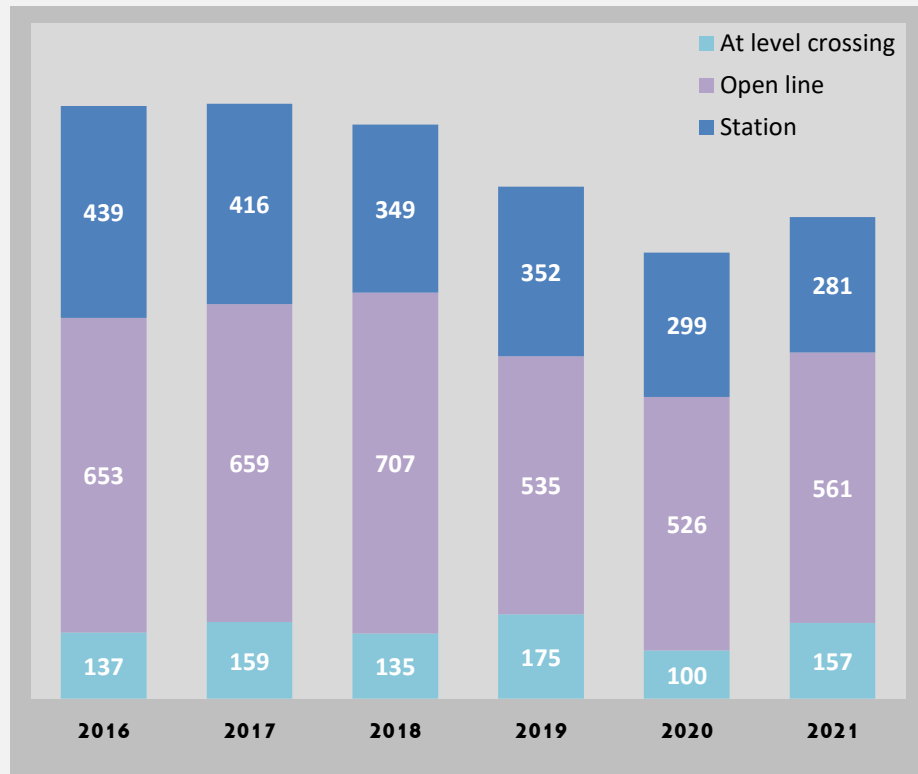
No casualties were recorded in 2021.

2.14a Individuals hit by a train: accidents

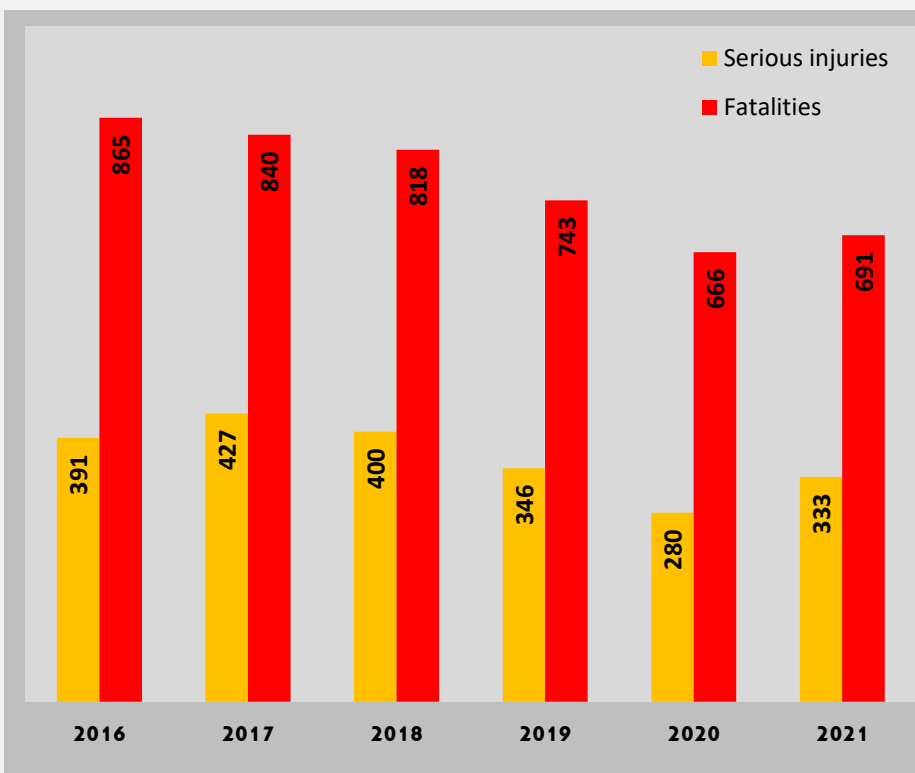
The number of accidents remained stable from 2015 to 2018. It decreased in 2019 (-172 accidents on open line) and again in 2020 (-51 accidents in station and -72 accidents at level crossing).

This may be explained by the exceptional restrictions on mobility: less road traffic led to less accidents at level crossing and less persons on platforms led to less accidents in station.

Figures obtained in 2021 confirm the exceptional situation of 2020. The total number of accidents in 2021 is -19% lower than the number observed 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 stable along the years.

Split of victims in 2021:

- ⇒ Trespassers 75%
- ⇒ LC users 15%
- ⇒ Persons hit on platform 4%
- ⇒ Staff 5%

Split of accidents per number of victims in 2021:

- ⇒ 1 victim: 993 events (98%)
- ⇒ 2 victims: 20 events
- ⇒ 3 victims: 1 event
- ⇒ 4 victims: 1 event

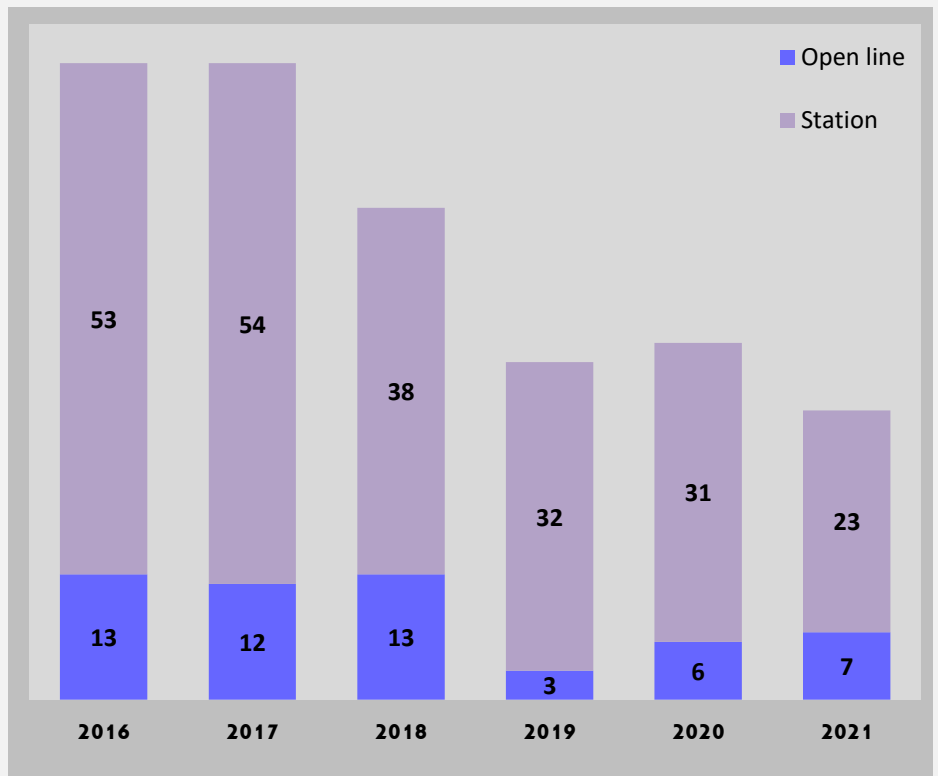
2.15a Individuals falling from a train: accidents

Individuals falling from a train are less and less common. This type of accident now represents 2% of all accidents (7% ten years ago).

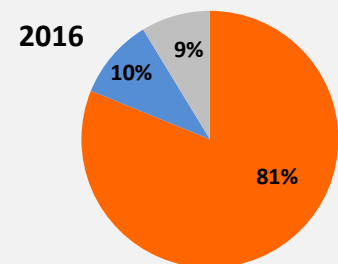
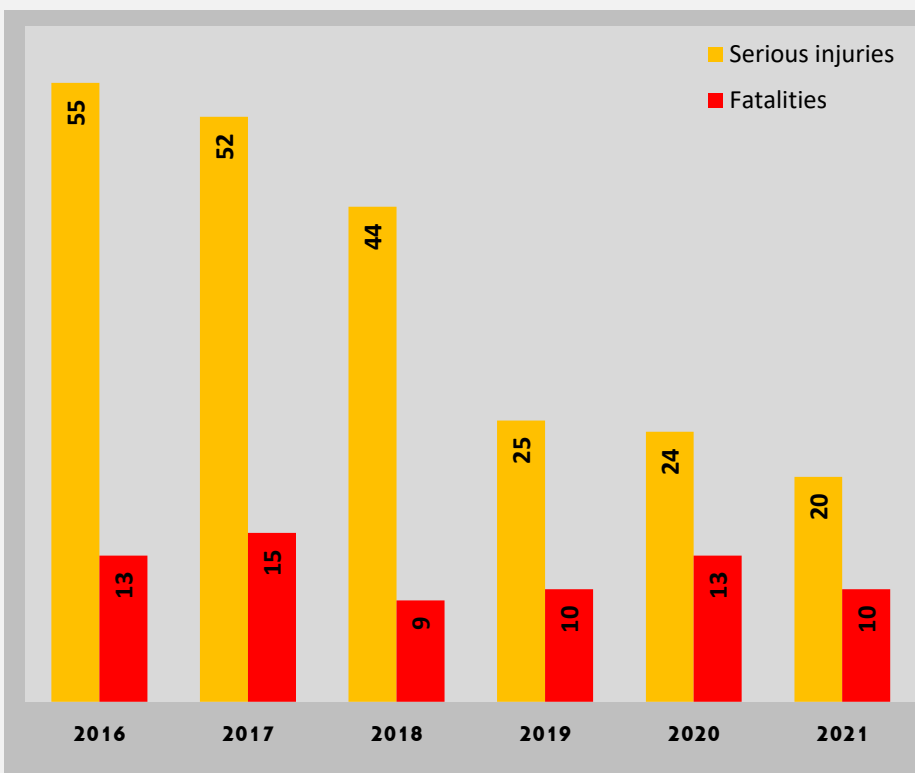
Most events occurred at station.

During the year 2021, passengers were involved in 23 cases, staff in 3 cases and trespassers in 4 cases.

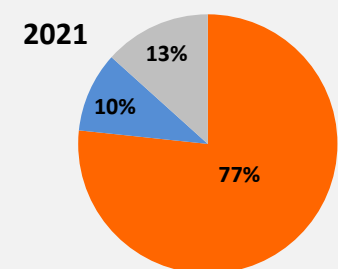
The graph excludes shunting operations.



2.15b Individuals falling from a train: victims



Passengers
Staff
Third parties

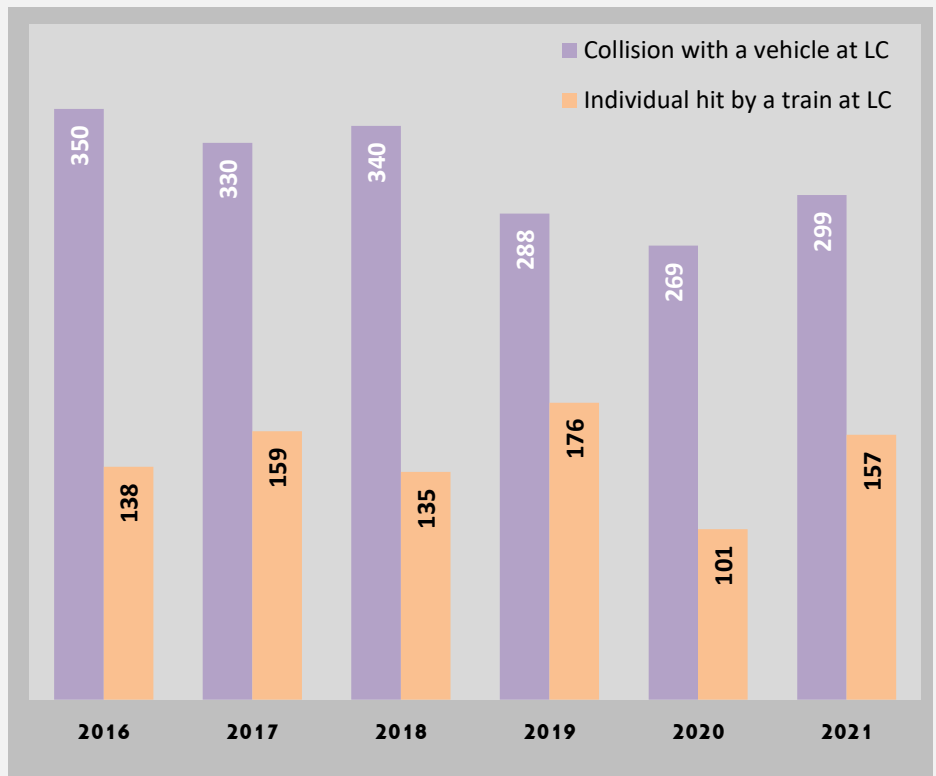


2.16a Accidents at level crossings

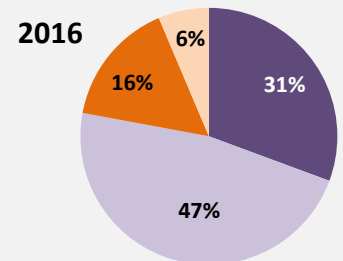
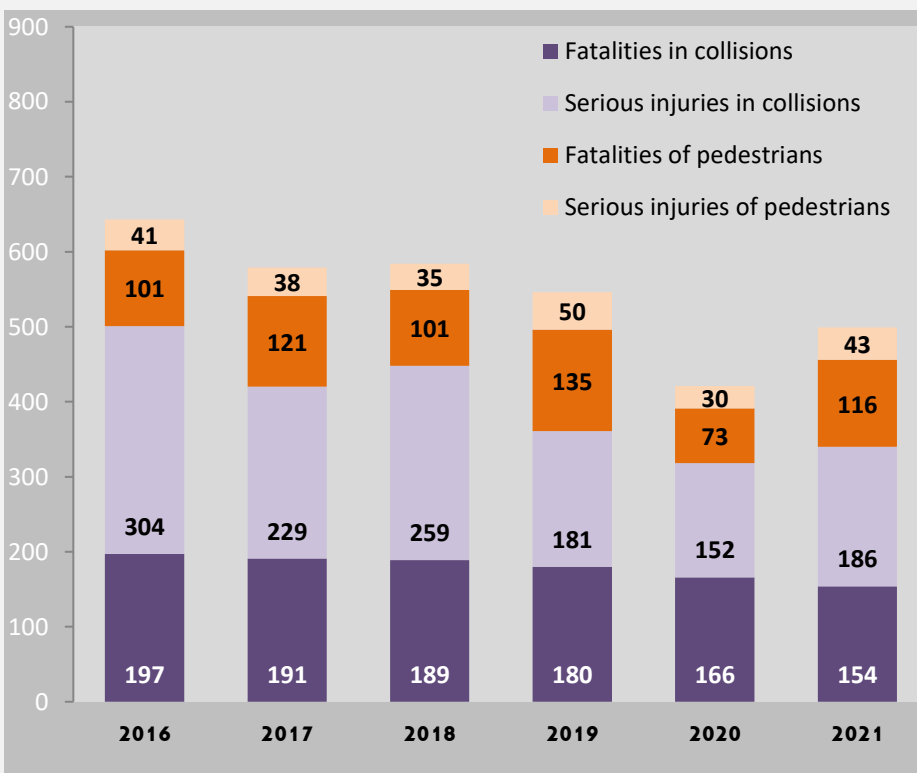
After years of stability, the number of accidents at level crossing decreased slightly in 2019 and again in 2020. Like other types of accidents, the number of events increased in 2021.

There were two collisions with a road vehicle for one accident involving a pedestrian or a cyclist.

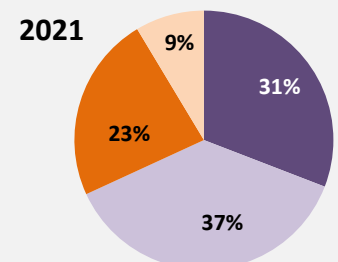
The split of victims shows a relative increase of fatalities of pedestrians (see graph below). Fatalities represent 54% of victims in 2021 (47% in 2016).



2.16b Victims of accidents at level crossings



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



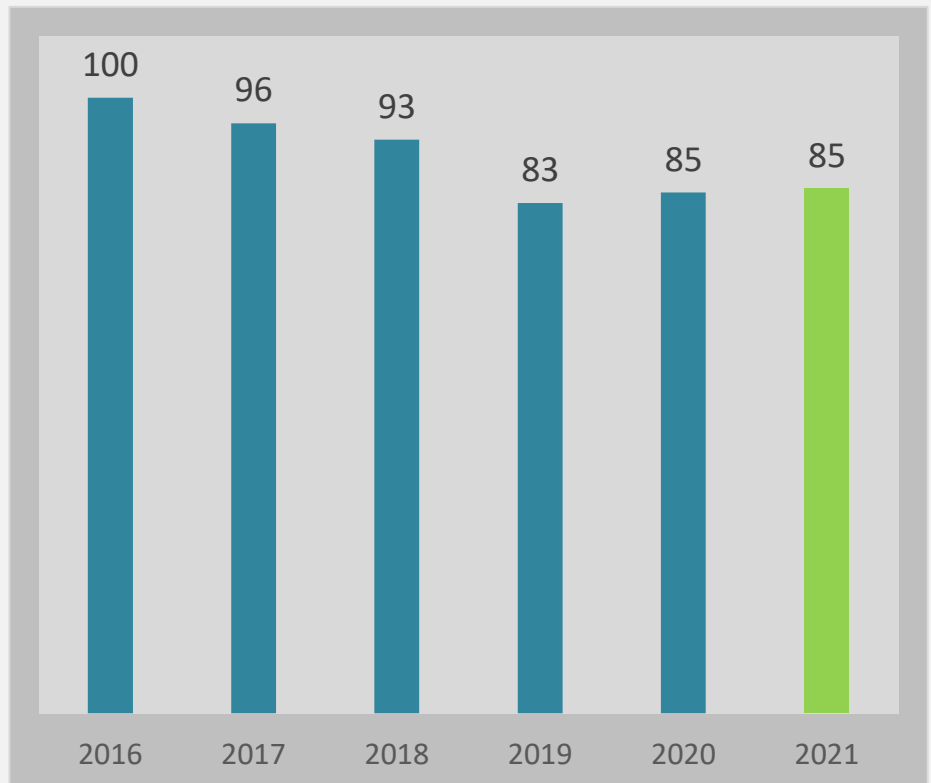
2.17a Significant accidents per million train-km (basis 100 = year 2016)

The number of significant accidents per million train-km regularly decreased between 2016 and 2019.

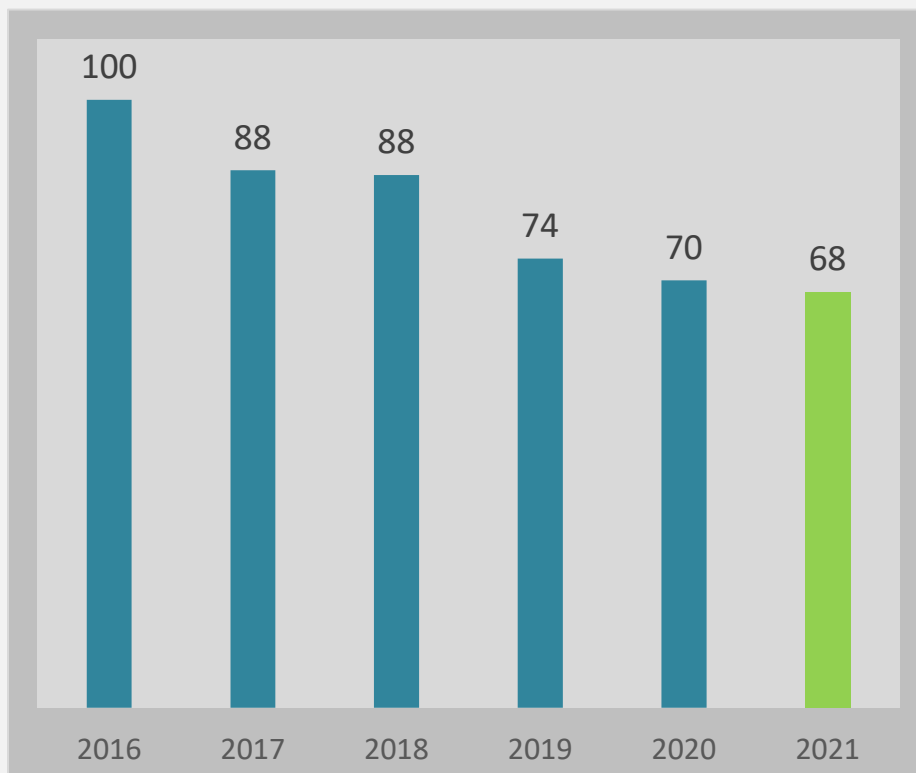
During the year 2020, the traffic dropped -9% but significant accidents only dropped -7%.

Logically, the ratio "significant accidents per million train-km" increased.

During the year 2021, the traffic increased but significant accidents followed the same pattern. The ratio between accidents and traffic remained at the level of the year 2020



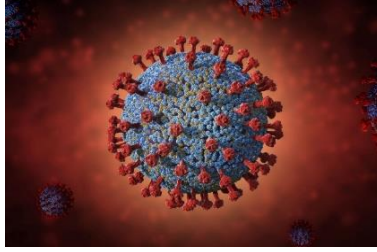
2.17b Victims per million train-km (basis 100 = year 2016)



The ratio "victims per million train-km" dropped -12% in the year 2017, remained stable in the next year and dropped again -16% in the year 2019.

We observe a slight improvement of the ratio in the year 2020, despite the increase of the ratio "accidents per train-km".

The year 2021 shows a new improvement and the ratio is now -32% lower as the value observed five years earlier.



Part 3

Focus on the effect of the COVID-19 pandemic on traffic and accidentality



Part 3 - Effect of the COVID-19 pandemic on traffic and accidentality in 2020 and 2021

3.00 Highlights

3.01 Reported COVID-19 cases and fatalities 2020-2021

3.02a Countries per severity of the pandemic 2020

3.02b Countries per severity of the pandemic 2021

3.03 Passenger and freight traffic by month (train-km)

3.04 Passenger traffic by month (train-km)

3.05 Freight traffic by month (train-km)

3.06a Accidents involving passenger and freight trains by month

3.06b Accidents involving passenger and freight trains per train-km by month

3.07a Accidents involving passenger trains by month

3.07b Accidents involving passenger trains per train-km by month

3.08a Accidents involving freight trains by month

3.08b Accidents involving freight trains per train-km by month

3.09a LC accidents by month

3.09b LC accidents per train-km by month

3.10a Individuals hit by trains outside LC by month

3.10b Individuals hit by trains outside LC per train-km by month

3.11a Victims by month

3.11b Victims per train-km by month

3.12a Fatalities by month

3.12b Fatalities per train-km by month

3.13a Safety index of accidents involving passenger and freight trains by month

3.13b Safety index of accidents involving passenger and freight trains per train-km by month

3.14a Safety index of accidents involving passenger trains by month

3.14b Safety index of accidents involving passenger trains per train-km by month

3.15a Safety index of accidents involving freight trains by month

3.15b Safety index of accidents involving freight trains per train-km by month

3.00 Highlights

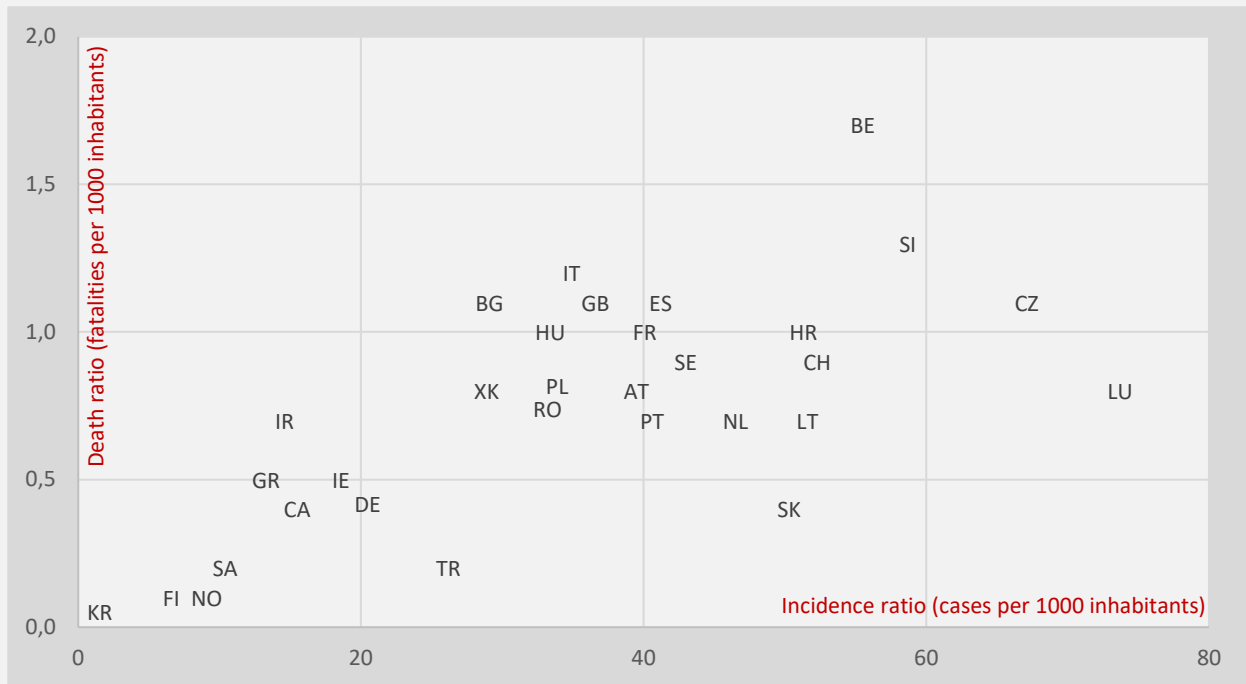
1. In the year 2021 the COVID-pandemic struck much harder in most countries compared to 2020. Due to availability of vaccinations we see predominantly higher death-rates in Eastern European countries (graphs 3.02 and 3.03).
2. Passenger train km increased through 2021 and is now almost back to pre-pandemic levels. Freight interestingly is above 2019 / pre-pandemic levels.
3. Accidents involving passenger and freight trains per train km per month for February - May 2021 are lower and June – December 2021 are higher than when compared to the equivalent month in 2019 (chart 3.06b).
4. Interestingly accidents involving only freight trains per train km per month range from 58 till 187% when compared to the equivalent month in 2019 (chart 3.08b).
5. When comparing the covid affected months (March – December) for level crossing accidents per train km per month (3.09b) between 2020 and 2021 we see that for 7/10 of those months the numbers for 2021 are higher. Possibly reflecting the greater mobility people had in 2021 and therefore more interactions with level crossings.
6. Level crossing accidents per train km per month vary from 35 till 171% in 2020 and 69 till 128% in 2021 when compared to the equivalent month in 2019 (chart 3.09b). This probably reflects reduced train traffic (graph 3.03a) combined with lockdowns and curfews in 2020, while in 2021 train traffic was more or less normal (91-101% of 2019), but still there were lockdowns and strong recommendations to work at home when possible.

3.01 Reported COVID-19 cases and fatalities 2020-2021

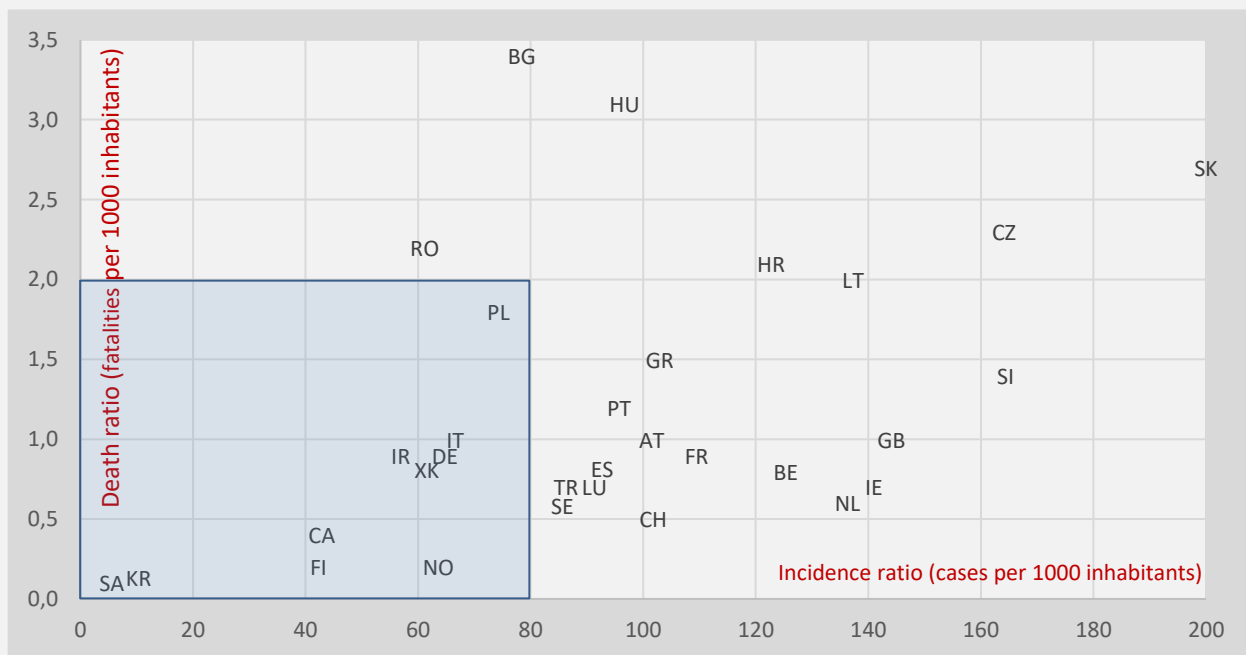
	Population	Cases	Fatalities	Incidence ratio ¹	Death ratio ²
AT	9,01	1 270 811	16 815	141	1,9
BE	11,64	2 105 343	28 331	181	2,4
BG	6,95	747 108	30 955	108	4,5
CA	38,07	2 223 735	30 570	58	0,8
CH	8,65	1 332 615	12 217	154	1,4
CZ	10,71	2 475 729	36 129	231	3,4
DE	84,07	7 193 186	112 111	86	1,3
ES	46,77	6 294 745	89 405	135	1,9
FI	5,54	270 829	1 714	49	0,3
FR	65,28	9 761 814	121 201	150	1,9
GB	68,24	12 328 103	142 224	181	2,1
GR	10,42	1 210 853	20 790	116	2,0
HR	4,11	715 245	12 538	174	3,1
HU	9,66	1 256 415	39 186	130	4,1
IE	4,94	788 559	5 912	160	1,2
IR	83,97	6 194 401	131 606	74	1,6
IT	60,38	6 125 683	137 402	102	2,3
KR	51,47	635 253	5 625	12	0,1
LT	2,75	519 597	7 387	189	2,7
LU	0,63	103 766	915	165	1,5
NL	17,17	3 137 942	20 999	183	1,2
NO	5,42	394 259	1 305	73	0,2
PL	37,85	4 108 215	97 054	109	2,6
PT	10,20	1 389 646	18 955	136	1,9
RO	19,24	1 808 891	58 752	94	3,1
SA	34,81	556 236	8 877	16	0,3
SE	10,16	1 314 784	15 310	129	1,5
SI	2,08	464 048	5 589	223	2,7
SK	5,46	1 371 082	16 635	251	3,0
TR	84,33	9 482 550	82 361	112	1,0
XK	1,77	161 484	2 990	91	1,7

¹ Cases per 1000 inhabitants² Fatalities per 1000 inhabitantssource: Johns Hopkins University (github.com/CSSEGISandData/COVID-19)

3.02a Countries per severity of the pandemic 2020

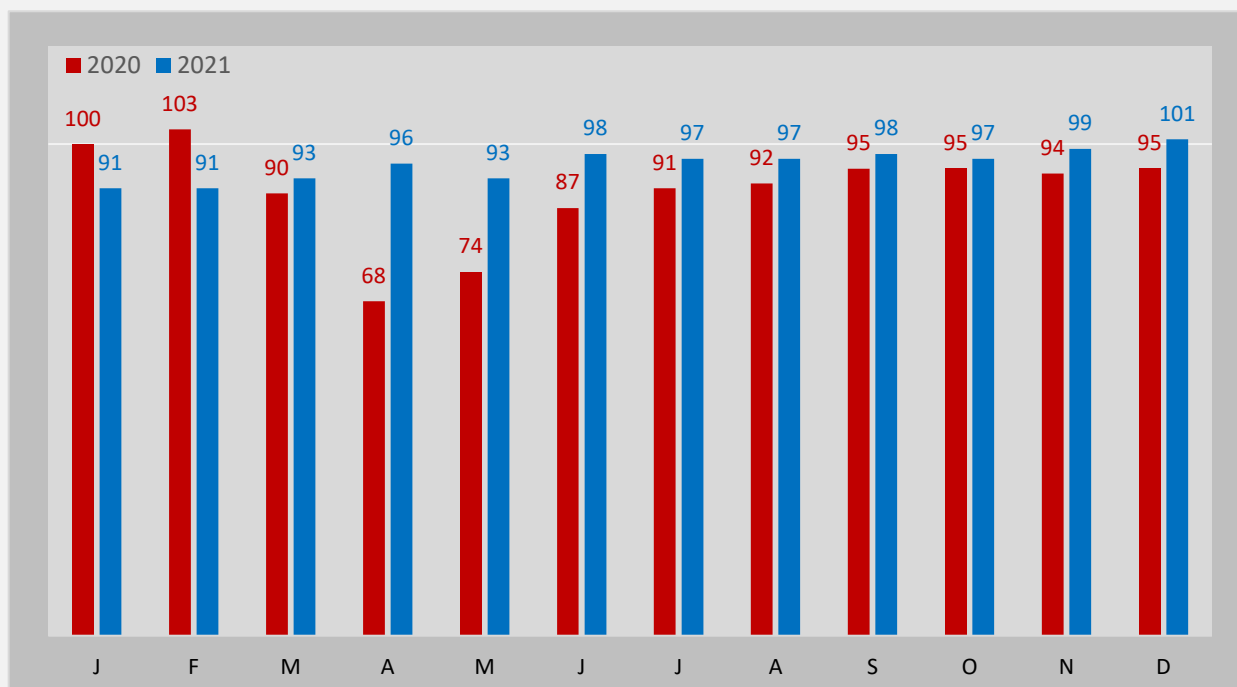


3.02b Countries per severity of the pandemic 2021



Scale of graph 3.02a

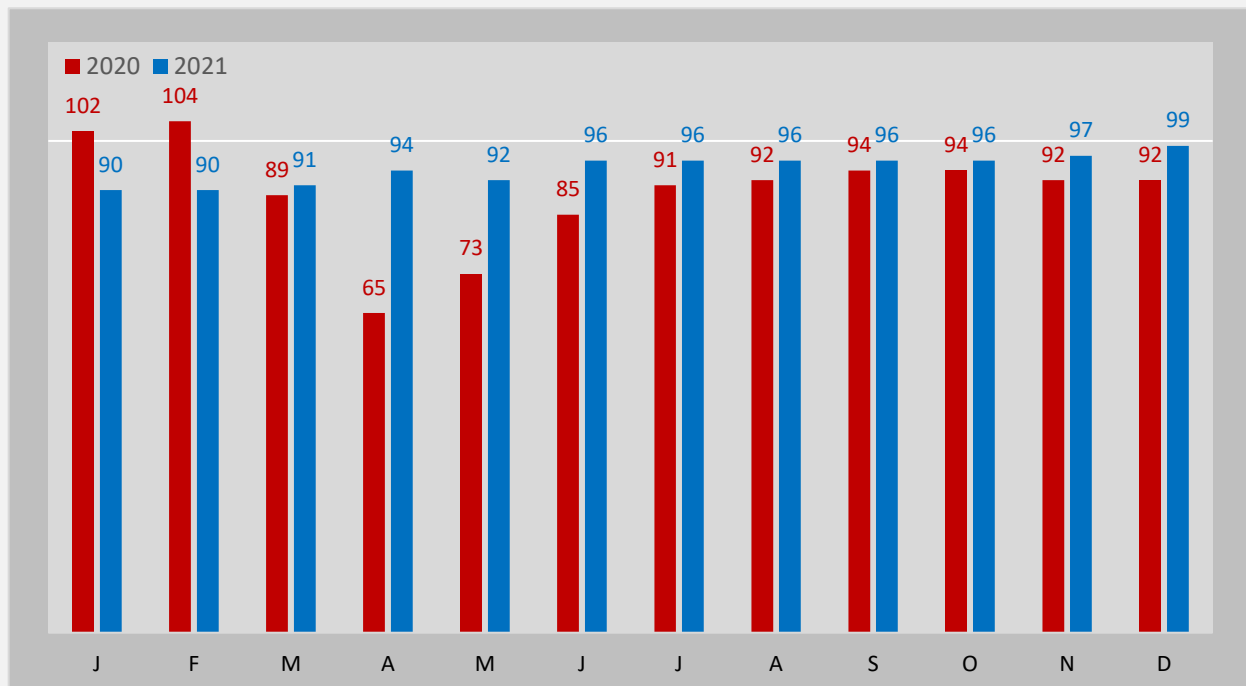
3.03 Passenger and freight traffic by month (train-km)



Perimeter: 23 countries

base 100 = same month 2019

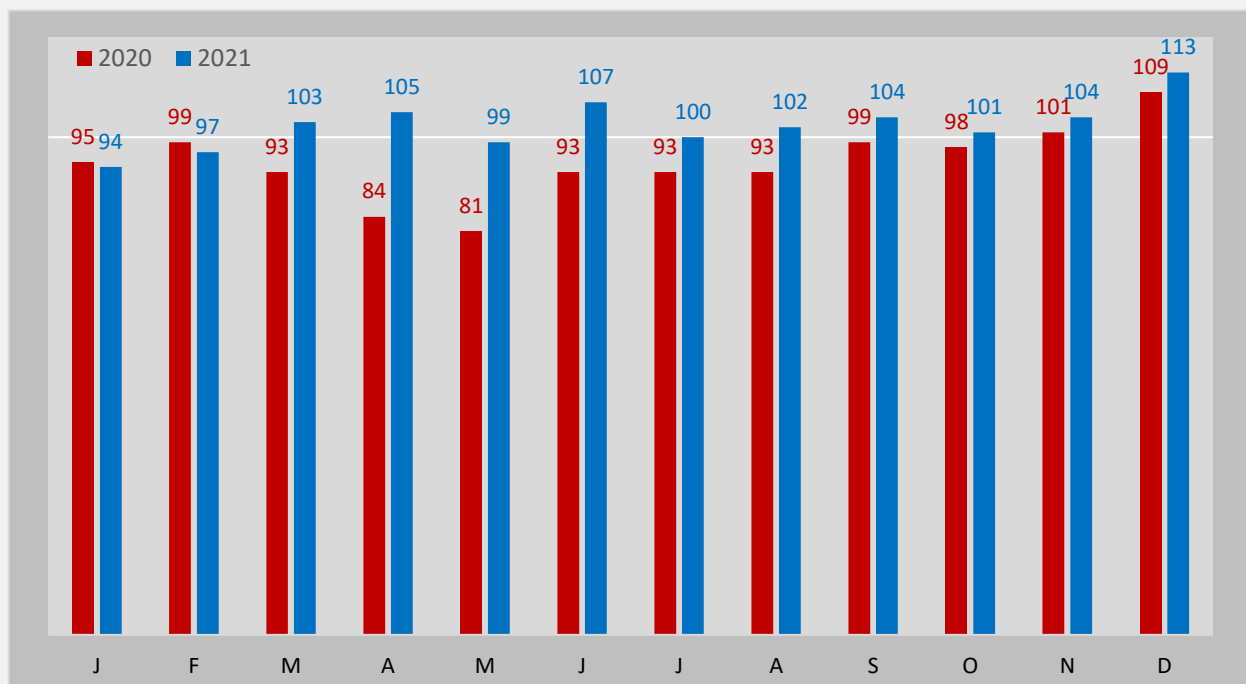
3.04 Passenger traffic by month (train-km)



Perimeter: 23 countries

base 100 = same month 2019

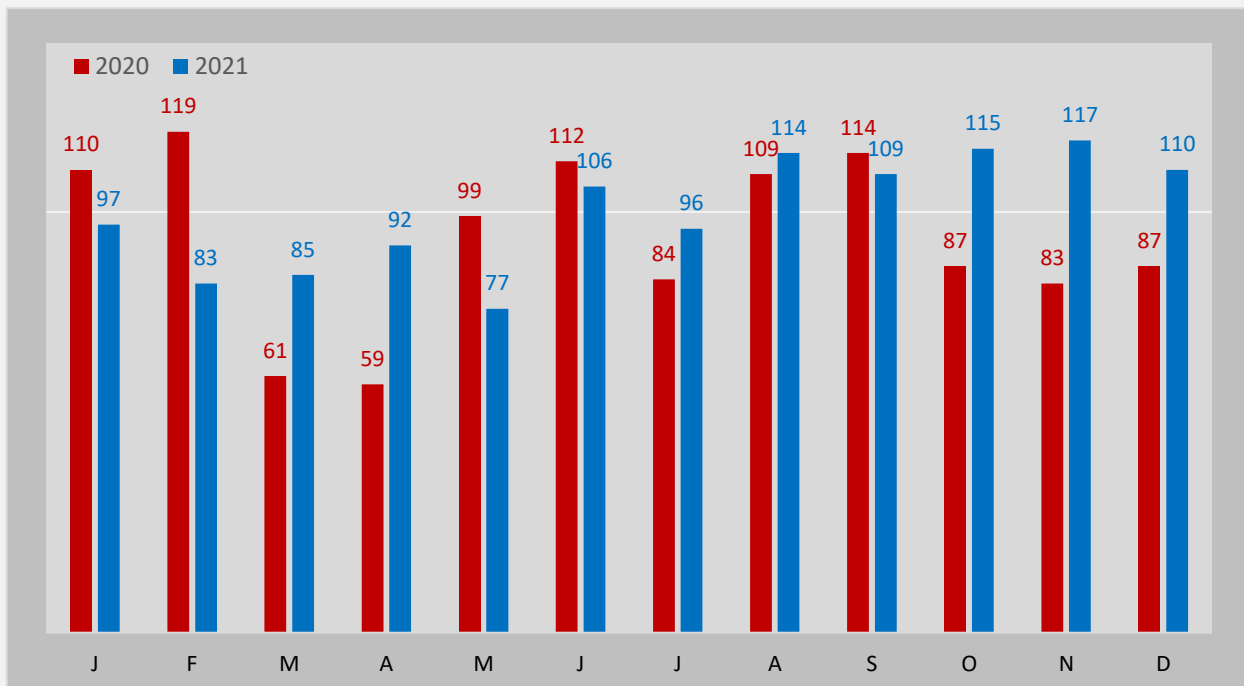
3.05 Freight traffic by month (train-km)



Perimeter: 23 countries

base 100 = year 2019

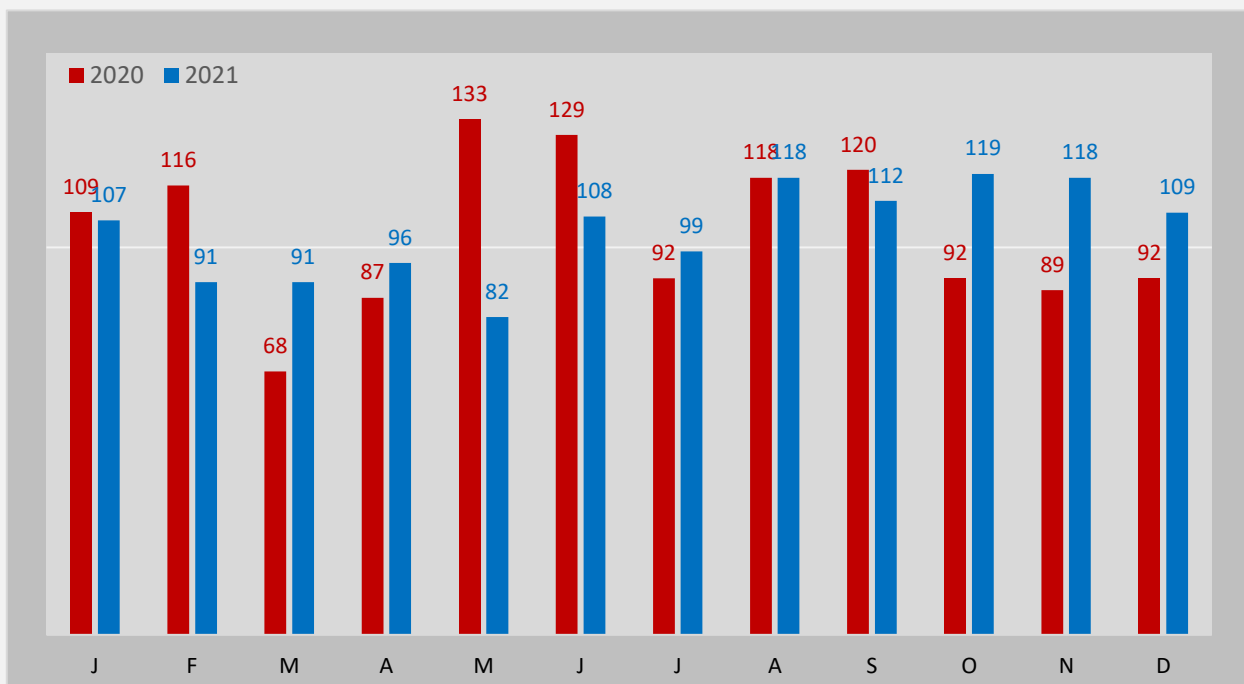
3.06a Accidents involving passenger and freight trains by month



Perimeter: 23 countries

base 100 = same month 2019

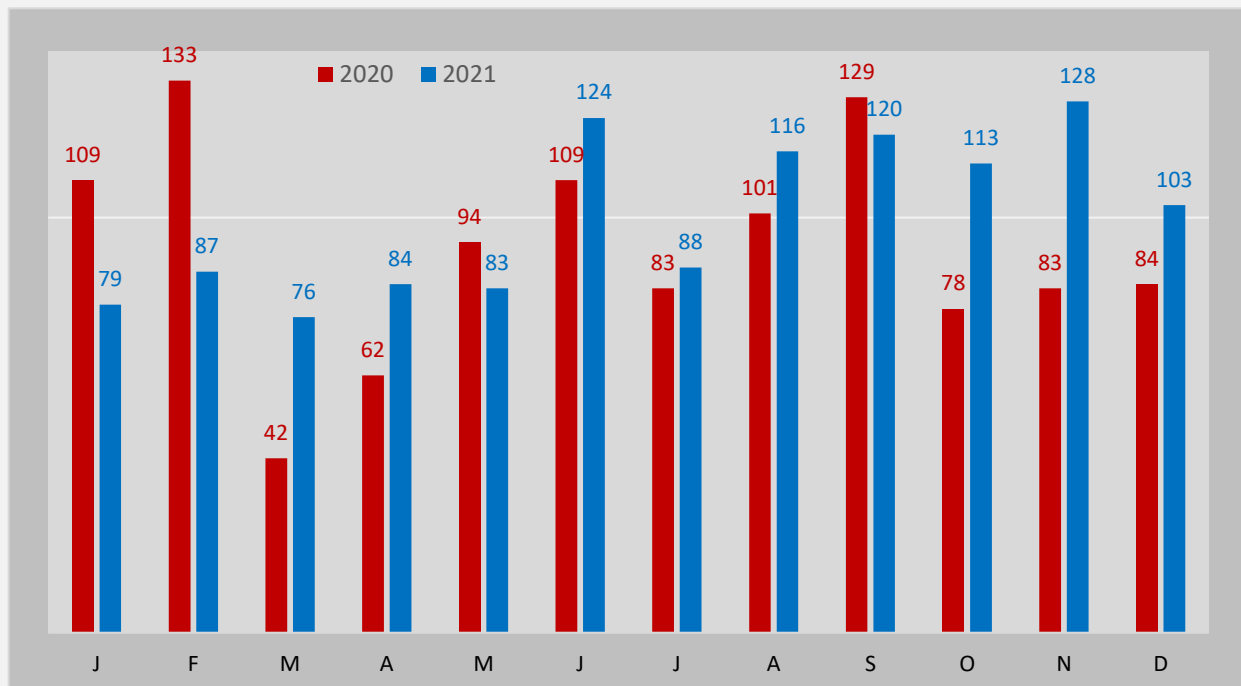
3.06b Accidents involving passenger and freight trains per train-km by month



Perimeter: 23 countries

base 100 = same month 2019

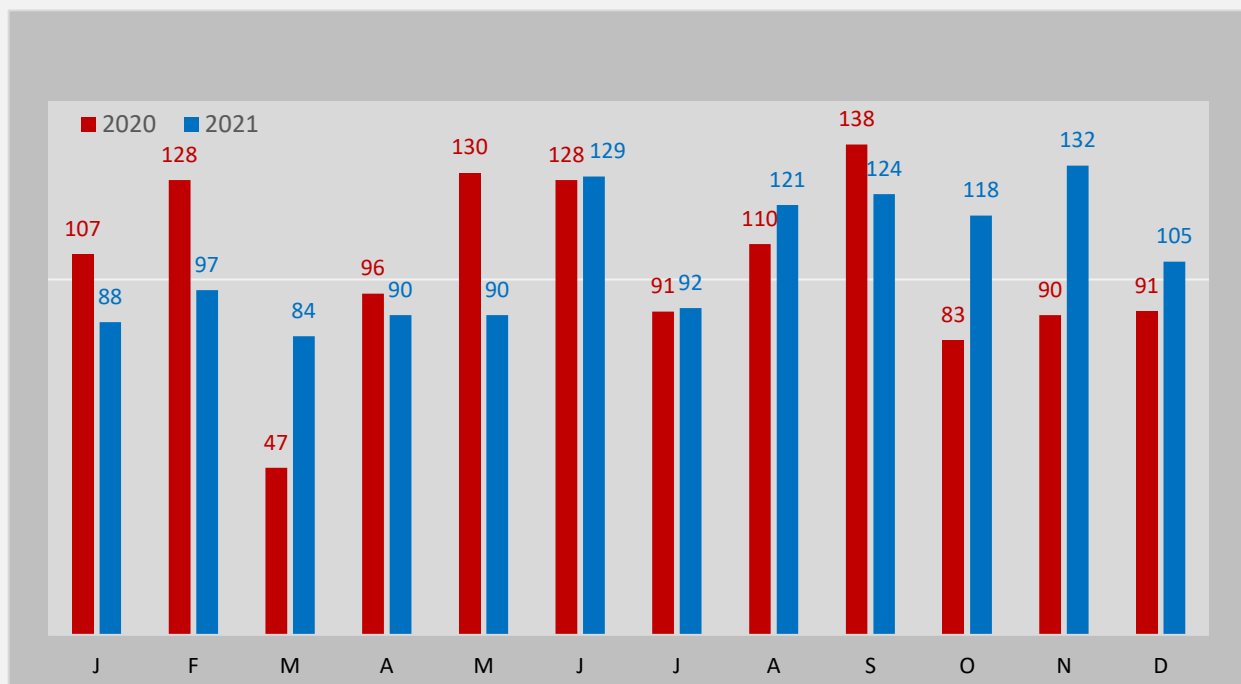
3.07a Accidents involving passenger trains by month



Perimeter: 23 countries

base 100 = same month 2019

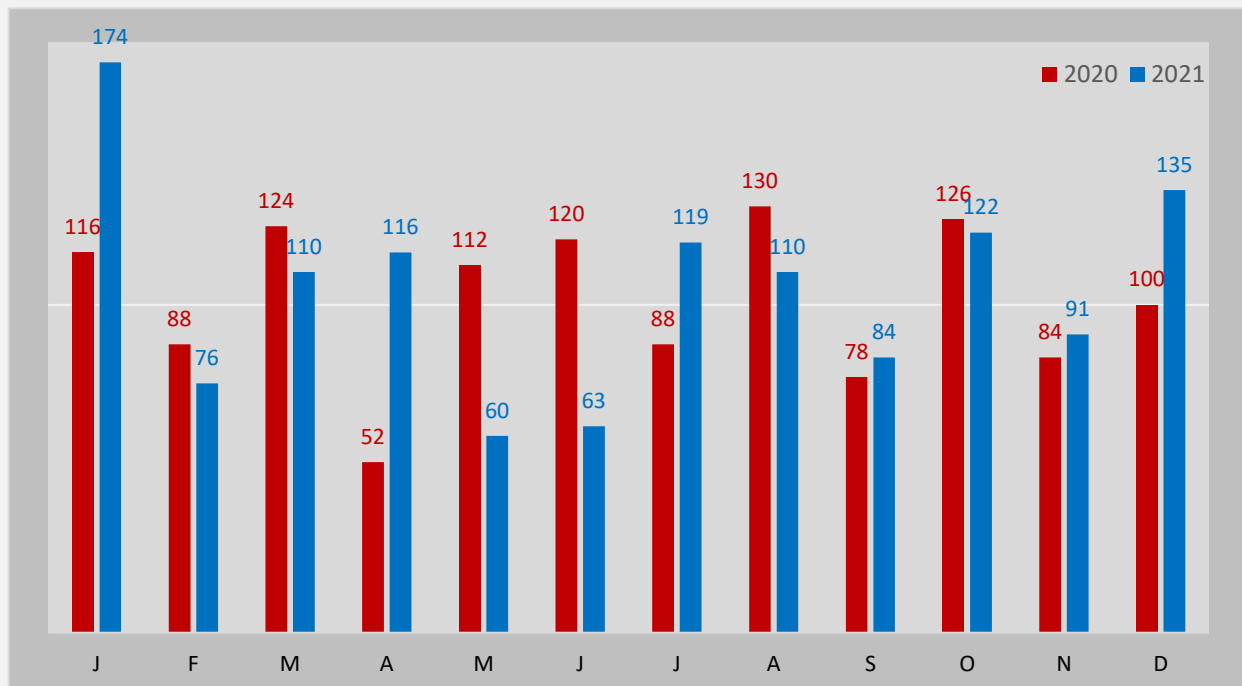
3.07b Accidents involving passenger trains per train-km by month



Perimeter: 23 countries

base 100 = same month 2019

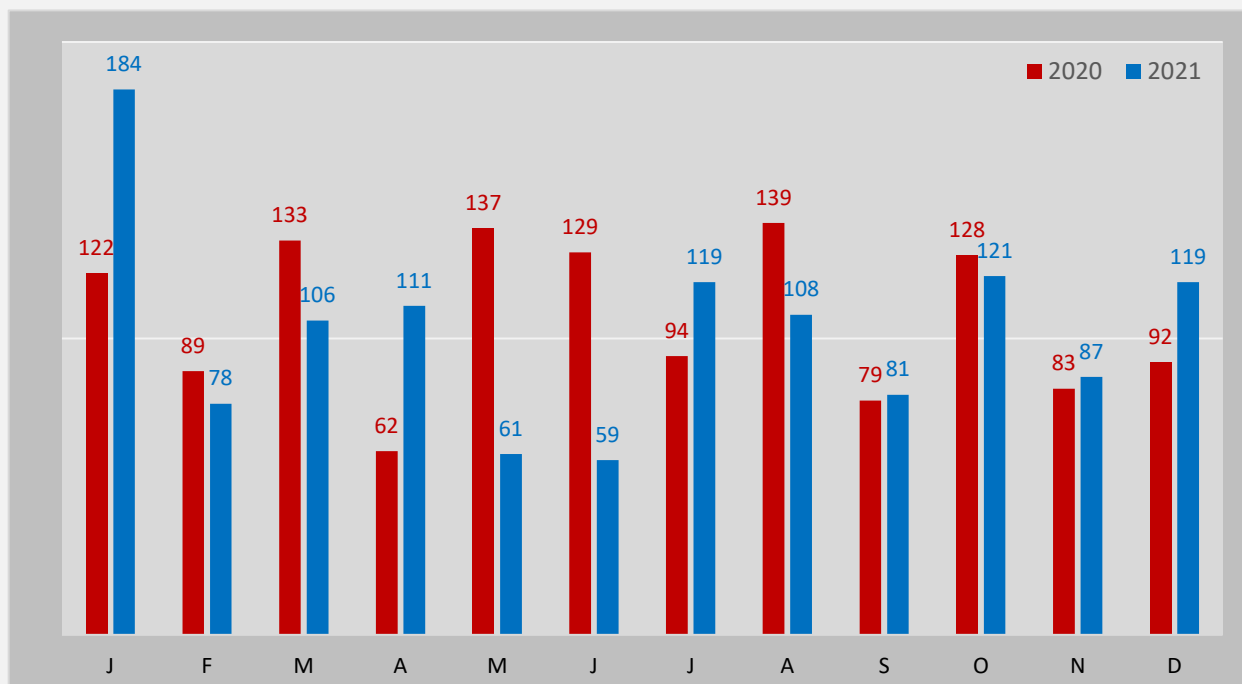
3.08a Accidents involving freight trains by month



Perimeter: 23 countries

base 100 = same month 2019

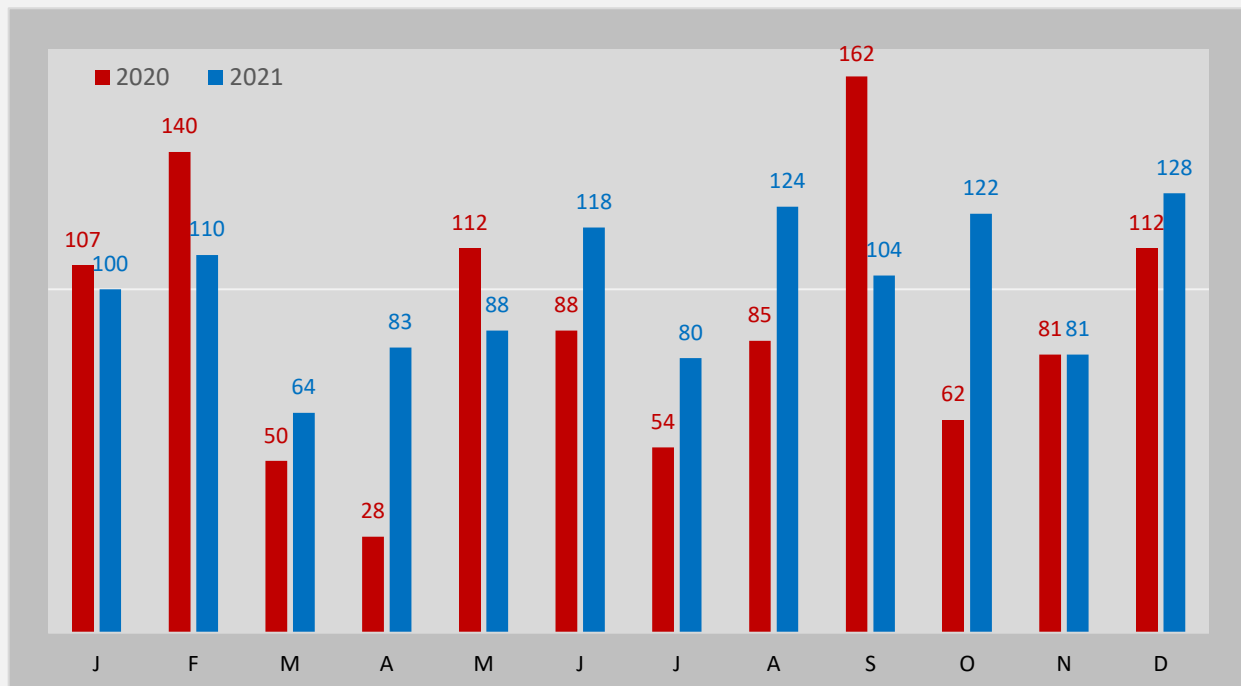
3.08b Accidents involving freight trains per train-km by month



Perimeter: 23 countries

base 100 = same month 2019

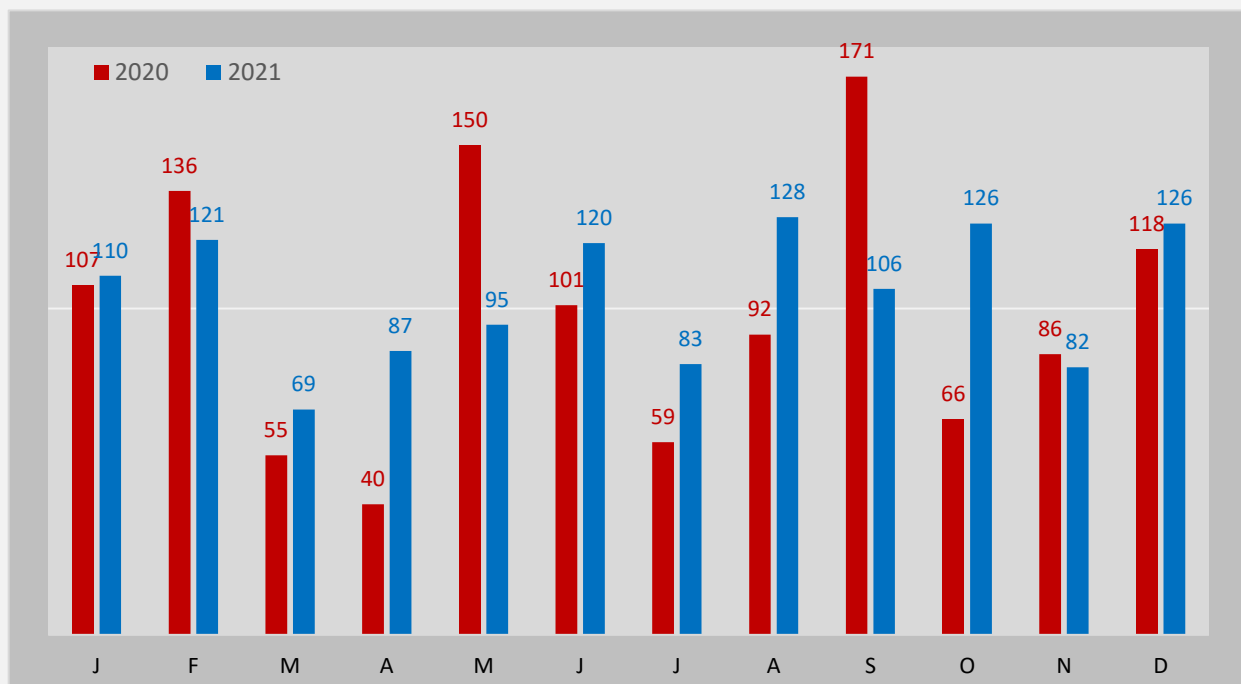
3.09a LC accidents by month



Perimeter: 23 countries

base 100 = same month 2019

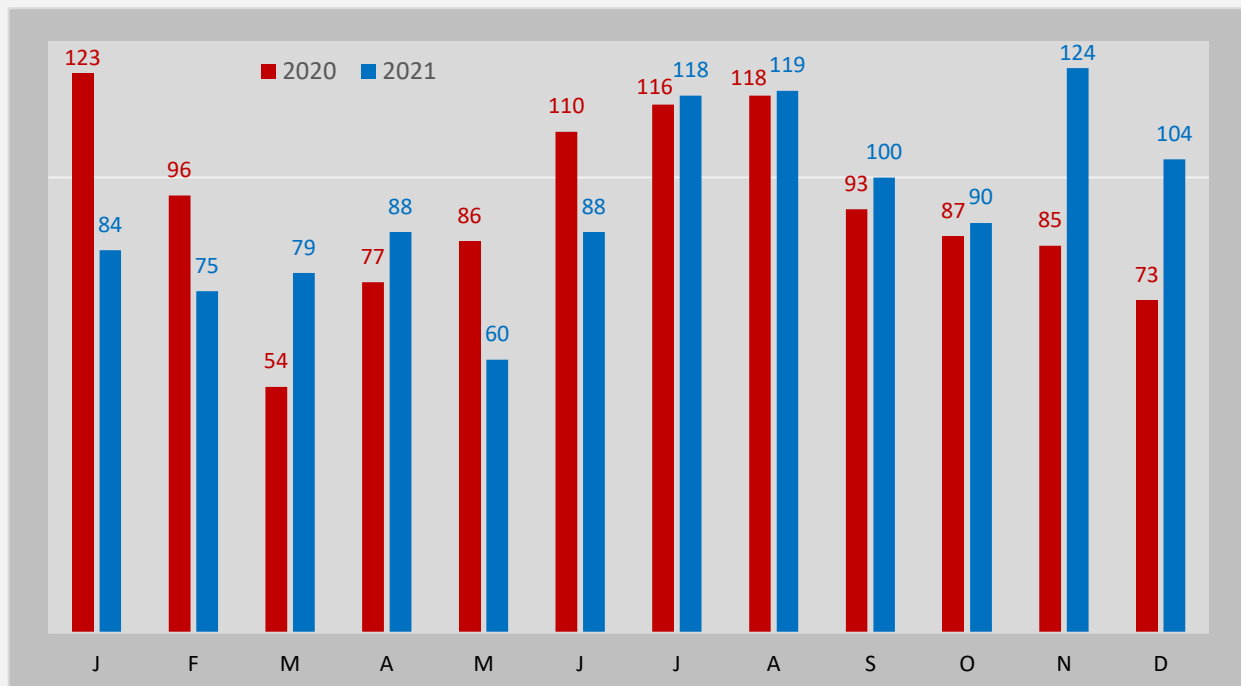
3.09b LC accidents per train-km by month



Perimeter: 23 countries

base 100 = same month 2019

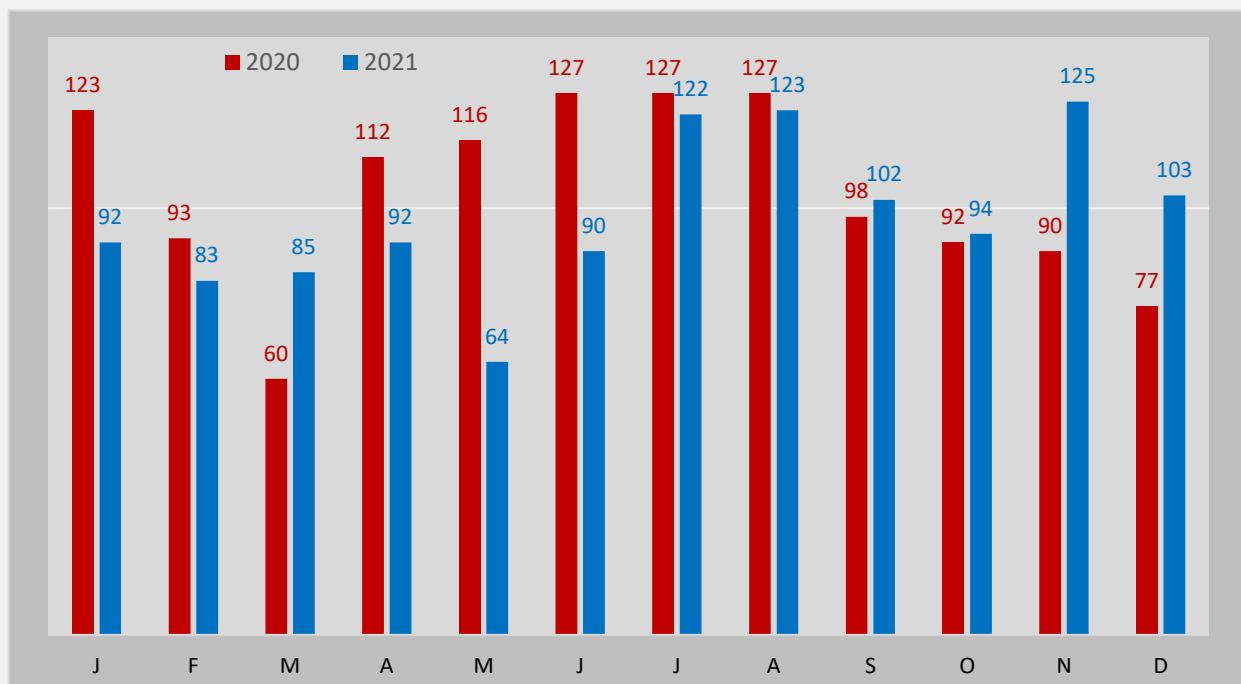
3.10a Individuals hit by trains outside LC by month



Perimeter: 23 countries

base 100 = same month 2019

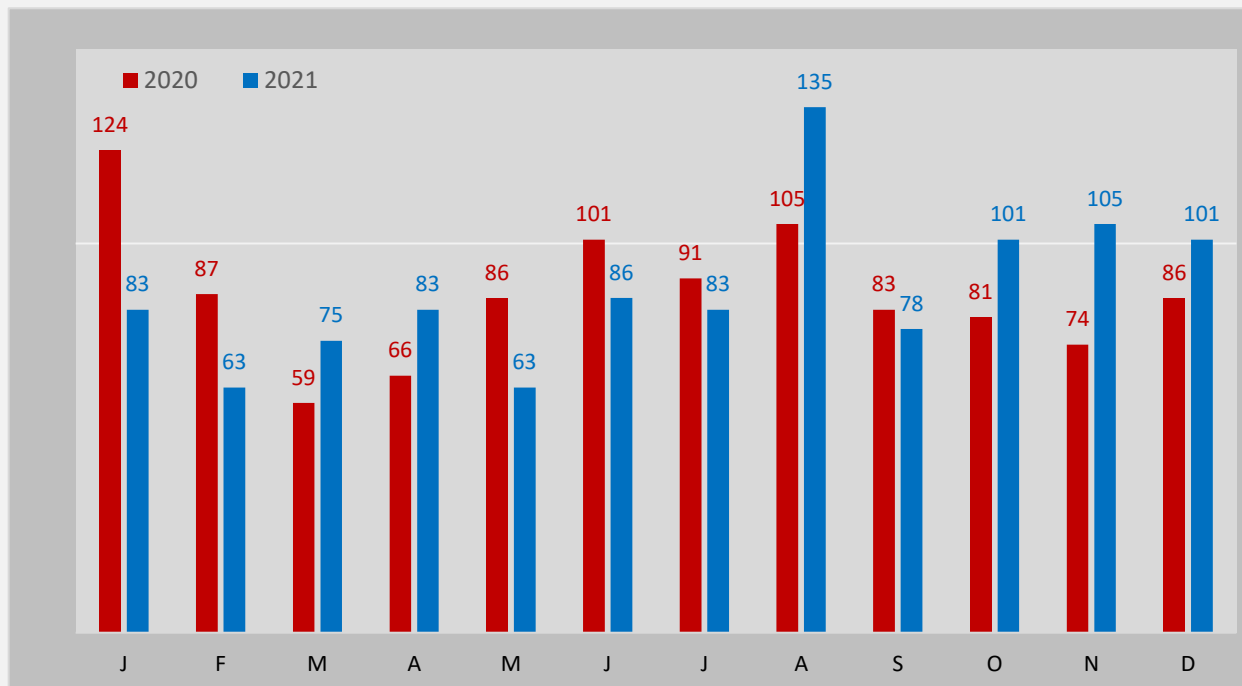
3.10b Individuals hit by trains outside LC per train-km by month



Perimeter: 23 countries

base 100 = same month 2019

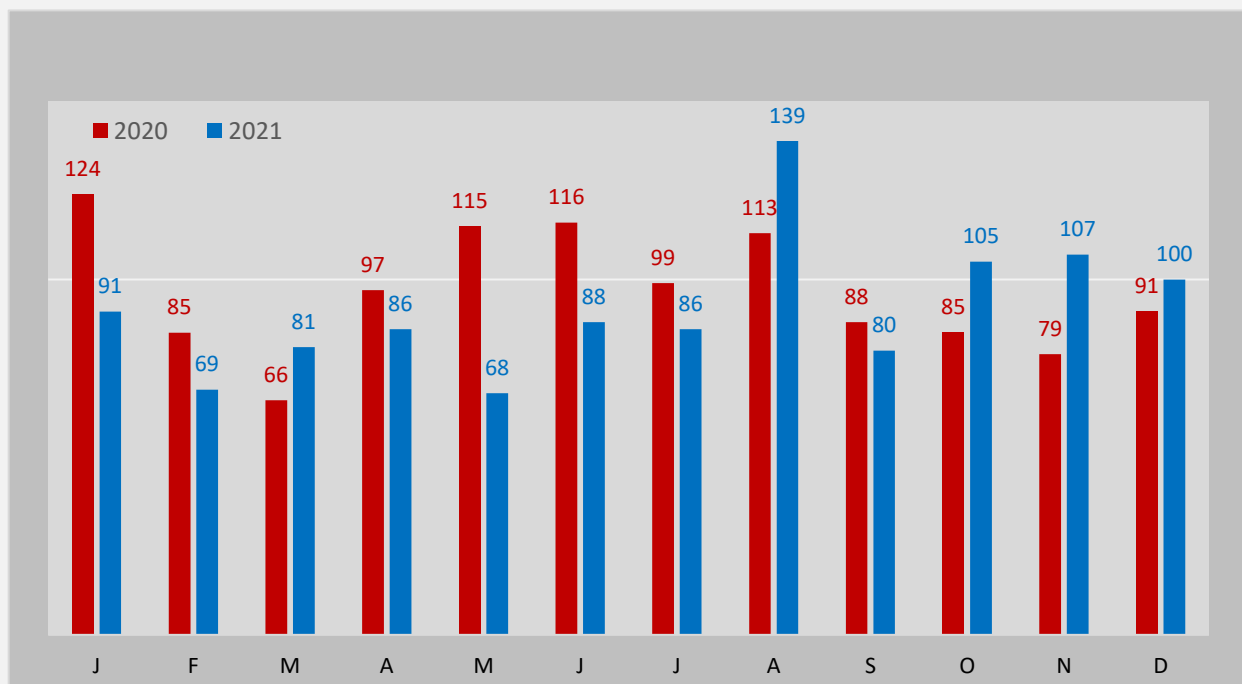
3.11a Victims by month



Perimeter: 23 countries

base 100 = same month 2019

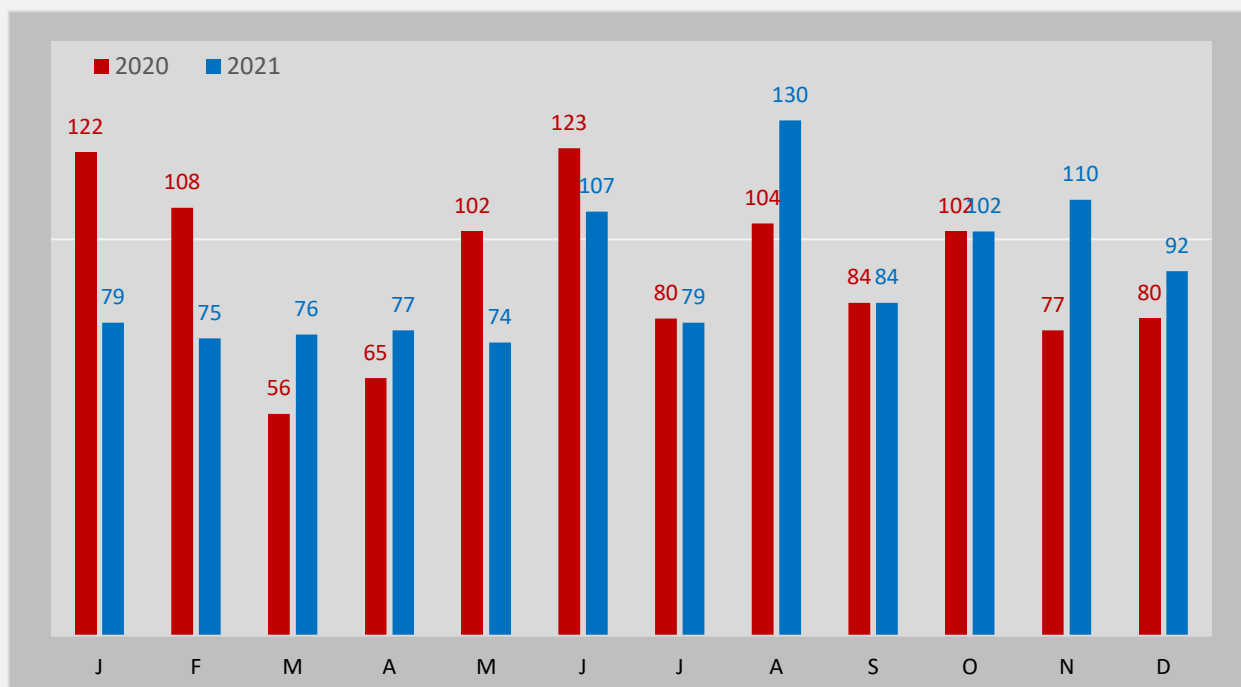
3.11b Victims per train-km by month



Perimeter: 23 countries

base 100 = same month 2019

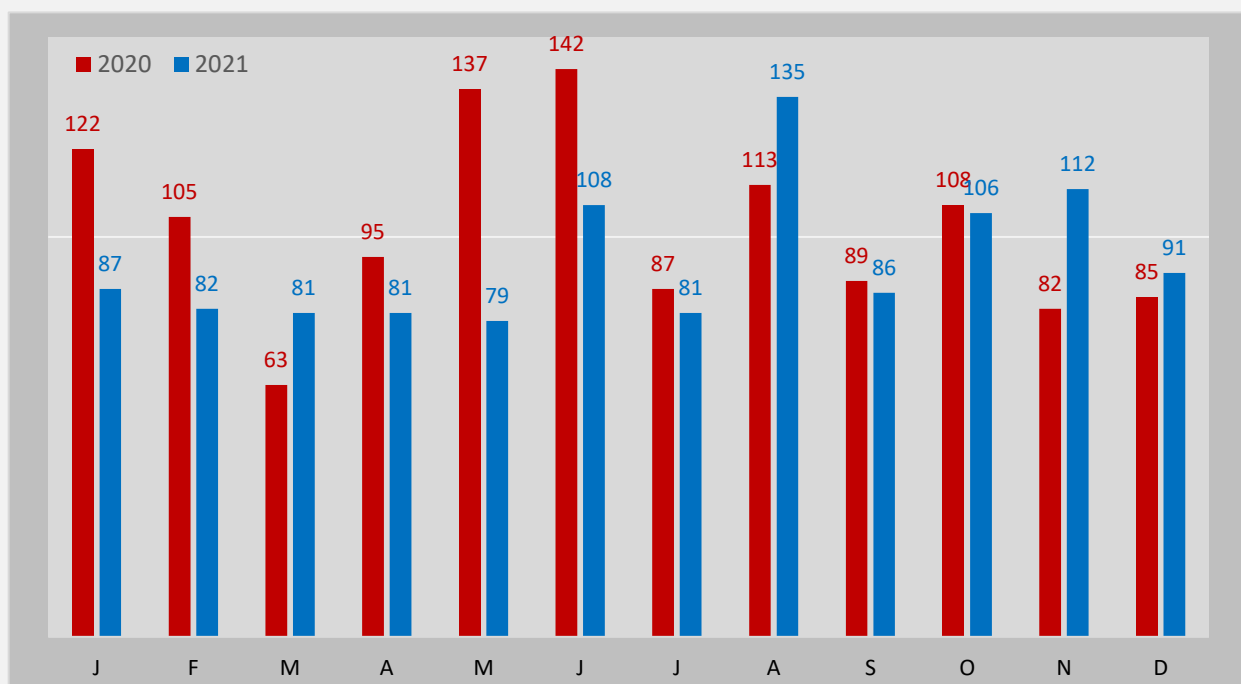
3.12a Fatalities by month



Perimeter: 23 countries

base 100 = same month 2019

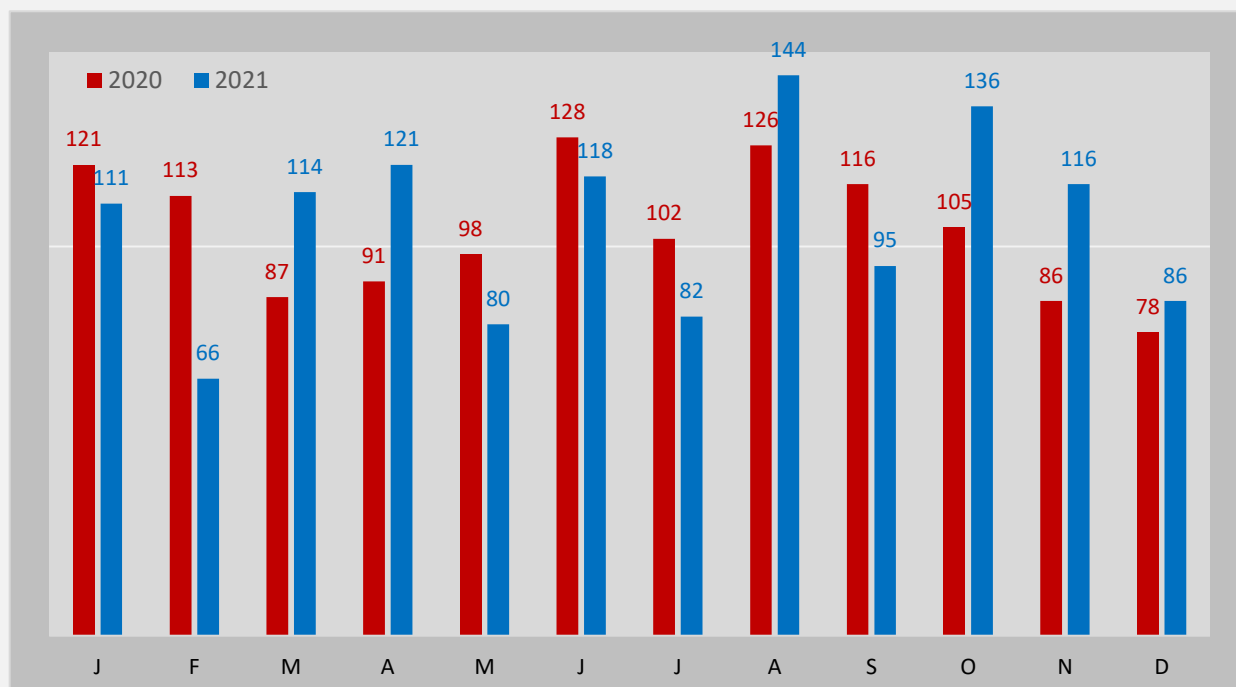
3.12b Fatalities per train-km by month



Perimeter: 23 countries

base 100 = same month 2019

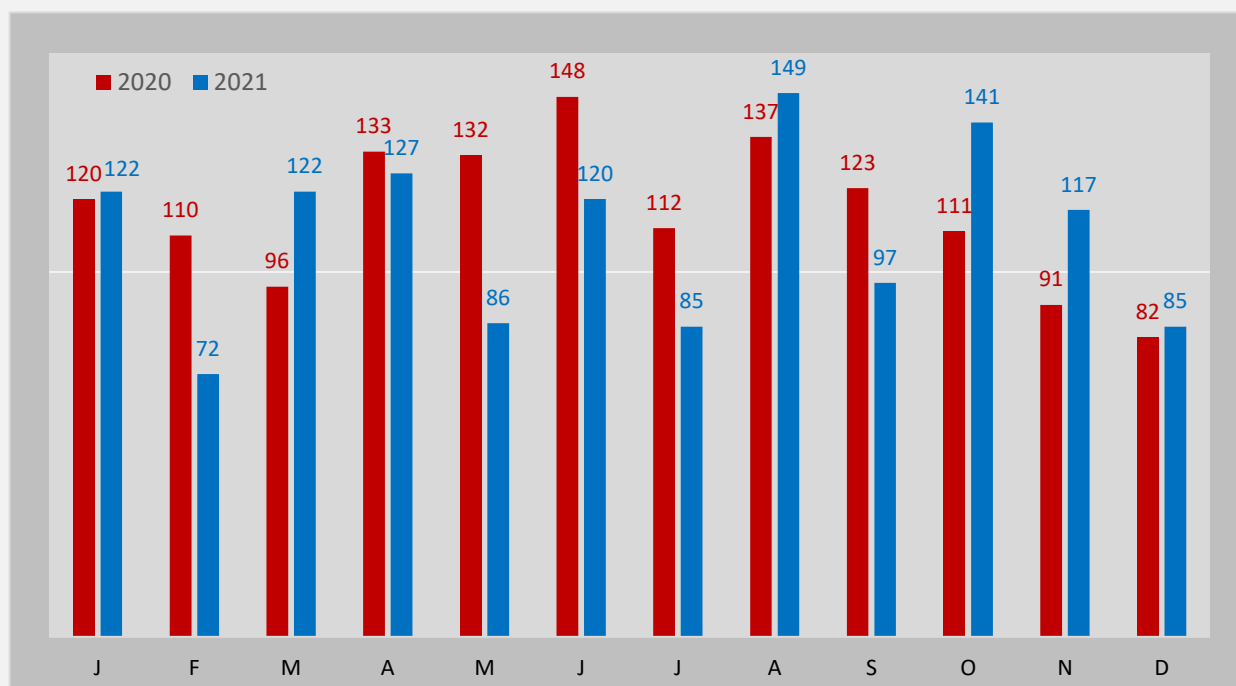
3.13a Safety index of accidents involving passenger and freight trains by month



Perimeter: 23 countries

base 100 = same month 2019

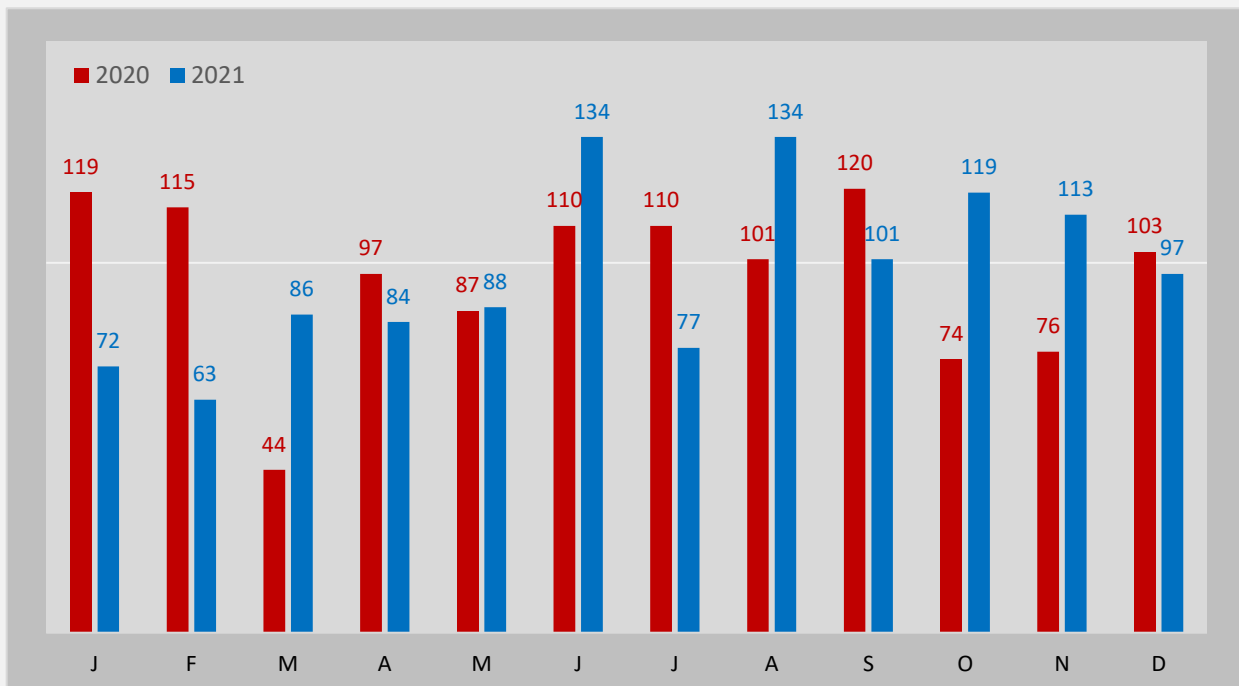
3.13b Safety index of accidents involving passenger and freight trains per train-km by month



Perimeter: 23 countries

base 100 = same month 2019

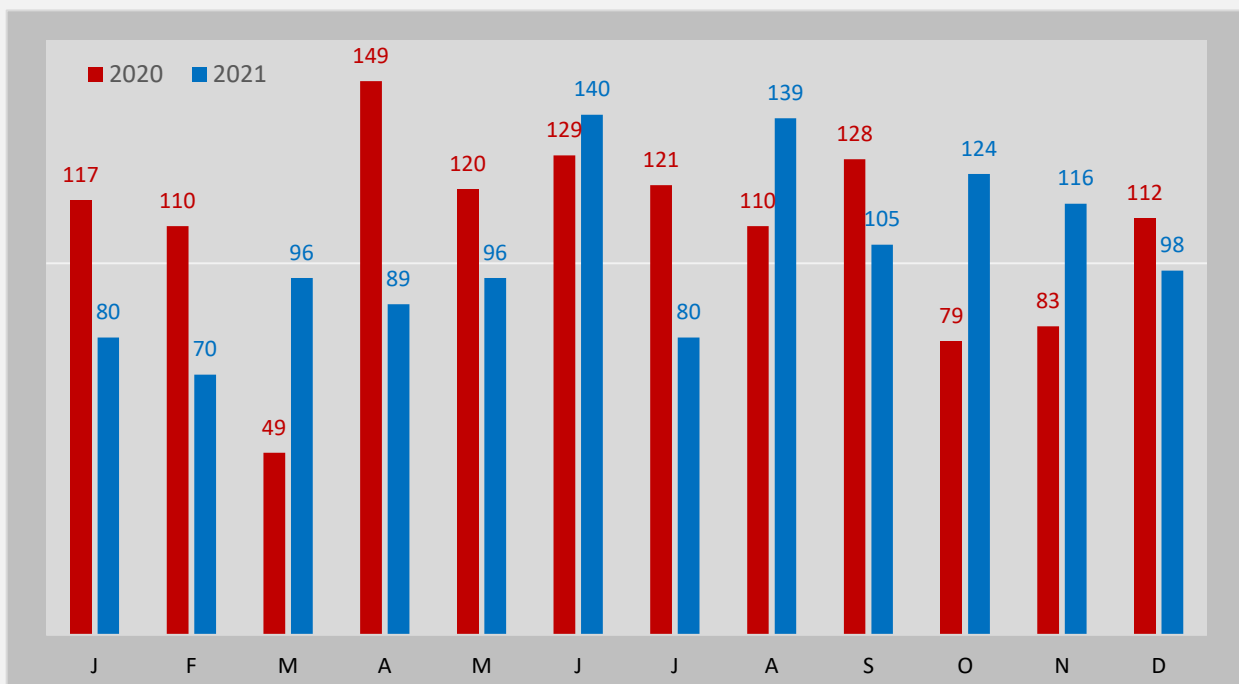
3.14a Safety index of accidents involving passenger trains by month



Perimeter: 23 countries

base 100 = same month 2019

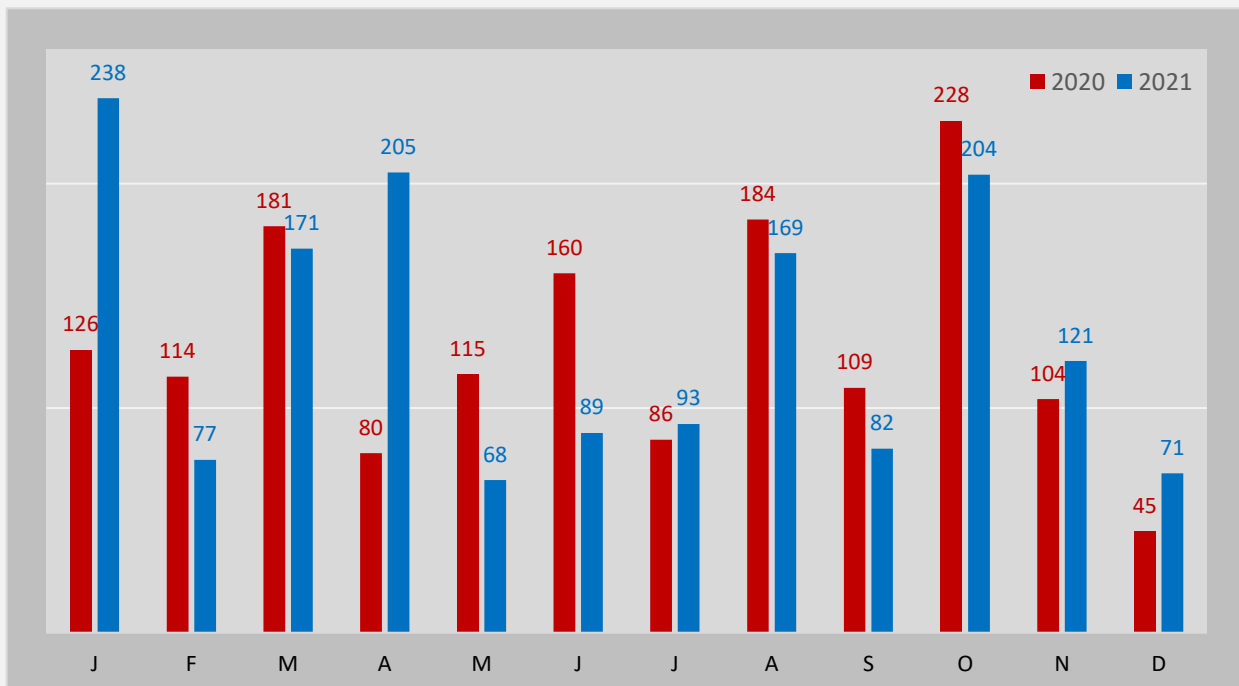
3.14b Safety index of accidents involving passenger trains per train-km by month



Perimeter: 23 countries

base 100 = same month 2019

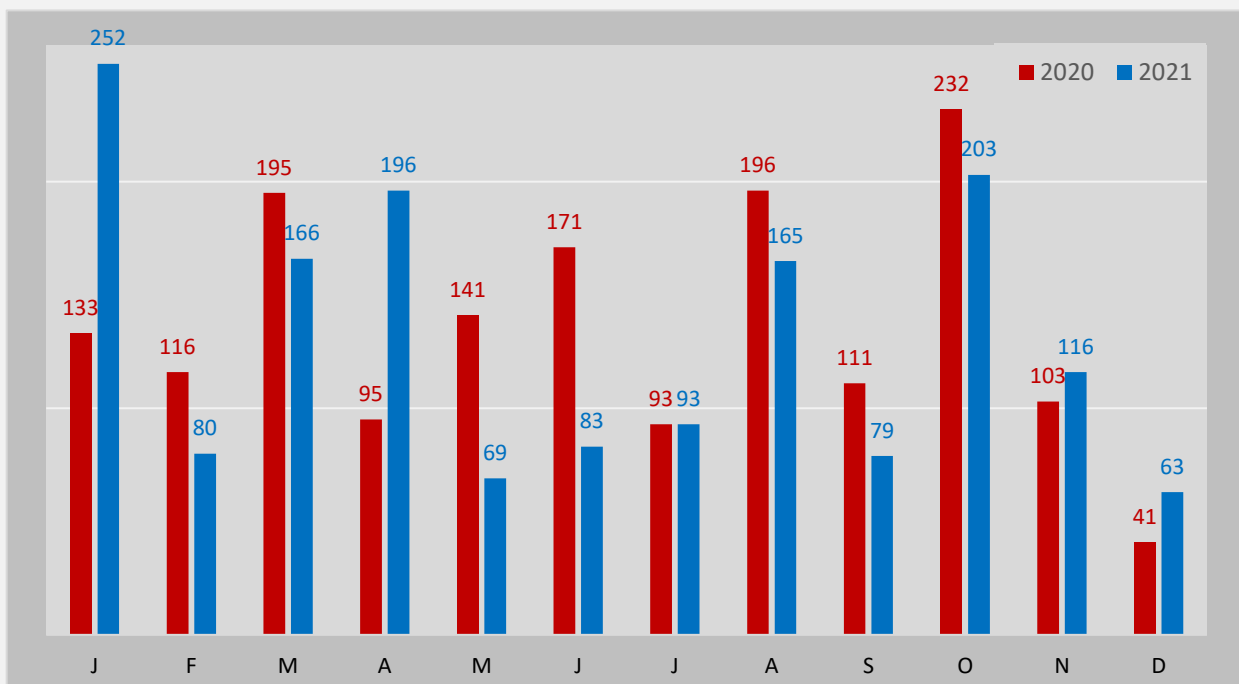
3.15a Safety index of accidents involving freight trains by month



Perimeter: 23 countries

base 100 = same month 2019

3.15b Safety index of accidents involving freight trains per train-km by month



Perimeter: 23 countries

base 100 = same month 2019

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.

UIC Safety Database

Report 2022

Significant Accidents 2021

Public report available on the UIC website

<http://safetydb.uic.org>



Contact

UIC Safety Unit
International Union of Railways
16 rue Jean Rey - F-75015 Paris
safety@uic.org
www.uic.org

INTERNATIONAL UNION OF RAILWAYS
16, rue Jean Rey - 75015 Paris - France
Tel. +33 (0)1 44 49 20 20
Fax +33 (0)1 44 49 20 29
Email: info@uic.org

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